UNIVERSITÉ DU QUÉBEC À MONTRÉAL

PRACTICES AND PERSPECTIVES FOR DEVELOPING DIGITAL INTERPRETATION PROJECTS IN CROSS-SECTORAL COLLABORATIONS BETWEEN MUSEUMS AND TECHNOLOGY PARTNERS

THESIS

PRESENTED

AS PARTIAL REQUIREMENT

OF THE DOCTORATE IN MUSEOLOGY, INTERPRETATION, HERITAGE

BY

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APRIL 2026

UNIVERSITÉ DU QUÉBEC À MONTRÉAL

PRATIQUES ET PERSPECTIVES POUR LE DÉVELOPPEMENT DE PROJETS DE MÉDIATION NUMÉRIQUE DANS LE CADRE DE COLLABORATIONS INTERSECTORIELLES ENTRE MUSÉES ET PARTENAIRES TECHNOLOGIQUES

THÈSE

PRÉSENTÉE

COMME EXIGENCE PARTIELLE

DU DOCTORAT EN MUSÉOLOGIE, MÉDIATION, PATRIMOINE

PAR

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AVRIL 2026

ACKNOWLEDGEMENTS

First, I want to express my sincerest gratitude to Dr. Anik Meunier. So much of the doctoral journey is shaped by the quality of the relationship between supervisor and student, and Anik's wise guidance, intellectual rigor, and steadfast encouragement imbued this academic marathon with pleasure. Most of all, I thank her for respecting my rhythms as a scholar and as a human. I would wish the same for every PhD candidate.

As the jury for this dissertation, Dr. Florence Andreacola (Université Grenoble Alpes), Dr. Yves Bergeron (UQAM), and Dr. Haitham Eid (Southern University at New Orleans) gave me invaluable feedback that was truly *constructive.* Doctoral seminars and discussions with Dr. Jean-Marie Lafortune, Dr. Jason Luckerhoff, Dr. Catherine Saouter, and Dr. Magali Uhl inspired fresh directions for this research project.

I had the enormous privilege of completing a doctoral residency at the École du Louvre's Centre de recherche, thanks to Dr. François-René Martin, with funding from the Gail and Stephen A. Jarislowsky Institute for Studies in Canadian Art at Concordia University and the UQAM Groupe de recherche sur l'éducation et les musées (GREM). The mentorship I received from Dr. Jacqueline Eidelman during that spring in Paris was transformative.

I wish to thank Charlène Bélanger and Rose Mercier-Marcotte for facilitating the preliminary study of the PRISM innovation cell program at the Montreal Museum of Fine Arts. This dissertation was enriched through reference interviews conducted with Noémie Couillard (Voix/publics), Eva Sandri (Université Paul Valéry Montpellier 3), Koven Smith (Knight Foundation), and Florence Vielfaure (Ministère de la Culture).

I would also like to heartily thank the web of professional and academic communities that supported my work, especially the Museum Computer Network, the ICOM International Committee for Education and Cultural Action, and the GREM x l'École du Louvre international research seminar.

Thirty-one museum professionals and technology providers graciously shared their time and perspectives as participants in this research project. I was honoured to be trusted with their words (and grateful for such eloquent data).

This dissertation was a full-body effort that required living into new stories. I would not have been able to sustain the work without Megan generously helping me unearth my capability, while also pulling up a chair to undo my aloneness at the desk. Leigh Hopkins and Lidia Yuknavitch of Corporeal Writing facilitated metamorphic spaces to make art about the embodied experience of writing this dissertation. Daniele midwifed me through the process of decomposition so I could birth my own fluidity.

To borrow a concept that will be explored in this thesis, I'd like to thank my ecosystem of family, friends, and colleagues for "augmenting my capacity" to do this work through their emotional, logistical, spiritual, and corporeal care. Thanks to my husband for believing in the inevitability of my boldness, and for supporting this work through domestic labour. Thanks to my son for the radiant joy of his existence, and for making me a MOTHER. Thanks to my grandmothers for modeling life-long love affairs with education and the arts.

Thanks to my mother for blazing so many trails (including this doctoral one), and for listening with curiosity and compassion to my stories from the desk.

Lastly, I would like to offer my gratitude to my local forest for holding me during this process—in particular, to the reverent maples, audacious evergreens, ruffly lichens, pillowy mosses, operatic ferns, encouraging berries, chirping birds, grumpy squirrels, ruminating deer, embracing shadows, contemplative clouds, numinous aromas, regulating marshes, persistent streams, sage rocks, and mysterious roots. You met me in the freeze of winter and guided me into this muddy thaw. *Merci.*

May the care poured into me
Flow back out into the world
Through my actions and my words.

DEDICATION

To my mother and to my child,

of course
and always.

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ABSTRACT

This dissertation is an examination of the dynamics and procedures within cross-sectoral collaborations between museum teams and technology companies. Through the lens of the collaborative development of museum interpretation projects using ever-changing digital technologies, the study of these public/private partnerships facilitates an analysis of the factors impacting the capacity of museum teams to support institutional objectives for serving their audiences in the postdigital era. This research project proposes using the metaphor of museum professional ecosystems to conceptualise cross-sectoral collaborations as ecotones—the transitional areas where distinct ecosystems meet and interact. These hybrid spaces mobilize the questions facing museum teams around the themes of process and partnership, sustainability and innovation, capability and imagination, resources and relevance, vulnerability and dependence, conservation and transformation.

To anchor the research in the shifting developments in the field, this doctoral project adopts a qualitative and inductive methodological approach. A preliminary study was conducted to analyze a collaborative digital interpretation development program led by the PRISM innovation laboratory at the Montreal Museum of Fine Arts. A theoretical framework was subsequently developed to guide a study of the professional practices and perspectives of international museum workers and technology partners regarding the collaborative development of digital interpretation projects. The findings are examined as both a linear collaborative process and through a deeper exploration of the interplay between the transversal themes of museum interpretation, digital capacity, and cross-sectoral collaborations.

The diversity of procedural structures, professional practices, and interpersonal dynamics present in the collaborative development of digital interpretation projects—across different contexts and constraints—reveals the complexities inherent to visitor-facing digital museum work. This dissertation concludes that the examination of ecotone activities at the edge of museum professional ecosystems provides a fertile perspective for analyzing the challenges and potentials that characterise this ever-evolving field.

Keywords: digital interpretation, visit experience, cross-sectoral collaborations, museum professional ecosystems, ecotones, postdigital, partnership models, development processes, innovation, digital capacity, digital transformation, digital imaginaire

RÉSUMÉ

Cette thèse examine les dynamiques et les démarches au sein des collaborations intersectorielles entre les équipes des musées et les entreprises technologiques. À travers le développement collaboratif de projets de médiation muséale utilisant des technologies numériques en constante évolution, l'étude de ces partenariats public-privé permet d'analyser les facteurs qui influent sur la capacité des équipes des musées à soutenir les objectifs institutionnels visant à répondre aux besoins de leur public à l'ère post-numérique. Ce projet de recherche propose de s'appuyer sur la métaphore des écosystèmes professionnels muséaux pour conceptualiser les collaborations intersectorielles comme des écotones, c'est-à-dire des zones de transition où des écosystèmes distincts se rencontrent et interagissent. Ces espaces hybrides mobilisent les questions auxquelles sont confrontées les équipes muséales autour des thèmes du processus et du partenariat, de la durabilité et de l'innovation, de la capacité et de l'imagination, des ressources et de la pertinence, de la vulnérabilité et de la dépendance, de la conservation et de la transformation.

Afin d'ancrer la recherche dans les évolutions constantes du domaine, ce projet de doctorat adopte une approche méthodologique qualitative et inductive. Une étude préliminaire a été menée pour analyser un programme collaboratif de développement de médiation numérique mené par le laboratoire d'innovation PRISME du Musée des beaux-arts de Montréal. Un cadre théorique a ensuite été élaboré afin d'orienter une étude sur les pratiques et les perspectives des professionnels des musées internationaux et des partenaires technologiques en matière de développement collaboratif de projets de médiation numérique. Les résultats sont examinés à la fois comme un processus collaboratif linéaire et à travers une exploration plus approfondie de l'interaction entre les thèmes transversaux de la médiation muséale, des capacités numériques et des collaborations intersectorielles.

La diversité des modes de fonctionnement, des pratiques professionnelles et des dynamiques interpersonnelles présentes dans le développement collaboratif de projets de médiation numérique—dans différents contextes et avec différentes contraintes—révèle la complexité inhérente au travail muséal numérique destiné aux visiteurs. Cette thèse conclut que l'examen des activités écotones à la périphérie des écosystèmes professionnels muséaux offre une perspective fertile pour analyser les défis et les potentiels qui caractérisent ce domaine en constante évolution.

Mots clés : médiation numérique, expérience de visite, collaborations intersectorielles, écosystèmes professionnels des musées, écotones, post-numérique, modèles de partenariat, processus de développement, innovation, capacité numérique, transformation numérique, imaginaire numérique

INTRODUCTION

> *Le numérique y est la pierre angulaire d'un partage entre les rêves de transformation politique et sociale à un niveau de « haute » politique dans lequel s'investissent théoriciens, acteurs politiques et journalistes, et le souci d'entretenir et de faire évoluer le musée en dépit des contraintes, des injonctions, compte tenu des moyens, grâce à des intensifications de la réflexion sur dans le cadre d'un projet.*
> - Joëlle Le Marec[1]

In 2016, the San Francisco Museum of Modern Art (SFMOMA) opened its doors after a three-year closure, inviting visitors to discover a newly expanded facility—and a new mobile application. This app quickly caught the attention of the wider museum technology community and beyond, as seen in headlines like: "The SFMOMA's New App Will Forever Change How You Enjoy Museums[2]" and "See How SFMOMA Is Re-inventing the Museum-Tour Audio Game[3]." Rather than a traditional museum audio guide experience of punching in a number to access content about artworks, the SFMOMA app used location-aware technology that could adjust (and even auto-play) audio content based on where a visitor was located, creating "an uncanny sense that the narrator is 'aware' and responsive to your presence" (Pau, 2017). This ambitious project was codeveloped with Detour, a local start-up that created location-based audio walking tours, in a partnership that augmented the museum's digital capacity:

> Rather than building the SFMOMA app from the ground up—an endeavor that was beyond the scope of our budget and in-house expertise—we realized that we had an opportunity to form a mutually beneficial partnership. The SFMOMA app would integrate key features of Detour's backend, while Detour would gain a museum partner willing to manage the risks involved with developing what had until that point been elusive: a story-first, indoor, location-aware app experience. (Pau, 2017)

This "mutually beneficial partnership" was not the only collaborative structure that supported the development and operationality of the app. The museum also partnered with a brand strategy firm, a

[1] From the preface to Eva Sandri's *Les imaginaires numériques au musée ? : débats sur les injonctions à l'innovation* (2020, p. 13).

[2] "The SFMOMA's New App Will Forever Change How You Enjoy Museums", Wired, Published: May 5, 2016, Retrieved: September 6, 2025. Available https://www.wired.com/2016/05/sfmoma-audio-tour-app/

[3] "See How SFMOMA Is Re-inventing the Museum-Tour Audio Game", Vanity Fair, Published: May 6, 2016, Retrieved: September 6, 2025. Available https://www.vanityfair.com/culture/2016/05/see-how-sfmoma-is-re-inventing-the-museum-tour-audio-game

research and strategy agency, an audio production company, independent audio contributors, and even a nearby historical society that displayed photographs that could be visited as part of a neighbourhood audio tour (Pau, 2017). Grants from Bloomberg Philanthropies and the Institute of Museum and Library Sciences supported the work (Pau, 2017). And within the museum itself, a cross-disciplinary approach brought in internal stakeholders beyond the core project team; governance and advisory committees provided accountability and expertise to help ensure the relevance of the app (Pau, 2017).

The resulting visit experience aimed to be engaging, immersive, and fun. When visitors opened the app, the voice of radio journalist Marianne McCune introduced the experience: "The guides will tell you where to go. They'll wait for you, because they know where you are too. Oh, that sounds creepy—it's not[4]." Beyond audio commentaries for individual artworks, users could also select from a series of 15 to 45-minute Immersive Walks. These audio tours were guided by a wide range of narrators: "I Don't Get It" brought comedians from HBO's *Silicon Valley* into conversation with an SFMOMA curator (Figure 0.1); "Unbalanced" featured high-wire walker Philippe Petit musing about artists who were obsessed with color, material, form, and the limits of art itself. This approach to museum interpretation fell within a broader institutional content strategy that valued storytelling informed by curatorial expertise, as outlined by Chad Coerver, then SFMOMA Chief Content Officer:

> What most visitors really need is a story—a memorable, emotionally resonant way to connect with a fundamentally foreign object. When I say *story*, I don't mean the reason why the work is important according to terms established by the high priests of art history (alas, what many art museums offer their befuddled visitors). Rather, I am talking about something closer to a seduction, delivered with a tone that is by turns curious, passionate, open, and excited to share. *Hey, welcome! I am super excited to tell you a really cool story about this thing, because I think you're going to find it fascinating and compelling.* The art object must become, in Nina Simon's parlance, a social object. And it has to happen within the three to fifteen seconds a visitor typically glances at an artwork[5].

When this human-centered approach was delivered in the vehicle of Detour's digital platform, these audio stories were able to "create magical intersections with physical reality" (Pau, 2017). Visitors could leave their phones in their pockets as they were guided through the galleries by vocal cues attuned to their

[4] "The SFMOMA's New App Will Forever Change How You Enjoy Museums", Wired, Published: May 5, 2016, Retrieved: September 6, 2025. Available https://www.wired.com/2016/05/sfmoma-audio-tour-app/

[5] Chad Coerver (2016). "On Digital Content Strategy." On SFMOMA.org. Exact publish date unknown. Consulted September 6, 2025. Available https://www.sfmoma.org/read/on-digital-content-strategy/

precise locations, allowing them to keep their eyes on the artworks. QR codes enabled groups of users to sync their devices and listen to audio at the same time, facilitating shared experience and interaction.

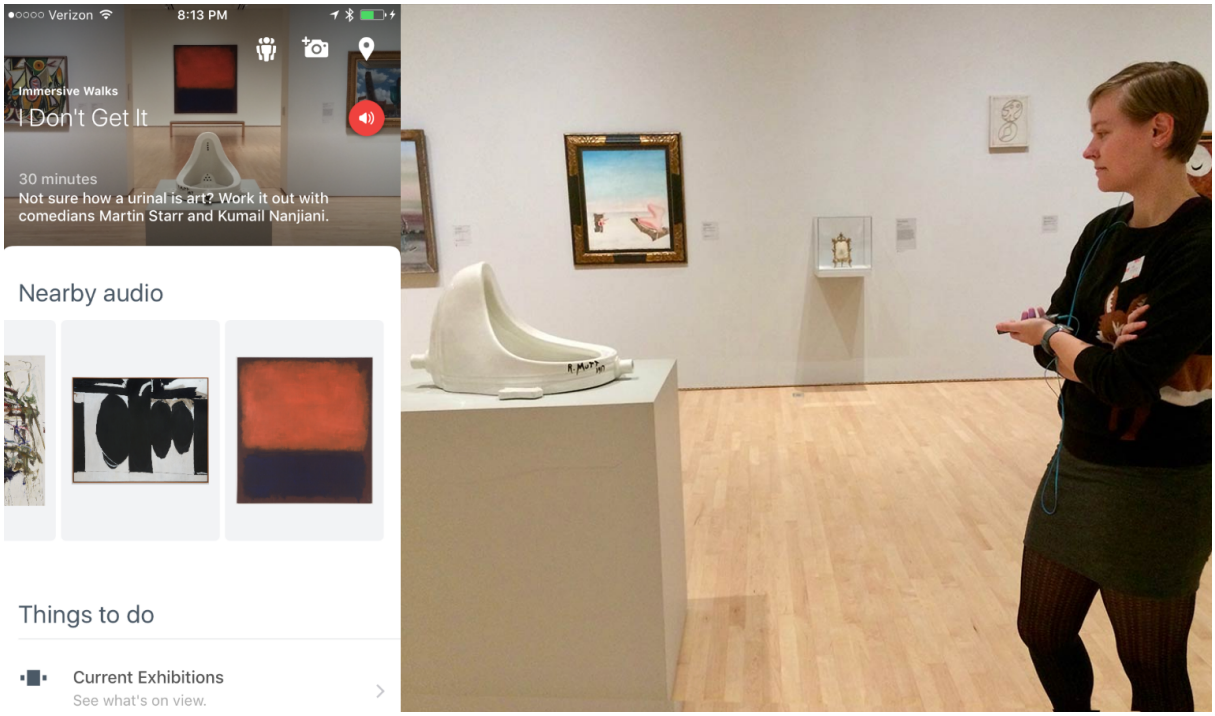

Figure 0.1 Screen capture of the SFMOMA App[6]; and an SFMOMA app user beginning the "I Don't Get It" Immersive Walk in front of Marcel Duchamp's Fountain (1917/1964), photograph: Frankly, Green + Webb (Pau, 2017).

At the beginning of this PhD program, I had the opportunity to test the SFMOMA app while visiting family. We easily synced our devices after downloading the app over the museum's free Wi-Fi. As Philippe Petit guided us between floors of the museum in "Unbalanced", Monsieur Petit chatted in our ears about the themes of the visit. As the *Silicon Valley* comedians cracked jokes about Marcel Duchamp's Fountain in "I Don't Get It", our little group laughed at the same time rather than in syncopated bursts. I kept my phone in my bag the whole time.

This type of digitally facilitated in-gallery experience seemed like a natural direction for my doctoral research. I had spent my master's program investigating how the interpretation objectives of museum professionals were translated into mobile digital projects for their audiences, and how those projects in turn impacted museum discourses and visitor experience (Gross-Hoy, 2012; Gross-Hoy, 2014). My

[6] "GLAMi nomination: The SFMOMA App", *MW 2017*, Exact publish date unknown, Retrieved: September 6, 2025. Available https://mw17.mwconf.org/glami/the-sfmoma-app/index.html

professional experience as a project manager[7] for a company that produced on-site augmented reality (AR) interpretation experiences with museums allowed me to witness firsthand the diversity of approaches to working with these new technologies across different types of institutions and collections. For my doctoral research, a digital interpretation tool could be the focus of a methodological approach that included an analysis of the perspectives of both the museum team and visitors, an examination of how the tool participates in the communication process of the exhibition space (Gross-Hoy, 2014), and an exploration of the impact of digital expertise on conceptions of visit experience. And centering this research on immersive and story-led digital interpretation projects—such as SFMOMA's novel pairing of high-quality audio content with Detour's location-aware technology—promised to be a rich terrain for continuing to explore the intersections of narrative, embodiment, imagination, participation, and informal learning as facilitated by mobile digital technologies.

When it came time to design the research project for this dissertation, however, the study of digitally facilitated in-gallery experiences was rendered impossible, indefinitely. The arrival of the COVID-19 pandemic ushered in a large shift in how museums utilized digital technologies to engage with their audiences (Chaumier, 2020; Marty & Buchanan, 2022). Rather than designing projects to bring visitors together for shared in-person experiences, cultural institutions were faced with the challenge of serving their audiences from their own homes. Many museums made concentrated efforts to translate their interpretation offerings, educational programming, and even visit experiences onto digital platforms (ICOM, 2020). The subsequent waves of the pandemic, punctuated by the arrival of new COVID-19 variants, led museums to also experiment with hybrid models for programming, where digital tools allowed for visit experiences both in the museum and at home. The shifting realities of creating and sustaining digital museum work mandated a pivot in the direction of my doctoral research on interpretation projects using new technologies.

But ultimately, it was not the pandemic that precluded the possibility of analyzing the visit experience facilitated by the SFMOMA app within this dissertation. In 2018, two years after launch, the start-up

[7] I worked as a project manager for GuidiGO from 2017-2018, participating in the storyboarding and development of AR experiences with a dozen North American museums. Projects included the *Lumin Mobile Tour* at the Detroit Institute of Arts (https://dia.org/about/media-room/news/detroit-institute-arts-premiere-lumin-mobile-tour-using-augmented-reality-0), *Still & Art* at the Clyfford Still Museum (https://clyffordstillmuseum.org/exhibitions/still-art/), and the *1907 Tour* at the Morgan Library & Museum (https://www.mediacombo.net/case-study/morgan-library-augmented-reality-audio-tour).

Detour was acquired by audio giant Bose[8], who decided to turn off all Detour's services. The museum's app, "entirely dependent on external partners to operate and maintain[9]," no longer had access to the location-aware technology it needed to function. Four weeks later, the SFMOMA app was deleted from the App Store[10].

* * *

Visitor-facing digital projects participate directly in the communication role of museums. Digital interpretation tools are fundamentally *interpretation* tools; and, like other interpretation strategies, they are involved in shaping the visitor experience and the resulting construction of meaning in the museum context (Davallon, 2000; O'Neill & Dufresne-Tassé, 2010). When museum teams create digital interpretation projects for their audiences, they must integrate institutional objectives for visitor experience, including learning, meaning-making, and sensory engagement (Falk & Dierking, 2013), with an understanding of the specificities of working with digital technologies as communication tools (Parry, 2008; Sandri, 2020). But researching, developing, and maintaining relevant digital tools requires important allocations of budgetary and staff resources, which are often beyond the scope of museums (Parry, 2008). Many cultural institutions report possessing inadequate levels of in-house digital skills and knowledge (Parry et al, 2018; Silvaggi & Pesce, 2017). The use of these new communication mediums can even influence the structure of museum organisations, such as through the creation of new digital museum roles (Marty, 2006a) and the decloistering of digital competencies by training professionals across departments in digital skills (Parry et al, 2018; Tallon, 2017).

Western museums have entered a postdigital era, where digital technology has become normative in the larger sociocultural contexts (Parry, 2013). To be seen as dynamic and relevant institutions, museums are increasingly expected to utilize ever-evolving digital technologies in their visitor-facing efforts (Appiotti & Sandri, 2020). Investments and experimentations in these digital activities have the potential to grow

[8] Andrew Mason (2018). "Detour: The Next Chapter", *Medium*. Published April 20, 2018. Consulted September 6, 2025. Available https://medium.com/detour-dot-com/detour-the-next-chapter-6f1aa2d97a14

[9] Aaron Straup Cope (2020). "Talking about the Pen without talking about the Pen", *this is aaronland.* Published April 26, 2024. Consulted September 6, 2025. Available https://www.aaronland.info/weblog/2024/04/26/matrix/

[10] Keir Winesmith (2020, p. 131). "Conversation 7: Shelley Bernstein + Seb Chan." In K. Winesmith and S. Anderson (Eds.), *The Digital Future of Museums: Conversations and Provocations* (pp. 122-140). Routledge.

audiences and increase revenue, as well as shift public perceptions of museums (Tamma & Artico, 2015). While producing interpretation tools using new communication technologies to engage with visitors is not a new phenomenon in museums (Annhernu, 2019)—and while museums have been working with digital technologies for decades (Sandri, 2016; Tallon & Walker, 2008)—, the growing expectation that digital offerings will be integrated into museum experiences puts pressure on museums to engage with digital practices, regardless of the skills and infrastructures present within their institutions (Jacobi, 2012). More broadly, this ceaseless demand for digital projects can leave museums without adequate space for critical reflection on the long-term implications of their digital practices and the relevance of the digital interpretation tools they create (Rosa, 2010; Sandri, 2016).

The restrictions of the COVID-19 pandemic brought another significant shift in museum digital practice, exacerbating the expectations that cultural institutions would use digital technology to connect with their visitors through virtual interpretation experiences (Chaumier, 2020; ICOM, 2020). Many institutions chose to quickly pivot—or invent—their digital practices for visitor engagement. Some museum professionals reported that "greater institutional appetite had enabled new possibilities for experimentation with digital" (Frost, 2025, p. 53), including through increased skill acquisition. The demand to offer digital experiences was urgent, as museums were struggling financially and needed to prove their cultural relevance for both public and private funding, while also facing continued losses in revenue (AAM, 2020) with decreased admissions income due to rolling health-mandated closures and reduced visitor capacity, as well as "reduced earnings from space rentals, cafe and retail sales, investment earnings, and philanthropic donations" (Marty & Buchanan, 2022). However, these same pandemic-related financial struggles resulted in eliminating many staff positions (ICOM, 2020), including the jobs of many museum technology professionals:

> As budgetary constraints forced museum directors to focus on only essential staff, technology departments were often significantly downsized even as remaining employees were expected to reinvent their museum's digital strategy and develop new digital experiences seemingly overnight. (Marty & Buchanan, 2022)

Thus, while digital projects were in increasing demand, there were overall fewer on-staff technology specialists in museums—and the ones who remained were often overworked and under-resourced (Frost, 2025). This phenomenon translated into decreases in institutional knowledge about "museum computing, digital technologies, audience engagement, and online outreach" (Marty & Buchanan, 2022) and the increased need to partner with external service providers to create digital projects.

Pandemic-mandated measures eventually ceased, and museums re-opened their doors to visitors. But, on the other side of the health crisis, cultural institutions are still facing questions about the direction of their digital activities:

> Today we are at a different pivot point, a different catalytic moment, confronting the question of whether to return to 'business as usual' or to continue the pivot towards digital. Museums have found themselves asking whether they should forget about what happened during periods of closure during the pandemic and just go back to the same old ways of working, or alternatively to take the opportunity to pause, reflect, and re-imagine. We are left reflecting upon why it took a catastrophic event to force museums to change their relationship with digital so fundamentally, so quickly, and unquestionably. What did we learn during this time? What do we want to take forward with us? How do we embed a digital mindset that was so necessary during closure into a permanent, critical feature of the culture of museums in the future? (Royston, 2025, p. xxiv)

The rapid pace of technological acceleration, and the increased expectations for museums to produce digital projects, make it difficult for museum digital workers to have the space to "pause, reflect, and re-imagine" institutional digital strategy and professional practice (Rosa, 2010; Sandri, 2016). Beyond the changes stemming from the pandemic, museums are also grappling with the challenges of engaging with emerging technologies, like Artificial Intelligence, amidst a context of larger societal challenges. With so much unpredictability, "the parameters and contexts around the museum and its use of digital technology continue to shift, remaining fluid, 'convoluted' (Frost & Vargas, 2024), and open to rapid change" (Parry et al., 2025, p. 25). These open questions—reflecting on how to strategically shape institutional relationships with digital culture, in a quickly transforming context, in order to be equipped to face the future—are not unique to museum professionals. In 2021, French president Emmanuel Macron announced France 2030, a major investment project that responded to the challenges of the era (particularly climate change) by working to "faire émerger les futurs champions technologiques de demain[11]." In the wake of the vulnerabilities and foreign dependencies exposed during the pandemic, France 2030 aims to foster a more robust French digital ecosystem, including through the objective to "maîtriser les technologies numériques souveraines et sûres[12]". This initiative impacts the operational priorities of French museums operating within the purview of the Ministère de la Culture, which supports

[11] "Présentation du plan France 2030", *Élysée.* Published: October 12, 2021 Retrieved: September 6, 2025. Available https://www.elysee.fr/emmanuel-macron/2021/10/12/presentation-du-plan-france-2030

[12] "Discours du Président de la République à l'occasion de la présentation du Plan France 2030", *Élysée.* Delivered: October 12, 2021. Retrieved: September 6, 2025. Available https://www.elysee.fr/emmanuel-macron/2021/10/12/presentation-du-plan-france-2030

this broader governmental mandate for digital acceleration towards modernisation and innovation[13]. In Canada, a similar measure was undertaken on a provincial level through the Plan culturel numérique du Québec (PCNQ), launched by Quebec's Ministry of Culture and Communications in 2014. As part of their investment in developing digital practices in the Quebec cultural field, the PCNQ mandated the creation of a collaborative innovation laboratory within the Montreal Museum of Fine Arts with a focus on Quebec digital museum interpretation, bringing together museum professionals with local start-ups and scholars to develop new ways of collaborating on visitor-facing projects[14]. Like France 2030, the PCNQ aimed to equip its cultural institutions for the future by cultivating durable local networks and plunging strategically into digital transformation. These broad governmental initiatives reveal larger societal preoccupations with questions of *how* to engage sustainably in digital practice, as well as *with whom* to partner.

This dissertation explores these themes of practice and partnership, sustainability and innovation, vulnerability and dependence, transformation and conservation. When *digital interpretation* tools are treated fundamentally as *interpretation* tools, visitor-facing digital projects can be understood as operating within the larger paradigm of a cultural institution's communication with their audiences. Through the lens of developing museum interpretation projects using ever-changing digital technologies, the examination of the professional practices and collaborative processes utilized by digital museum workers—grounded in their technical expertise and lived experience working in museum contexts—will facilitate the analysis of the factors impacting the capacity of museum ecosystems to support institutional objectives for serving their audiences at this pivotal moment in time.

Overview of the thesis

Digital interpretation in museums is a phenomenon in movement, composed of elements that are difficult to stabilize and isolate within their evolving contexts, both post-pandemic and postdigital. To anchor the research in the shifting realities of the developments occurring within museums, this doctoral project

[13] "Soutenir la création en environnement numérique", *Ministère de la Culture*, Exact publish date unknown, Retrieved: July 28, 2024. Available https://www.culture.gouv.fr/thematiques/innovation-numerique/soutenir-la-creation-numerique-et-l-innovation/soutenir-la-creation-en-environnement-numerique

[14] Further explorations of this laboratory can be found in Chapter Two.

adopted a qualitative and inductive methodological approach. This choice facilitated a responsive posture to the examination of the procedural structures and relational dynamics involved in developing digital projects in museums: both grounded in the scholarly literature and flexible enough to pursue the dynamics that emerged during the data collection.

To provide a theoretical foundation for this dissertation, Chapter One contextualises the creation and reception of museum digital interpretation tools through an overview of two major museological currents: the changing relationships between museums and their visitors, and museum interpretation in the communication paradigm. The larger shift in museums away from being centered around collections, and towards becoming more visitor-centered institutions, is situated within the development of the social role of the museum, as well as communication and commercial shifts that shape how museums attract and engage with their visitors. These currents underpin the decisions made about how to approach digital museum interpretation, constantly finding the balance between ideological missions and financial realities. Different definitions and conceptualisations of interpretation and the resulting visitor experience are also examined, with the concept of narrative being proposed as a framework for understanding how visitors engage with the experiences facilitated by museum interpretation. The use of digital technologies in museum interpretation contexts is presented, including an introduction to the postdigital era, the changes in the professional structures of museums, and the particularities of how digital tools can support museum interpretation missions.

Chapter Two presents the preliminary study that was conducted in the field to help determine the most relevant direction for the next phase of the doctoral research project. Informed by the review of the literature surrounding the evolving phenomenon of digital museum interpretation, this study analyzed a collaborative digital interpretation development program, led by the PRISM innovation laboratory at the Montreal Museum of Fine Arts during the COVID-19 pandemic. The qualitative and inductive methodological approach facilitated the identification of a relevant line of inquiry for the dissertation: dynamics involved in cross-sectoral collaborations between museum teams and technology companies.

The theoretical framework that was developed to guide the next phase of research is outlined in Chapter Three. Grounded in the findings of the preliminary study and the literature review, this framework consists of two conceptual axes. The first axis situates cross-sectoral collaborations within the metaphor of museum professional ecosystems as an analytical construct for examining the interplay and tensions

between emergent themes when mobilized in partnerships between museum teams and technology companies. The associated concept of ecotones—the transitional areas where distinct ecosystems meet and interact—is expanded to facilitate an understanding of the hybrid spaces created through these collaborations. The second conceptual axis of the theoretical framework develops three core themes that emerged from the preliminary study and the literature, reflecting the complexities within the relationships, procedural structures, and professional practices that are mobilized in the development of digital interpretation projects in museum contexts: the intersection of museum interpretation and digital technologies, the notion of digital capacity within museum teams, and the implications of cross-sectoral and collaboration.

Chapter Four describes the methodology for the subsequent research project, which centered the professional practices and perspectives of experienced museum workers and technology partners about the collaborative development of digital interpretation experiences in museums. The study aimed to document the declared practices for working in these collaborations, the discourses of the digital imaginaire held by these professionals for these interpretation tools, and the perceptions of both the collaborative process and of the needs of museum teams to be equipped to develop relevant digital projects. Thirty-one semi-structured interviews were conducted with museum professionals and technology providers who had experience working in, and with, cultural institutions in Canada, France, and the United States. This approach was designed to facilitate an exploration of the larger currents impacting the capacity of museums—across different contexts and constraints—to develop relevant digital interpretation offerings while navigating the constant changes of the postdigital age.

The results of the research project are presented in Chapter Five through a conceptual and analytical structure, which was developed to examine the interplay of theoretical concepts and emergent themes across the linear progression of the collaborative process. Grounded in the analysis of the thirty-one interviews with experienced professionals, the structure intricately maps out four broad phases of collaborative partnership: before the collaboration, selecting a partner, during the collaboration, and after the project launch. Each phase is outlined with commonly reported processes, tensions, strategies, and points that require decision-making, strategic reflection, or adapted procedures. Ambitious in scope and rich in detail, the data analysis facilitates a transversal and thematic understanding of the dynamics and structures involved in developing museum digital interpretation projects with technology partners within the broader functioning of museum professional ecosystems.

Chapter Six discusses the results of the data analysis through a deeper examination of the transversal themes that wove their way through participant responses. While the conceptual and analytical structure braids together professional practices and perspectives across the linear collaborative process, this discussion is structured around the three core themes developed within the second conceptual axis of the study's theoretical framework: museum interpretation (including objectives for visit experience and the discourses of the digital imagination), digital capacity (approached on both the institutional and individual levels through the concepts of digital maturity, organizational change, and digital skills and literacy), and cross-sectoral collaborations (positioning partnerships as ecotone contexts with unique dynamics resulting from differing expertise, languages, motivations, working processes, and guiding objectives). The diversity of dynamics and themes evoked in participant responses reveals the complexities inherent to visitor-facing digital museum work.

The dissertation concludes with a series of five provocations that engage with several significant reflections and quandaries that emerged through this research project—across diverse contexts, institutions, partners, and technologies—with the hope of illuminating relevant lines of inquiry for future research in this ever-evolving field.

CHAPTER 1

CONTEXT OF THE RESEARCH

This chapter is an opportunity to explore the major concepts that shape the research area of this doctoral dissertation, which can be broadly described as the development of interpretation projects using constantly evolving digital technologies in museums. In order to understand the context in which these tools are created and experienced, they will be situated within two major museological currents: the changing relationships between museums and their visitors, and museum interpretation in the communication paradigm.

The first section of this chapter examines the relationships between museums and their visitors. Museums are cultural institutions that have objectives for the role museum visits will play for their visitors, and they work to design their communication structures accordingly. This chapter addresses the transformation in museums away from being centered around their collections towards becoming more visitor-centered institutions. These reflections include the development of the social role of the museum that birthed the new museology, as well as communication and commercial shifts that have shaped how museums attract and engage their visitors. This concept is crucial to understanding this research area because it underpins the decisions made about how to position digital museum interpretation, balancing between ideological missions and financial realities.

The second current addressed in this chapter is museum interpretation and its impacts on visitor experience. This section explores different definitions and conceptualisations of interpretation and the resulting visitor experience. The concept of narrative is proposed as a framework for understanding how visitors engage with the experiences facilitated by museum interpretation. Finally, the use of digital technologies in museum interpretation contexts is examined, including an introduction to the postdigital museum, the changes in the professional structures of museums, the impossibility of isolating the *digital* from the *physical* aspects of the visitor experience, and the particularities of how digital tools can support museum interpretation missions. *Digital interpretation* tools are treated as fundamentally *interpretation* tools. Thus, when museum teams develop visitor-facing digital tools, they are operating in the already

established paradigm of their institution's missions and practices for designing and facilitating interpretation initiatives.

The intention of this chapter is not to present an exhaustive history of the development of the museum's communicational role and the adoption of digital technologies. It aims rather to explore the underlying themes and lingering questions found in the literature surrounding the evolving phenomenon of developing digital interpretation projects in museums. Rather than focusing on a single aspect of the implications of these tools, this approach instead considers the broader context surrounding the actors and dynamics involved, for museum professionals and visitors, from conception to reception, as a comprehensive whole.

1.1 The changing relationship between museums and their visitors

When museum teams develop visitor-facing interpretation projects using digital technologies—and when visitors decide to cross the threshold to enter a museum—, both professionals and audiences are operating within the larger paradigm of what they believe the experience of a museum visit can and should accomplish. These expectations influence how exhibitions are designed and what interpretation tools are offered, as well as the quality and depth of visitor engagement within museum spaces.

According to the current ICOM definition dating from 2022, museums operate under common fundamental missions, including researching, collecting, conserving, interpreting and exhibiting tangible and intangible heritage—as well as "offering varied experiences for education, enjoyment, reflection and knowledge sharing[1]." How museums have *interpreted heritage* and offered experiences for visitors has evolved over time: from informational pamphlets to guided tours, from wall texts to audio guides. Thus, despite the fact that emerging forms of digital technology offer museum professionals new tools for interpretation, the effort to impact and shape the visit experience is not a new objective. This section will address the larger principles that guide the direction and modalities of this communication between museums and their audiences, and how they are informed by deeper historical currents.

1.1.1 Towards a new museology

Western museums have been active communication systems with objectives for their impact on visitors since their precursory inception in the form of cabinets of curiosity (Brout, 2004; Burcaw, 1997). These princely semi-private collections were designed with symbolic power to inspire wonder in visitors, to uphold the status and power of patrons, and to present a visual representation of ordered knowledge structures (Hooper-Greenhill, 1994; Pomian, 2003). With the arrival of the Age of Enlightenment in the seventeenth and eighteenth centuries, models for museums were established that categorized knowledge, such as in history or archaeology societies, or displayed collections that constructed national identity, like the Musée du Louvre (Brown & Mairesse, 2018). In the case of the Louvre, this free and public museum

[1] *Museum Definition*. ICOM International Council of Museums. Retrieved April 21, 2025. https://icom.museum/en/resources/standards-guidelines/museum-definition/

also participated in the state education system of forming the French people into citizens, displaying for the first time "both the immense power of museums to appeal to a vast public, and the enormous inherent educational potential of museums" (Hooper-Greenhill, 1994, p. 258). The nineteenth century saw the establishment of new museums in the United States inspired by the grandeur of European museums such as the Louvre, and by the education and financial models of London's South Kensington Museum (now the Victoria and Albert Museum), including the Metropolitan Museum and the Museum of Fine Arts, Boston (Conforti, 2000, p. 56). Over the course of the nineteenth century, the movement continued of museums and cultural attractions becoming vehicles for governments to instruct and manage their populations in morality, productive citizenry, and intellectual constructs like aesthetic sensibility and natural history (Bennett, 1995; Conforti, 2000).

Despite these education and communication intentions, the dominant priority of these institutions was centered around the conservation, study, and display of the tangible heritage in their collections. However, this hierarchical power dynamic in the communication between museum institutions and their visitors began to shift on an ideological level as some museums began to explore how they could more deeply pursue their social role.

An early example of this intentional development of the social role of the museum was found in the work of John Cotton Dana in the Newark Museum, which he founded in 1909. Dana believed that a museum should be useful to its local community and was effective only when it added "to the pleasure, the general enlightenment, the physical well-being and the industrial power of its citizens" (Dana, 1920, p. 55). Dana also stressed the importance of the educational role of the museum, and how museum workers should act as the interface between museums and their communities (Mairesse, 2000, p. 40). Dana's conception of a more visitor-centered museum was one of several predecessors to a broader current of efforts amongst museum professionals who were working to open museums up specifically to their local communities. These currents were formed amidst larger questions of the social role of the museum and its place in society (Mairesse, 2000, p. 40).

Many museum practitioners continued developing this social approach and imagining new relationships between museums and their visitors. The Anacostia Neighborhood Museum, led by John Kinard starting in the 1960s, presented the lived aspects of the African American culture that was present in the local community, and it is considered the first community museum in North America (Jutant et al., 2021, p. 314).

The guiding values of this institution were new to museum spaces: inclusion and diversity, creativity and engagement, trust and respect, empowerment and collaboration (Jutant et al., 2021, p. 315). Around this same time in France, the concept of écomusées was developed and theorized by George Henri Rivière and Hugues de Varine, and it was based on community participation in heritage (Brulon Soares, 2015; Mairesse, 2000; Varine, 1978). This type of institution contrasted with classic museum functioning because its structure integrated the active engagement of community members, with a focus on the needs of the local community rather than collections. In 1972, the "Declaration of Santiago de Chile", published by UNESCO, codified the idea that museums should address the needs in their local communities, and in 1974, ICOM adapted the Declaration's phrase "at the service of society and its development" into its museum definition (Brown & Mairesse, 2018):

> These changes in the 1970s marked a shift from a museum focused on traditional values of custodianship, preservation and interpretation to one where the needs of the community are located at its core. [...] Ultimately, these anti-elitist ideas and practices challenged existing structures in society, and worked towards cultural decolonisation. (Brown & Mairesse, 2018)

The museum thinkers engaged in this shift operated in the register of utopia (Mairesse, 2000)—Dana likened himself to a "lay preacher of museum gospel" (Dana, 1920, p. 55). These museums had visions of empowering their local communities by providing them with "a knowledge of the methods, processes, and techniques through which they, in turn, could make better-informed judgments about their own past and more insightful choices about their future" (Weil, 1990, p. 53; as cited in Montpetit & Bergeron, 2009, p. 4).

This revolutionary approach to structuring museum missions was not the dominant approach in Western museums, and many of these radical institutions progressively shifted to become more centered on collections, balancing their social objectives with the traditional priorities of collection management, conservation, and research, as well as with objectives for cultivating tourism and economic development (Mairesse, 2000, p. 47). However, these currents had an influence on the missions of, and expectations for, classically structured museums. They contributed to the development of what Desvallées defined in an encyclopedia entry in the 1980 *Encyclopedia Universalis* as the "Nouvelle Muséologie". The concept of new museology described the prioritized focus on the role of community development in museums, as well as the shift to centering museum operations around visitors (Brulon Soares, 2015; Desvallées, 1981). The repercussions of this movement are wide-reaching (Bautista, 2014) and will be addressed in the following section.

Museums today are still struggling to determine their role in their societies and in the lives of their visitors (Janes & Sandell, 2019). The dynamics of this wrestling could be seen in the tension over the attempt in 2019 to update the ICOM museum definition, when the following alternate definition was put forth for discussion with members:

> Museums are democratizing, inclusive and polyphonic spaces for critical dialogue about the pasts and the futures. Acknowledging and addressing the conflicts and challenges of the present, they hold artefacts and specimens in trust for society, safeguard diverse memories for future generations and guarantee equal rights and equal access to heritage for all people.
>
> Museums are not for profit. They are participatory and transparent, and work in active partnership with and for diverse communities to collect, preserve, research, interpret, exhibit, and enhance understandings of the world, aiming to contribute to human dignity and social justice, global equality and planetary wellbeing[2].

There were strong reactions within the ICOM community to this proposal, from support for its aspirational focus on the social role of the museum, to criticism of its ideological stances that did not describe how most museums actually function[3]. After heated debate, the vote on the new definition was postponed and a new consultation committee was formed to continue the museum definition reformulation project[4]. Three years later in Prague, a new ICOM definition of museums was adopted that revealed traces of the social missions of the failed 2019 proposal. Still *in the service of society,* museums in the 2022 definition were *accessible and inclusive*, they *fostered diversity and sustainability*, and they conducted their activities *ethically, professionally and with the participation of communities*[5].

As seen in these tensions, the responsibility of museums to engage with the concerns of their larger societies is a pressing question. The social role of museums is being constantly redefined (Meunier & Maczek, 2021), through efforts ranging from the 1972 "Declaration of Santiago de Chile" that stated "le musée doit s'engager dans les débats actuels sur le changement des structures de la société" (Mairesse,

[2] "ICOM announces the alternative museum definition that will be subject to a vote", ICOM International Council of Museums. Published: July 25, 2019, Retrieved August 10, 2021. https://icom.museum/en/resources/standards-guidelines/museum-definition/

[3] "What Is a Museum? A Dispute Erupts Over a New Definition", The New York Times, Published: August 6, 2020, Retrieved: October 20, 2020. https://www.nytimes.com/2020/08/06/arts/what-is-a-museum.html

[4] *Museum Definition*. ICOM International Council of Museums. Retrieved June 12, 2021. https://icom.museum/en/resources/standards-guidelines/museum-definition/

[5] *Museum Definition*. ICOM International Council of Museums. Retrieved April 21, 2025. https://icom.museum/en/resources/standards-guidelines/museum-definition/

2000, p. 44) to the 2017 Museums Are Not Neutral movement launched by La Tanya S. Autry and Mike Murawski[6]. In *Radical Museology,* Claire Bishop (2013) argued that museums "are a collective expression of what we consider important in culture, and offer a space to reflect and debate our values; without reflection, there can be no considered movement forwards" (p. 61). In this posture, the seemingly irreconcilability between collections missions and social missions, between the museum as conservative institution and as agent of social change, is a false dichotomy. This tension can create a fruitful environment for innovation: Haitham Eid (2019) conceptualises *museum innovation* as "the new or enhanced processes, products or business models by which museums can effectively achieve their social and cultural missions" (p. 7). Evolutions in professional practice have the potential to support social engagement in an approach unique to the expertise and knowledge within the collections and staff of cultural institutions.

The following section will examine how this new museology led many museums to transform their institutional priorities and relationships with their visitors, by shifting from a vertical collection-centered model of transmission to a more horizontal visitor-centered model of communication and participation (Chevry Pébayle, 2019, p. 235; as cited in Bélanger et al., 2021, p. 192).

1.1.2 The communicational shift in museums

Western museums began to enter a new paradigm of prioritizing their communicational role towards visitors in the 1980s. This was partially a result of profound changes in larger society, including rising levels of leisure time, higher levels of education, developments in communication, new forms of rapid transportation, and an increase in tourist travel (Jacobi, 2013, p. 16). In museums during this communicational shift[7], there was a new emphasis on the visitor-facing initiatives rather than the traditional collection-centered missions. While not as radical as the approach of ecomuseums or other such institutions that centered their work on the social role of the museum, many museums were starting to put more resources towards shaping the communication process and understanding their visitors. The

[6] *Museums are not neutral*. Mike Murawski, Art Museum Teaching. Published: August 31, 2017, updated July 2020, accessed August 10, 2021. https://artmuseumteaching.com/2017/08/31/museums-are-not-neutral/

[7] The term 'communicational shift' is used here in the sense of *tournant communicationnel* in French.

main functions of museums shifted to reflect this new paradigm, being reduced to three functions: to *preserve*, to *study*, and to *communicate*, where the latter term became a combination of to *interpret* and to *exhibit* (Desvallées & Mairesse, 2010; Weil, 2004).

When applying a theoretical understanding of communication to the museum institutions, Jean Davallon argued that museums can be conceptualized as a media when understood through their role of facilitating a social mediation operation between visitors and museum objects (*musealia*) and knowledge, through the circulation of semiotic codes in a public space (Davallon, 1992; Luckerhoff, 2011). As media, museum exhibitions are mediatized environments that become tools of communication and create space for exchanges. Davallon (1992) also identified three approaches to how museums mobilize museology, or the 'technology' of exhibitions. The *museology of the object* aims to facilitate the encounter of the visitor with the museum object by interfering as little as possible (Davallon, 1992, p. 112). The *museology of ideas (or knowledge)* is a communication-oriented approach that seeks, through exhibition design and presentation, to optimize visitor learning and interpretation of the displayed objects and museum knowledge (Davallon, 1992, p. 114). Lastly, the *museology of point of view* uses museum objects as materials to construct a mediatized space that presents multiple perspectives on the subject of the exhibition with which the visitor can engage (Davallon, 1992, p. 115). As many museums moved away from the assumption that there was a natural communication between visitors and museum objects (Schiele, 1992), they began to design exhibitions that facilitated the process of visitors connecting with museum objects and museum knowledge, as well as larger ideas and themes that led to reflections on society and self.

This conceptualizing of how museums approach the technology of exhibitions reflects the larger shift in how these institutions viewed the process of communication. The term *communication* in the museum context was initially understood through a simple linear model, where a message was transmitted by the museum and received by visitors (Hooper-Greenhill, 1995; Weil, 1990). Lasswell's (1948) ECR model described this understanding of communication as a process of emitters conveying a message through a channel to receivers with an effect. This transmission model explains the conception of communication underlying nineteenth century uses of culture to impart morality and it is based on a behaviourist explanation of education found in modernist museums (Hooper-Greenhill, 2000). In this hierarchical dynamic, visitors are treated like blank slates to be educated by museum authorities.

This model of information transfer is, however, too reductionistic. The communication process is not one-directional, rather it is equally shaped by what the visitor brings to the exchange (Falk & Dierking, 2013; Roberts, 1997). Starting in the 1970s, there was a paradigm shift in conceptualizing the communication process, from message transmission towards meaning-making (Rounds, 1999; Silverman, 1999). This approach recognized that visitor responses to an exhibition can differ greatly from what the designers intended. Hooper-Greenhill proposed understanding museum communication as *culture,* or "a materialized system for constructing meaning" (Hooper-Greenhill, 2000, p. 21):

> This more developed cultural model understands communication as a set of negotiated processes of making meaning as part of the complex and unequal culture of everyday life. It accepts that there are many, sometimes conflicting, perspectives from which to explain the world. In the consumption of culture, the active interpretive strategies for the perception and processing of knowledge and the differentiated agenda that participants bring to cultural experiences are acknowledged (Hooper-Greenhill, 2000, p. 22).

In this cultural approach to communication, there is an emphasis on the subjective process of meaning-making and the individual differences in what visitors bring to their museum visits. Museum interpretation strategies play an important role in the construction of meaning (Hooper-Greenhill, 2000), as well as supporting the informal education process. Informal education refers to the implicit learning that occurs outside of official education systems; in the museum context, this process supports diverse individuals in free-choice learning and lifelong learning (Falk & Dierking, 2019; Hein, 1998; Meunier, 2018). By designing exhibitions and interpretive content that offer visitors multiple entry points to meet their individual needs for processing knowledge and making meaning, the museum experience was opened up to a wider array of visitors. This new emphasis on the communication role of museums thus participated in the movement to make these institutions more accessible and to promote cultural democratisation (Lalancette, 1998; Le Marec et al., 2019). As part of these efforts, many museums sought to make themselves *relevant* to their audiences, which Nina Simon defines as the work of "unlocking meaning and value for diverse people in your community" (Simon, 2016, p. 22). However, Simon describes the mission of achieving relevance as a paradox: "It is essential; it gets people to pay attention, to walk in the door, to open their hearts. But it is also meaningless without powerful programming on the other side of the door" (Simon, 2016, p. 23). In this perspective, even if museum communication attracts new audiences to "walk in the door", it is only *relevant* if audiences find something of value within—that sustains both their engagement with the exhibition and their relationship with the institution.

These objectives for museum communication are grounded a comprehension within museums of how exhibition media functions with visitors. Museums began to understand that the presentation of their exhibitions needed to be adapted to a communicational format that the intended audience would be able to understand (Bourdieu, 1966; Chaumier 2011). This meant that museum teams, and any associated external service providers, needed to possess diverse skill sets for development, design, production, and presentation of these mediatized spaces (Davallon, 1992). Internal museum staff hierarchies shifted as specialists in education and interpretation became more involved in the development of exhibitions, working to ensure that these environments would facilitate self-directed learning experiences and meet visitor needs (Falk & Dierking, 2013; Franco, 1994; Hein, 1998).

This focus on designing exhibitions that optimized communication and made space for exchanges thus required cultural institutions to develop a thorough understanding of how their audiences responded to museum visits. In order to ascertain the impact of their communication strategies, museums also began to place more focus on the evaluation of their exhibitions and educational programs (Shettel et al., 1968; Hein, 1994). This resulted in an increased attention to visitor studies (Schiele, 2016), as the quality of the resulting visitor experience became the determinant of the success of the communication process. These audience studies were initially primarily centered on the psychology of visitor behaviour and learning outcomes (Schiele, 1992). But in the 1960s, a shift occurred in the orientation of visitor studies towards a *goal-referenced approach*[8], which required identifying the cognitive, affective, and behavioural objectives for exhibitions, and measuring their subsequent levels of success (Schiele, 1992). Here, the resulting visitor experience was understood through the lens of the objectives for the exhibition initially defined by the museum team. In this perspective, to fully understand the exhibition as media, the initial development phase must be included in the study of the communication process, including the museum's guiding objectives, their understanding of their audience's needs and interests, the selection of content, and the design process (Schiele, 1992). Another approach to the study of visitor experience went beyond visitor learning towards *goal-free evaluation*[9], recognizing the fact that informal learning environments can have different impacts on visitors than those anticipated by the museum, including social interactions between visitors and emotional responses (Silverman, 1995; Weil, 2004).

[8] This distinction was proposed by M. Scriven (Scriven, 1967) and applied to the work of H. Shettel and C.G. Screven, as cited in Schiele, 1992.

[9] This method was proposed by R. Wolf (Wolf & Tymitz, 1978), as cited in Schiele, 1992.

As museums became interested in identifying and understanding the larger effects of their communication on their targeted audiences through evaluation (Lalancette, 1998), some institutions added permanent evaluation professionals to their teams (Schiele, 1992). The focus on the communication role of the museum and on visitor evaluation also led to the shift of no longer viewing visitors as a homogeneous whole, but rather segmenting visitors into different categories according to their needs and desires for their museum experience (Davallon, 1992; Schiele, 1992). By identifying and understanding specific types of visitors, museums aimed to create exhibition spaces that met diverse visitor expectations and modes of engagement (Arpin, 1992; Davallon, 1997; Falk & Dierking, 2013).

This movement in museums to center their efforts around visitors rather than collections has had far-reaching implications for how museums function in their sociocultural context, how they use their resources, and the experiences they offer their audiences. These changes were also driven by economic circumstances that pushed museums to rethink their relationship to, and position within, the marketplace. The following section will explore how these financial realities participated in the transformation around museum conceptions of their role with visitors.

1.1.3 The commercial shift in museums

As museums were undergoing a shift towards prioritizing their communication role in the 1980s, they were also undergoing a commercial shift (Davallon, 1997). Economic instability left many museums with diminished financial capacities, while more museums than ever were competing for visitor attendance and both public and private funding (Bautista, 2014). Thus, while museums continued to find balance between their conservation and communication missions, commercial objectives began to take up a larger place in the museum sphere, as seen in reflections on entrance fees and membership models, strategies for museum branding, and the impact of tourism development (Davallon, 1997). As museums navigated these currents in the 1990s, their organisational structures adapted to reflect this shift from centering on collections to centering on visitors. Museums took a business-like approach to their management, with the development of strategic plans and museum directors increasingly coming from entrepreneurial, rather than curatorial, backgrounds (Kotler et al., 2008; Tobelem, 1997). These commercial considerations were essential to the survival of museums, both for directly bringing in income and for demonstrating their

sociocultural relevance when seeking public subsidies and private philanthropy. If the financial needs of museums were not met, then none of the larger missions of collection, conservation, research, and communication would be possible (Kotler & Kotler, 2004). Thus, while many of these commercial efforts were participating in the logic of the marketplace, they were ultimately in service of museums working to achieve their guiding objectives regarding both collections and visitors.

These changes marked a shift from a *selling* approach to that of *marketing*: museums were designing their offerings based on visitor needs and expectations rather than trying to convince the public to *buy* their traditional experiences (Weil, 1999). This meant that museums needed to have an understanding of visitor needs and expectations that went beyond studying visitor experiences in exhibitions and towards proactive front-end evaluation strategies. In this identification research, museums learned more about who their visitors were, what was important to them, and how they might connect with content presented in an exhibition (Silverman, 1995). This evaluation approach mirrors that found in market research into consumers and users. According to Eilean Hooper-Greenhill (1994), an ideal customer-centered museum would have certain characteristics, including a deep understanding of its current and potential visitors (with a segmentation of their needs and desires), sustained relationships with different groups in the community, capacities to engage with communication and education theory (including evaluation), and standards for designing accessible and enjoyable visit experiences (p. 333). This proposed structure of understanding audiences and thoughtfully designing exhibitions for visitors is aligned with the strategies previously discussed for facilitating museum communication.

Museums possessed a growing awareness that they were participating in society's cultural and leisure industries, and that potential visitors were making choices of how to spend their leisure time from amongst a diverse array of proposed experiences (Schiele, 2016, p. 7). In order to understand museum visitor expectations and experiences, other institutions and activities in culture were studied; museums were "looked at not only by themselves but also as part of the full panorama of modern communication systems and institutional experiences" (Graburn, 1977, p. 5). When seeking to understand visitor expectations for museum visits and their reactions to their visit experience, a parallel was made with how they spent their leisure time. Museums, and tourism experiences, were beginning to see themselves as "part of the modern search for authenticity which is increasingly sought in the non-mundane, the non-ordinary" (Graburn, 1977, p. 2). As with tourism, visits to museums fulfilled a felt need to have experiences that were out of the ordinary (Montpetit & Bergeron, 2009, p. 3).

Museums bore a dual status "comme institution publique et de service public et comme institution insérée dans le marché concurrentiel des industries culturelles et de loisirs" (Nouvellon, 2018). These efforts fall within the paradigm of the experience economy, where experiences are staged to be memorable to appeal to consumers (Pine & Gilmore, 1999). As Laurence des Cars, the then-president of the Musée d'Orsay, stated in March 2020 about the museum's project to revamp its exhibition and education spaces:

> This goes beyond the question of the display of the collection. We also want to fulfill our mission in a more modern and complete way. Visitors are no longer just expecting a museum to display works of art, but to offer a complete experience.[10]

Museums integrated practices from leisure activities to create familiar and desirable experiences for visitors, including architecture designed by famous architects, blockbuster exhibitions, boutiques, cafeterias, and marketing strategies (DesRoches, 2015, Mairesse, 2000; Montpetit, 2002). Parallels were made to the immersive experiences offered by amusement parks (Brulon Soares, 2016; Chaumier, 2011), and this tendency was sometimes referred to as the *Disneyfication* of museums (Mairesse, 2000). Diverse aspects of the visitor experience were carefully designed by museum teams with the intention of providing a streamlined and comfortable visit, as a way to meet visitor expectations and facilitate the communication process. As museums integrated these codes from leisure activities, the boundaries between museums and other cultural and leisure offers began to blur (Kotler & Kotler, 2004).

In a market saturated with cultural offerings, museums have had to stand out to attract visitors. A phenomenon that has arisen from this dynamic is the blockbuster exhibition. One of the first such exhibitions was the tremendously popular "Treasures of Tutankhamun" in 1976-1979, which traveled to multiple cities and had lines with wait times up to 8 hours[11]. These attractions utilize spectacle and novelty in their pursuit of maximizing visitor attendance and increasing sociocultural legitimacy. Over time, the role of temporary exhibitions has grown in importance in the ecosystem of museum offerings (Bishop, 2013, p. 24). As a result, the draw for museum visitation has become less focused on the permanent collection and more on the latest temporary exhibition, where the visitor can encounter "quelque chose d'inconnu, de surprenant, un autre regard" (Jacobi, 1997, p. 9). These exhibitions are major sources of

[10] "Musée d'Orsay to Expand Spaces for Exhibitions and Education", The New York Times, published: March 5, 2020, accessed: October 1, 2020. https://www.nytimes.com/2020/03/05/arts/design/musee-dorsay-expansion.html

[11] *Treasures of Tutankhamun*. National Gallery of Art, accessed: October 19, 2020: https://www.nga.gov/exhibitions/1976/tutankhamun_treasures.html

increased visitor attendance, which has become a defining descriptor of a museum's sociocultural relevance (Jacobi, 1997). These often elaborate productions can involve collaborations with outside actors, in arrangements such as partnerships with the private sector and public relations specialists, hiring external service providers, and inviting external lead curators (Lazzeretti, 2016; Sepúlveda dos Santos, 2001). To be seen as a dynamic and living institution, there is an expectation that museums will continually produce new and appealing temporary exhibitions, participating in the demands of the communication and consummation eras (Chaumier, 2011).

The functioning of museums has been greatly impacted by this phenomenon, described by Daniel Jacobi as the "tyrannie de l'exposition" (1997). The operational rhythm within these institutions has become increasingly centered on the ephemeral and constantly changing nature of temporary exhibitions (Jacobi, 1997; Luckerhoff, 2012). Criticisms of this trend claim that, in the paradigm of ceaseless novelty and innovation, the museum is forced into a position of "endlessly seducing visitors", rather than focusing on impacting or educating them in ways that are more strongly aligned with museum missions (Chaumier, 2011; DesRoches, 2015; Jacobi, 1997). In this perspective, there is a "contradiction entre communiquer pour responsabiliser [to empower] et le faire pour satisfaire les goûts d'un public diversifié" (Landry & Schiele, 2013, p. 33). This pull between education and entertainment, between scholarship and popularisation, in the communication with visitors has been a challenge for museums since the nineteenth century, as they balance their ideals for informing visitors with their need to cater to these visitors in order to survive (Roberts, 1997).

1.1.4 In summary

The questions explored in this section relate to the central issue of how museums view their role for visitors and for their societies. Museums today are navigating between the pulls of attracting the visitor-consumer, educating the visitor-learner, empowering the visitor-participant, co-creating with the visitor-citizen. But these objectives are not necessarily mutually exclusive; the movement towards positioning museum visitors as customers is not inherently at odds with the utopian vision of museums being at the service of their publics and communities. At their core, both the marketing approach and new museology place the visitor (or consumer) at the heart of their considerations (Mairesse, 2000). Museum education

and a customer-centered approach share similar values, both aiming to understand the visitor's needs so as to effectively facilitate a relevant and meaningful experience (Hooper-Greenhill, 1994; Silverman, 1995):

> [T]here are many other ways and reasons why visitors find value in museum visits. The future of museums lies in acknowledging, understanding, and facilitating these ways and reasons; in effect, fashioning a better fit between museums and human behavior. (Silverman, 1995, p. 165)

Thus, when museums prioritize their communicational role, aim to meet visitor expectations through attentive listening, and design experiences to facilitate effective interactions with exhibitions, museums position themselves in an attitude of service, generosity, and inclusion (Arpin, 1992; Jutant et al., 2021; Mairesse, 2000).

The following section will explore how museums translate these overarching objectives for their visitors into tangible interpretation strategies that shape the visitor experience and facilitate the construction of meaning, including through the use of digital technologies.

1.2 Museum interpretation in the communication paradigm

In the updated 2022 ICOM museum definition, there was a shift in terminology regarding the communication function of museums. While the previous definition identified *communication*[12] (2007) as a foundational activity for these institutions, the latest version instead included *interpretation*[13] (2022). The wording of the new definition also reflected the evolving conceptions and expectations for audience engagement, through the expansion of *for the purposes of education, study and enjoyment* (2007) into *offering varied experiences for education, enjoyment, reflection and knowledge sharing* (2022). These changes reveal a perception of the communication between museums and their audiences occurring through the concepts of interpretation and diverse types of visit experience.

While the previous section addressed the context for the shift in museum priorities from being centered on their collections towards a deeper focus on their communication role with visitors, this section will explore the theoretical conceptualisations and modalities of interpretation, as well as the resulting experience and construction of meaning. The narrative process will be examined as a framework for understanding the process of interpretation in museum spaces. Finally, the particularities of, and questions around, museum interpretation using digital technologies will be addressed.

1.2.1 Conceptualizing museum interpretation

Interpretation, in a broad sense, describes the actions undertaken by museums with the aim of supporting the process of informal education and helping visitors make meaning from their interactions with museum collections and knowledge (Hooper-Greenhill, 1994). The concept of interpretation was defined by Freeman Tilden (1957) in *Interpreting Our Heritage,* within the context of his work with the American National Park Service. According to Tilden, interpretation is:

[12] *Museum Definition*. ICOM International Council of Museums. Retrieved June 12, 2021. https://icom.museum/en/resources/standards-guidelines/museum-definition/

[13] *Museum Definition*. ICOM International Council of Museums. Retrieved April 21, 2025. https://icom.museum/en/resources/standards-guidelines/museum-definition/

> An educational activity which aims to reveal meanings and relationships through the use of original objects, by firsthand experience, and by illustrative media, rather than simply to communicate factual information. (Tilden, 1957, p. 8)

This definition illustrates the currents that are also visible in the larger communication shift of museums: the use of objects and artefacts to illustrate larger messages and facilitate visitor meaning-making, the importance of the direct experience lived by a visitor, the work to ensure that the language used in the communicational media is legible to visitors, and the distinction between presentations of information and "revelation based upon information" (Tilden, 1957, p. 18). Tilden offers a philosophical foundation for interpretation with six principles to guide this work. These principles include directives that interpretation should always connect to what is displayed or to the visitor's personality or experience, that interpretation should not aim to instruct but rather to provoke, and that interpretation is an art that can be learned (Tilden, 1957). Despite the fact that *Interpreting Our Heritage* was grounded in Tilden's work in American National Park Service, his conceptualisation of interpretation was assimilated into the vernacular of the museum field—including with the arrival of the term *interprétation* in the francophone sphere in the 1970s, introduced in the educational work of French natural parks and then probably moving into ecomuseum practice (Meunier & Jacobi, 1999, p. 4). In both English and French, the word *interpretation* is rooted in the Latin *interpretatio* and has several meanings, including explaining information, unveiling (or imposing) meaning, translating between languages, performing a role or musical score, and creating based on theme (Meunier & Jacobi, 1999, p. 3). The variations in meaning translate into museum practice, where these semantic understandings can be seen as broadly corresponding with three general interpretation orientations within professional museum practice: producing the informational content that is communicated to the public based on collections, understanding audiences and adapting to different categories of visitors, and creating tools that allow audiences to effectively (and autonomously) engage with exhibition content (Meunier & Jacobi, 1999, p. 4-5). These areas of practice demonstrate the overlapping conceptual orientations and objectives between interpretation and education in museums, both theoretically and operationally.

The nuances of meaning within the word *interpretation* are also reflected in the diversity of definitions for museum interpretation, illustrating how scholars and professionals understand the missions for, and the capacities of, museum interpretation. For example, in *Key Concepts of Museology*, the editors André Desvallées and François Mairesse (2010) offer another definition of museum interpretation:

> Mediation[14] is defined as an action aimed at reconciling parties or bringing them to agreement. In the context of the museum, it is the mediation between the museum public and what the museum gives its public to see; intercession, intermediate, mediator. (Desvallées & Mairesse, 2010, p. 46)

The work of museum interpretation is here seen as bringing together actors who are separated and facilitating connection across this distance; in the context of a museum visit, these parties are the public, the museum objects and the knowledge about them, and narratives illustrated through the display. This definition of museum interpretation continues on to address the hermeneutic nature of museum experiences, where interpretation can act as a "revelation and unveiling which leads visitors to understand, and then to appreciate, and finally to protect the heritage which it takes as its object" (Desvallées & Mairesse, 2010, p. 48). To achieve this, museums employ different communication approaches to enter into the interpretative process, including technology and interpersonal communication. This definition concludes by arguing that museum interpretation has a powerful role to play in helping individuals understand the world and their own identities:

> When the viewer stands face to face with works produced by other humans it is through mediation that he or she can arrive at a special subjectivity which can inspire self-knowledge and understanding of one's own human adventure. This approach makes the museum, the custodian of the evidence and signs of humanity, one of the best places for this inescapable mediation which, in offering contact with the world of cultural works, leads each person on the path of a greater understanding of self, and of reality as a whole. (Desvallées & Mairesse, 2010, p. 48)

In this conceptualization, the interpretive process has the power to enhance a foundational role of museum institutions: helping visitors learn about themselves as individuals and understand humanity as a whole. There is an emphasis on the subjective nature of museum visits, where meaning is made by each visitor based on what is "considered personally significant by an individual, whether or not that meaning is the intention of the artist or exhibit designer" (Silverman, 1995, p. 164). The museum visit is highly personal and connects the visitor to both the individual and the universal.

[14] While there are differences in the conceptualizations between the two concepts, the editors of *Key Concepts of Museology* used the term 'mediation' (the translation of the French *médiation*) in their text as roughly comparable to the English 'interpretation'. The conceptual analysis of the nuances between interpretation and médiation is not within the purview of this dissertation.

Eilean Hooper-Greenhill (2000) also proposed using the perspective of hermeneutic philosophy (Dilthey, 1976; Gadamer, 1976; Gallagher, 1992) to analyze the process of interpretation, as well as constructivist learning theories (Hein, 1998) in the context of the cultural approach to communication:

> Both hermeneutics and constructivism propose that knowledge is constructed through active interpretations of experience. Knowledge is not a single, self-contained body of facts that can be transmitted, unchanged, from one individual to another. Knowledge is plural, and fluid, brought into being by the processes of knowing. Both hermeneutics and constructivism assert that knowers, or learners, are active in the process of making sense of experience (including the formal or informal experience of learning). (Hooper-Greenhill, 2000)

These notions of subjectivity and temporality are also seen in the two major principles of experiential learning proposed by John Dewey (1938): the principle of continuity and the principle of interaction. The principle of continuity states that the current experience is inextricably linked to previous and future experiences; the principle of interaction asserts that experience results from the interaction between an individual's subjectivity and the objective physical and social conditions of the environment where the experience occurs (Dewey, 1938; Montpetit & Bergeron, 2009). This approach has similarities to phenomenological thought, where *phenomenography* is a research method for studying "the way people perceive the world. It is not solely a description of what people see, but how they see and make sense of their world" (Ryan, 2000, p. 122; as cited in Montpetit & Bergeron, 2009, p. 6). As in Dewey's principles of experiential learning, the phenomenological approach merges the subjective experience of individuals at a specific moment in time, with the objective characteristics of the phenomena in the world around them.

These conceptualisations acknowledge that museum interpretation is closely associated with experience, and that the experiences that result from a museum visit go beyond the cognitive function of learning (Dufresne-Tassé et al., 1998; Montpetit & Bergeron, 2009; Packer & Ballantyne, 2016). Understanding a museum visit as an experience enables a more complex understanding of this multidimensional phenomenon (Montpetit & Bergeron, 2009, p. 4), including different types of personal and emotional experiences that can result from a museum visit (Packer & Ballantyne, 2016, p. 128), such as social experiences (Masberg & Silverman, 1996), aesthetic experiences (Dewey, 1934), imaginative experiences (Bedford, 2014; Greene, 1995), restorative experiences (Packer & Bond, 2010), and numinous experiences (Latham, 2013). Jan Packer and Roy Ballantyne (2016) found that the visitor experience has not been uniformly defined or conceptualized in the museum visitation context, and a literature review in the adjacent fields of leisure and tourism allowed them to define the visitor experience as "an individual's

immediate or ongoing, subjective and personal response to an activity, setting, or event outside of their usual environment" (p. 133). To facilitate the measurement of this experience beyond simple visitor satisfaction, they propose a multifaceted model to conceptualize the visitor experience with ten facets that "can be used to characterize the content and intensity of visitor experiences at different sites or for different groups" (Packer & Ballantyne, 2016, p. 137). The capacity to measure the visitor experience enables museums to better support communication objectives when designing interpretation projects (Blondeau et al., 2020).

Professional perspectives also provide insight into how museums translate theoretical objectives for interpretation into tangible actions. In a 2017 dictionary of competencies in museum education produced by the Société des musées du Québec (SMQ), "médiation" is characterized as one of three branches of museum education, where the fundamental objective is to create relationships between visitors and museum objects or knowledge (SMQ, 2017, p. 5):

> Longitudinale, la médiation muséale prend racine dans la communauté et fait corps avec elle en s'inscrivant, notamment, dans une continuité temporelle. Elle favorise les approches relationnelles et résolument collaboratives. (SMQ, 2017, p. 5)

When this interpretive work took the form of the development and production of interpretation[15] tools (including digital supports such as mobile applications or audio guides), the necessary skills for professionals were identified as including the ability to "structurer, vulgariser et rédiger les contenus des outils éducatifs" (SMQ, 2017, p. 11) and to either develop the educational tools or collaborate in their production. The document further identifies three main categories of actions for developing médiation in museums, including creating dialogue with the public, co-creating interpretation projects, and implementing interpretation activities (SMQ, 2017, p. 13). This definition, and the subsequent categorisation of competencies reflect priorities similar to those found in the communicational shift of museums and considerations of their social role, including the objective of collaborating with the larger community.

This definition also reflects the importance of developing understanding and mastery of the best practices for creating and implementing interpretation strategies that support the communication objectives for visitors. Interpretive strategies operate in the complex realities of individual visitors in physical space at

[15] The SMQ document places these interpretation tools in the category of "outils éducatifs".

precise moments in time, where different factors can impact visitor experience. John H. Falk and Lynn D. Dierking (2000, 2013) proposed the Contextual Model of Learning to illustrate how these different elements impact the visitor experience and informal learning. In Falk and Dierking's model (2013), the role of each visitor's sociocultural, personal, and physical contexts over time are considered as key factors in how they engage with the messages presented by the museum. These factors provide a structural framework for analyzing how museums can foster visitor engagement and learning. The personal context includes each visitor's unique background, knowledge, values, motivations for visiting, and beliefs (including those about the museum objects and museums themselves as institutions); the sociocultural context includes both the larger society and personal interactions with others; the physical context includes the environment of the museum and the materials within; and element of time refers to the fact that experiences occur over time—and that museum experiences begin before the visit, include the experience during the visit, and continue long after the visit (Falk & Dierking, 2013, p. 33). These factors work together and not in isolation, and thus they must be studied as a comprehensive whole. Similarly to Dewey's principles of experiential learning (Dewey, 1938; Montpetit & Bergeron, 2009), this framework argues that there is a direct connection between the modalities of the visit experience, past and future experiences, and the resulting processes of meaning-making.

Furthermore, museum interpretation shares common themes and considerations with the larger communicational shift in museums, including identifying the needs and desires of defined segments of visitors, understanding how different interpretation projects can impact the experience lived by visitors, knowing how to communicate content effectively, and adapting activities based on evaluations of visitors reactions (Chaumier 2011; Davallon, 1997; Falk & Dierking, 2013; Hooper-Greenhill, 1994; Schiele, 2016). Through its role in the communication process of museum visits, interpretation helps shape the visitor experience and participates in the construction of meaning. To further understand the impact of the introduction of these interpretative elements into museum visits, the following section will explore the communication process of exhibition spaces through the concept of narrative. When applied to museum visits, a narrative approach helps contextualize how museums create messages and how visitors participate in the dynamic and active communication process.

1.2.2 Narrative as a framework for the construction of experience and meaning

The concept of narrative offers a relevant framework for understanding the construction of experience and meaning in the context of a museum visit. Experience and meaning are major concepts within the communication shift in museums, with roots in the universal expositions in Chicago (1934) and New York (1939), where objects and their interpretations were presented through the use of storylines (Niquette & Buxton, 2004; Samson, 1993; Schiele, 1992). These universal expositions were the first instance on such a large scale of a predefined narrative being communicated through the use of objects and artefacts (Schiele, 1992). These productions also innovated in how they presented their messages, creating immersive experiences using sounds, visual effects such as lights and colour, demonstrations, interactivity, and intentional circulation in the space (Samson, 1993). The endeavors were commercial in nature, mirroring the relationship between the logic of advertising and the use of storytelling in the shift of museums towards the paradigm of communication (Niquette & Buxton, 2004). Similarly, the use of storyline and *connected story* created a language of exhibition as a communicational medium, and even an educational tool (Calver, 1939; Schiele, 1992; Shaw, 1939).

Whether or not they explicitly integrate this narrative approach into their exhibition and interpretation design, museums are, at their essence, storytellers[16]. Leslie Bedford argued that storytelling is the "real work" of museums:

> It makes sense that storytelling is appropriate to the work of a museum for museums are storytellers. They exist because once upon a time some person or group believed there was a story worth telling, over and over, for generations to come. (Bedford, 2001)

As in cultural performance, Bruno Brulon Soares (2016) contended that museums "are supposed to be imagined and not just created or developed. They work like a story being told and they need creativity as a starting point" (p. 17). Elaine Heumann Gurian (2006) proposed that the most essential definition of future museums will be rooted in both place and "storytelling in tangible sensory form" (p. 45), where "it

[16] Story and narrative are not synonyms (though several sources cited in this document use story and narrative interchangeably). *Narrative* consists of *story* (the event or sequence of events) and *narrative discourse* (how the story is told) (Abbott, 2002). Narrative is thus built on stories, which are composed of a series of events and agents who interact with those events (Bal, 1997). The order in which the events are presented can change the narrative's significance: the "meaning [of events] is given by their place in the overall configuration of the sequence of a whole—its plot or fabula" (Bruner, 1990). In this section, storytelling will be considered as narrative: it creates a temporal and spatial framework that guides a story by creating a world (Wong, 2015).

is the story told, the message given, and the ability of social groups to experience it together that provide the essential ingredients of making a museum important" (Gurian, 2006, p. 46). Understanding the visitor experience through the lens of narrative provides an insightful framework for analyzing the interactions that occur between museums and their publics.

Museums construct and communicate narratives in diverse forms. First of all, if *collection* is defined as "the collected objects of a museum, acquired and preserved because of their potential value as examples, as reference material, or as objects of aesthetic or educational importance" (Burcaw, 1997), then the museum's choices of what constitutes a collection (or not) communicate in themselves a narrative to museum audiences (Pearce, 1994). These choices of what objects to acquire and preserve impact the narratives that the museum can communicate in its galleries, and they reflect the metanarratives into which the museum inscribes itself. Secondly, the intentional *display and exhibition* of these objects present narratives through symbolic language that support visitors in creating meaning (Davallon, 2000; Hooper-Greenhill, 1994). When seen through this lens, the storytelling nature of museums has been evolving since these institutions began (Roussou et al., 2015). Finally, *interpretation,* considered as "the work of revealing, to such visitors as desire the service, something of the beauty and wonder, the inspiration and spiritual meaning that lie behind what the visitor can with his senses perceive" (Tilden, 1957), and partnered with *education,* equally participates in the construction of narrative (Parry, 2008). The language of the narrators of interpretation systems can manifest in straightforward storytelling, or in the larger metanarratives of the "ideological stance" (Coxall, 1994) of the museum.

Narrativity, another concept addressed by narratologists, is "the power to evoke story in the listener or viewer's mind" (Bedford, 2014). This is relevant to museum communication because it implies that "something does not have to be a formal story (with setting, action, and characters) in order to generate one" (Bedford, 2014). A museum object can elicit narrative, as can the meaningful display of such objects.

While storytelling involves choices on the part of the narrator, the audience also plays an important role in the narrative: they do the active work of constructing meaning (Wong, 2015). Leslie Bedford (2014) notes:

> Storytelling, or the narrative mode of thought, is about both the storyteller and the listener (or viewer or visitor). Narrative stimulates personal interpretation; the person [...] experiencing the exhibition is engaged in his own kind of internal dialogue with the story. In this process of making

> meaning, he creates a story out of story so that perceiving and creating become two sides of the same coin. (p. 59)

Narrative discourses thus introduce explicit layers of subjectivity into the museum setting, both on the part of the storyteller who crafts the narrative, and the audience who creates meaning. Despite storytelling being engrained in different levels of museum functioning, some institutions demonstrate a discomfort with balancing "scholarly authority and the authority of individual experience or community values" (Franco, 1994, p. 152). This dynamic can be troubling for museums that have traditionally positioned themselves as the authority in their communication with visitors

Even when the same narrative is communicated to visitors, different individuals can construct diverse meanings. Stories are particularly apt to produce *polysemia* (a plurality of meanings), notably through the concept of narrative gaps, which are "aspects of a story that are not immediately or fully explained" that "prompt the audience to fill in missing information" (Wong, 2015). In this mode, storytelling provides a frame while "simultaneously suggesting all that lies outside the frame" (Wong, 2015). Narrative is thus powerful because it "open(s) up a space into which the listener's own thoughts, feelings, and memories can flow and expand" (Bedford, 2001). The audience participates in narrative by filling in details from their own experiences and creativity. Imagination plays a key role in this process: "Something happens in the imagination in the face of a real story; it creates a new one" (Bedford, 2014). In this process of appropriation, narrative begets narrative. The audience becomes a storyteller within their own experience.

Storytelling is an important process to understand when supporting visitors in museum education and informal learning. Humans are constantly creating narrative in their minds. In Heider and Simmel's famous psychological experiment, researchers showed a film of three moving geometrical shapes to subjects, who attributed personality and narrative discourses to the objects (Heider & Simmel, 1944). But the construction of narrative is not limited to external objects. McAdams's life story model of identity posits that people possess a *narrative self*, which is to say that they "provide their lives with unity and purpose by constructing internalized and evolving narratives of the self" (McAdams, 2001). For the context of museums, these findings imply that visitors are constantly constructing narrative about what they perceive and about their very own identities.

Storytelling can support museum educational goals in diverse manners. Narrative approaches can also support memory retention, because "information received in story form is more easily absorbed and

remembered" (Bedford, 2014). Storytelling can "help people direct their attention, provoke inquiry, and can motivate deep engagement with content" (Wong, 2015). Bedford (2001) illustrates the primordial nature of narrative in museum learning:

> Stories are the most fundamental way we learn. They have a beginning, a middle, and an end. They teach without preaching, encouraging both personal reflection and public discussions. Stories inspire wonder and awe; they allow a listener to imagine another time and place, to find the universal in the particular, and to feel empathy for others. They preserve individual and collective memory and speak to both the adult and the child. (p. 33)

The power of storytelling also encourages emotional engagement (Roussou et al., 2015) which can make objects in museums feel more relevant for visitors. This facilitation work of museums as storytellers aims "to successfully turn their institutional knowledge and authority into meaningful, engaging emotional experiences" (Roussou et al., 2015).

But there are ethical issues to consider when using narrative to achieve objectives in visitors. Because stories can also strongly influence the emotions and thoughts of those who experience them, they are "inherently manipulative" (Wong, 2016). The notion of visitors engaging with narratives in their own meaning-making processes is seen as a counterpoint to the manipulative nature of stories. Additionally, the construction of narrative can pose a challenge to museum communication, as how the stories are framed can "offer the illusion that they present the events in their entirety (and if they leave out anything, the omitted portions are simply not relevant)" (Farman, 2013). Especially in a postmodern and postcolonial context, a growing number of museums are wary of simplistic metanarratives that diminish certain voices and perspectives, especially in institutions that deal with historical events and the sensitive issues of cultural representation (Hooper-Greenhill, 2000; Wong, 2015).

The concept of narrative provides a framework for understanding the active communication process that occurs during museum visits, resulting in the visitor experience and the construction of meaning. Interpretation strategies participate in the storytelling process of exhibitions, impacting both the message communicated by museums and how visitors engage with the presented narrative. The following section will explore the particularities of analyzing and developing interpretation elements that utilize digital technologies.

1.2.3 Digital interpretation in the postdigital museum

In the 1960s, digital technology first entered museums in a systematic way in the form of computers in the Smithsonian Institution in Washington, DC (Parry, 2007). While this initial introduction was in a mostly information management role, digital technologies subsequently exploded in their reach across the functioning of museums, the lives of visitors, and the larger sociocultural contexts. As society navigated the changes stemming from the arrival of the digital revolution, new technologies became less like isolated objects and more like an environment, where they "less and less resemble tools—discrete objects that can be considered separately from their surroundings—and more and more resemble systems that are intertwined with natural systems, sometimes on a global scale" (Williams, 1990, p. 1, as cited in Bautista, 2014, p. xxiii). This section will explore the issues surrounding the development and study of digital technologies used by visitors in the context of museum interpretation, whether in museum buildings or in a virtual setting.

Digital technologies employed in museum interpretation have generally followed two categories: digital tools integrated into the communicational process of the exhibition media that *enriched* or *augmented* the visit experience (such as interior tools like mobile apps, touch screen kiosks, multimedia guides) and adjacent communication efforts online (such websites, virtual exhibitions, social media accounts, databases) (Sandri, 2020, p. 36; Jacobi, 2014). Digital interpretation tools even have the potential to become their own versions of exhibition media when they create a simulated museum visit in a completely virtual format, such as online exhibitions and virtual reality experiences. The use of these new communication mediums impacted on the structure of museum organisations, as the management and development of projects created with digital technologies require professionals with specialized skill sets and capacities—and new ways of working (Tallon, 2017). Some museums responded by creating new positions on their staff to oversee digital operations, such as in 2013 when the Metropolitan Museum recruited its first chief digital officer, Sree Sreenivasan. There have also been efforts to move digital competencies out of the cloister of specialized staff members by re-imagining the models for digital teams (Price & James, 2018) training professionals across museum departments (including leadership) in digital skills and culture (Malde et al., 2019), developing relevant working processes (Finnis & Kennedy, 2020), and defining institutional digital strategies (Morrison, 2019). Financial realities are associated with work on constantly evolving technologies, as the resources needed to research, develop, and maintain innovative experiences using digital tools, are often beyond the scope of museums (Parry, 2008). There are also variations in institutional capability (and openness) to undergo the organisational changes

necessary to support a sustainable digital transformation (Carding & Paul-Chowdhury, 2015; Nikolaou, 2024; Taormina & Baraldi, 2022).

Ross Parry argued that museums are now in a postdigital era, where the presence of digital technology is normative (Parry, 2013). Parry identifies two major consequences of this movement towards digital normativity in museums and their impacts on museological research. First, the study of digital practices in museums no longer needs to focus on the questions of emergence and "newness" (such as *adoption, uptake, advocacy, risk,* and *opportunity)* and can rather explore the "continuous" changes unfolding (Parry, 2013; Peacock, 2008). The second consequence that Parry identifies is the transition within museums where digital is, as John Stack wrote in the Tate Digital Strategy for 2013-15, "a dimension of everything" (Parry, 2013; Stack, 2013). Museological research will "benefit from blurring (if not entirely removing) previous distinction between 'digital' and 'nondigital'" (Parry, 2013, p. 35), instead holding the postdigital as an *augmentation*:

> This is joined by an in-gallery aesthetic where technology (though present) is ever more ambient, and where a new contract between the connected institution and the connected visitor allows digital media to no longer be the interloper but rather the familiar and expected. This is public engagement and programming that no longer makes a reductive choice between 'digital' and 'nondigital', but instead anticipates a blend of the two, an embodied augmentation of one with the other. (Parry, 2013, p. 37)

This framework of understanding the role of digital media in museum communication strategies takes a holistic approach to the visitor's lived experience, and underscores the importance of integrating missions for museum interpretation with digital strategy, rather than relegating the latter to a separate area of consideration. The physical cannot be extricated from the digital; in this intertwining, museums can be seen as "une institution transformée et fragmentée par le numérique à partir de l'événement muséal" (Andreacola, 2020):

> Celui-ci repose sur l'expérience culturelle de l'individu prenant sa source dans le monde physique, en visitant une exposition au sein du musée ou sur Internet via le site web du musée, mais aussi tout autre espace numérique au sein duquel sont diffusés et circulent des contenus culturels et patrimoniaux. Dans cette approche individualisée et individualiste, chaque personne reconfigure et crée son musée personnel au gré de ses navigations sur le web, ses productions sur les plateformes et ses visites *in situ*. (Andreacola, 2020)

The approach of not isolating the digital from the nondigital could be reflected in museum practices and infrastructures, such as when Carolyn Royston was recruited in 2018 by the Cooper Hewitt Smithsonian

Design Museum as Chief Experience Officer. Royston was initially hired to be the Director of Digital, but she pushed back on specifying *digital* in the title:

> It is concerned with thinking about the experience across both the physical and digital spaces. And also the human interaction space. It is about looking at how those areas work across an entire visitor journey. Looking at the touchpoints, and at the responses or interventions as a museum that we need to make across those touchpoints, to make it a more holistic and seamless experience.[17]

Royston also ran the Cooper Hewitt's Interaction Lab, "an embedded research and development program driving the reimagining of Cooper Hewitt's audience experience across digital, physical, and human interactions[18]". These integrated approaches to engaging with digital technologies within nondigital frameworks echoes themes that have been discussed around the communication shift in museums and the relationship between interpretation and experience.

A major question when studying interpretation tools that use digital technologies is whether or not the *digital* aspect changes the nature of the interpretation process or the resulting visit experience. It is important to separate the *medium* (such as the technology used) and the *concept* (the role the medium is playing for the visitor) (Parry, 2008, p. 181). For example, the study of digital storytelling in museums illustrates how a new digital medium does not necessarily translate to a new concept. Digital storytelling[19] is a popular theme in museum interpretation circles (Wong, 2015), and it was the object of a 2016 conference funded by the National Endowment for the Humanities at the Tenement Museum in New York

[17] Carolyn Royston, quoted in "Digital is key: Carolyn Royston of Cooper Hewitt, Smithsonian Design Museum", Blooloop, published: August 26, 2020, accessed: August 10, 2021. https://blooloop.com/museum/in-depth/carolyn-royston-cooper-hewitt/

[18] *Tools and Approaches for Transforming Museum Experience*. Cooper Hewitt. Retrieved August 19, 2021, from https://www.cooperhewitt.org/interaction-lab/tools-and-approaches-for-transforming-museum-experience/

[19] *Digital storytelling* first appeared as a concept in a very specific context: it was created by Dana Atchley in the early to mid-1990s, who later developed the Center for Digital Storytelling (now the 'StoryCenter') in Berkeley, California, with several partners (Hartley et McWilliam, 2009). In this context, digital storytelling is defined as "a workshop-based practice in which people are taught to use digital media to create short audio-video stories, usually about their own lives" (Hartley et McWilliam, 2009). Here, digital is a tool and not a revolutionary approach to narrative: "despite the term 'digital' in digital storytelling, the emphasis is on the *story* and the *telling*" (Hartley et McWilliam, 2009). Digital storytelling "transforms everyday *experience* into shared public culture" (Burgess, 2006), and is a social movement that "is explicitly designed to amplify the ordinary voice".

City. However, the participants of the "Museums and Digital Storytelling" conference agreed that *digital-age storytelling* was a more appropriate term:

> Digital-age storytelling would signify that digital brings added capacity and potential to our forms of storytelling. Over time, this potential would be reimagined and reincorporated into storytelling until the novelty is gone, until it is simply part of storytelling. Reminiscent of the term "industrial age," while we as a society still benefit from forms of mass production, these attributes are enmeshed within everyday life, and we no longer name those elements as industrial age. (Haley Goldman, 2016)

Digital-age storytelling thus refers to "the use of digital media to play with or disrupt [the norms of narrative]" (Wong, 2015). Digital-age storytelling and its multiple applications provide the opportunity to explore the very notion of narrative theory (Page & Thomas, 2011): narratives that play with interactivity, non-linearity, and coherence can change how audiences engage with storytelling and potentially how researchers can measure this engagement (Schneider, 2005). However, these disruptions in narrative are not necessarily revolutionary: "as much as digital media have complicated storytelling, they have not reinvented it" (Wong, 2015). More broadly, while interpretation projects using digital technologies do not automatically change the role they play for visitors, they are still new communication technologies that have their own codes and languages that need to be mastered by museums if they are to optimize communication (Sandri, 2020, p. 87). Research into digital museum interpretation must study the communicative role of the tool with visitors and the characteristics of the resulting experience—only then can the implications of *digital* be investigated.

In the context of the PRISM digital interpretation innovation laboratory in Montreal, the founding director Charlène Bélanger wished to avoid centering the concept of digital interpretation on the interactions with the digital tools, but rather to "bien marquer la volonté d'appréhender la relation pouvant se développer entre l'institution muséale et ses publics" (Bélanger, 2021, p. 192). This approach led to the laboratory proposing the following definition for digital museum interpretation:

> Toute action menée par un-e ou des professionnel-le-s d'une institution muséale, pour développer la relation du grand public ou d'un public particulier avec la collection, la thématique d'interprétation, une exposition réelle ou virtuelle, ou toute autre proposition de l'institution culturelle à des fins diverses au moyen du numérique, grâce aux capacités d'encodage informatique, et des réseaux, équipements et applications logicielles. (Larouche et al., 2019; as cited in Bélanger, 2021, p. 192)

As seen in this definition, despite the specific capabilities of various digital technologies, digital interpretation tools are fundamentally *interpretation* tools. As with nondigital interpretation strategies, they participate in shaping the visitor experience and the resulting construction of meaning in the museum context (Davallon, 2000; O'Neill & Dufresne-Tassé, 2010). Falk and Dierking (2008) argue that new technologies can participate in the contextual learning experience when used in museums:

> [Digital] technologies, when designed well, can have the potential to positively impact visitor meaning making, by (1) enabling visitors to customise their experiences to meet their personal needs and interests; (2) extending the experience beyond the temporal and physical boundaries of the museum visit; and (3) layering multisensory elements within the experience, thereby enriching the quality of the physical context. (Falk and Dierking, 2008, p. 27-28)

According to Falk and Dierking (2008), two significant assets of digital technologies are their ability to increase the personalisation of the museum experience and to engage the senses of visitors. The authors emphasized that museum technologies exist in complex environments that include both the galleries of the museum and the world beyond. To be successful, digital technologies must contribute to the museum's reach beyond its walls, "situating the experience within the broader context of the lives, the community, and the society in which visitors live and interact" (Falk and Dierking, 2008, p. 27). The Contextual Model of Learning makes room for this complexity and allows for an analysis of the plethora of factors that can impact a visitor's experience. For these digital tools to enhance visitor experience and support the museum's communication mission, they "must build on and optimize visitor's prior experience and knowledge, connect to their social group, and directly support visitor's motivations for visiting and their interests before, during, and after the experience" (Falk and Dierking, 2008, p. 28). It is also vital that visitors understand how to operate the digital tool itself, so as not to impede access to the content and functionality (Gammon & Burch, 2008, p. 42).

1.2.4 In summary

Museums have long aimed to develop interpretation projects that aligned with their institutional missions and met audience needs, while also developing methods for analyzing the resulting visitor experience. This work is further complicated when the interpretation projects are created using constantly evolving digital technologies, which require specialized knowledge and skillsets to design and develop. The lens of the

postdigital museum—where digital is normative and the boundaries blur between *digital* and *nondigital* (Parry, 2013)—raises questions about the conceptualization, development, and analysis of digital museum interpretation. Museum teams are faced with the task of translating the overarching institutional objectives for audience engagement into tangible interpretation strategies that shape visitor experience through the use of digital technologies. While museums were already expected to innovate with their digital offers (Parry, 2008; Rosa, 2010; Sandri, 2016), the arrival of the COVID-19 pandemic exacerbated the expectations that museums would offer interpretation experiences using digital technology to connect with their visitors as their physical spaces closed (Chaumier, 2020; ICOM, 2020; Marty & Buchanan, 2022). The repercussions of the digital practices developed during the COVID-19 pandemic were felt in museums across the world[20].

In order to define a doctoral research project that would accurately reflect the realities of these changing digital practices in museums, a preliminary case study was conducted in the context of the qualifying exams. The subject of this study was PRISM, the digital innovation laboratory at the Montreal Museum of Fine Arts (MMFA). PRISM used collaborative and human-centered design strategies to develop new forms of digital museum interpretation, aiming to engage innovative approaches for responding to the questions and challenges that arose when designing digital interpretation experiences in museum contexts. In 2019, PRISM created a program of intensive innovation cells to help facilitate the development of digital mediation tools in museums across Quebec. These series of collaborative sessions brought together museum professionals and technology partners from local start-ups, guiding them through a co-creation process that resulted in the prototype of a digital interpretation experience that could be tested with museum users.

The following chapter will present the analysis of the PRISM innovation cell that was conducted in 2020 with a team of MMFA employees in the context of the COVID-19 pandemic. The group worked to create a digital project that would help visitors experience a temporary exhibition that was scheduled to open during the province-wide closure of cultural institutions in the midst of the second wave of the virus. An inductive research approach was selected to facilitate the identification of the larger currents at play in

[20] The *Lettre de l'OCIM* n°189 of May - June 2020 offers a series of articles on the impact of COVID-19 on museums and their visitors.

this innovative process of collaboratively producing a digital museum interpretation project, as well as inform the subsequent lines of inquiry for this doctoral research project.

CHAPTER 2

PRELIMINARY STUDY

The key concepts needed to be identified for this doctoral dissertation—which, at the initial stages of this research project, could be broadly described as the creation of digital interpretation tools using constantly evolving technologies in museums. This research area was undergoing major shifts, especially in response to the COVID-19 pandemic (Chaumier, 2020; ICOM, 2020; Marty & Buchanan, 2022), making it particularly timely as a subject of doctoral study. It was therefore decided, with departmental and ethical approval, that a preliminary study would be conducted early in the research process. Given the swiftly evolving nature of both creating digital projects with constantly changing technologies and understanding their impact on visitors, as well as the unfolding repercussions of the digital practices developed during the COVID-19 pandemic, it was determined that the identification of key concepts in the preliminary study would benefit from an inductive research approach based in grounded theory (Glaser & Strauss, 2017). This posture was also framed as participating in the differentiation between the practical realities of working with digital technologies and the theoretical promises that were associated with these tools (Le Marec, 2020, p. 13). The findings in the field would be used to guide the identification of the key themes at play and to inform the direction of the subsequent doctoral research project.

A program run by PRISM, the digital innovation laboratory at the Montreal Museum of Fine Arts (MMFA), was identified as a relevant case study[1] for conducting the initial sampling. PRISM was an innovative example of the mobilization of the concepts that are found in the dynamics of developing digital museum interpretation experience. The laboratory used a collaborative approach that employed human-centered strategies and the design thinking model to imagine, develop, and test new forms of digital museum interpretation. And, unlike the situation of many museums where there were not sufficient time or resources for taking a reflexive approach to digital practice (Parry, 2008; Rosa, 2010; Sandri, 2016), PRISM

[1] The term “case study” is used in the perspective of the initial sampling phase in grounded theory methodology (Charmaz, 2006; Gentles & Vilches, 2017), as well as in the sense of *échantillage intentionnel* in French: this innovation cell was intentionally selected as an initial field of study due to its relevance to the larger research area.

was structured to strategically engage with innovation in digital interpretation based on findings from research and praxis.

The program selected for the preliminary study was the series of intensive innovation cells[2] that the PRISM team had created to help facilitate the development of digital interpretation tools with museums across Quebec. In the innovation cells, museum professionals participated in collaborative sessions that were structured as creative sprints based on the five steps of the design thinking model. PRISM coordinators guided participants through a co-creation process to design a digital interpretation project, eventually bringing in technology specialists from start-ups to develop the prototype of a digital tool which was immediately tested with visitors in their museums. Ethical approval was obtained to conduct the study of an innovation cell.

The preliminary study analyzed the innovation cell run by PRISM with a team of MMFA employees in the context of the COVID-19 pandemic in the autumn of 2020 (Gross-Hoy, 2021). The participants of that cohort worked to create a digital interpretation project that would help visitors virtually experience a temporary exhibition that was scheduled to open during the province-wide closure of cultural institutions in the midst of the second wave of the virus. The inductive research approach facilitated the identification of both the larger currents at play in the innovative process of collaboratively producing a digital museum interpretation project, as well as the emerging themes and lines of inquiry for this doctoral research.

[2] Translated from “cellules d’innovation” in French.

2.1 Context

2.1.1 The origins of PRISM and the innovation cells

In 2014, Quebec's Ministry of Culture and Communications launched the *Plan culturel numérique du Québec* (PCNQ), a multi-year project to support the Quebec cultural field to invest in digital practices[3]. Measure 115 of the PCNQ laid out the plan for the creation of a collective innovation laboratory within the MMFA, with a focus on Quebec digital museum interpretation. The PRISM laboratory was launched within this context in 2019.

Charlène Bélanger was hired as PRISM's founding director in October 2018. Given a specific but succinct mandate of five broad objectives[4], Bélanger was tasked with creating the laboratory's concrete structures, methodology, and programming. During her first few months in the role, she met with professionals in different sectors, from museums to digital business incubators, to learn about their needs and pain points (Bélanger, 2020). She compiled an inventory of potential problematics that were reported to arise in the dynamics of interactions between museums and the digital sector. These exchanges, paired with research into other collaborative laboratory models (especially living labs) and design methodologies, informed Bélanger's approach to the creation of structures that would be relevant tools for PRISM to support collaborative processes for developing digital museum interpretation projects.

The creation of the innovation cells fell within PRISM's research and development mission with two main objectives: supporting innovation in museum interpretation and new technologies, and creating knowledge. The program was created to help facilitate the development of digital interpretation tools with museums across Quebec. Museum professionals could apply to participate in a series of collaborative sessions where they were guided through the process of designing a digital interpretation project. Technology partners from local start-ups joined the collaborations midway through the program, selected

[3] *À propos*. Ministère de la Culture et des Communications, Plan culturel numérique du Québec. Retrieved June 12, 2021, from http://culturenumerique.mcc.gouv.qc.ca/a-propos/

[4] *115 – Mettre sur pied le LAB incubateur collectif de la médiation culturelle numérique québécoise*. Ministère de la Culture et des Communications, Plan culturel numérique du Québec. Retrieved June 12, 2021, from http://culturenumerique.mcc.gouv.qc.ca/115-mettre-sur-pied-le-lab-incubateur-collectif-de-la-mediation-culturelle-numerique-quebecoise/

based on their project proposals. They developed a prototype of the digital interpretation tool, which was then tested with museum visitors.

When determining the structure for the innovation cells, Bélanger's research into the professional practices of living labs and technology companies demonstrated the potential applicability of design thinking with the innovation cells. Design thinking was a model developed at Stanford University's Hasso Plattner Institute of Design (d.school) that proposed five steps for the design process: empathise (immerse), define, ideate, prototype, and test (Both & Baggereor, 2017). This model was considered to be particularly relevant to PRISM for two main reasons. First, the philosophy and approach of design thinking was deeply ingrained in how technology companies functioned, with an emphasis on being user-centric, iterative, and innovative. This was perceived to be the 'language' used by many major technology companies, digital startups, creative incubators, and living labs. Thus, it appeared to be an important factor to utilize when facilitating communication between technology developers and museum professionals in the framework of the laboratory's programming.

Second, the design thinking model's human-centered strategies (Buchanan, 2001) aligned with PRISM's overall goal of "collaborative innovation centered on the human[5]". While PRISM immersed itself in the language of the technology sector, it was equally anchored in the domain of museum interpretation with its focuses on facilitating learning, experience, and meaning making. The laboratory was also hosted within the MMFA, an institution that valued the power of museums to impact the overall well-being of visitors[6]. The human-centered model within design thinking was determined to be an appropriate tool to help PRISM work towards its guiding mission for interpretation: "rassembler les forces de tout un réseau pour offrir aux publics des musées de nouvelles expériences numériques humanistes, inspirantes et porteuses de sens[7]".

The design thinking model was selected as the strategic approach for bringing together professionals from different sectors. The PRISM team structured the innovation cell programs to consist of five sessions that each corresponded to one of the steps of the design thinking process, with a sixth session held after the

[5] From the presentation given by Charlène Bélanger in the innovation cell first session.

[6] *Wellness.* Montreal Museum of Fine Arts. Retreived April 16, 2025. https://www.mbam.qc.ca/en/education/wellness/

[7] From the presentation given by Charlène Bélanger in the first innovation cell session.

initial user-testing phase to review the development process and the resulting tool. The laboratory adapted existing design tools to meet the needs of the program, such as creating visitor avatars and mapping out the visit experience.

After the PRISM team had run the first versions of the innovation cells, feedback from participants indicated that the organic and less structured nature of the process had induced stress as they had not previously been familiar with the design process (Bélanger, 2021). The laboratory subsequently collaborated with a graduate student in design to help adapt the design thinking process into structured activities that facilitated the design process and encouraged productive collaboration (Bélanger, 2020). These more defined sessions provided participants with clear steps for each session, while aiming to leave room for creativity and co-creation within an established structure. With each innovation cell, the PRISM team evaluated the program and made adjustments in an effort to improve the process.

2.1.1.1 EXAMPLE OF DESIGN THINKING ACTIVITIES IN A SESSION

The following example illustrates how the activities in a session of the innovation cell guided the participants through one step of the design thinking process, using concrete activities and examples to engage with the larger concepts.

The first session[8] focused on the first step of the design thinking process, *Empathise,* which utilized engagement, observation, and immersion to understand potential users[9]. Group participants were invited to empathise with potential visitors through an activity where they were asked to list the new constraints, opportunities, and needs that the pandemic context brought to museums and to themselves as museum employees. By looking at their own contexts, the participants immersed themselves in the experience of living through a pandemic and thus empathised with the users of their future digital interpretation project. By reflecting on the challenges and possibilities for museums in the pandemic, the participants assessed their museum's resources for meeting these visitor needs. This exercise aimed to place participants in the

[8] The following describes the first session of the innovation cell that took place in the autumn of 2020 in response to the constraints of the COVID-19 pandemic.

[9] From the presentation given by Charlène Bélanger in the innovation cell first session.

mindset of opening their eyes to needs that could be met and opportunities that could be seized amidst the pandemic-mandated constraints.

After immersing themselves in the realities of their current context, the group identified categories of visitors who could potentially be addressed by the digital interpretation project. For each category, the group listed what they imagined to be the visitor's habits (devices they used, places they visited, with whom) and desires (what made a museum experience important and meaningful). In this exercise, the group members were reminded that various types of visitors had different needs and desires, and they reflected on how these visitors might still pursue museum experiences despite the constraints of the pandemic. This was reported to support the idea that a digital project should be designed with specific visitors in mind, rather than a 'one size fits all' approach.

At the end of the session, participants were given homework assignments to be completed before the next meeting. This session's assignment was divided into three activities that corresponded with the main themes of *Empathise*, the first step of the design thinking process: engagement, immersion, and observation. The first activity invited group members to engage with potential users of the future digital interpretation project. Participants were asked to conduct a guided interview with an acquaintance who fit into one of the visitor typologies. PRISM provided interview questions were structured to help group members to describe and understand the subjective experience of their interviewee, including their conceptions of meaningful museum experiences and their digital habits[10]. When the group met for the next session, the information gathered by participants from these interviews would be used in the creation of personas for potential visitors.

2.1.2 Adapting the innovation cells for the COVID-19 pandemic

The COVID-19 pandemic arrived in Canada in early 2020. As the health crisis worsened, the Quebec government ordered museums across the province to close their doors to visitors starting in March of that

[10] Because the MMFA was closed due to the pandemic, the two additional guided activities were not possible for this group. They consisted of a tool to help participants evaluate their own experience during a museum visit (*immersion*), and a guide for observing visitors in a museum space (*observation*).

year. PRISM was thus forced to pivot its planned activities to adapt to the evolving situation. The coordinators of the laboratory sent out a survey to museum professionals in the Société des musées du Québec (SMQ) network to learn about their needs for education and interpretation support in this time of crisis. In June 2020, the PRISM team launched a series of virtual innovation cells to help museum professionals across Quebec create adapted digital interpretation projects for visitors as museums gradually began to reopen to the public. The themes of these innovation cells were determined based on needs identified in the survey of SMQ museum professionals. The digital tools designed in the cells aimed to respond to the constraints of pandemic safety measures, including physical distance between visitors and minimal shared tactile surfaces, as well as accommodating remote visitors who were not able to physically visit the museums.

PRISM invited professionals from member museums of the SMQ to apply to participate in one of the four innovation cells planned for 2020, two in the summer and two in the fall (Figure 2.1). These innovation cells were restructured to a virtual format, with ten museum professionals meeting remotely to develop a digital project for their museums. The working process was shortened to a twelve-week period to enable a faster timeline for launching the digital projects, and thus to more effectively respond to the emerging needs of pandemic visitors.

Figure 2.1 Extract from the announcement of PRISM's COVID-19 innovation cells[11] (Source: PRISM).

[11] The full announcement can be found in Appendix A.

The first two pandemic innovation cells ran from June to September, with one group focusing on touch-free interactive tools and the other on projects for school audiences. Sixteen institutions participated in these cohorts, along with professionals from three partner technology companies who were selected to contribute their expertise in prototyping the projects and testing usability. The two autumn cohorts would focus on projects for schoolchildren with special needs and for isolated elderly visitors. However, three weeks before the two autumn cohorts were scheduled to begin, a rise in COVID-19 cases led to provincial government restrictions that indefinitely closed museums in Montreal starting on October 1, 2020. Given this new context, PRISM rescheduled these two innovation cells for January in order to prioritize providing support for MMFA projects that were directly impacted by the sudden closure of the Museum.

And so, that autumn, in the place of the original two innovation cells for provincial museums, PRISM launched an internal innovation cell to develop a digital project for the MMFA exhibition that was scheduled to open on November 24, 2020, despite the physical galleries being closed to visitors at that time. The innovation cell was tasked with designing a virtual format that could offer a guided group tour of the exhibition remotely. The group's participants were invited from different visitor-centered MMFA departments, and the internal innovation cell was launched on October 22, 2020, on the videoconferencing platform Zoom.

2.2 Methodology

This preliminary study aimed to identify the themes that were mobilized in the development of digital interpretation tools using constantly evolving technologies in museums. As this research area was undergoing major shifts, the PRISM innovation cell offered in response to the emerging needs and dynamics within museum teams during the COVID-19 crisis was considered to be a relevant case study for purposive sampling[12] that would inform the direction of this doctoral research. Ethical approval was obtained to conduct this preliminary study in the context of the doctoral exam[13].

It was determined with the doctoral research committee that this line of inquiry would benefit from an inductive research approach based in grounded theory (Creswell & Poth, 2018; Glaser & Strauss, 2017; Luckerhoff & Guillemette, 2012; Meunier et al., 2020). This methodological approach enabled a reflection on the theory and concepts found in scholarly literature based on the emergent themes from the data collected. Participant observation facilitated a detailed analysis of the dynamics that arose in the process of collaboratively developing a digital museum interpretation project.

Data collection consisted of several tools, including participant observation in the innovation cell, field notes, research memos, a documentary review, and a semi-structured interview. The use of participant observation allowed for direct experience with the working processes and in the group dynamics. Innovation cell participants gave their consent for the doctoral researcher to fully participate in all the sessions of the innovation cell. Direct observations of the sessions were recorded in field notes, and the emerging themes were expounded upon in research memos. The corpus of PRISM's documentation related to running the innovation cells was assembled for analysis, including the guided activities, presentations given to the group, and technical support documents. Lastly, a semi-structured interview was conducted with Charlène Bélanger (2020) about PRISM's history, structure, and missions, as well as the evolution of the innovation cells.

[12] The term 'purposive sampling' is used here in the sense of *échantillage intentionnel* in French: this innovation cell was intentionally selected as an initial case study due to its relevance to the larger research area.

[13] The CERPE approval certificate can be found in the Appendix B.

2.2.1 Analytical framework

To support the identification of emerging themes in the case study, the use of a deliberative[14] induction process was employed as a part of the data analysis. This approach used an analytical framework to guide the research process, enriched with elements that emerged from the data (Mukamurera et al., 2006; Anadon & Savoie Zajc, 2009). For this study, an existing analytical framework was adapted to analyze how the innovation cell functioned—that is, how it was structured to encourage collaboration that took advantage of the expertise of the diverse participants and how it facilitated the development of a digital tool.

The Groupe de recherche sur l'éducation et les musées (GREM) at the Université du Québec à Montréal proposed an analytical framework for evaluating the dynamics at play within museum pedagogical tools (Legendre, 1983; Allard & Boucher, 1998; Meunier, 2011). This framework offered a model for understanding learning in museum contexts, through the examination of its four components: the visitor (S: subject), the guide or educator (A: agent), the theme treated by the pedagogical tool (O: object), and the museum (E: environment). In this model, the relationships between each of the first three composing actors built on each other to characterise the overall pedagogical process, all within the context of the environment (Figure 2.2). The model's three pedagogical relationships were:

- **The Relationship of Transposition** (R-1): how the educator transforms the specialized theme into accessible content and designs the pedagogical tool;
- **The Relationship of Support** (R-2): how the educator presents the pedagogical tool to the visitor; how the educator encourages and facilitates the visitor's use of the tool;
- **The Relationship of Appropriation** (R-3): how the visitor uses the pedagogical tool to become familiarised with the theme; how the visitor goes more deeply into the theme by using the pedagogical tool (Meunier, 2011).

[14] The term 'deliberative' is used here in the sense of *délibératoire* in French, with the meaning of 'relating to', signifying an induction process that is related to an analytical framework.

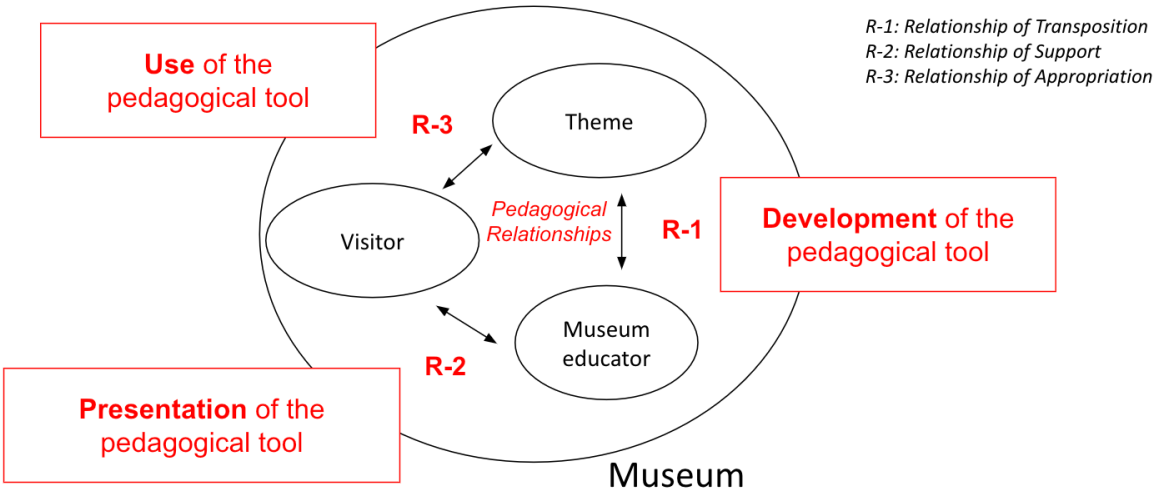

Figure 2.2 GREM analytical framework for evaluating pedagogical museum tools (Meunier, 2011).

In this preliminary study, the GREM analytical framework was determined to be a relevant model because the PRISM innovation cells were pedagogical situations intentionally designed by the laboratory's team to teach participants with different backgrounds how to understand and employ the design thinking process in the context of co-creating museum digital interpretation projects. The GREM analytical framework facilitated an examination of the efforts involved in designing a pedagogical tool, the relationship between the educator and learner when using the tool, and the learner's experience appropriating the content through the use of the tool. An evaluation of a PRISM innovation cell based in the GREM's model would allow for an analysis of the dynamics and structures within the sessions, as well as the mobilization of the program objectives related to process and outcomes.

In this adaptation of the GREM analytical framework to the context of the PRISM innovation cells, the Object (O) became the collaborative process of co-creating a digital interpretation project. The innovation cell's exercises and reflections were all oriented around collaboratively designing an interpretation offering for remote visitors. The Agents (A) became the two PRISM team members who guided the group through this collaborative process. These individuals had contributed to the design and facilitation of the innovation cells. The Subject (S) became the MMFA employees who were the group members. The collaborative process was designed to encourage the participation of these individuals, and they had not

been involved in the creation of the program. Lastly, the Environment (E) became the innovation cell itself, led on Zoom, within the larger professional contexts of PRISM and the MMFA.

In the analysis of the innovation cells (Figure 2.3), the Relationship of Transposition (R-1) examined how the PRISM coordinators designed the innovation cells to make the co-creation process accessible to the participants. The Relationship of Support (R-2) described how the PRISM team members presented the innovation cell process to the participants, as well as how they facilitated and encouraged the participants' engagement with the process. The Relationship of Appropriation (R-3) explored how the group members used the innovation cell sessions to learn about, and participate in, the collaborative creation process.

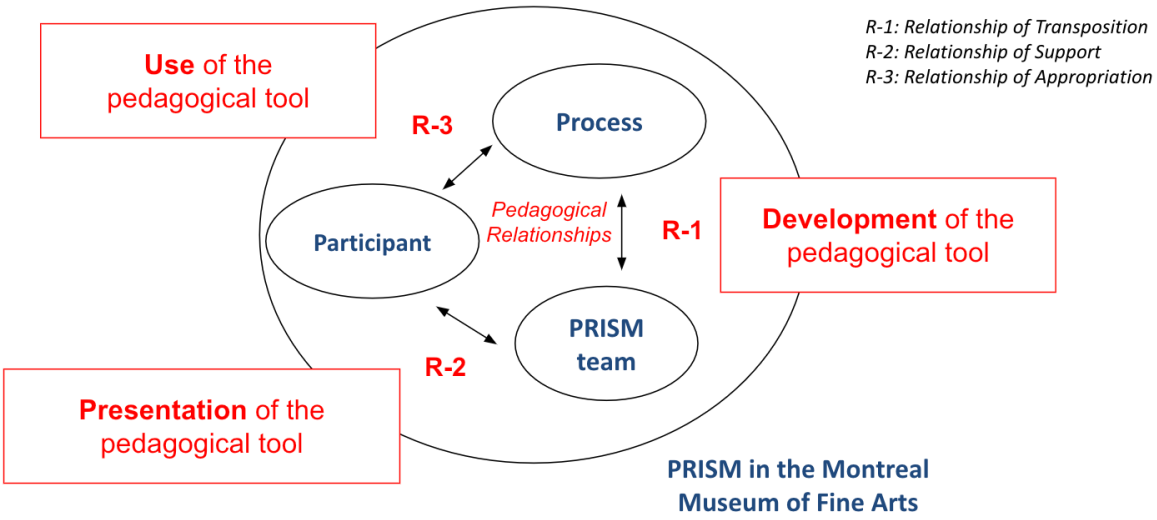

Figure 2.3 Adaptation of the GREM analytical framework for evaluating pedagogical museum tools (Source: author).

To facilitate data analysis, each innovation cell session was divided into the composing units of activities, including the homework that was assigned to be completed between sessions. Each unit was then examined according to the following criteria[15]:

- Description of the activity;

[15] An extract from the analysis table can be found in Appendix C.

- What the activity achieved regarding program objectives;
- Level of participant engagement (active / passive);
- Tools used (in addition to Zoom);
- Relationship of Transposition (R-1) between the PRISM team and the collaborative process;
- Relationship of Support (R-2) between the PRISM team and the group members;
- Relationship of Appropriation (R-3) between the participants and the collaborative process.

The three pedagogical relationships were thus identified and examined through the adapted GREM analytical framework, which was supported through the use of field notes, direct experience from being a participating observer, and the themes developed in the research memos. This facilitated the analysis of the dynamics at place between actors, structures, and environment.

2.3 Results and analysis

2.3.1 Components of the internal MMFA innovation cell

The internal MMFA innovation cell was launched the autumn of 2020 to guide MMFA employees through the process of developing a digital interpretation project for the Museum's upcoming exhibition, *Riopelle: The Call of Northern Landscapes and Indigenous Cultures*[16]. The objectives for this innovation cell were both outcome and process oriented. First, the MMFA had mandated the development of a specific digital tool. Since the exhibition was scheduled to open while the physical galleries were closed to the public during the province-wide closure of cultural institutions in the midst of the second wave of the COVID-19 pandemic, the innovation cell participants were tasked with developing an innovative digital format for virtual group tours of the exhibition. Additionally, PRISM also had objectives for how the process would function, stemming from the laboratory's broader goals for the development of digital interpretation. For actual co-creation dynamics to occur, participants would need to be active contributors in the collaboration. To follow the design thinking model, participants would need to understand each step of the process and integrate that understanding into their professional practices. And to develop a relevant digital tool, participants would need to be capable of communicating effectively with the digital specialists brought into the process from the selected technology companies.

The innovation cell's participants were invited from various visitor-centered MMFA departments, including Education and Wellbeing, Membership and Customer Service, and Volunteer Guides. These professionals had different levels of familiarity with both developing and using new technologies, with a range of expertise in designing interpretation experiences for museum visitors. Each participant demonstrated a deep understanding of how their area of professional expertise functioned within the Museum. Several of the group members either currently worked with each other or knew each other from previous professional experiences, which incorporated a level of familiarity into the group dynamics.

The sessions were co-facilitated by the laboratory's director and coordinator, both of whom had previous experience guiding PRISM innovation cells. They had professional backgrounds in museum education,

[16] This exhibition was held at the MMFA from November 25, 2020 to September 12, 2021.

program evaluation, and facilitating the use of new technologies. These two professionals already had existing working relationships with many of the cell participants, who were their MMFA colleagues.

The sessions were run virtually using the online videoconference platform, Zoom. This environment allowed the participants to meet all together from different locations, and also to work in smaller subgroups in online 'breakout rooms'. The platform enabled participants to share their screens, so they could collaborate with interactive PDFs. Additionally, PRISM team used the online platforms Mural and Google Docs, which allowed participants to simultaneously contribute to shared documents. The online messaging platform Slack facilitated asynchronous discussions and the sharing of resources between sessions. The PRISM team shared the group's working documents using the online platform Trello; using this website, the team presented each session with an introduction to the content, relevant links, PDFs for group activities and the 'homework' assignments to be completed independently between sessions, and a portal for participants to submit their finished assignments. The PRISM team also organized an on-site visit of the exhibition for group participants midway through the innovation cell process.

The internal MMFA innovation cell was launched on October 22, 2020. The five design sessions took place through December, with two evaluation follow-up sessions held in February and July 2021. Each session lasted for three and a half hours, including a thirty-minute break.

2.3.2 Relationship of Transposition (R-1)

The Relationship of Transposition took place between the Agent and the Object. In the context of the adapted analytical framework, this relationship described how the PRISM team (Agents) designed the innovation cells to facilitate a collaborative development process (Object) that was accessible to the participants (Figure 2.4).

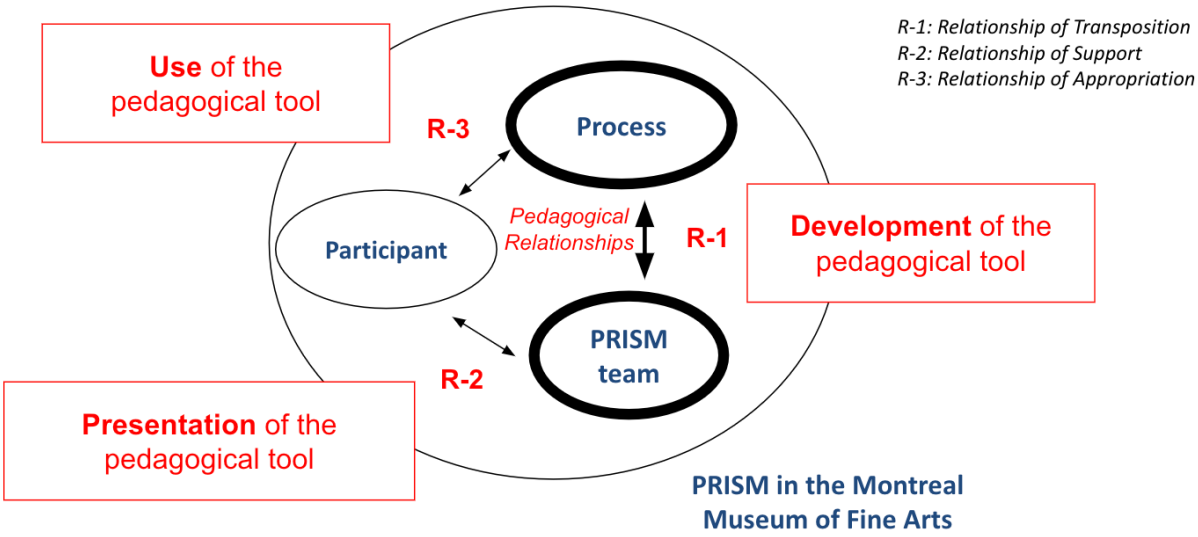

Figure 2.4 Relationship of Transposition (R-1) in the adapted GREM analytical framework (Source: author).

The PRISM team created the overall structure of the innovation cell process based on the design thinking model, with each session corresponding to one of the five steps. This clearly delineated the different stages of the process, allowing participants to engage with each theme over the course of three and a half hour-long working sessions and through subsequent homework assignments. While the sessions were designed with the objective of guiding the participants through the process, they also aimed to be open enough to allow the participants to be active co-creators.

To achieve engagement with the design thinking process, the PRISM team divided each session into thematic sections with corresponding activities. Each of these exercises was structured with clearly defined steps and was designed to be completed during the allotted section of the session. Participants were also assigned homework activities to complete independently after each session; these assignments acted as bridges, providing transitions between the themes addressed in each step. The exercises aimed to make each step accessible by breaking down the larger design thinking process into more manageable activities that could guide the group as it worked on its specific digital project. The exercises linked the design concepts to concrete examples.

While the PRISM team guided the interactions of participants during the sessions, the activities themselves were conducted with the aid of written formats. The documentation for the activities often included an

introductory text that explained how the activity would support the design thinking process and what its components would be. The documents for the activities themselves featured response boxes that participants could fill in, either as a group during the session or independently at home.

The group activities flowed organically from one to the next, the ideas building on each other as the sessions progressed. For example, in the second session, the participants worked together to create two potential visitor personas, describing aspects of their identities and both their digital and cultural practices. After completing this task, the group was asked to imagine what quality of experience each persona was looking for in a digital museum project. Based on the results of this exercise, the group subsequently listed the specifications for a potential digital interpretation tool, both for the interpretation experience and for the tool's technology. Each activity in the session was a necessary stepping stone to progress to the next phase in the design thinking process. The PRISM team regularly reminded the group of their previous efforts at strategic moments in the sessions, aiming to ensure that participants were grounding their work in reflections that were relevant to the tasks at hand.

The structure of the cells allowed the PRISM team to engage in techniques of both explicitly explaining concepts and putting that theory into practice. For example, the design thinking model and its steps were presented through spoken introductory presentations, documentation to read between sessions, and carefully designed guided activities. Each step of the process was explored through direct connections with the specific project at hand. Group members could therefore learn the process passively through listening and actively by doing.

This approach of putting the participants in alternating passive and active stances was also integrated throughout the sessions to encourage engaged participation in the collaborative process. For example, the concept of collaboration was explained to the participants both explicitly through spoken presentations and implicitly through the structure of the sessions. In the second session, the PRISM team shared their expectations for how the participants would act in the collaborative process. Participants were subsequently asked to fill out a document with their ideas for qualities of successful collaboration, and values and actions to which they would commit. This shared document became an agreement amongst the participants for how they would approach the collaborative process. But participants were also regularly put in situations where collaboration was encouraged, and even required. This could be seen at the launch of the first session of the innovation cell when participants were randomly put into pairs for an

ice breaker activity, requiring every participant to begin practicing active participation in an informal way, from the very beginning of the process.

2.3.3 Relationship of Support (R-2)

The Relationship of Support took place between the Agent and the Subject. In the context of the adapted analytical framework, this relationship examined how the PRISM team (Agents) presented the innovation cell process to the participants (Subject), and how the team facilitated and encouraged the participants' engagement with the process (Figure 2.5).

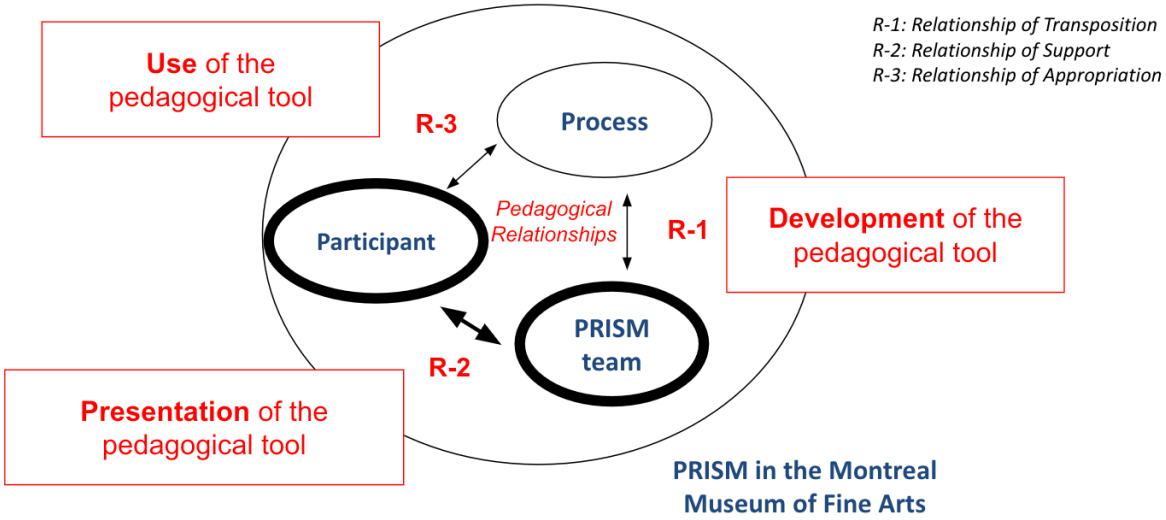

Figure 2.5 Relationship of Support (R-2) in the adapted GREM analytical framework (Source: author).

The two members of the PRISM team responsible for this innovation cell were highly involved in running the collaborative process. They led each session by setting the agenda, introducing and facilitating activities, identifying priorities, managing time, assigning subgroups, and guiding the flow of discussions to stay relevant to the project at hand. They also did work between the sessions, including synthesizing the group's brainstorming work so it was available as a written resource for the next session and helping

the selected technology specialist to prepare the language of his presentation so it would be accessible for the MMFA group members. This work during and between sessions created a streamlined experience for the participants.

While the PRISM team guided the group through the established structure for the process, they also stated explicitly that the participants were to be co-creators for the project, within the bounds of the innovation cell's structure. The PRISM team defined their main role within the innovation cell process as providing support and resources for the group members to mobilize in the project. These resources included research, technical expertise, the innovation cell structure, and the working tools. The PRISM team supported their statements regarding co-creation through offering activities that put the participants in situations that encouraged active participation, opportunities for participants to weave their specific expertise into the process, and clearly defined moments where participants could vote on the direction of the project.

There were four main modes of engagement between the coordinators and the participants. In the first mode, the coordinators actively lead the discourse, and participants were put in a passive position. For example, the first session of the innovation cell began with a presentation of PRISM, which helped participants understand the larger context, learn how their participation would contribute to the laboratory's objectives, and primed them to engage with PRISM's approach to the design process. In the second mode of engagement, the coordinators guided the participants through structured collaborative activities together. Examples of this type of engagement included when the whole group would simultaneously add text to the shared Mural page and discuss their ideas. In this mode, the coordinators engaged with the participants' comments by distilling larger themes and connecting them back to the work of the innovation cell. By doing this, the PRISM team extracted what they perceived to be relevant ideas from the participants' work in order to incorporate these contributions into the group's working process. The team also modeled to the participants how to distill larger themes from specific examples and empowered the participants by validating their observations. The third mode of engagement involved the coordinators providing an activity for the participants to complete on their own, while still being present if their support was needed. For example, this mode of engagement could be seen when participants were split into subgroups for certain activities. A PRISM team member was present in each group, but the participants led the discussion in a more active way. The PRISM team helped structure this dynamic by instructing participants to select one person to write down the group's responses in a PDF and another to

present their work to the other subgroups when they came back together. In the last mode, the participants completed activities autonomously. The homework assignments were examples of this type of engagement. Yet even when participants were completing work independently, the PRISM staff made themselves available to answer questions or provide support through digital platforms, such as Slack and email.

The PRISM team encouraged group members to feel comfortable engaging in the co-creation process by clearly communicating about the process and fostering open dialogue. The PRISM team provided clear explanations of each exercise, so participants had a solid understanding of what was expected of them as they engaged with the work. Questions from participants were treated with respect and openness, both during and between sessions. The PRISM team regularly oriented the participants within the process by providing summaries of what the group had already done and what the next steps of the process would be, a practice which primed participants to understand where their current work fit within the overall process.

A convivial atmosphere also contributed to this open communication. The PRISM team fostered these collegial dynamics by building in time before the sessions for socializing and making room in the process for humour (for example, participants could vote for ideas they liked in a document using a flame emoji, because the idea was *'lit'*). These informal dynamics fostered comfort when communicating with each other, encouraging participants to feel at ease when engaging in the collaborative process together.

The PRISM team facilitated the interactions between the participants and the digital specialists from the selected technology company. The PRISM coordinators managed the initial communication with the start-ups, using the group's reflections as the basis for a call for proposals aimed at technology companies and selecting the two finalists. They also streamlined the communication between the teams from the start-ups and the innovation cell participants during the sessions. This was achieved through guided activities and the PRISM team's fluency in these different professional languages—they reportedly acted as "interpreters[17]" between the worlds of start-ups and museums. For example, when representatives from the two finalist companies came to the third session of the innovation cell, the PRISM team facilitated the interaction by splitting the group into two smaller subgroups, each paired with one of the technology

[17] Charlène Bélanger, quoted in "L'avenir de l'expérience muséale se dessine au MBAM", Le Devoir, February 26, 2021, https://www.ledevoir.com/culture/arts-visuels/596224/l-avenir-de-l-experience-museale-se-dessine-au-mbam

companies. Together, each subgroup completed an activity that guided the participants through a structured evaluation of how the proposed digital project would meet the needs of the defined personas, inviting them to reflect on possibilities for how this technical solution would impact user experience. When the groups came together, a representative from each subgroup presented their paired company's proposal to the other subgroup, allowing the museum participants to interpret the digital project in their own words. The PRISM coordinators were present to distill key points, interpret between professional languages as needed, and direct the discussions to stay relevant to the project at hand.

To make the content of the innovation cell accessible, the PRISM team provided technical support for the participants. This was especially important in the virtual context mandated by pandemic restrictions, where all interactions and working processes were completed remotely on online platforms. The PRISM team provided detailed documentation for each digital tool used for the innovation cell (such as Trello, Zoom, Google Workspace, and Slack) and responded quickly when group members had questions, both during and between sessions. To encourage participants to engage with the online platforms, the coordinators employed strategies such as sending an email reminding participants to check an important message on Slack rather than just sending the message in email form.

2.3.4 Relationship of Appropriation (R-3)

The Relationship of Appropriation took place between the Subject and the Object. In the context of the adapted analytical framework, this relationship examined how the participants (Subjects) used the innovation cell sessions to learn about the development process (Object) and engage in the collaboration (Figure 2.6).

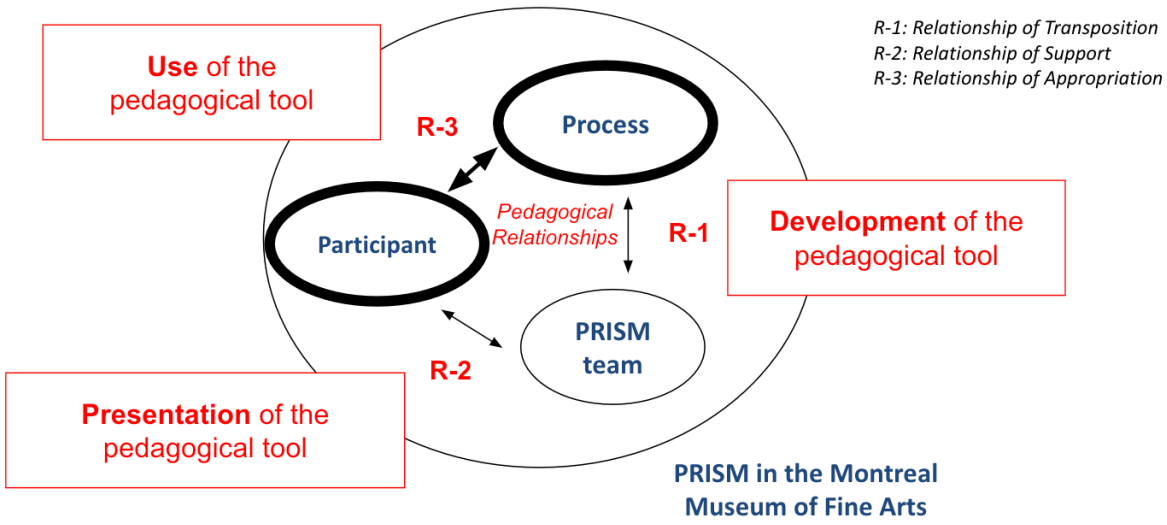

Figure 2.6 Relationship of Appropriation (R-3) in the adapted GREM analytical framework (Source: author).

The participants' relationship with the collaborative creation process changed over the course of the innovation cell's sessions. At the beginning of the process, participants were guided through various exercises where they were in listening mode (which helped build a shared understanding of the process) and activities with highly structured collaboration. For example, the group worked together on exercises that were completed on shared platforms like Mural that allowed participants to contribute simultaneously and under the guidance of the PRISM team. They also were split into subgroups for structured activities with defined roles (such as 'scribe' and 'presenter') that enabled more active participation due to the smaller group size. In these activities, participants were in a generally passive role as they learned how to engage in the process by following the lead of the PRISM team. This allowed them to practice active participation in a highly structured dynamic, as well as to familiarise themselves with the process in order to eventually build enough confidence to make it their own.

The collaboration became more organic and active as the sessions progressed, when the group members felt more at ease with, and ownership of, the process. There was a large shift in the movement from passive member of a guided process to active participant after the third session, when the technology solution was selected by the group. With work on a specific digital interpretation project underway, participants were more empowered to bring their individual expertise and perspectives to the process.

For example, when storyboarding the virtual visit of the exhibition, the educators shared their knowledge of how to create a meaningful museum experience for visitors, while other participants with knowledge of technological tools helped the group design the equipment configuration and online platforms that would facilitate that experience.

One of the tools that developed helped foster this autonomy was the homework assigned between sessions. These activities were inspired by the steps of the design thinking process, including analyzing a digital offering in another museum or interviewing a person about their digital and cultural practices. As the sessions continued, the assignments became more specialized and participants used their diverse professional skills to contribute to the project, such as designing methods to recruit prototype testers or developing the educational content that would be featured in the digital tool. The independent investigations facilitated by the homework assignments took these tools beyond just teaching design thinking concepts: they also guided participants toward autonomy and making the process their own.

As the process progressed, the lines between innovation cell and museum roles blurred. Participants worked outside the sessions in the context of their professional roles at the MMFA, including efforts around content design, visitor recruitment, and tour guide training. Work for the innovation cell incorporated collaborations with additional MMFA colleagues and on-site visits to the exhibition galleries. In fact, so much work on these projects began to be completed outside of the innovation cell meetings that later sessions included time blocks dedicated to checking in on the status of this outside work. The participant experience thus shifted from a workshop introducing theoretical ideas to a working process integrated with their professional museum roles. Participants deepened their understanding of the design process by becoming more autonomous, and they were thus empowered to act more as co-creators when they were encouraged to incorporate their individual expertise and skillsets to the collaboration.

The dynamics between the participants and the PRISM team adapted to this shift in the distribution of authority. As participants positioned themselves as the experts of their specific contribution to the project, they became situated more like peers in their level of expertise with the PRISM team. While the PRISM coordinators still enforced the structure of the innovation cell process (and held the ultimate authority to make decisions for the project), the power dynamics balanced out to a more equal level. The participants used their power within the established structure to approach co-creation. The PRISM team's role became

less that of leader and closer to what they had originally stated: to provide support and resources for the work of the participants.

2.4 Discussion

2.4.1 Synthesis of the themes identified by PRISM

The efforts surrounding the design and facilitation of the PRISM innovation cells were grounded in their mandate to support digital museum interpretation practices. According to the laboratory's documentation, PRISM operated with a mission of collectively imagining new digital interpretation tools that aimed to offer visitors enriching experiences using co-creation and design thinking[18]. Through the definition of these goals, the PRISM team identified the themes that they perceived to be fundamental elements of the process of the innovation cells. These themes were: collaboration and co-creation, the use of the design thinking framework, the development of innovative digital tools, and the creation of meaningful visitor experiences through museum interpretation. Through the findings that resulted from applying the adapted analytical framework to this preliminary study, the mobilization of each concept was analyzed to assess if these foundational elements were supported through the innovation cell process.

2.4.1.1 COLLABORATION AND CO-CREATION

Collaboration was developed in the participants through the dynamics fostered throughout the sessions. The PRISM team incorporated structures into the guided activities that helped group members learn how to participate in the process, including through techniques like alternating between guided and more active stances, splitting the group into smaller subgroups, and providing tools that allowed participants to work together, such as Mural and shared PDFs.

As the process progressed and participants shifted towards the more empowered role of co-creator, they were able to engage their specific skill sets and to position themselves as experts alongside the PRISM

[18] *PRISME, le laboratoire numérique du MBAM, annonce les participants à ses cellules d'innovation muséale en contexte de COVID-19*. Musée des beaux-arts de Montréal. Published August 24, 2020. Retrieved June 12, 2021, from https://www.mbam.qc.ca/fr/actualites/prisme-annonce-les-participants-a-ses-cellules-dinnovation/
Translated from the French: "PRISME a lancé, en juin 2020, un appel aux institutions membres de la Société des musées du Québec afin d'imaginer collectivement de nouveaux outils de médiation numérique visant à offrir aux visiteurs des expériences enrichissantes et sécuritaires. [...] (Q)uatre cellules d'innovation [...] prendront ainsi part à des rencontres de cocréation et de réflexion conceptuelle (design thinking)."

team. While participants only had the authority to co-create within the established structure of the innovation cell, they had agency to help guide the direction of the project within those confines. This included specific moments where they could vote directly for different options within the project, as well as integrating their professional museum work with their innovation cell tasks. Evaluation of PRISM's previous innovation cell format found that less structure actually hindered full collaboration in the sessions; the current version found a balance between an established guiding structure and an active dynamic of co-creation. The authority of the PRISM coordinators to make decisions and steer the process ultimately fostered collaboration between diverse professionals gathered together within the confines of project-based engagement, by empowering them to develop their own unique capacity to contribute to the process.

The PRISM team facilitated the collaboration between the group participants and the technology partners. Their efforts began even before the companies entered the innovation cells, as the coordinators were responsible for crafting the language in the call for proposals and selecting the two finalists. The PRISM team also streamlined the communication between MMFA employees and the technology specialists during the sessions through the design of the structured collaborative activities and their practices as facilitators (distilling key points, reminding the group of their previous efforts at strategic moments, directing the discussions to stay relevant). The PRISM team's fluency in these different professional languages—and their capacity to act as *interpreters* between the worlds of start-ups and museums—also played significant roles in enabling collaboration to occur between partners from different sectors.

2.4.1.2 DESIGN THINKING

The design thinking model was the foundation for the innovation cell structure. Each step of the design thinking process was intentionally integrated into a dedicated session, allowing participants the time and space to immerse themselves in the themes related to that step. Different approaches allowed participants to explore the different steps of the process through a variety of engagement modes, including presentations, collaborative activities, and tasks to complete between sessions.

The first step of the design thinking process was to empathise with users, or museum visitors. Participants approached this step by conducting semi-structured interviews with contacts who shared characteristics

with the targeted audiences, and by immersing themselves in the opportunities and constraints of the pandemic for visitors and museums. Group members used this work to support the second step of identifying the needs and desires of two visitor personas, and using those reflections to define interpretation intentions and conception criteria for a digital interpretation project. This foundational work was integrated into every subsequent step of the innovation cell process, and it was used to justify both the larger directions for the digital project and smaller design choices.

The third step of generating ideas was modified to the context of the innovation cells, as the participants did not possess the skills themselves to develop digital projects. Instead, the group identified existing digital projects that featured elements that were relevant to the interpretation intentions and conception criteria defined in the previous step. However, the potential project ideas were constricted to those that would fit within the contexts of the digital solutions proposed by the two selected start-ups.

When the group selected one of these proposed digital solutions, they approached the fourth step of prototyping through the exercise of storyboarding the user experience and adapting it to each of the visitor personas. The group delved into the details of the mechanisms that would constitute the visit experience, starting with the technical format and followed later by educational content. The posture of experimenting and testing prototypes as soon as possible was integrated into this process. When the group faced design decisions, the laboratory coordinators often responded by proposing testing different formats to find the answer. The methodology presented was to test the group's design choices with real visitors to determine their validity.

The final step of testing the digital solution went beyond the scope of the initial five innovation cell sessions. The latter stages of the design thinking process involve making rapid iterations of the project and testing them with users, continuously repeating these last two steps. However, the fifth session of the innovation cell was dedicated to finalizing the first iteration of the prototype and developing appropriate evaluation tools. While two subsequent innovation cell sessions were held to inform the participants of the results of the testing phase and brainstorm ideas for changes, this final phase was outside the bounds of the structured innovation cell process.

2.4.1.3 DIGITAL TOOL DEVELOPMENT

In the development process in the innovation cell, digital technologies were treated as neutral tools that had the potential to be shaped and harnessed to the objectives of the project. Use cases of these technologies were initially approached and understood through the lens of visitor needs and desires. The digital project was conceptualised by examining the digital and cultural practices of targeted audiences, and designing a visit experience aligned with those practices. Technology was presented not as the goal but rather as a method; PRISM stated that their priority was to position the digital project as the support for an experience lived by visitors.

In the dynamics of communicating about the capacities of the project's digital specifications, there were occasional gaps of understanding between different actors. This dynamic was especially salient during the first interactions between the start-up companies and the museum professionals. For example, one company presented their ideas for an immersive virtual reality experience through the use of an online video as a visual aid for communicating their project proposal; for group participants who had never worn a virtual reality headset, it was more difficult to understand how the specificities of this proposed digital experience would translate to the desired museum interpretation outcomes. When participants were asked to vote between the two digital proposals at the end of the session, the different levels of previous familiarity with the technology made it difficult to equally empower each participant to make a fully informed decision.

When working on the selected digital solution for the project, the participants engaged with the technology mainly through the lens of the needs of the two personas and the museum guides who would be leading the virtual visits. The group collaborated in storyboarding each step of the virtual experience with the personas in mind, which enabled the participants to visualise the potential impacts of the digital tool on these specific visitors. Participants often justified their design preferences using the identified needs of one or both personas, as well as previous MMFA evaluation research of experiences for similar segments of visitors. While a global understanding of the technology was employed in storyboarding the experience, participants gained a more specific understanding of the mechanisms of the digital project through their individual tasks, such as determining how many artworks the guides should present in one visit, what types of complementary material could be added to the digital platform, and what microphones or media carts would be appropriate in the gallery space to support the digital experience.

Participants identified several potential benefits of using digital technology in an interpretation project over the course of the innovation cell, including: connecting visitors with artworks and each other, educating them about the content of the exhibition, immersing them in a virtual visit experience of an exhibition that was otherwise closed to the public, and cultivating the MMFA's relationship with its membership through special access to a virtual experience. The possible downsides of the selected technology solution were mostly addressed in concerns about difficulties users might face in navigating the interface of this specific digital tool. However, discussions about potential negative constraints did not extend to reflections on larger issues of working with digital technologies in museum contexts, including accessibility, inclusion, or institutional sustainability.

2.4.1.4 MUSEUM INTERPRETATION AND VISITOR EXPERIENCE

The PRISM team presented the concept of museum interpretation to the group members through the lens of the MMFA's human-centered values, which aimed to create experiences that were "humanistes, inspirantes et porteuses de sens[19]". By having an experienced team of MMFA educators and volunteer guides as participants in the innovation cell, there was a consistency in the approach to content design for the digital project that was aligned with the MMFA's other interpretation programming. Attention was paid to designing the innovation cell's digital experience so that it would facilitate museum interpretation, rather than solely being a virtual visit of the space. The evaluation of the prototype enabled the participants to verify that this new format met the standards of the MMFA for their programs.

While most of the working reflections were centered around designing the interpretation approach to the artworks for the visitors, there was also attention paid to the "médiation de la technologie", as one participant put it. The participants storyboarded every action and interaction that would occur within the project's experience, such as signing up for the program, logging into the virtual visit, and accessing technical support before and during the experience. This work highlighted the perceived importance of relevant design for the user experience and user interface as methods that enabled visitors to actually engage with the museum interpretation content and have a satisfactory visit experience.

[19] From the presentation given by Charlène Bélanger in the first innovation cell session.

In keeping with the human-centered approach, the voices and lived experiences of visitors were present in the work of the innovation cell. The PRISM team built in proxies for visitors through various exercises. At the beginning of the process, participants were asked to conduct preliminary interviews with contacts who matched the profiles of targeted visitors. The information gathered about these real people informed the subsequent work of creating the imaginary visitor personas to be used in the design process. These two personas were given histories and preferences, and participants referred to them by their first names throughout the sessions. Each design decision was reflected back onto these visitor stand-ins, to help adapt the project specifications to cater to their needs and desires. In the prototype phase, actual visitors were brought back into the process to test the project. These visitor voices were incorporated into the design process through evaluations of the first iterations of the digital experience.

2.4.2 Identification of the themes emerging from the preliminary study

Through the adaptation and application of the GREM's analytical framework to conduct the analysis of the PRISM innovation cell, several broad themes emerged as playing critical roles in the development of interpretation projects using digital technologies in museum contexts. Identified from observations of one specific program, these areas of reflection revealed larger currents flowing under the professional practices and dynamics in the field of digital museum interpretation.

The themes that most strongly emerged from this preliminary analysis were those related to the specificities of working collaboratively with digital technologies to meet interpretation objectives. These themes fell into three main areas of reflection:

- **WORKING IN INTERPRETATION**: How to understand and apply digital technologies as museum interpretation initiatives;
- **WORKING WITH TECHNOLOGY**: How to engage effectively with digital technologies in the context of cultural institutions;
- **WORKING TOGETHER**: How to collaborate and communicate between diverse professional languages and practices.

These three core thematic considerations, identified from the initial sampling in the PRISM innovation cell, reflected the complexities within the decisions, structures, and professional practices that were mobilized in the development of digital interpretation projects in museum contexts. Explorations into the dynamics and tensions within each of these three themes were used to inform the direction of this doctoral research.

2.4.2.1 WORKING IN INTERPRETATION: DISCOURSES OF THE DIGITAL IMAGINAIRE

Through discussions about designing digital tools to respond to visitor needs and institutional objectives, the theme emerged of how to understand and apply digital technologies as museum interpretation initiatives. In the context of the innovation cells, there was a consistency in the conceptualization of interpretation between the PRISM team and the MMFA participants, as the group contained an experienced team of Museum educators and volunteer guides. This coherency facilitated the design and decision-making processes, as both laboratory and museum employees were working within the same institutional context. The question arose of how PRISM could equip professionals from diverse museums to engage with digital technologies to support potential institutional variations on the conceptualization and mobilization of interpretation objectives.

A concept that is related to the broader reflections on, and understandings of, the impact of digital tools on museum visitor experience is the digital imaginaire. As outlined in the doctoral dissertation of Eva Sandri (2016), this concept defines the expectations held by museum professionals for digital tools, especially in regard to the possible effects on visitors. When conceptualizing and developing a digital tool for museum visitors, what were the discourses of digital imaginaire that were being mobilized by the different participants in the collaboration regarding the impacts of these digital museum interpretation tools? And what discourses were present on the institutional level, as seen in the guiding missions for interpretation and communication, the administrative structures, and the budgetary allocations?

In the analysis of the innovation cells, the variations in professional languages and practices between museum professionals, the laboratory team, and technology partners demonstrated the diversity of approaches to conceptualizing museum interpretation. The PRISM coordinators helped the start-up team to adapt their frame of working to the museum context. What would the perspectives and adapted practices of the technology companies that had experience partnering with museums reveal about the

needs and capacity of these cultural institutions to harness digital technologies for interpretation initiatives?

2.4.2.2 WORKING WITH TECHNOLOGY: DIGITAL LITERACY AND DIGITAL CAPACITY

From observations of the innovation cell, the theme emerged of how to engage effectively with digital technologies in the context of cultural institutions. The analysis of the sessions found that while the participants were empowered to actively collaborate in the development of the project, there were different levels of understanding regarding the digital project proposals and the specificities of the impacts of the technology on the museum visitor experience.

When reflecting on these themes in the context of this study, the question arose of the larger objectives for PRISM's innovation cell program. The laboratory's founding mandate was to support innovative digital interpretation in Quebec museums, which could potentially be achieved in part by supporting museum workers in evaluating and increasing their digital literacy. Was the objective of the innovation cells solely to develop a digital project, or to also develop a more digitally literate museum worker? While the innovation cell process guided museum teams through the development of one specific digital project, how could museum professionals be supported in increasing their digital literacy beyond this specific collaboration (and to what extent)?

When designing and developing digital projects, museum professionals must utilize both their digital skills and digital literacy. Digital skills are the capability and competence to work with digital technologies; digital literacy is a more reflective mode in which to understand the impacts of digital tools in different contexts (Malde et al., 2019; NMC, 2016; Parry et al., 2018). Digital literacy has been increasingly seen as a vital component for museums operating in a postdigital age, in order to produce digital interpretation projects that are aligned with larger institutional objectives and that effectively steward staff and financial resources. What were the elements that museum professionals must understand to be fully informed when deciding if a technology is a relevant and useful format to meet their interpretation goals? What processes and structures within the larger museum environment would best support the digital activities of museum professionals?

2.4.2.3 WORKING TOGETHER: COLLABORATIONS BETWEEN SECTORS

In observing the interactions that took place in the sessions, the theme emerged of how to best facilitate collaboration between professionals possessing different familiarities with various forms of digital technologies, including how they could effectively communicate in the process of developing a digital project. In the analysis of the innovation cells, the question arose of how specialized staff members could successfully act as "interpreters[20]" between the professional languages and practices of technology partners and museum professionals.

These cross-sectoral collaborations that brought together professionals from museums and technology companies could feature particular dynamics (Arcon, 2018; Austin, 2000; Li & Ghirardi, 2018; Stafford, 1994; Wymer & Samu, 2003). Over the course of the innovation cells, the PRISM coordinators were highly involved in facilitating the interactions between the museum professionals and the representatives from the start-ups. They selected the submitted digital proposals that they considered to be relevant for the group's project, and they were active in structuring the working process and communication during the sessions. The question also arose of how PRISM could scale their resources in order to support more museum teams in learning how to navigate the particularities of cross-sectoral collaborations (such as the selection of appropriate technology partners and the communication during the collaborative process), given the highly time intensive nature of the innovation cells.

In order to make informed decisions about what digital tools to employ in their interpretation projects, museum professionals needed to be empowered to understand the capacities and specificities of different digital tools for shaping visitor experience and learning, as well as the realities of developing and sustaining these projects. Additionally, technology partners needed to be receptive to the interpretation objectives of their museum collaborators. To enable these dynamics, effective communication needed to occur between the museum professionals across departments, as well as any external technology service providers that were brought in as partners for the development of the project. When technology specialists presented proposals for digital interpretation projects, what were the best practices for communicating and translating the capacities of the technology solution to make them relevant to museum interpretation professionals, especially for those who did not have experience with those

[20] Charlène Bélanger, quoted in "L'avenir de l'expérience muséale se dessine au MBAM", Le Devoir, February 26, 2021, https://www.ledevoir.com/culture/arts-visuels/596224/l-avenir-de-l-experience-museale-se-dessine-au-mbam

technologies? How could museum professionals be empowered to be active collaborators in the development process in the context of cross-sectoral partnerships?

2.5 In summary

In June 2020, several months into the COVID-19 pandemic, the then-director of the MMFA Nathalie Bondil spoke about reopening the Museum for the first time since its closure in March, describing museums in the context of pandemic as "des lieux calmes, des lieux de contemplation, des lieux de promenade, des lieux où le temps est ralenti, où on peut se perdre dans une certaine lenteur face à une œuvre, dans la délectation[21]". This perspective positioned museums within society as a balm to the fear and uncertainty of navigating the COVID-19 pandemic. Bondil also contrasted the physical experience of visiting a museum as a relief from the increased reliance on digital technology necessitated by health measures, including social distancing and remote working:

> On a plus que jamais besoin de s'échapper de ce confinement virtuel dans lequel nous étions obligés d'aller. La culture est vivante et elle s'incarne par des œuvres, et quand on est en contact avec elles, elles suscitent toutes sortes de réactions physico-chimiques, qui ne sont pas réductibles à un seul écran.[22]

However, four months later, when yet another wave of the pandemic mandated the closure of cultural institutions across Quebec, the Montreal Museum of Fine Arts was able to offer visitors access to its new temporary exhibition as a result of the collaboration that occurred in a PRISM innovation cell, where interdisciplinary professionals came together to imagine new ways of connecting visitors with the exhibition displays, MMFA educators, and each other, through the use of digital interpretation.

As seen in the case study, the continued context of the COVID-19 pandemic led many museums to alter their digital practices out of the necessity of maintaining connections with visitors given the realities of gallery closures and modified visit conditions. In addition to the repercussions on digital practices, there was also a broader question about what impact of societal transformations like the pandemic—as well as broader concerns around racial inequity and climate change—would have on the role museums played in society, and in the lives of their visitors. The larger currents of utopian missions for the social and communication functions of museums were confronted with the requirements stemming from

[21] Nathalie Bondil, quoted in "Réouverture des musées : Il y aura un grand besoin de s'oublier au travers des œuvres", Radio-Canada, published: June 5, 2020, accessed: October 10, 2020. https://ici.radio-canada.ca/nouvelle/1709553/reouverture-mbam-nathalie-bondil-covid-19

[22] Ibid.

commercial and financial realities. Museums were constantly seeking equilibrium as they worked to stay afloat while navigating these evolving and intersecting forces.

The preliminary study approached the examination of these dynamics through the analysis the innovation cell that PRISM conducted with a team of MMFA employees in the context of the COVID-19 pandemic in the autumn of 2020. An inductive research approach was selected to facilitate the identification of the larger themes that were mobilized in the process of collaboratively producing a digital museum interpretation project. These emerging themes would inform the direction of subsequent lines of inquiry for this doctoral research.

Through the use of participant observation and the adapted GREM analytical framework, the identification of the core themes was grounded in the dynamics that arose in collaborative design processes. These were present in diverse manifestations, such as: the discourses of digital imaginaire regarding the expectations for how digital museum interpretation tools could (or should) shape visitor experience, the impacts of various levels of digital literacy within museum professionals, and professional practices for facilitating communication between actors from different sectors. The three main thematic threads that emerged from the preliminary study were:

- **MUSEUM INTERPRETATION**: Developing visitor-facing interpretation projects using digital technologies to achieve institutional objectives;
- **DIGITAL CAPACITY:** Assessing the ability of museum teams to work effectively with digital technologies within the context of cultural institutions;
- **CROSS-SECTORAL COLLABORATIONS**: Understanding the dynamics of introducing external partners and cultures into museum professional ecosystems.

These emerging themes were increasingly relevant to museum environments where there was pressure to allocate their resources for the creation of visitor-facing digital projects using constantly evolving technologies, developed with teams often composed of members with varying levels of digital literacy, in partnerships with technology companies driven by the priorities of their sector, all while operating with potentially conflicting conceptions between partners of what specific digital experiences should offer visitors.

2.5.1 Emerging lines of inquiry

To engage more deeply with these questions and emergent themes, the next step of this doctoral research project consisted of defining a terrain of study. Based on the three emerging themes from the preliminary study that related to museum interpretation, digital capacity, and cross-sectoral collaborations, it was determined that a relevant approach would be to center the research project around the collaborations that occurred when museum teams partnered with technology companies to develop digital interpretation tools for museum visitors. As seen in the innovation cells, these moments of collaboration between professionals from diverse sectors, where they worked to support institutional missions through digital technologies in museum environments, were prime case studies for the analysis of the mobilization of the three thematic considerations. The complexities inherent to these partnerships required museum professionals to navigate diverse processes, decisions, and competencies, such as:

- Designing interpretation experiences with digital technologies that supported larger institutional objectives for museum interpretation and met visitor needs;
- Making well-informed decisions about what digital tools to employ (and how) in visitor-facing interpretation projects;
- Selecting appropriate service providers;
- Communicating and collaborating effectively with technology partners;
- Understanding how to gauge the capacities of diverse digital technologies to impact visitors within the context of museum experiences.

With the selection of cross-sectoral collaborations as the focus for this research project, a theoretical framework was then defined based on the emergent themes of the preliminary study. As will be explored in the following chapter, this framework was structured to encompass the diverse areas of reflection identified in the innovation cell, including the objectives and intentions for digital interpretation tools, professional practices and institutional systems involved in the development process, and conceptualizations for the subsequent impact on museum visitors.

The theoretical framework utilized the concept of museum professional ecosystems as a metaphor for understanding the interplay and tensions between the emerging themes when mobilized in cross-sectoral collaborations between museum teams and technology companies when developing digital interpretation tools for visitors. This metaphor reflected the GREM analytical framework's approach of facilitating the

examination of relationship dynamics between individuals within particular environments. Structured around the emergent themes of the preliminary study, the theoretical framework would guide the subsequent study of the dynamics involved when developing museum digital interpretation projects with technology partners, by situating and examining these cross-sectoral collaborations within the broader functioning of museum professional ecosystems.

CHAPTER 3
THEORETICAL FRAMEWORK

This chapter offers an overview of the theoretical framework that was created to guide this doctoral research. The structure of the framework was informed by the review of literature (Chapter One) and the themes that emerged in the preliminary study (Chapter Two), which examined the innovation cell program run by PRISM, the digital interpretation innovation laboratory at the Montreal Museum of Fine Arts (MMFA). Conducted in the autumn of 2020 amidst the COVID-19 pandemic, the study analyzed the dynamics within an innovation cell cohort that consisted of MMFA employees working with PRISM coordinators and technology partners to design a digital interpretation project that would help visitors virtually experience a temporary exhibition that was scheduled to open during the province-wide closure of cultural institutions during the second wave of the virus.

The inductive research approach of the preliminary study facilitated the identification of the broader themes that were mobilized in the process of developing a digital museum interpretation project, as well as in adapting museum digital practices to respond to the constantly shifting constraints of the pandemic context (Chaumier, 2020; ICOM, 2020; Marty & Buchanan, 2022). The emerging themes that informed the theoretical framework thus stemmed from the analysis of a collaborative structure that was created with the aim of strategically supporting museum innovation—unlike the context for many museums which lacked sufficient time or resources for taking a reflexive approach to digital practice (Parry, 2008; Rosa, 2010; Sandri, 2016)—during a pandemic period that required heightened levels of navigating continuous change, a core component of digital work in the postdigital museum (Parry, 2013; Peacock, 2008). These thematic considerations centered around the process of producing museum interpretation tools with digital technologies in collaborations between diverse professionals.

To pursue deeper engagement with these emerging themes, it was determined that cross-sectoral collaborations between museum teams and technology companies would be a relevant subject for the next phase of this doctoral research project. The use of the adapted GREM analytical framework (Legendre, 1983; Allard & Boucher, 1998; Meunier, 2011) within the preliminary study revealed the complexities involved in effectively adapting processes and facilitating communication during partnerships between

diverse professionals with their own practices, priorities, and competencies. This framework facilitated an examination of the efforts involved in designing working processes for the development of digital interpretation projects, the relationships between diverse professionals as they navigated these processes, and the experience of individuals with less digital expertise learning how to participate—all occurring in the context of a collaboration. The analysis of the dynamics and structures present within cross-sectoral collaborations would allow for a continuation of this line of inquiry, as well as a deeper exploration of the core thematic considerations.

Based on the findings from the preliminary study, the theoretical framework for the following phase of this research project was structured to position cross-sectoral collaborations with the larger currents of developing digital interpretation projects within museums. To provide a foundation for anchoring the concepts of the study, this framework was defined across two conceptual axes: situating these collaborations within museum professional ecosystems, and developing the emergent themes to be mobilized in the subsequent analysis.

First, the theoretical framework utilizes the metaphor of museum professional ecosystems (Eidelman, 2017; Suteau, 2022) as an analytical construct for examining the interplay and tensions between the emerging themes when mobilized in partnerships between museum teams and technology companies when developing digital interpretation tools for visitors. The choice of this metaphor was inspired by the GREM analytical framework's approach of prioritizing the examination of relationship dynamics between individuals within particular environments. Cross-sectoral collaborations created hybrid contexts through the gathering and interactions of entities and actors with different languages, motivations, and working processes. Paired with the associated concept of ecotones—the transitional areas where distinct ecosystems meet and interact (McArthur & Sanderson, 1999; Ryberg et al., 2021; Suteau, 2022)—, the metaphor of museum professional ecosystems was the basis for an exploration into what these partnerships could reveal about the capacity and needs of museum teams to work strategically on digital projects.

Second, the theoretical framework was developed to encompass the three core thematic considerations that emerged during the preliminary study. These themes reflected the complexities within the relationships, procedural structures, and professional practices that were mobilized in the development of digital interpretation projects in museum contexts. The structure of the theoretical framework

integrated these emergent themes as conceptual anchors to guide the subsequent study of cross-sectoral collaborations, by examining the dynamics involved in developing museum digital interpretation projects with technology partners within the broader functioning of museum professional ecosystems. This study was designed to continue the analysis of relational dynamics and structures that originated through the preliminary study's use of the adapted GREM analytical framework, by centering the perspectives and practices of the professionals engaged in cross-sectoral collaborations. This approach, supported by the theoretical framework, would uniquely position the study to analyze the larger currents impacting the capacity of museums to develop relevant digital interpretation projects while navigating the constant changes of the postdigital context.

3.1 Situating cross-sectoral collaborations within museum professional ecosystems

When creating digital interpretation tools that aimed to connect visitors with museum collections and knowledge, museums could choose to engage the services of private technology companies for cross-sectoral collaborations. Museum teams would benefit from the knowledge and expertise of these partners in an open innovation environment (Arcon, 2018; Chesbrough, 2003; Li & Ghirardi, 2018; Wymer & Samu, 2003) through collaborations that supported the development and maintenance of digital interpretation projects. These partnerships thus were defined by the intersections and interactions between teams from distinct sectoral contexts, which resulted in hybrid professional environments (Ryberg et al., 2021). To understand the dynamics and implications of these cross-sectoral collaborations, as well as their role within the broader functioning of museums, the metaphor of museum professional ecosystems was determined to be a relevant analytical construct.

Metaphors have long been employed by researchers as conceptual tools to foster new cognitive understandings of interpersonal dynamics or organizational functioning, including within the sociology of professions (Dingwall, 2016; Hogan, 1980; Lakoff & Johnson, 1980; Liljegren & Saks, 2016). They could have significant impacts on both theory and praxis: "Our thinking about organizations and the assumptions we make about how they work are embedded in the metaphors we use to describe them" (Peacock, 2008, p. 335). The metaphor of ecosystems has been used as a framework for understanding the dynamics within diverse areas of inquiry, including business networks, digital networks, digital humanities, professional skills, and sustainable development—as well as within museum research (Buchanan et al., 2017; Parry et al., 2018; Suteau, 2022). For example, Vargas (2019) applied the ecosystem metaphor in the conceptualization of museum digital maturity as being achieved, in part, "when all aspects of the digital ecosystem are understood and operate as a system; maintained and optimised" (Vargas, 2019, p. 222). This organic metaphor facilitated a holistic approach to conceptualizing phenomena (Peacock, 2008).

In a 2022 special issue of *Musées et Collections publiques de France*, the presentation of the results from an AGCCPF national study[1] explored museum professions through the lens of professional ecosystems and organizations (Ballé & Suteau, 2022). Rachel Suteau outlined the transformation of the ecological and

[1] This study was conducted at the centenary of the AGCCPF, the Association nationale des conservateurs et des professionnels des musées et des patrimoines publiques de France, previously known as the Association générale des conservateurs des collections publiques de France. (AGCCPF, "L'ASSOCIATION.", consulted March 31, 2025) https://www.agccpf.com/lassociation/presentation

biological definition of ecosystems into a metaphor that could be employed to describe “une grande diversité d’unités (individus, institutions, entreprises, etc.) qui interagissent au sein d’environnements spécifiques” (Suteau, 2022, p. 11). As in an ecological ecosystem, this metaphor could be used to describe the ensemble that was formed by a delimited environment and the communities that operated within it—a unit that is characterized by constant interactions and dense networks of interdependencies, both between the ‘living beings’ and between these individuals and their environment (Suteau, 2022, p. 11). And like digital work in the postdigital museum, this metaphor described an ever-evolving context where survival required adapting to constant changes and relational shifts:

> Enfin, tout écosystème considéré est dynamique, en ce sens qu’il génère une coévolution des individus qui le composent ainsi que de leur habitat. Un écosystème n’est donc jamais totalement stabilisé, ni fermé, il est en rééquilibrage permanent, selon les impulsions internes des individus ou du fait de chocs extérieurs. (Suteau, 2022, p. 11)

The maintenance of continuity within this constantly transforming and interdependent context required sustaining the relational structures in operation, and developing new approaches when existing processes ceased to function. In this metaphor, there was an emphasis developing and maintaining *life*, or continued existence.

When proposing the metaphor of ecosystems as a framework for understanding museum professions, Suteau (2022, p. 12) demonstrated how different conceptions of ecosystems had been applied to museum contexts. For example, François Mairesse (2011), referencing the work of George Brown Goode, described museums as being individual actors existing within a larger ecosystem of knowledge and inquiry, where their survival depended on their relationships with related external communities (such as universities, libraries, donors, and visitors). Jean-Michel Tobelem (2011), in contrast, characterized museums as each being individual ecosystems that developed and adapted in response to the dynamics of four tendencies: “la circulation des financements publics/privés ; la circulation des publics ; la professionnalisation des conservateurs versus managers et, enfin, l’activité des réseaux de soutien entre les musées” (Tobelem, 2011; as cited in Suteau, 2022, p. 12). When adapting the metaphor of ecosystems within the AGCCPF national study of French museums, researchers were inspired by the conceptualization of museum professional ecosystems in *Inventer des musées pour demain : Rapport de la Mission Musées XXIe siècle* (Eidelman, 2017), which posited that “le musée est devenu un système complexe de compétences [...] dont les missions se sont largement transformées” (Ramond et al., 2017, p. 143). The principle of professional ecosystems facilitated an analysis of museum professions “sous l’angle de l’écosystème

professionnel qu'elles constituent et des organisations dans lesquelles ces professions s'exercent" (Ballé & Suteau, 2022, p. 3). This approach considered museum professional roles through interprofessional dynamics rather than competencies (Ballé & Suteau, 2022, p. 3), framing the interactions of professionals as sustaining the life of museums:

> L'écosystème considéré est à comprendre ici comme une unité fonctionnelle (le musée) dont la vie et le développement n'est possible que grâce aux interactions des professionnels qui le composent. (Suteau, 2022, p. 14)

In this conceptualization, the dynamics within the museum ecosystem were characterized as occurring both between professional roles (notably across curators and the professions in charge of education and interpretation) and with the fertile environment of the museum (Suteau, 2022, p. 13).

The framework of museum professional ecosystems also facilitated the analysis of interactions between different ecosystems, such as those that occurred between a museum team and a technology company. In ecology, the transitional areas where distinct ecosystems meet and interact are known as ecotones (McArthur & Sanderson, 1999; Suteau, 2022). As defined by ecologist Frederic Clements, ecotones are the "junction zone between two communities, where the processes of exchange or competition between neighboring formations might be readily observed" (Clements, 1905; as cited in McArthur & Sanderson, 1999, p. 3). These areas of intersection have characteristics that are "uniquely defined by space and time scales and by the strength of the interactions between adjacent ecological systems" (Holland, 1988; as cited in McArthur & Sanderson, 1999, p. 3). Ecotones have been applied as analytical constructs in research across diverse disciplines, such as innovation studies and postdigital education (Brown et al., 2010; Coles & Scarnati, 2015; Krall & Shepard, 1994; Pendleton-Jullian, 2019; Ryberg et al., 2021). In "Ecotones: a Conceptual Contribution to Postdigital Thinking," Ryberg et al. argued for the usefulness of applying the metaphor of ecotones as conceptual lenses for understanding the dynamics within postdigital environments that aimed to weave together "the seemingly contradictory and irreconcilable into a new whole" (Ryberg et al., 2021, p. 408). They identified two major dimensions of ecotones for consideration:

- *Affective and conceptual* dimensions that are characterised by *tension and diversity;*
- *Spatial and material aspects* that have *generative or innovative properties* (Ryberg et al., 2021, p. 417).

These aspects revealed ecotones to be sites that were conducive to "not only tension, conflict and struggle but also richness, potential and diversity" (Ryberg et al., 2021, p. 410). In the metaphor of museum professional ecosystems, ecotones could be conceptualized as the hybrid spaces created during cross-sectoral collaborations. On a broader scale, these zones of junction between museums and businesses could also be understood through the changes to their partnerships over time. In "Arts, Culture and Business: A Relationship Transformation, a Nascent Field", McNicholas (2004) described how the commercial shift in cultural institutions, paired with the social shift in businesses related to postmodern consumers, resulted in more interactive relationships and new partnership ventures between these sectors:

> From the early 1990s on, arts sponsorship has become increasingly integrated into business practices as a part of the marketing mix. There has also been a movement towards greater professionalism in arts management, including an increase in the incorporation of business practices with the maturation of the field. [...] Simultaneously, postmodern effects of globalization, such as a diffusion of barriers, borders, and boundaries, have paved the way for this evolution in the field and revolution in arts and business relationships. (McNicholas, 2004, p. 57).

The hybridity present in this description echoed the blurred boundaries within the digital practices and structures of the postdigital museum, as well as the economic transformations in museum business models towards social entrepreneurship (Eid, 2019; Eidelman, 2017). The "on-the-edge position or *edgy* relationship" (McNicholas, 2004, p. 57) between sectors demonstrated the relevance of the ecotone metaphor as an analytical construct. Due to the rapid adaptations within these *edgy* innovation systems, McNicholas argued that the analysis of "their changes may be a useful barometer of societal and business trends, and may enable swift response to our rapidly changing environment" (McNicholas, 2004, p. 67).

The metaphors of museum professional ecosystems and cross-sectoral ecotones can be utilized to facilitate examination across several levels of interactions: between diverse museum colleagues, between these museum professionals and the particularities of their institutional environment, and between museum professional ecosystems and adjacent ecosystems.

3.2 Conceptualizing the emergent themes

The theoretical framework was shaped around the three core thematic considerations that emerged during the preliminary study of the PRISM innovation cell program (Chapter Two). These themes reflected the complexities within the relationship dynamics, procedural structures, and professional practices that were mobilized in the development of digital interpretation projects in museum contexts. The emergent themes fell into three main areas of reflection:

- **MUSEUM INTERPRETATION**: Developing visitor-facing interpretation projects using digital technologies to achieve institutional objectives;
- **DIGITAL CAPACITY:** Assessing the ability of museum teams to work effectively with digital technologies within the context of cultural institutions;
- **CROSS-SECTORAL COLLABORATIONS**: Understanding the dynamics of introducing external partners and cultures into museum professional ecosystems.

To guide this doctoral research project, the three emergent themes were developed as the structure for the theoretical framework. The first theme was conceptualized through an examination of the intersection of *museum interpretation* and *digital*—and through the lens of discourses of the digital imaginaire held by the professionals responsible for these projects. The second theme centered around the notion of digital capacity within museum teams, which was approached on both the institutional and individual levels through the concepts of digital maturity, organizational change, and digital skills and literacy. The third theme conceptualized the intersection of cultures through the implications of *cross-sectoral* and *collaboration,* positioning partnerships as ecotone contexts with unique dynamics resulting from differing expertise, languages, motivations, working processes, and guiding objectives.

3.2.1 Interpretation and the digital imaginaire

As explored in Chapter One, *digital interpretation* tools were fundamentally *interpretation* tools that participated in shaping the visitor experience and the resulting construction of meaning in the museum context (Davallon, 2000; O'Neill & Dufresne-Tassé, 2010). This understanding was present in PRISM's

founding director Charlène Bélanger's description of the shift from centering the concept of digital interpretation on the interactions with the digital tools, to instead "bien marquer la volonté d'appréhender la relation pouvant se développer entre l'institution muséale et ses publics" (Bélanger, 2021, p. 192). This perspective demonstrated a conceptualization of digital interpretation projects as being capable of facilitating relationships between museums and their audiences.

A concept related to understanding of the impacts of digital interpretation tools on visitor experience was the digital imaginaire[2]. In the context of museums, as outlined in the doctoral dissertation of Éva Sandri (2016), the digital imaginaire was distinct from the sociological concept of the social imaginaire because it was neither an ideology nor a social representation (Sandi, 2016, pp. 69-71; Flichy, 2008; Lakel et al., 2008; Scardigli, 1992; Wunenburger, 1991). Instead, the digital imaginaire was comprised of the expectations held by museum professionals for digital interpretation tools, especially in regard to their possible effects on visitors (Sandri, 2016, p. 70-71). It also described the degree of confidence these professionals had in the promised impacts of digital technologies (Sandri, 2016, p. 71). The discourses of the digital imaginaire reflected the pressures on museums stemming from the increased demand for digital interpretation experiences (Sandri, 2016, pp. 71-74). By guiding the observations of "l'imaginaire des dispositifs numériques dans les musées [...] confrontés à la réalisation de dispositifs numériques pour la médiation" (Sandri, 2016, p. 4), the concept of the digital imaginaire created a framework to study the relationship between the discourses of expected outcomes for digital technologies and the practical realities of working with them.

Positive discourses of digital imaginaire that museum professionals associated with digital interpretation tools included the capacities to support interactivity, personalisation, innovative forms of interpretation, gamification, immersion, data collection on visitors, social exchanges and sharing, easy access to information, and enjoyable experiences (Sandri, 2016; Schall & Vilatte, 2016). These tools could also be seen as a method for encouraging attendance by being novel and attractive, adapting to visitors' digital practices, and responding to the demand for digital experiences (Sandri, 2016, p. 94-96). The participatory culture of the digital age was seen as a way to enable more direct collaborations between museums and their visitors (Bautista, 2014, p. 27-28), which supported the larger movement towards the participatory museum as outlined by Nina Simon (2010). This aspect brought together two imaginaires: "l'imaginaire du

[2] This dissertation uses the French word 'imaginaire', following the example of the English translation of P. Flichy's *L'imaginaire d'Internet* (2001) into *The Internet Imaginaire* (2007) by the MIT Press.

participatif (supposé favoriser l'empowerment) et l'imaginaire du numérique (supposé favoriser le partage, l'intelligence collective et l'innovation)" (Sandri, 2022). Another approach to empowering audiences to create their own relationships with museum collections was through facilitating active and embodied engagement (Antoine-Andersen, 2021; Grassin, 2022; Vilatte & Crenn, 2023).

Digital technology's inherent interactivity could be seen as a way to empower audiences as it "facilite l'instauration d'une relation de réciprocité entre l'institution culturelle et ses publics et, par conséquent, permet la mobilisation de savoirs citoyens" (Bélanger et al., 2021, pp. 191-192). These discourses had both technological and symbolic aspects (Sandri, 2020, p. 88). The use of familiar digital technologies was also framed by some museums as a form of accessibility and cultural democratisation—making the museum institution appear less elitist and more welcoming for certain visitors (Sandri, 2016, p. 130; Carrozzino & Bergamasco, 2010; Champagne-Poirier & Luckerhoff, 2023). In a 2011 press conference to discuss how the Musée du Louvre was offering visitors handheld multimedia guides on Nintendo 3DS consoles, Henri Loyrette, the former Louvre president, stated:

> Digital development has become a strategic issue for museums. People's habits have changed. But that offers us a huge opportunity to extend the museum's territory and build a lasting relationship with our visitors. (AFP, 2011; as cited in Bautista, 2014, p. 206)

As previously discussed, museums could adapt the codes from other leisure activities when aiming to attract greater numbers of visitors. These efforts could also participate in the marketing approaches that originated in the commercial shift within museums (Bautista, 2014; Davallon, 1992; Kotler & Kotler, 2000; Stelmaszczyk et al., 2024; Weil, 1999). In the context of difficult economic realities, "in order to attract sufficient visitors to justify continuing public funding, [museums] thus now often seek to imitate rather than distinguish themselves from places of popular assembly" (Bennett, 1995, p. 104; as cited in Bautista, 2014). Some digital manifestations of this discourse in museums included offering visitors mobile apps to download on their own devices or including platforms on their websites for purchasing tickets. Sree Sreenivasan, the former Chief Digital Officer at the Metropolitan Museum of Art, bluntly described this dynamic by saying, "Our competition is Netflix and Candy Crush[3]" and not other museums. In this posture,

[3] Sree Sreenivasan, quoted in Les Shu, "Van Gogh vs. Candy Crush: How museums are fighting tech with tech to win your eyes," Digital Trends, published: May 5, 2015, accessed August 13, 2021. http://www.digitaltrends.com/cool-tech/how-museums-are-using-technology/

museum teams were faced with the task of transposing the broader codes of digital communication to their interpretation tools.

Discourses of the digital imaginaire could also be negative. Many discourses that were critical of these digital practices in contemporary museum interpretation could be characterised by "la crainte de voir les contenus du musée dégradés par ces campagnes de communication vantant les dispositifs technologiques" (Sandri, 2016), including a fear that screens would interfere with visitor interactions with museum displays (Damala et al., 2016; Jeanneret, 2011)—or even replace the visit to the physical building of the museum itself (Sandri, 2020). And, as seen in the reflections around the notion of the "tyrannie de l'exposition" (Jacobi, 1997) and the larger communicational shift in museums—including the balance of entertainment and education (Illsley et al, 2024; Janes & Sandell, 2019; Roberts, 1997)—, there could be a similar demand[4] for innovation and novelty from museums regarding their use of digital technologies (Appiotti & Sandri, 2020; Jacobi, 2013; Jeanneret, 2014).

To be seen as a dynamic and relevant institution, increasingly museums needed to utilize digital technologies in their visitor-facing efforts (Jacobi, 2012; Sandri, 2016). This ranged from basic expectations for a museum website or a mobile application (or responsive website), to the proposal of more spectacular offerings, such as immersive environments or augmented reality experiences. Investments and experimentations in these projects were perceived as having the potential to grow audiences and generate increased revenue, as well as shift public perceptions of museums. But to achieve the objectives for visitor experience and audience loyalty, the interpretation project needed to satisfy the visitors' needs and desires with a meaningful and enjoyable experience within the context of their expectations for leisure activities (Masberg & Silverman, 1996; Packer & Ballantyne, 2016).

More broadly, this ceaseless demand for digital projects could leave museums without adequate space for critical reflection on the long-term implications of their digital practices and the relevance of the digital interpretation tools they create (Rosa, 2010; Sandri, 2016). However, the capacity to work effectively with digital technologies could impact the museum's ability to support institutional missions. Because, while the *digital* did not automatically change the role that *digital interpretation* projects played for visitors, they were still operating with new communication technologies that had their own codes and languages that needed to be mastered by museums if they were to optimise communication (Sandri, 2020, p. 87). The

[4] The term 'demand' is used here in the sense of 'injonction' in French.

relevance of these projects could thus depend on the integration of objectives for visitor experience into the museum's digital activities and strategy, rather than relegating the latter to a separate area of consideration.

3.2.2 Digital capacity within museums

The capacity of museums to work effectively with digital technologies could be described on different scales, from institutional to individual. On a broader level, the concept of digital maturity reflected an institution's ability to work with digital technology in an efficient and reflexive manner (Vargas, 2019). In her 2019 doctoral thesis, Lauren Vargas argued that the path to digital maturity for museums was subjective, fluid, and unique to each institution—and was a complex concept to define and measure. She adapted private sector business tools to propose new ways for museums to measure their levels of digital maturity and to navigate their own digital transformations:

> Digital maturity is achieved when all aspects of the digital ecosystem are understood and operate as a system; maintained and optimised; monetary investments and resources are prioritised by offering expanded personalised experiences, well understood and used platform ecosystem is designed, legacy technologies are integrated with emerging technologies, and persistent paradoxes of change are accepted and viable options explored and baked-into the museum strategic goals; and finally, innovation is cross-pollinated within the institution and community to allow for multiple pathways to set-up a successful digital transformation journey. (Vargas, 2019, p. 222)

Vargas's proposed definition of digital maturity emphasized the importance of fostering sustainable systems grounded in institutional missions, including engaging in a "systematic preparation to adapt consistently to ongoing digital change" (Knight Foundation, 2023, p. 6). The use of the digital ecosystem metaphor in this conceptualization demonstrated the relevance of understanding museum digital work through the interactions that occurred between interconnected elements and their shared environment, as was seen in the museum professional ecosystem metaphor. Digital maturity is holistic and rooted in the museum's structure, missions, and functioning (Martins et al., 2021). Similarly, the Knight Foundation (2023) developed a Digital Maturity Framework with a rubric for cultural institutions to assess three functional categories of digital maturity (Planning and Development, Operations and Implementation, People and Culture), according to the degree that they had been integrated into the organization. Earlier,

as part of a report on digital readiness and innovation based on a survey of over 400 American museums, the Knight Foundation (2020) had also identified the attributes of cultural institutions that supported or hindered digital innovation: strategy (strategy creation and dissemination, goals development and outcomes tracking, cross institutional planning of digital projects), people (internal expertise, leadership support, silos), practices (integration of digital, project managers, innovation processes), audience research, and external processes.

As seen in the diverse factors that impact institutional digital maturity, the use of digital tools as communication mediums could have significant impacts on the structure of museum organisation. The approaches to enhancing digital capacity included efforts around reshaping digital team models, centralizing digital activities, training professionals across museum departments, and formalizing digital strategies (Price & James, 2018).

However, fully engaging in the institutional digital transformation that would be necessary to create conducive conditions for strategic digital work in museums could require significant investments of resources, as well as a broader institutional openness to modifications in infrastructure and working processes (Carding & Paul-Chowdhury, 2015; Finnis & Kennedy, 2020; Peacock, 2008; Taormina & Baraldi, 2022). Those constraints, when paired with the constant evolution of digital technologies, resulted in a wide variety of operational infrastructures, professional roles, and reporting structures across museums (Marty, 2006a; Price & James, 2018; Ramond et al., 2017; Silvaggi & Pesce, 2017; Tallon, 2017). This lack of standardization in museum digital careers could impact both the professionalization and externalization of these roles:

> De manière globale, l'évolution des musées, de leurs modèles économiques, des attentes des publics, de leur mise en relation avec les différents acteurs de la société a généré de nouveaux métiers qui ne correspondent pas aux cadres d'emplois traditionnels de la fonction publique d'État ou de la fonction publique territoriale. Il s'en est régulièrement suivi l'appel à des contractuels, des délégations de service public ou le recours à des prestataires extérieurs. (Eidelman, 2017, p. 61)

While the externalization of digital work could take the form of cross-sectoral collaborations with technology companies, other partnerships with external actors could also support the digital capacity of museums. Both formal and informal, these included relationships with universities, digital innovation laboratories, museum consortiums, professional networks, and consultants (Li & Coll-Serrano, 2019; Ramond et al., 2017). As seen in the preliminary study of PRISM, some museums housed laboratories for

the research and development of digital technologies in museum contexts, including MLab Creaform, the digital innovation and creation laboratory at the Musée de la civilisation in Quebec City, and the Cooper Hewitt's Interaction Lab, "an embedded research and development program driving the reimagining of Cooper Hewitt's audience experience across digital, physical, and human interactions[5]". Access to shared knowledge and professional practices could support the digital activities of museum workers.

The digital roles in charge of the development and maintenance of digital projects necessitated professionals with specialized skillsets and capacities. On the level of individuals, digital capacity in museum teams could thus be conceptualized in terms of digital skills and digital literacy. Digital skills were the capacity and competence to work with specific digital technologies; digital literacy was a more reflective mode in which to understand the impacts of digital tools in different contexts (Malde et al., 2019; Nikolaou, 2024; Parry et al., 2018). At the 2014 Museums and the Web Conference, a set of principles, known as the 'Baltimore Principles', were created to guide the direction of digital training for museum teams:

> [The 'Baltimore Principles'] asked for a move from thinking about 'technical skills' around specific forms of technology, to thinking instead about 'digital literacies' and forms of creative (and design) thinking; a move from digital training being 'about technology', to being 'with technology'. (NMC, 2016, p. 24; as cited in Parry et al., 2018, p. 2)

This proposed shift illustrated a broader movement away from focusing on the skills needed to use specific technologies, and the increasing priority of building a *literacy* to understand the most appropriate ways to work with digital tools. This was especially relevant when working with digital technologies that were constantly changing (Marty, 2006b; Parry et al., 2018). Like digital maturity, digital literacy is a complex concept to precisely define and measure. The European Commission's DigEuLit project developed a definition of digital literacy:

> Digital literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyse and synthesise digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action and to reflect upon this process. (Martin & Grudziecki, 2006)

[5] *Tools and Approaches for Transforming Museum Experience*. Cooper Hewitt. Retrieved August 19, 2021, from https://www.cooperhewitt.org/interaction-lab/tools-and-approaches-for-transforming-museum-experience/

The question of measuring and increasing digital literacy in museum workers was the subject of research in the field of Museum Studies, including by the University of Leicester's 'One by One' project in museums in the UK and United States (Malde et al., 2019; Parry et al., 2018). Individual capacity to engage in digital museum work could also be impacted by considerations related to interpersonal communication, willingness (and agency) to experiment and learn, and navigating fear and discomfort (Finnis & Kennedy, 2020). Digital literacy was increasingly perceived as a vital component for museums to successfully operate in a postdigital age, as it was perceived to enhance institutional capacity to produce relevant digital interpretation projects using ever-evolving technologies that are aligned with larger institutional objectives and that effectively steward staff and financial resources—including when engaging in cross-sectoral collaborations.

3.2.3 Cross-sectoral collaborations

When museum teams engaged the services of private technology companies for support in developing and maintaining their digital interpretation projects, their partnerships took the form of cross-sectoral collaborations (Arcon, 2018; Li & Ghirardi, 2018; Wymer & Samu, 2003). With the increased integration of digital technologies into museum practices, these "exchanges across cultural and technology sectors are becoming more prevalent" (Arrigoni et al., 2020, p. 424; MTM, 2015; Stuedahl & Vestergaard, 2018).

The concept of cross-sectoral collaborations was comprised of two elements. First, *cross-sectoral* indicates the coming together of diverse sectors, from the perspectives of business model (e.g., for profit, public, not-for-profit) and industry (e.g., arts and culture, technology, higher education) (Erakovich & Anderson, 2013; Wang & Kaspar-Pascal, 2021). The overlapping of sectors between museums and technology companies created conditions with their own particularities (Austin, 2000; Stafford, 1994) resulting from potential differences between museum professionals and external service providers in areas such as working processes, visions for the visitor experience, understanding of the technology, discourses of the digital imaginaire, resources available, and guiding priorities.

Second, the concept of *collaboration* in this context describes the process that occurs at the intersection of sectors, which has parallels to the networks and interactions that occur in the ecotone zones of contact

between distinct ecosystems. Thomson et al. (2007) proposed a theoretical model that frames collaboration as a "multidimensional, variable construct" (Thomson et al., 2007, p. 25):

> Collaboration is a process in which autonomous or semi-autonomous actors interact through formal and informal negotiation, jointly creating rules and structures governing their relationships and ways to act or decide on the issues that brought them together; it is a process involving shared norms and mutually beneficial interactions. (Thomson et al., 2007, p. 25).

This conceptualization, comprised of five dimensions that describe the characteristics and mechanisms of collaborations (governance, administration, mutuality, norms, and organizational autonomy) demonstrates the complexity of negotiating working processes and relational dynamics when bringing together actors from different sectors to create cross-sectoral territories. Successful collaborations between cultural institutions and business partners could depend on several factors, including shared objectives, consensus on decision-making processes, structures for leadership and involvement, open communication, trust, and adequate resources (Scheff & Kotler, 1996). The notion of mutuality was applied to different aspects of the collaborative process (Wang & Kaspar-Pascal, 2021), including incorporating mutual benefits, responsibilities, risks, trust, and goals across partner operations:

> Collaboration can be defined as the mutual engagement of participants in a coordinated effort to solve the problem together, wherein collaborators share some common objectives in the clear division of labour. (Li & Coll-Serrano, 2019, p. 591)

Even when collaborating across sectors, the creation process could also require the weaving in of internal collaborations across museum departments. This complexity could foster "a networked environment to achieve some complex goals, such as innovation" (Li & Coll-Serrano, 2019, p. 591; Thomson et al., 2007), which mirrors the relational dynamism of the museum professional ecosystem metaphor.

Cross-sectoral collaborations between museums and technology companies could take a wide range of forms with differing modalities of engagement (McNicholas, 2004; Wymer & Samu, 2003; Wang & Kaspar-Pascal, 2021), ranging from delegation to partnership. In the *outsourcing* form of collaboration, museum teams "transferred specific tasks or jobs to external specialists or contracted third-party organisations to source external knowledge and technologies" (Li & Coll-Serrano, 2019, p. 599). While outsourcing could be employed in the development of museum digital interpretation tools (Arrigoni et al., 2020; Hemsley et al., 2017; Li & Coll-Serrano, 2019), this study will center on *teamwork* as a process of "integrative collaboration" (Austin et al, 2021; Wang & Kaspar-Pascal, 2021). This latter form of collaboration is "based

on the creation of joint project teams, which comprise museum staff as well as external personnel, and where [...] external knowledge is acquired and disseminated through learning by doing in a cooperative environment" (Li & Coll-Serrano, 2019, p. 599-600). Financial considerations could also shape the dynamics within cross-sectoral collaborations, such as when companies engaged in sponsorship or co-production partnerships, or required museums to pay continued licensing fees to maintain the digital project.

Common motivations within museums to engage in cross-sectoral collaborations included "to gain funds, to engage new audiences, to fulfil their social responsibilities, to offer new experiences, and to keep up with latest trends" (Arcon, 2018, p. 40). These partnerships could support museums in the process of innovation (Camarero & Garrido, 2012; Li & Coll-Serrano, 2019; Li & Ghirardi, 2018), which could be conceptualized as "the new or enhanced processes, products or business models by which museums can effectively achieve their social and cultural missions" (Eid, 2019, p. 7). Cross-sectoral collaborations allowed museums to benefit from the knowledge and expertise of technology partners in an open innovation environment (Chesbrough, 2003; Li & Ghirardi, 2018), where museum teams could access existing digital infrastructures and platforms without having to create them from scratch. This was especially relevant for museums facing constant demands to produce new digital experiences while operating with limited internal resources (Appiotti & Sandri, 2020; Ramond et al., 2017):

> In response to the intrinsic limitations (time, dedicated staff, finances) of cultural organisations in engaging autonomously in digital innovation, collaborations and partnerships with technology firms have been advocated as the way forward, particularly for small and medium-size organisations. (Arrigoni et al., 2020, p. 426)

Cross-sectoral collaborations could potentially be utilized to increase museum digital capacity by supporting workloads and compensating for "a shortage of skilled staff and related knowledge" (Li & Coll-Serrano, 2019, p. 598) within museum teams. The characteristics of the actors and environment within museum professional ecosystems could impact the agency of museum teams to strategically determine the modalities of external partnerships. However, the parameters around the externalization of museum work raised questions about ensuring the resulting initiatives were aligned with institutional missions:

> Le risque consiste à recruter des entreprises privées qui font à la place du musée ce qu'il souhaite faire. Cela soulève la question des limites et des périmètres de l'externalisation, ainsi que celle de la délégation de service public. Il paraît fondamental de maîtriser ce que l'on externalise : ne pas externaliser parce qu'on ne sait pas faire, au risque de déléguer in fine des pans entiers de la stratégie de l'établissement… (Ramond et al., 2017, p. 145)

The presence of knowledge and expertise within museums—in the forms of digital literacy within museum professionals and institutional digital maturity (Martins et al., 2021; Vargas, 2019)—could potentially mitigate the risks associated with external partnerships. These factors could impact the ability of museum teams to make informed decisions about and within cross-sectoral collaborations, such as the selection of technology partners, designing for accessibility and inclusion, visitor privacy, the longevity of interpretation content in the face of evolving technologies, and access to the digital tool if the collaboration with the technology partner came to an end.

In the context of developing digital interpretation projects, there was a wide range in the typology of technology partners, including companies that worked exclusively with cultural institutions, firms that had specific teams that engaged in cross-sectoral collaborations, or businesses that rarely partnered with museums. These differing structures could impact their familiarity with the processes and priorities of the cultural sector. Business partners were reported to have various motivations and perceived benefits for working with cultural institutions (McNicholas, 2004; Fonrouge, 2019; Wymer & Samu, 2003), such as "to gain profit, to gain new knowledge, expertise, to get new business opportunities" (Arcon, 2018, p. 52). Cross-sectoral collaborations could also enhance corporate reputation, especially when accompanied with the perception of "sincerity, value alignment with the non-profit organizations, and credibility" (Wang & Kaspar-Pascal, 2021, p. 96). However, without the presence of trustworthiness, "mutual construct of meaning between [partners]" (Wang & Kaspar-Pascal, 2021, p. 98; Iyer, 2003), and the alignment of social missions (Nicholas, 2004), cross-sectoral collaborations with technology companies could be perceived as potentially compromising the capacity of museums to serve their collections and audiences.

3.3 In summary

Grounded in the themes that emerged from the preliminary study of the PRISM innovation cell program (Chapter Two), the theoretical framework was developed to facilitate the analysis of cross-sectoral collaborations between museums and technology companies by positioning them within the larger currents of developing digital museum interpretation projects. Ecotone partnerships could have impacts on museum functioning and professional practice, given that "new modes of working require new knowledge and new collaborative strategies across cultural institutions themselves, as they conceive and manage new relationships with external parties" (Arrigoni et al., 2020, p. 425). Cross-sectoral collaborations were thus determined to be a relevant focus for the subsequent phase of doctoral research, as their dynamics and structures were zones of intersection and adaptation for the emergent themes. The study of these "*edgy"* (McNicholas, 2004, p. 57) relationships would facilitate a broader exploration of the capacity of museums to support their institutional missions within the postdigital context.

The theoretical framework was defined across two conceptual axes, starting with situating cross-sectoral collaborations within museum professional ecosystems. The organic nature of the metaphors of ecosystems and ecotones offers a holistic foundation (Peacock, 2008) for engaging with this area of research, framing digital practices and organizational change through the lenses of adaptation and survival. The second axe of the theoretical framework developed the three emergent themes:

- **MUSEUM INTERPRETATION**: Developing visitor-facing interpretation projects using digital technologies to achieve institutional objectives;
- **DIGITAL CAPACITY:** Assessing the ability of museum teams to work effectively with digital technologies within the context of cultural institutions;
- **CROSS-SECTORAL COLLABORATIONS**: Understanding the dynamics of introducing external partners and cultures into museum professional ecosystems.

Through the conceptualization of these thematic areas, it became clear how much these themes were interconnected and dependent upon one another. This mutuality underscored the relevance and usefulness of positioning the analysis of these themes within the broader functioning of museum professional ecosystems.

For the next phase of doctoral research, a study was conducted to explore the interactions and complexities within cross-sectoral collaborations between museums and technology companies when developing digital interpretation projects. The theoretical framework informed the research project's methodology to understand the emergent themes through the metaphors of ecotones and museum professional ecosystems.

To continue the analysis of relational dynamics and structures that originated through the preliminary study's use of the adapted GREM analytical framework (Legendre, 1983; Allard & Boucher, 1998; Meunier, 2011), the study was designed to examine the experiences of the professionals engaged in cross-sectoral collaborations. This would include their perceptions of the dynamics within these partnerships between museums and technology companies, as well as the practices that were employed to facilitate the working processes. By centering the analysis on the perspectives of professionals—who were the actors engaged in the collaboration process with the most expertise in working across sectors—, the research project would be uniquely positioned to analyze the larger currents impacting digital museum interpretation as these cultural institutions adapted to the ever-changing postdigital context.

Through analyses centered on the perspectives of museum professionals and technology partners, this research project aimed to examine how museums could employ digital tools to support interpretation objectives, while mitigating recurring areas of tension when working across sectors. The results could lead to insights that could serve museum teams as they defined professional practices for developing digital projects with increasing reliance on external technology partners. The research project also aimed to deepen the understanding of the positioning and influence of technology partners in the conception and development of digital interpretation projects within museum contexts. These themes were inseparable from the larger shifts in the evolving relationship between museums and their visitors, and the role of museum interpretation in the communication paradigm.

CHAPTER 4
METHODOLOGY

This chapter presents the methodology for the research project that was designed to pursue the lines of inquiry that emerged through the review of literature (Chapter One) and the preliminary study of the PRISM innovation cell (Chapter Two). Cross-sectoral collaborations between museum teams and technology companies were identified as a relevant subject for this study. The use of the adapted GREM analytical framework (Legendre, 1983; Allard & Boucher, 1998; Meunier, 2011) within the preliminary study revealed the complexities involved in effectively adapting processes and facilitating communication during partnerships between diverse professionals with their own practices, priorities, and competencies. This facilitated an examination of the efforts involved in designing working processes for the development of digital interpretation projects, the relationships between diverse professionals as they navigated these processes, and the experience of individuals with less digital expertise learning how to participate—all occurring in the context of a collaboration. The analysis of the dynamics and structures present within cross-sectoral collaborations would allow for a continuation of these lines of inquiry, as well as a deeper exploration of the core thematic considerations. A theoretical framework was defined to guide the study (Chapter Three), situating cross-sectoral collaborations within museum professional ecosystems and developing the three main emergent themes from the preliminary study.

This research project aimed to explore what the professional practices and perspectives of experienced technology partners and museum professionals would reveal about the collaborative development of digital interpretation experiences in museums, including the discourses of the digital imaginaire, the role of internal digital capacity, and the structures and support needed by museum teams to be equipped to engage in the process. To respond to the research objectives, this study employed a qualitative inductive research approach to document the declared practices for working in these collaborations, the objectives held by these professionals for museum interpretation tools, and the perceptions of both the collaborative process and of museum professionals' needs for developing these digital projects.

4.1 Research Orientation

This research project aimed to analyze the perspectives and declared practices of museum professionals and technology partners on their cross-sectoral collaborations when developing digital interpretation projects. These seasoned professionals had experience partnering with an array of diverse institutions and companies, giving them unique insights into the capacity of museum teams to collaborate effectively on these projects, as well as recurring dynamics in these interactions. The scope of the research included analyses of the currents at play when museum teams developed digital interpretation experiences for visitors with external technology partners, including the interplay of differing interpretation objectives and the understanding of the specificities of working with digital tools in museum contexts.

While the creation of digital interpretation tools was at the center, this study focused on the perspectives of professionals on the development process, taking into consideration their perceptions of these cross-sectoral collaborations and the practices they employed to facilitate the working process. By focusing the analysis on the perceptions of these experienced practitioners—who had amassed a wealth of expertise in working with new technologies in museum contexts—, the research project was uniquely positioned to analyze the larger currents in digital museum interpretation beyond the pandemic context. These currents included the levels of digital capacity in museum professionals and the correlating discourses of the digital imaginaire at play regarding the shaping of visitor experience through digital museum interpretation. These themes were inseparable from the larger concepts of the evolving relationship between museums and their visitors, and the role of museum interpretation in the communication paradigm.

The study was designed with the following objectives:

- Understand how experienced practitioners conceptualize digital museum interpretation and ascertain their corresponding discourses of the digital imaginaire for interpretation tools made with various technologies;
- Document the declared practices of professionals for ecotone collaborations between technology partners and museum teams on digital interpretation projects;
- Analyze the perceptions of professionals concerning the digital capacity within museum professional ecosystems, as well as the needs of museum teams for support to be able to effectively collaborate on these digital projects.

Through analyses centered on the perspectives of experienced professionals, this research project aimed to provide insights into how museum teams could develop digital tools to support institutional

interpretation objectives, while minimizing recurring areas of tension when working with digital technologies.

The results had the potential to lead to reflections that could serve museum teams as they define strategies and professional practices for developing digital projects with increasing reliance on external technology partners. The research project could also help deepen the understanding of the positioning and influence of technology partners in the conception and development of digital interpretation projects in museums.

4.1.1 Questions

Three main areas of inquiry emerged from the identified objectives, which informed the structure of the methodological approach of this research project. For each research question, hypotheses were formulated based on a review of scholarly literature and the findings of the preliminary study.

The first question concerned how experienced practitioners conceptualized digital museum interpretation. We surmised that these professionals integrated their understanding of the concept digital museum interpretation with their practices for its implementation, and that they identified compelling overlaps between the capacities of different digital technologies and museum interpretation intentions. We also thought that these professionals worked with the belief that these digital tools had the capacity to support museum objectives for interpretation experiences.

The next question explored how these professionals viewed the roles of technology partners and museum professionals within ecotone collaborations to build digital projects. We postulated that museum professionals had developed practices for strategically bringing in external partners to support their objectives for interpretation and visit experience. We supposed that technology partners, based on their experiences working on projects with diverse museum teams, developed strategies for collaborating with museum professionals with various levels of digital capacity, including how they structured the design process and the language they used to discuss the technology's specifications and impacts on visitors. We

also surmised that there was a positive impact on the collaboration when professionals used their understanding of their partner's sector to communicate with each other.

The final question centered on the patterns that these professionals observed in how their partners approached the development of digital interpretation tools in ecotone collaborations. We conjectured that they observed recurring approaches to digital projects from their partners, including motivations for creating a digital museum tool, degrees of familiarity with the digital development process in museum contexts, and points of tension in the collaboration. We also posited that these professionals experienced more productive working processes within museum contexts where there were high levels of institutional support, and where teams across the museum professional ecosystem demonstrated the belief that these digital projects were capable of facilitating interpretation experiences for visitors that supported museum objectives. Lastly, we surmised that technology partners would report experiencing more productive working processes with museum workers who exhibited an understanding of the types of experiences facilitated by the relevant technologies, or who already had a high level of digital literacy—regardless of their familiarity with the specific technology.

4.2 Data collection

As with the preliminary study, this research project was conducted using an inductive approach with qualitative data based in grounded theory (Creswell & Poth, 2018; Glaser & Strauss, 2017; Luckerhoff & Guillemette, 2012; Meunier et al., 2020) and informed by the theoretical framework defined in Chapter Three. This methodological process enabled an in-depth reflection on the implementation and interplay of the concepts explored in previous sections—identified through scholarly literature and the findings of the preliminary study—, as well as providing the flexibility to explore the themes that emerged during the data collection.

Data collection was conducted using semi-structured interviews with museum professionals and technology service providers. This was complemented by a review of supporting documentation when provided by the participants, as well as of examples of collaborative structures and projects when mentioned in the interviews. These data collection tools were structured to document the perspectives of museum professionals and technology partners on the digital interpretation development process through their perceptions and declared practices of working in these collaborations. This approach was distinct from a direct observation of the working process, as the participants provided information through interviews and documentation (Boivin, 2021; Martin & Thibault, 2017). Therefore, the results of this study centered on the perspectives of these professionals when working across sectors to develop digital interpretation projects for museum visitors, rather than an analysis of the collaborative processes themselves.

Ethical approval for this research project was obtained before the study began from the Comité d'éthique de la recherche pour les projets étudiants (CERPE) at the Université du Québec à Montréal (UQAM)[1].

4.2.1 Interviews

Thirty-one semi-structured interviews were conducted with museum professionals and technology partners. The interview questions followed two main lines of inquiry: the declared practices for working

[1] The CERPE approval certificate can be found in Appendix D.

in ecotone collaborations to create digital interpretation tools, and the perceptions of the dynamics and structures present in the development process. The responses were studied to analyze the concepts that emerged, including the issues at play when museum professionals collaborated with technology partners on the development of digital interpretation tools, how different working structures supported or hindered that process, and the impacts on the collaboration of the discourses of digital imaginaire and of museum digital capacity.

To conduct the semi-structured interviews (Meunier et al., 2020), a framework of questions [2] was developed based on the themes identified in the findings of the preliminary study and a review of relevant scholarly literature. These questions were designed to guide participants in sharing their declared practices and perspectives. Given the inductive nature of this study, the questioning in the interviews followed the themes and concepts that emerged within participant responses, resulting in interviews that focused on different areas of the framework of questions. For example, some participants addressed each area within the framework in their responses, while others spoke in-depth about a specific theme. The researcher recorded field notes during and after each interview, expounding upon the core themes and identifying emergent concepts. This reflective approach facilitated the process of pursuing the elements that emerged through participant responses, so that each interview was informed by the conversations that had preceded it.

The following sections give an overview of the scope of the interview questions across two main areas: perceptions of dynamics and structures, and declared practices for collaborations.

4.2.1.1 PERCEPTIONS OF DYNAMICS AND STRUCTURES

The questions in this category centered on the patterns that participants observed in how museums and technology companies approached the collaborative development of digital interpretation tools, and the factors that facilitated (or complicated) the process in these ecotone contexts. These professionals were asked to provide their perceptions of partners who were well-equipped to collaborate on digital interpretation projects, and those that struggled in the process. The specificities of working in museum

[2] The general framework of questions that guided the interviews can be found in Appendix E.

contexts was addressed through the insights from participants that worked with other sectors. These questions examined these professionals' experience working with different types of partners, as well as any changes concerning these collaborations over recent years. The responses to these questions allowed the researcher to discern the discourses of the digital imaginaire held by these professionals regarding the potential of various digital technologies to connect with interpretation experience objectives, as illustrated through descriptions of the specific applications of different technologies in museums. These responses also provided insights into how participants understood institutional objectives for visitor experience as facilitated by interpretation tools. This established the context for the following questions regarding the professional practices implemented to facilitate collaborations between museums and technology partners.

4.2.1.2 DECLARED PRACTICES FOR COLLABORATIONS

These questions explored how professionals viewed their role in ecotone collaborations, as demonstrated by their descriptions of strategies for across sectors on digital interpretation projects. Subjects were asked to describe the process of collaborating with partners on a digital project, from the initial contact until after the digital project was launched. Questions aimed to reveal why these professionals established their particular set of practices, how they discussed specific technology's capacities to support interpretation objectives, and if they adjusted their procedural structures based on differences between partners, including varying levels of digital literacy or familiarity with museum contexts, institutional support and resources, and openness to new processes. The responses to these questions aimed to gather insight into what these professionals considered to be effective approaches for museum teams to collaborate on digital interpretation projects with external service providers, based on their experience within numerous collaborations. The responses were also examined to reveal participant perceptions of digital capacity and discourses of the digital imaginaire present within museum professional ecosystems.

4.2.2 Documentary analysis

To help contextualize the interview responses, a review of documentation was conducted when relevant resources were provided by research participants. This documentation included educational or promotional documents created by technology companies for their museum partners, documents defining museum digital strategies and governance, news and research articles about specific digital interpretation projects or collaborations, and the presentation of digital projects on websites and in presentations. The review of these documents supported the analysis by offering additional context and nuance to the elements that emerged in participant responses: these references were shared in the course of, or immediately following, the interviews to illustrate or explain specific ideas that were discussed. Relevant information in the documentation included details about the outline of the structure for the collaborative process, the established institutional practices for working with digital technologies and designing museum interpretation, the language used to discuss working with a particular technology in the field of museum interpretation, the features of these digital projects that were deemed relevant to museum contexts, and the discourses of the digital imaginaire on display.

4.3 Research participants

This study was positioned with an international and cross-sectoral perspective, examining the perceptions of museum professionals and technology partners associated with museums across the United States, France, and Canada. An international sample was selected to facilitate a deeper understanding of the major issues at play when museums develop digital interpretation projects through the analysis of responses from participants with similar professional roles operating in different national and institutional contexts. The scope of this qualitative approach included a nuanced examination of the variations found in the process of collaboratively developing digital interpretation projects, but did not aim to make explicit comparisons between countries.

The choice of the three countries included in the research sample emerged from the profile of the researcher, whose academic and professional activities were formed by the museum contexts and Museum Studies scholarship of the United States, France, and Canada. She has studied Museum Studies in the course of obtaining a Bachelors of Arts degree in History of Art at the University of Michigan (USA), a master's degree in *muséologie* at the École du Louvre (France), and the present doctoral research in *muséologie, médiation, patrimoine* at the Université du Québec à Montréal (Canada); and professionally, she has worked for, and with, museums in each of these three countries. To deepen her understanding of the socio-cultural context of French museums after the pandemic, the researcher was invited in the winter of 2023 to complete a doctoral research residency during the data collection phase of this study at the École du Louvre's Centre de recherche in Paris under the supervision of Jacqueline Eidelman. This residency allowed her test various digital interpretation offerings in Parisian museums and to conduct reference interviews with French experts:

- Noémie Couillard, Voix/publics;
- Eva Sandri, Université Paul Valéry Montpellier 3;
- Florence Vielfaure, Ministère de la Culture.

During the defense of the research proposal for this project, a jury of professors suggested that this international approach—both in the selection of subjects and in the reference texts constituting the bibliography—would be a strength and defining feature of this dissertation.

While the choice of national contexts for the sample was chosen for reasons of prior experience, as well as for accessibility of language and networks, a study of museums in these three countries was determined to be well-adapted to the research question due to the active lines of communication between their museum communities. For example, museum colleagues from these three countries shared knowledge and critical reflections through professional and scholarly exchanges, such as within the FRench American Museum Exchange (FRAME) consortium, the research seminar organized by the École du Louvre and the UQAM *Groupe de recherche sur l'éducation et les musées* (GREM), and the annual NUMIX LAB and Museum Computer Network (MCN) conferences. While the specificities of their national contexts differed, the museum communities of these three countries maintained international dialogue and shared findings regarding best practices and use cases of digital technologies in museums.

This research project was initially designed to exclusively study the responses of participants who worked for technology companies, so as to approach the research questions through an analysis of the companies' adaptations to the realities of collaborating with museums. To determine if this approach was adequate—or if the discourses of museum professionals would also be relevant to the scope of the research—, an exploratory interview was conducted with a museum professional. This participant's responses provided a relevant complementary perspective to the question of cross-sectoral collaborations, which indicated that the participation of museum professionals would be essential to this research project. Therefore, both museum professionals and technology partners were included as participants in this study.

4.3.1 Selection criteria

The criteria for inclusion in the study were defined to ensure that research participants possessed adequate experience in the field of developing museum digital interpretation projects, so that the participants (and their associated institutions or companies) would have established practices for cross-sectoral collaborations and informed perspectives on the process, built over the course of their professional work. However, the criteria were also intentionally designed to be open enough to allow for the inclusion of a diverse range of professional perspectives on the research question when pursuing the themes that emerged in the interviews.

In the scope of this study, a digital interpretation project was identified using the broad definition proposed by the PRISM digital interpretation innovation laboratory (Larouche et al., 2019; as cited in Bélanger et al., 2021, p. 192): any museum interpretation project that facilitated a relationship between the public and museum objects (including the knowledge and narratives associated with them), through the use of digital tools. This definition included a range of projects, designed for visitors both in-gallery and online, including digital tools such as websites, mobile applications, touchscreens, augmented and virtual reality experiences, and interactive displays.

As this study was designed to examine perspectives and declared practices, the participants were positioned as speaking to their own experiences as professionals, and not on behalf of their institution or company.

Participants who worked for museums were selected based on their demonstrated professional experience developing digital interpretation projects in French, American, and/or Canadian museums, as determined by a portfolio of their museum's completed digital projects (at least three launched digital projects with external partners), and the participant's professional involvement in the development of digital projects or strategy within their institution. Professionals who had previously worked for museums in one of these three countries, but who currently worked for a museum in a different country, were included in the sample. Professionals who worked for public establishments that managed groups of museums or historic monuments, including through supporting the development of their digital interpretation tools, were also included in the sample.

Participants who worked as technology service providers were selected based on their demonstrated professional experience in companies that collaborated with French, American, and/or Canadian museums, as determined by the company's longevity (at least three years), and a portfolio of completed museum digital interpretation projects (at least three launched digital projects with museums) or consultations on digital projects (at least three consultation contracts with museums for digital projects and/or strategy). Providers were eligible to be included as research participants if their role within the company involved direct engagement with the development of digital projects with museums, in any aspect of the collaborative process. Companies that were not located in one of these three countries, but that worked regularly with French, American, or Canadian museums, were included in the sample. The types of collaborations included in this study were trade strategies (Stafford, 1994; as cited in Arcon, 2018), where

there was a two-way exchange between museum professionals and technology partners. This parameter excluded technology companies that solely offered digital platforms for museums to customize independently, but included companies that acted as consultants for museums developing digital projects, including with other collaborating external partners.

4.3.2 Characterization of the sample

Thirty-one semi-structured interviews were conducted with museum professionals and technology partners between August 2022 and November 2023. This extended period of data collection facilitated an intentional approach to the selection of research participants through the analysis of the emergent themes as documented in the field notes, as well as in-person contact with professionals at the ICOM General Conference Prague (2022) and a doctoral research residency at the École du Louvre's Centre de recherche (2023).

The sample size was determined as the research progressed and overall saturation was achieved in the subjects' responses, as determined by the field notes recorded during and after the interviews. While the aim of this study was not to exhaustively compare the particularities of each national context, it was deemed important to maintain relative parity regarding the number of subjects in each country and sector to ensure equal weight in the data. This resulted in around ten interviews with professionals working for, or with, museums in each country, half with museum professionals and half with technology partners.

Potential participants were identified as the research progressed. An initial list of companies and museum professionals was compiled based on consultation of documented projects in academic literature, attendance at relevant conferences, reference interviews conducted with researchers and experts, and the researcher's monitoring of updates in the field on social media and industry newsletters. During the data collection phase, an additional approach to identifying potential subjects arose as participants suggested relevant professionals to contact. This 'snowball' effect provided access to professionals who could further elucidate and develop topics that had come up in the interviews, directly supporting the inductive exploration of themes that emerged as the data was collected.

Participants were given the choice of whether or not their name and employer would be included in the list of research subjects. As a reminder, this study was designed to examine perspectives and declared practices of professionals, and the participants were therefore positioned as speaking to their own experiences and not on behalf of their institution or company.

The list of museum professionals who participated in this research project, as well as their roles and employers at the time of being interviewed, can be found in Table 4.1:

Name	Position	Museum	Location
USA			
Chan, Seb	Director and CEO	ACMI *(*formally Cooper Hewitt Smithsonian Design Museum)*	Melbourne (Australia) **formerly New York City, NY*
Elliott, Matt	Head of Creative and Digital Experience	The Henry Ford	Dearborn, Michigan
Franzini, Martín	Head of Digital Product and Experience	National Gallery of Art	Washington, D.C.
Nuñez, David	Director of Technology and Digital Strategy	MIT Museum	Cambridge, Massachusetts
Wambold, Sarah	Executive Producer and Content Strategist	Metropolitan Museum of Art	New York City, New York
Winesmith, Keir	Chief Digital Officer	National Film and Sound Archive of Australia *(*formerly SFMOMA)*	Canberra (Australia) **formerly San Francisco, CA*
FRANCE			
Baudry, Marine	Cheffe de projets innovants et multimédias	Musée d'Orsay	Paris, Île-de-France
Greco, Scarlett	Cheffe du service numérique	Paris Musées	Paris, Île-de-France
Legeay, Guilaine	Chargée de projet, Médiation numérique	Musée du Louvre-Lens	Lens, Hauts-de-France
Mauvieux, Hanna	Responsable Incubateur du patrimoine	Centre des monuments nationaux	Paris, Île-de-France
Targui, Stéphanie	Chargée de mission projets numériques et audiovisuels innovants	Muséum national d'Histoire naturelle	Paris, Île-de-France
CANADA			
Delfino, Laura	Responsable de programmes éducatifs, Recherche, innovation, médiation numérique	Musée des beaux-arts de Montréal	Montreal, Quebec
Gillam, Scott	Director, Design and Digital Experience	Canadian Museum for Human Rights	Winnipeg, Manitoba
Smith, Melissa	Program Curator, Collaborative Learning	Art Gallery of Ontario	Toronto, Ontario
Anonymous	*Role in digital leadership*	*Anonymous*	*Ontario*
Anonymous	*Role in digital leadership*	*Anonymous*	*Ontario*

Table 4.1 List of museum professional research participants and their roles at the time of the interview.

The museum professionals who participated in this research project were mostly associated with medium to large institutions located in urban areas, with diverse funding structures and collections. There were also variations in structures: two participants worked for organisations that supported groups of cultural

institutions and one participant worked in a digital innovation laboratory within a larger museum. Examples of the subjects' roles included C-suite level position, departmental head, project manager, producer, and curator. Several subjects had previously worked in the private sector, including with technology companies that partnered with museums. The majority of the subjects' professional roles were centered around digital projects. Of the participants selected due to their experience with American museums, two subjects no longer worked in the US; the international scope of this research project, as well as these individuals' continued contributions to the field, determined their inclusion in this study.

The list of technology service providers who participated in this research project, as well as their roles and employers at the time of being interviewed, can be found in Table 4.2:

Name	Position	Company	Location
USA			
Bojko, Ben	Technology Director	Bluecadet	Philadelphia, Pennsylvania & New York City, New York
Brin, Sarah	Business Strategy Director	Good Afternoon	London (UK)
Cummins, Andy	Managing Director	Cogapp	Brighton (UK)
Devine, Catherine	Industry expert		Washington
Miller, Aaron	Account Manager	Forum One	Arlington, Virginia
FRANCE			
Bougnères, François	Co-founder	Summum 3D	Paris, Île-de-France
Carré, Marion	Co-founder and CEO	Ask Mona	Paris, Île-de-France
Pesquer, Omer	Consultant indépendant		Paris, Île-de-France
Roland, Antoine	Associé Fondateur	{CORRESPONDANCES DIGITALES]	Paris, Île-de-France
Rouillier, Emmanuel	Designer interactif et directeur	Mosquito	Paris, Île-de-France
CANADA			
Doig, Jessica	Executive Producer	ngx interactive	Vancouver, British Columbia
Laliberté, Hugo	Cofounder et Maker	Ottomata	Montreal, Quebec
Manalo, Armando	Partner, Strategy Director	Upswell	Portland, Oregon (USA)
Roy, Nicolas S.	CEO / Creative director	Dpt.	Montreal, Quebec
Waitzer, Sara	Exhibit Developer	CREO	Montreal, Quebec

Table 4.2 List of technology service provider research participants and their roles at the time of the interview.

The technology service providers who participated in this research project were associated with diverse companies, including design studios, digital agencies, consulting firms, media producers, and multinational corporations. These companies varied in team size, technology specialities, and types and sizes of museum partners. Some of these companies worked exclusively with museums, while others had clients in other

cultural or commercial sectors. Participant roles ranged in the degree that they were centered on digital technologies, partner relationships, and media production and communication of information. Examples of these roles included project manager, business development manager, technology director, and consultant. Several subjects had previously worked in museums. In three cases, participants based in another country were selected for their participation in projects with museums located in one of the three selected countries.

4.4 Data analysis

The use of a deliberative[3] induction process was employed for the data interpretation for this study. This approach used a theoretical framework to guide the analysis, enriched with elements that emerged from the data (Anadon & Savoie Zajc, 2009; Mukamurera et al., 2006). For this study, an analysis tool[4] was created based on the literature surrounding digital maturity, cross-sectoral collaborations, discourses of the digital imaginaire, and museum interpretation. The analysis tool facilitated the identification and analysis of these concepts in the responses of these professionals—as well as those that emerged over the course of conducting the interviews—, which influenced the directions of subsequent interviews. The transcriptions of the interviews were coded according to the presence of the identified concepts in the tool, which enabled the subsequent analysis of the data.

A conceptual and analytical structure[5] was developed to communicate the findings from participant responses about their declared practices for working in these collaborations, the discourses of the digital imaginaire held by these professionals for museum interpretation tools, and the perceptions of both the collaborative process and of museum professionals' needs for developing these digital projects.

4.4.1 Presentation of participant data

Measures have been taken in the discussion of the data in this dissertation to protect the anonymity of the research participants. As outlined the consent forms approved by the Comité d'éthique de la recherche pour les projets étudiants (CERPE) at the Université du Québec à Montréal (UQAM), while the participants' words could be cited in the dissertation, their identity and that of their employer would remain anonymized in any discussion of the data.

[3] The term 'deliberative' is used here in the sense of 'délibératoire' in French, with the meaning of 'relating to', as in an induction process relating to an analytical framework.

[4] The analysis tool can be found in Appendix F.

[5] This structure is presented in the following chapter.

When citations are included, participants are identified as being either a “museum professional” or “provider”. The choice of using the subject’s role rather than their institutional affiliation (for example, “museum” or “company”) was chosen to emphasize the fact that the data consist of the perspectives of individuals in certain roles within specific contexts, and not official institutional perspectives. This is especially important given the fluidity of affiliation found in the fact that several participants have worked for both museums and companies over the course of their careers.

To further protect anonymity within this small sample size, participants are not identified by their country. This also reflects the fluidity of national context, with certain professionals having experience working both in, and with, museums and companies based in different countries. Additionally, to prevent identification of participants by language, responses given in French have been translated to English by the researcher.

Lastly, participants are referred to using the pronouns ‘they’ and ‘them’. The choice of this gender inclusive language was inspired by Noémie Couillard’s use of “un langage non sexiste” in her doctoral dissertation:

> L’usage exclusif du « masculin neutre » dans un travail scientifique, *a fortiori* lorsqu’il s’agit de rendre compte d’une enquête de terrain, risquait d’invisibiliser la présence des femmes alors qu’elles forment une majorité des professionnel·le·s des musées. (Couillard, 2017, p. 7)

The use of gender inclusive pronouns aims to both protect participant anonymity and highlight the presence of professionals across a range of gender identities making contributions to the field.

4.4.2 Terminology

Given the diversity across languages, national contexts, and sectors, a large range of terminology was used by participants to describe the same, or similar, concepts. To simplify the presentation of the data analysis, and to protect participant anonymity, certain terms were used interchangeably:

- [Professionals from technology companies]: *provider, partner, service provider*
- [Technology companies]: *vendor, firm, company, studio*
    - More specific language was used in certain models of engagement, such as co-productions or consultations.

- [Museum visitors]: *visitors, public, audience*
    - This could refer to both on-site and online engagement.
- [Digital interpretation projects]: *digital tool, project, product, experience, device*

4.5 Potential limitations of the study

This methodological approach centered the perspectives of museum professionals and technology partners, thus excluding from its scope the perspectives of museum visitors. The results of this study thus did not determine if the resulting digital interpretation tools met objectives for visitor experience. This limited perspective was partially mitigated by selecting professionals from museums and companies who had experience collaborating on these tools over many years and who possessed a portfolio of completed interpretation projects.

This study excluded insights into the professional ecosystems of certain institutions, as the resources necessary to collaborate with technology partners to develop digital interpretation projects could be beyond the capabilities of smaller museums with limited budgets. Additionally, the perspectives of professionals from companies that did not have vast experiences working with museums (such as new start-ups or companies that worked with other sectors) were not included in this study. However, due to the range of previous professional experiences of the research participants, as well as their dialogue with colleagues, several of these professionals shared insights from previous roles or professional communication.

There was a wide range of factors that could potentially impact the responses gathered within this research project—including different national contexts, diverse digital interpretation projects, and participants associated with museums and companies with different sizes and types. As the scope of this qualitative approach included a nuanced examination of the process of collaboratively developing digital interpretation projects, and not to make explicit comparisons across these factors, the nuances and details of these specific contexts were not fully pursued in the data analysis.

Additionally, due to the commercial nature of partnerships with technology companies, it was possible that service providers or museum professionals might have been hesitant to reveal the details of the points of tension involved in working across sectors as it could result in financial, relational, or reputational damage. This factor was addressed by anonymizing participant responses, not publishing the transcripts of the interviews, and allowing professionals to decide if they wanted to be included in the list of research participants. These confidentiality measures were clearly communicated to professionals in the consent form so they understood that responses that could be harmful to them or their employer would not be included in the final report.

4.6 Researcher's resources and skills to conduct qualitative research

The researcher has an academic background in qualitative research in Museum Studies. In the context of a master's degree at the École du Louvre, she conducted a research project that included interviewing museum and technology professionals involved in both the creation of three temporary exhibitions in Parisian museums and of their associated digital interpretation tools (Gross-Hoy, 2014). This research also included designing an analysis framework to study the content communicated in these exhibitions through diverse mediums. More recently, in the context of this doctoral research, the researcher designed the preliminary study of an innovation cell in the PRISM digital interpretation innovation laboratory of the Montreal Museum of Fine Arts (Gross-Hoy, 2021). As previously discussed, this analysis used an inductive approach to identify the concepts at play in the development process of digital interpretation project with museum professionals and technology partners.

The researcher's professional experiences complement these previous research projects. She has worked for both an art museum in France, collaborating with technology partners to develop in-gallery interpretation projects, and for a technology company in North America, collaborating with a dozen museum teams in the US and Canada to create augmented reality interpretation experiences. These professional roles gave her firsthand insights into the dynamics at play when museum teams and technology partners collaborate on digital interpretation projects for visitors.

Finally, the researcher conducted this study under the direct supervision of Anik Meunier, full professor of Education and Museology at the Université du Québec à Montréal (UQAM) and director of the Groupe de recherche sur l'éducation et les musées (GREM) at UQAM. The researcher is a member of the GREM, an organisation with more than 40 years of experience in studying museum education and interpretation projects. Over the course of this study, she benefited from the expertise of the researchers associated with the GREM.

CHAPTER 5
RESULTS AND ANALYSIS

This study aimed to explore what the declared practices and perspectives of experienced technology partners and museum professionals could reveal about the roles and development of digital interpretation experiences in museum professional ecosystems. The research was conducted using a deliberative induction process grounded in a theoretical framework to guide the data analysis, enriched with themes that emerged from the data (Anadon & Savoie Zajc, 2009; Mukamurera et al., 2006). To construct this framework, a preliminary study was conducted of a program led by the digital innovation laboratory at the Montreal Museum of Fine Arts (Chapter Two). This enabled the identification of relevant concepts when studying the collaborative development of digital projects in museum contexts: museum interpretation and discourses of the digital imaginaire, digital capacity as understood through factors like digital literacy and digital maturity, and cross-sectoral collaborations. The scholarly literature around these emergent concepts—as well as the metaphors of museum professional ecosystems and ecotones—became the basis for the theoretical framework (Chapter Three), which guided the qualitative inductive study that aimed to analyze the declared practices and perspectives of professionals from museum teams and technology companies.

The first objective for this research project aimed to assess how experienced practitioners conceptualized digital museum interpretation, as well as how they worked with the capabilities of digital technologies to support museum interpretation and visit experience goals. The next objective centered on the perceptions of these professionals on the collaborative development of digital interpretation projects, including motivations for creating digital tools for museum audiences, practices for adapting the digital development process within museum contexts, and potential points of tension in these collaborations. The research project's final objective was to explore the capacity of these professionals to collaborate effectively across sectors, including the understanding of their partner's sector and their ability to communicate with each other.

To respond to the objectives of this study, thirty-one semi-structured interviews were conducted with experienced professionals in the field. Participant responses centered on their declared practices for

working in cross-sectoral collaborations, their perceptions of the collaborative process and their partners, and the discourses of the digital imaginaire held by these professionals for museum interpretation tools. An analytical tool was created to facilitate the identification and analysis of the major concepts found in the responses of these professionals, both those previously identified in the preliminary study and those that emerged over the course of conducting the interviews. Using this tool, a conceptual and analytical structure was developed to examine the interplay of concepts and themes across the collaborative process. The four main categories of this structure can be found in Table 5.1:

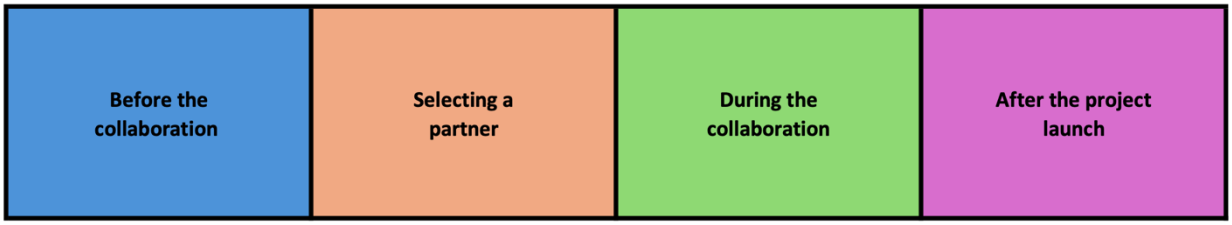

Table 5.1 Four main categories of the conceptual and analytical structure of the research findings.

This chapter presents the findings of the study through the conceptual and analytical structure, following four broad phases of collaborative partnerships: *Before the collaboration, Selecting a partner, During the collaboration,* and *After the launch of the digital project*. This approach facilitates a comprehensive presentation of the data by describing the practices of professionals across the collaborative process, as well as exploring common areas and questions that require decision-making and strategic reflection. A more detailed visual presentation of the conceptual and analytical structure is shared in the conclusion of this chapter.

5.1 Before the collaboration

This section explores the contexts that preceded the process of engaging in cross-sectoral partnerships. Participants described their perceptions of the capacities of digital projects to meet institutional objectives, as well as their reasons for engaging with external partners in the development of these tools. Participants also shared the preparations that occurred before the initiation of these collaborative relationships, including the preliminary efforts undertaken within museum teams to cultivate their understanding of both digital technologies and their audiences.

5.1.1 Relevant uses of digital tools for museum interpretation projects

Participants shared many reasons why museum teams might decide to employ digital technologies as the format for visitor-facing interpretation experiences. These included the contexts for the choice to develop with digital tools, the capacity of these projects to support various institutional objectives, and the tensions and strategy at play when determining relevant uses for digital tools in visitor-facing interpretation experiences.

5.1.1.1 EXTERNAL AND INTERNAL CONTEXTS

Participants reported various contexts within museums that could initiate the decision to develop a digital interpretation project for their visitors. External circumstances could motivate the creation of these projects, such as those that were originally conceived for time-bound events like temporary exhibitions in museums. In these cases, museum teams might begin discussing their plans for the development of digital projects in the context of the conception of the exhibition itself, ranging from handheld interpretation tools to immersive elements that would be part of the scenography. Other events reported by participants that motivated the decision to develop a digital tool included creating a new museum, reopening a museum after a building closure, updating gallery displays, and redefining the brand of a museum. In some cases, the digital project was initiated in response to the need to update an existing digital product, such

as redesigning an institutional website or creating a new digital platform to display content from a former mobile application.

Some participants also described the internal dynamics that could lead to the development of digital products to support these institutional initiatives, including "internal asks" (Museum Professional) from leadership for the implementation of projects using specific technologies. In such cases, a curator or a member of museum leadership might make a request of the museum's digital team to develop a new digital product—such as a mobile application for the permanent collection or a touchscreen for a temporary exhibition—or to update an existing product, such as a website redesign. Other participants described broader internal requests for digital experiences, where the museum staff in charge of developing digital projects were approached by colleagues to conceive of products to address identified visitor needs for an initiative or event, such as in the context of the interpretive plan for a new exhibition. This also included requests stemming from the larger "pressure felt by museums" (Provider) to offer digital interpretation devices in their galleries and online.

When describing the strategic rationale for the inception of digital projects, some participants described how projects made with emerging technologies could stem from their institutions' practice of experimenting with new technologies to innovate with new possibilities for museum interpretation. Other participants mentioned how the creation of digital projects was motivated by a strategic objective to establish new partnerships, for reasons such as creating ties with the surrounding community by engaging with local businesses or pursing innovative projects with actors outside the cultural sector. As will be discussed in this section, many participants mentioned that the origin of these tools was rooted in the effort to support interpretation objectives and visit experience needs identified by the institution, as well as to benefit the museum through improved reputation and increased visitor attendance.

5.1.1.2 ACCESSIBILITY AND WELCOME

Digital tools were reported to be a method to make museums more accessible to their visitors by "adding a layer" (Museum Professional) to existing structures. Accessibility was a broad concept that raised diverse areas of reflection for the professionals developing these digital projects: "How do we make it as least exclusive as possible, so that it accommodates the most users?" (Provider). The capacity to make museums

more accessible was described by many participants as a way to support their fundamental mission of communicating the knowledge about their collections to as many people as possible, which was noted to be especially important in the context of museums supported by government funding. These efforts could help museums demonstrate their relevance within larger sociocultural contexts, enabling them to continue forward as institutions: “I believe that digital is only going to help foster a lot more of that connectivity and that relevance with the audiences that we are trying to engage with” (Museum Professional).

This objective could be supported through inclusive design that enabled visitors to access the functionalities of the digital tool, and even to access the museum itself, across a range of ability levels, languages, backgrounds, and ages. Participants mentioned examples of digital projects that facilitated wayfinding within museum buildings for visitors with vision impairments, and that enabled personalization in language and format for how visitors would consume text in the galleries. The accessibility of the technology of the tools themselves was also mentioned, with many participants sharing their practices to make the devices as easy to use as possible to accommodate a large range of visitors. For example, this approach could include designing digital projects that “involve the senses and limit the interface” (Provider), making the use of the tool intuitive so visitors would not be asked to master a new technology.

Accessibility was also described in the context of making museums feel inviting to people who had previously felt uncomfortable in these institutions: “There's a lot of things that would make [the museum] very, very intimidating or unwelcoming to lots of populations, so how do you break that barrier and use digital to do that?” (Museum Professional). By offering appealing digital projects such as an immersive experience, or familiar technologies such as a video game, these tools could potentially act as marketing strategies to enlarge and diversify museum visitor bases. While such novel digital experiences were described as having the potential to “democratize culture” (Provider), some participants mentioned that these projects were sometimes only accessible by paying high ticket prices: “So who is it really aimed at? Does it really broaden audiences?” (Provider). Other participants mentioned the practice of making digital tools in museums financially accessible, such as by offering digital experiences that are supported by both ‘bring your own device’ and a free supplied device.

Additionally, digital projects were reported to help museums make “institutional knowledge and engaged learning” (Museum Professional) accessible to people who were not able to visit their buildings, such as

for reasons related to health or incarceration, or if the museum was closed or located in a destination that made it difficult logistically to visit. Several participants described their experiences during the lockdowns of the COVID-19 pandemic where they worked to connect with visitors remotely: “I think if COVID has taught us anything, it is the importance of digital and the possibilities of engagement, especially for place based-organizations" (Museum Professional). These digital interpretation projects for remote visitors could help support museum missions for serving larger communities, as a museum professional mentioned when sharing about an online digital project:

> We’re really good at storytelling, which is important for inviting people into the museum. But even if no one comes to the museum, we have the ability to help people understand the world and history, and invite them to build perspective taking and empathy. (Museum Professional)

However, these experiences destined for remote visitors were not reported to exclude or replace physical visits to museums. In fact, several participants described them as sources of outreach to invite users to come on-site. Digital projects that were experienced in museum galleries could also be motivators for visitation, and several museum professionals described recent shifts in their work towards digital projects that participated in marketing efforts to encourage visitors to come to museums: “Coming out of the pandemic, the focus has really returned to driving on-site visitation and using digital as the driver for that” (Museum Professional). This approach could include being the first museum to offer a certain type of experience, or the use of emerging technologies that “have a lot of hype” (Provider). While creating “high-profile” (Museum Professional) digital experience could attract visitors, there was also a potential to promote the museum’s image as an innovator. The attention and prestige these projects garnered could also encourage future partnerships: “The more this brand shines, the easier it will be for us to be identified by technologists and sponsors” (Museum Professional). Additionally, the potential for increasing visitor attendance was perceived as a way to generate revenue and donations.

5.1.1.3 COMMUNICATION

Digital museum interpretation tools were, of course, a form of museum interpretation, which a participant framed as “the way in which we construct a journey within a museum, but also how the content is understood by a visitor and different types of visitors” (Museum Professional). These digital tools were reported to participate in the communication of museums with their audiences. When designed to be used

on-site, digital projects could participate in the experience and discourses of exhibition spaces: “Physical experiences are increasingly integrated with digital experiences, to the point that, from our perspective, the distinction between exhibition design and media design is extremely artificial” (Provider). Participants described diverse approaches to the implementation of additional discourses into the communication-rich environments of museums, from discrete tools that did not “overshadow” (Provider) the collection on display, to an interactive and immersive incorporation of technology into the scenography. While these approaches varied between different types of institutions, such as art museums and science centers, they were often framed as aiming for integration rather than imposition:

> I think that if you walk through the galleries, you really see digital as part of the DNA and the thread that runs through - it's as important as the artifacts themselves or the spaces, it really does feel like it's a really significant component to the expression of the story. (Museum Professional)

These digital tools were reported to be designed to uphold museum standards and practices for interpretation and communication with their audiences: “Museums are very careful about how something is communicated” (Provider). Many participants described the importance of authenticity and scientific accuracy in these projects. This could include ensuring the validity of facts in digital content, making educated guesses based on research when details were not known, and developing real simulations of phenomena rather than pre-recorded visualizations: “I believe that a visitor will have a very different experience if they're experiencing a ‘real’ digital thing” (Museum Professional). These projects were also often designed to support the voice and tone of the institution, by offering “a consistent coherent experience for end users [that is] a reflection on brand promise” (Museum Professional). This could include high standards for the quality and aesthetic design of the tools, as well as incorporating the museum’s approach to displaying and communicating about their collections:

> We could have easily just done [a standard digital project]. But that wouldn't have delivered on how the [Museum] as an institution thinks about our collection and talks about our collection. So it was bringing that [Museum]-ness into that experience that makes it so successful and so awesome. (Museum Professional)

These experiences often had “pedagogical and interpretation objectives” (Provider) for their users, such as: helping visitors understand the collections and their origins, sharing contextual and complementary information, displaying elements that might not otherwise be visible and revealing hidden meanings, highlighting other perspectives, introducing themes and concepts, connecting with objects and places beyond the walls of the museum, making historical objects relevant to current issues, and teaching

children how to visit museums. Experiencing these digital projects could “give keys to visitors” (Museum Professional) to understand what they were seeing and empower them to make meaning:

> [The digital tool] allows us to bring in other perspectives. Visitors tell us the effect of being able to hear them, “It allows us to look differently—sometimes to criticize, sometimes to discover—something we don’t know.” It’s a way to literally give meaning to objects that are poorly understood. (Museum Professional)

Digital experiences were reported to contribute to visitor learning by enabling different modes of engaging with content: “When we layer it with other modes that allow people to relax or interact or experience the content in a different way, it all knits together in terms of their construction of the visit” (Museum Professional). Participants described communication practices for these tools, including sharing complex information in simplified ways, centering discourses around the objects on display to help visitors make connections with the collections, and integrating options to personalize the experience. The use of storytelling and being “story forward” (Provider) was a commonly mentioned technique for encouraging visitor learning: “We'll get the closest we absolutely can to accuracy, while still an emotional, compelling story is really important to us” (Provider). Digital tools were also described as having the potential to help museums tell stories in new ways. Incorporating storytelling techniques was described by some participants as a guiding principle for these projects: “It isn't tech-led—it's story-led, it's experience-led and visitor-led. And then the tech is the way to enable that. (Provider). Storytelling was conceptualized as a method to support and shape the visit experience that came from using digital interpretation tools.

5.1.1.4 EXPERIENCE

While digital projects could be educational, many participants mentioned how they should also be engaging and compelling, a combination that was described as “what makes them specifically museum experiences” (Museum Professional). A common theme in participant responses was the capability of digital tools to facilitate *experience*: “Experiential means that you're not just thinking about the logic or the content, but really how a person experiences that over time, how they engage with it” (Provider). Digital tools could play an integral role in shaping the visit experience, including by helping to create the feeling of, and flow through, a museum space or an online site. They could also extend this experience across time by connecting with audiences before and after an on-site visit. These experiential qualities

were also reported to support content integration by “adding another layer of experience” (Museum Professional), where visitors could engage with the content “without even realizing that they’re learning” (Provider). In this perspective, the more that digital tools were able to attract visitors to museums and keep them engaged, the more attention these visitors would pay to the museum’s knowledge and stories. Many types of experiences were reported to be possible when facilitated through the use of digital tools, including interactive, immersive, social, “scholarly and in-depth" (Museum Professional), aesthetic, playful and gamified, fun and enjoyable, and adapted to specific ages. To fully enter into these experiences, several participants mentioned that it was important for these tools to be easy to use and comfortable for visitors.

Digital tools could facilitate social interactions in a variety of ways, including by helping groups of people communicate with each other, encouraging strangers in the museum to interact, and facilitating “human interpretation” (Museum Professional) with museum staff. The hunger for immersive digital experiences bringing together large numbers of people was perceived by a participant as being a result of the pandemic, where “people are tired of having been isolated” (Provider). In addition to the experience of being around other people, several participants shared the view that on-site digital projects in museums should take advantage of the physicality of museum spaces and distinguish themselves from digital experiences that could take place in visitors’ homes:

> Are we giving people enough of an experience that justifies the ticket prices for them getting out of their houses, something they can't do online? A real experience that we have in the four walls. Are we taking advantage of having them here of the space we have and making it worth their while? (Provider)

These reflections centered on how to satisfy the expectations of visitors who had “invested the time and the energy to go to physical space” (Provider). Several participants mentioned the power of experiential digital tools to evoke emotional responses, which was mentioned as a way to cultivate sustained visitor engagement and create meaningful experiences:

> It's a really experiential, very beautiful, not super didactic experience. It has proven to be very successful because people sit down and they have these long-lasting experiences with the [digital project]. And it's emotional. It hit all the right notes. We haven't done any real evaluation, we don't really know if we succeeded in the story that we're trying to tell. But I can say that I've watched people use the experience. And they're crying, they're having this really emotional engagement with this thing that we built. (Museum Professional)

Such “wow moments” (Provider) were reported to be particularly meaningful for visitors by defying their expectations of what they thought was going to happen: “Something like that destabilizes and it immediately arouses engagement” (Provider). These experiences could spark the imagination of visitors, kindle curiosity, foster a sense of awe, and even feel “magical” (Museum Professional).

Many participants remarked on the capacity of some digital tools to engage all the senses in museum contexts. These sensory experiences could encourage visitors to explore their embodied responses to the collection and understand complex concepts in new ways. A museum professional described the capacity of sensory immersion to help visitors create relationships with museum collections and knowledge by facilitating engagement: “Visitors didn't watch it, they lived it” (Museum Professional). When these experiences were interactive, visitors could feel a sense of agency:

> “For us, interaction happens when the person can interact in different ways, letting their personality show a little. [...] It’s really about setting the scene, creating mechanisms and technologies that will allow the public to feel that they have a role to play and that their body has an impact on what’s around them. (Provider)

A sensorial approach could involve an integration between digital technology and physical spaces and objects, creating new environments. It was also reported to have the potential to help visitors retain what they learned after the visit. The capacity of embodied experiences to change perspectives and impact people after their visits was mentioned as a powerful way to encourage visitors to imagine new possibilities and become engaged citizens: “Multimodal expressions that can help create palpable or scaffolded experience for people to enter thinking about [the subject matter] and become active” (Museum Professional). By immersing the visitor in a sensorial experience, digital tools could empower visitors to work for change in the world based on what they learned in the museum:

> There's a gravity there, in terms of leveraging [digital] through powerful content, through powerful stories, and through understanding what the visitor might need in the moment to then create change. (Museum Professional)

Some participants described digital experiences where this dynamic could move in many directions, with “museum informing visitor, visitor informing the museum, and then ultimately, visitors informing other visitors, creating a full circle” (Museum Professional). Empowerment was fostered through story, relationality, and the experience of empathy.

5.1.1.5 TENSIONS AND STRATEGY

Some participants described a tension in their efforts to find the balance between education and entertainment, between rigorous standards and trendy technologies. This work required professionals to "surf" (Museum Professional) between different requirements and objectives: "We're always walking the razer's edge between making something that's really engaging but just for fun, and on the other hand making something really educational but users say it's a bit boring" (Provider). A participant described the tension of treating museums as places of entertainment for visitors who felt alienated by more traditional forms of museum communication:

> Not everybody has that degree of literacy. Not everybody has an academic background. Not everyone is an adult. How do children relate to that? And so this is why you end up with a scenario where people don't want to come to museums, because they see it's not for them. It's a hard one to change because museums don't want to be Disneyland, they still need be educational. They need to move somewhere along the spectrum. (Provider)

Many participants described trying to find their place "along the spectrum" (Provider) of how digital tools could support their interpretation objectives.

When determining relevant uses of digital technologies, many participants also described their wariness of choosing to work with digital tools categorized as *shiny objects*, a term that connotated projects that utilized flashy or emerging technologies for the sake of novelty. These professionals reported favoring an intentional and reflexive approach to the use of digital projects, "where the technology has added value for people rather than just being a gadget" (Provider). This often meant grounding decisions about which digital tools to pursue in the larger missions of the museum for interpretation and visitor experience:

> It's the technology's job to meaningfully connect the collection to the audience. It's not a means to itself. And if you set the project up such that that connection isn't primary or is fragile, then it's not a project worth pursuing. The technology isn't sitting between those two things and making it meaningful; the technology is over here trying to do this other thing and so it's a distraction from the mission. [...] It's easy to say no [to project ideas] to when you think of it with that lens: not "Am I interested in it?", not "Is it cool?", not "Can we fund it?", but actually "Is it doing that work and doing it sustainably?" (Museum Professional)

In this perspective, an intentional approach to technology could involve reflecting on the visitor needs that the project would address and then determining if a digital format would be the best solution: "If we're going to introduce digital into our spaces, it has to have an overwhelming reason, there has to be a 'why'.

If you can do it with analog ways, then do it that way" (Museum Professional). This work could also include reflections on the role of technology within the larger communication and experiential context of the galleries, the practice of "making every pixel count" (Provider) by centering choices around digital tools on how they could create value for museum visitors, and integrating digital tools carefully and discretely into the physical environment to avoid the sensation of being "bombarded with screens" (Provider). The importance of sustainability in the strategic development of digital museum projects will be explored later in this chapter.

The wariness around *shiny objects* did not mean that creating an interpretation project with an innovative or novel technology could not be a strategic use of digital that was grounded in museum missions. Several participants described how they "pushed the boundaries" (Museum Professional) and experimented with new forms of digital interpretation projects as part of their professional practices to best serve their audiences. These experimentations could also be a modality to respond to broader government mandates for audiences and digital innovation, as well as to develop museums' internal digital practices and infrastructures. Other professionals described how offering standard "cookie-cutter" (Museum Professional) experiences that were not innovative could fail to satisfy their visitors' desires and expectations. And, as previously mentioned, the attention that these projects garnered could potentially diversify museum audiences and increase visitation. A participant noted that, because museums cannot sell their collections, offering digital experiences could allow museums to develop their own resources to financially support themselves:

> There is actually starting to be an awareness that digital interpretation can increase visitor attendance. It's very 'management', very 'economics'. But I think that museum directors have finally started to be a little more interested in digital technology since seeing that [an immersive digital experience] attracts a lot of visitors in a year—that intrigues them. So there is this need to develop their own resources, which encourages them more and more to move towards these [digital] formats and opening the heritage sector towards the cultural and creative industries—and orients them towards other practices, other methods, other tools. And to integrate that into their establishment strategy. A question nevertheless arises, to what extent? (Provider)

As this participant remarked, when museum teams moved towards offering their visitors interpretation tools that used digital technologies, they opened themselves towards other sectors and the integration of new ways of working within their institutions. In some cases, this meant entering into partnerships with technology companies.

5.1.2 Reasons for entering into a partnership

When digital technologies were determined to be the most appropriate formats for a museum interpretation tool, museum teams had to decide if they would develop the project in partnership with an external provider. Participants described the reasons why both museum teams and technology companies sought out cross-sectoral partnerships for these interpretation projects. These perspectives included both why a museum team would choose to engage with an external partner rather than developing a digital tool internally, and why technology companies would choose to work within the cultural sector. The rationales shared by participants ranged from intentional decisions to choices made from necessity, and were influenced by infrastructural, economic, entrepreneurial, and strategic factors.

5.1.2.1 MUSEUM CAPACITY

A recurring reason reported by participants for museum teams to decide to seek out technology partners was to augment the capacity present within museum teams to develop digital projects. This capacity was mentioned in two regards: on the individual level and on the structural level. On the individual level, several participants described museum teams where there was a desire to offer digital interpretation projects for their visitors but where the staff members lacked adequate technical competency to develop the products themselves. In these cases, partnerships with external technology companies were necessary for obtaining the expertise required to create the digital project: “So many museums don’t have the capability in-house to do any of this kind of stuff, so they are turning to external vendors” (Museum Professional). Participants mentioned possible explanations for this dynamic, including a lack of investment from museum leadership in building qualified digital teams and the departure of many qualified digital museum professionals into the private sector: “We could not employ the technologists required to build that sort of tech, because we can’t compete with the tech companies for technical salaries” (Museum Professional). This was reported to be both a matter of offering adequate salaries to staff members, as well as cultivating an environment that valued digital work and infrastructures:

> [Museums] definitely are relying more on that collaboration—they can't retain qualified staff related to technology and digital, because the market is so tight. We've seen quite the exodus of people who are qualified going to all the big tech companies. [...] Because they’re paid more, they're valued more. Because, in this ecosystem they're not valued in museums in the way that a

> curator or a marketing person is. [...] And so they're relying [on external providers] because they have to, it's more out of a necessity. (Provider)

The issues around building sufficient in-house capacity to develop and manage digital projects will be developed in the following sections.

On a structural level, the requirements for developing and maintaining digital projects could go beyond the internal capacity of museum teams, whether or not they included individual staff members with digital expertise. This was related to the structures of museum teams and their missions: “We’re a museum at the end of the day. We’re not a software production company. So of course we have finite resources in our team” (Museum Professional). While resources were limited within many museum teams, participants also described their perception of an increased demand for digital interpretation projects:

> I think the demand for digital content and digital products far outstripped the ability to resource for it inside museums, and still does in many cases. Which is where the opportunities for partnering with vendors and freelancers and contractors and agencies comes in. (Museum Professional)

This high demand could stem from time-bound events, such as a temporary exhibition or the opening (or reopening) of a museum space, or more generally from the increased expectations that there would be a sustained rhythm of new digital experiences within museums. This dynamic led many museum teams to form strategic partnerships to augment their internal digital capacity, where collaborations with technology companies played a significant role in their digital practices:

> It often happens that most of those resources [in the digital team] are already spoken for. And this is where the strategy piece comes in. For my role and for [leadership], if we're going to do a project, what projects are we clearing off the plate for the internal resources that we need? It's almost a foregone conclusion that we will work with somebody on the outside because we can't take the whole department and just pivot them towards one project. [...] I would say there aren't really all that many projects that we don't work with an external vendor, in one way or another. (Museum Professional)

This dynamic was mentioned in both museums where there were low levels of internal digital expertise, as well as in museums that employed large and dynamic digital teams. In these contexts, the digital work of museums became cross-sectoral environments, bringing together the entrepreneurial and cultural worlds, where external partners could augment internal museum teams: “Walter Benjamin would be

happy because there is a lot of porosity" (Provider). A museum professional shared their team's active reflections on how best to balance this hybrid space of internal staff and external partners:

> We definitely are thinking about this. I don't know which way we're going to go yet, but I suspect that we're going to go with a hybrid approach, where we will have on-site staff who can manage this. I think these days it's kind of worth it to have on-site people. But also with external staff augmentation, external support. We are building so many products and I only have so many people, that I need an extra UX designer or I need an extra back-end developer, or I need a different type of back-end developer. And so, you're bringing people in and working as a team. (Museum Professional)

These hybrid team configurations could have implications for the skillsets and workloads of the museum staff managing these digital projects. Participants described how the roles of some museum professionals had shifted from more technically oriented work like producing and developing, towards a role more focused on project management or liaising: "We 'art direct' technology rather than do it" (Museum Professional).

Many museum teams were deliberate when making the choice of when to work with external collaborators, and the modalities of deciding how to utilize collaborations could change from project to project. For example, a museum professional described how there were often variations in which elements were produced in-house by their team and which were developed in collaborations with partners: "The scale of those engagements really depends on the scale of the project, the time of the project, the number of resources we have internally to commit to it" (Museum Professional). Participants described instances of museum teams wanting to supplement their digital capacity for project-based needs. This could include digital projects that were so large in scope that additional professionals were needed to support staff capacity with an increased workload: "My in-house team has a lot of other work beyond just the [large digital project], and so I have this vendor working closely with us" (Museum Professional). This approach could be used strategically to support busy—and often overworked—museum professionals in accomplishing their digital objectives while maintaining consistency in the structure of their internal teams:

> There's not that many people [on a small museum's digital team]. So, to keep on top of everything they have to do anyway—which is a lot—and then to try and take care of relatively complex software stacks, it doesn't make sense. We see ebbs and flows of in-house teams. And so, we built [a digital project at a large museum] about 10 years ago. But they were always going to take that over as soon as we finished. [...] They have a big internal team with developers, so they have the capacity to manage that. But maybe not to do the big build, which would almost have to double their team, and then get rid of everyone again. (Provider)

Another participant described how their museum often worked with external partners on digital products for temporary exhibitions, which were only present in the galleries for a few months, while the internal digital team focused on developing projects for the permanent collections. This participant mentioned some of the financial reasons behind this practice: while the internal digital team had been shifting towards also supporting marketing objectives, the exhibitions team had a larger budget for projects—including short term partnerships with technology companies. Collaborations with external partners allowed their small team to offer their visitors digital interpretation projects that they would not have been able to develop otherwise: "We punch above our weight class as an institution. We don't always have the bandwidth so that's when we tend to partner with an outside contractor to support us" (Museum Professional).

Several museum professionals described their criteria for deciding whether or not to work with vendors in terms of avoiding dependence on external partners for the sustainability of digital projects. A participant described how, for this reason, their digital team only worked with technology companies on time-bound projects, such as digital interpretation tools for temporary exhibitions that did not need to be maintained for many years. With this strategic approach, their institution would minimize being beholden on technology companies for operations or remediation over the project's lifespan. However, this professional sometimes chose to bring on external partners in instances where the project's level of complexity was beyond the internal capabilities of the museum team to produce on their own:

> A lot of it does come down to resource allocation. A good example of this is our new [project]. An enormous amount of people from across the organization were involved. There are a number of digital components. And we made the conscientious decision that, as much as possible, we were going to try to build out these digital experiences using our own internal resources. Except for the areas that we had identified, that were going to just be way too technically complex for us to deal with. These are more complicated, larger projects that are just going to require a level of expertise and a capacity that we just don't have in-house. And so, we identified that these are going to be an exception. We are intentionally going to look for people in the private sector who have the expertise in this, and engage with them to do this work. (Museum Professional)

The theme of deciding how much to depend on external partners when developing and sustaining digital projects in museums will be explored further in 5.4.2 External support and internal capacity and 5.4.3 Operations and lifespan.

5.1.2.2 BENEFITS OF PARTNERSHIPS FOR MUSEUMS

In addition to the augmentation of internal capacity, participants mentioned other reasons that museums might decide to partner with technology companies to develop digital interpretation projects. A major theme in participant responses was how museum teams could benefit from having access to the expertise of experienced technology companies. This expertise could include both ideas for relevant design and applications of technology to support interpretation objectives, as well as processes for developing the digital tool and guidance for maintaining it in the operational phase. Many museum professionals mentioned valuing the ideas, knowledge, and processes of these digital experts, regarding both their technical capacity and in their ability to design for audiences:

> We relied on their expertise, on their proposal, because we needed help. [...] There is our area of expertise—the visitor's needs—but there is also theirs, which is important because they have another vision. And as a result, it gives a whole new dimension, and it is the strength of a project built together. (Museum Professional)

This benefit was described both for working with companies that had extensive experience with museums and the cultural sector, as well as partners with experience in other sectors who brought new perspectives. As will be explored in 5.2.1 Modalities for the choice of a partner, several participants worked to adapt the selection process to allow their partners to enter earlier into the development process, so they could contribute to the direction and strategic priorities for the digital product: “to help uncover opportunities but also anticipate issues faster" (Provider). This approach sought to take full advantage of the technical expertise and experience of external partners, as well as integrate digital experiences with physical ones. Participants also discussed how partners could help them develop more efficient working processes, as a museum professional described the positioning of vendors:

> You should work with us because we actually know what we're doing, and new ways of doing it that are efficient or more in line with your needs. We can provide subject matter expertise and also technical expertise that you do not necessarily have in-house. That is the nature of vendors. (Museum Professional)

Several participants described these partnerships as opportunities for their digital teams to experiment with new working processes, technologies, and economic models of collaboration. Collaborations could be “a great way for museums to get their feet wet” (Provider) in trying new approaches. By experimenting with different types of digital projects with expert partners, several participants described the benefit to

museums in terms of being empowered to support their institutions' objectives for interpretation and improve the visit experience. Other participants mentioned that digital projects using innovative or emerging technologies could bring visibility to the museum by "giving the institution an image of innovation" (Provider), which could increase the potential to generate revenue from visits. The projects created in these partnerships could also possibly benefit the reputation of the museum professional in charge of the project, who could "add it to their CV or be well-viewed internally at their museum" (Provider). Participants mentioned instances of museums that had created new structures to support these experimentations, including flexible frameworks such as digital innovation laboratories or incubators. In some cases, these pilot projects were funded partially or entirely by the partner or an outside sponsor, and certain economic models could earn revenue for the museum.

While these collaborations had benefits for the project created with the partner, they could also be used as a strategic modality to develop museums' internal digital practices and infrastructures. A museum professional described their approach to a systematic practice of partnerships that did not result in on-going reliance on external actors. Their institution's digital team intentionally engaged in collaborations when developing experimental digital projects in order to generate research that could contribute to building the museum's digital infrastructure, as defined across three poles: digital practices or structures, staff capacity and skills, or interpretation and content about the collection. Collaborations with external partners for digital experimentations were reported to be a modality to *inform* sustainable core digital practices, but not to be used *as* core digital practices:

> Let's do some projects that are beyond the [horizon of work we're working towards], and let's do a constellation of them, but none of them are key parts of our foundational technology stack. If they don't happen, it doesn't matter. It they do happen, it gives us great information, but they're not building blocks to the foundation. So, you keep strengthening your core, and then looking out beyond and doing pilots and experiments out there that influence how you do that core work. So, I haven't given up on doing projects and collaborations and weird sh-t. You got to do weird sh-t, but you can't make the weird sh-t necessary for the place to function into the future. They need to be informing how you then build those core building blocks. And so that way you can then be really promiscuous, because you're doing all these things where it doesn't matter if they do or don't work. You do better work because it's informed by the experiments. We will then learn from them and work out how to build them ourselves the right way, so they're sustainable and done safely and solidly and with the ten-year view. (Museum Professional)

The experimental projects developed in these partnerships were not used to sustain the core workings of the museum's digital infrastructure, as that would create a dependence on an entity external to the

institution. The theme of deciding how much to depend on external partners when developing and sustaining digital projects in museums will be explored later in this chapter. In this example, the participant's digital team learned from the findings of these collaborations and then used their internal resources and capacity to slowly and sustainably integrate them into their digital infrastructure. The choice to work strategically with external partners enabled the museum team to experiment with new structures and approaches.

5.1.2.3 BENEFITS OF PARTNERSHIPS FOR COMPANIES

Participants also reported various motivations within technology companies for engaging with museums on digital interpretation projects. Certain agencies were structured to work mostly or exclusively with cultural institutions like museums. Reasons for this orientation were described to result from the company being originally founded to work specifically in the cultural sector, a guiding objective to support mission-driven or nonprofit institutions, and an expertise or interest in the subject matter or storytelling practices of museums. With this specialization in the field, these companies could position themselves as "experts in museum work" (Museum Professional). A provider described how, with a high demand for digital solutions in museum interpretation, their company needed to identify what their technology brought to the market that differentiated them from other similar actors in the cultural sector in order to attract prospective clients.

Another reported reason for deciding to work with museums was the perspective that these partnerships could be opportunities for developing new markets and venues for the company's productions. This aspect was also mentioned in dynamics where vendors, who had never before worked in the cultural sector, sought out partnerships with museum teams to adapt their digital offers into new formats and "give them new life" (Provider). This could help companies "evolve and diversify" (Museum Professional) their products and potential clients. A museum professional described working on a project with a technology partner who believed there could be a market for an adapted version of one of their existing digital products; this provider conceived of the collaboration with the museum as a chance to refine their technology in a new context. Several participants mentioned how partnerships with museums could be used by companies as research and development (R&D) opportunities. This was also the case for start-ups

who were able to test their offers with museum visitors, giving them a valuable "proof of concept" (Museum Professional) and potentially even evaluation results to nourish their sales pitch.

The ability to display their products in a museum setting was perceived by some participants as a mode to increase visibility for companies and their products:

> The [museum's project] converged and coincided with a moment where [a digital technology] was emerging and where the professionals realized that museums were venues for this technology. Because the production ecosystem was looking for places where these projects could be seen. Because if they were not being seen in museums, the reality was that they were only seen in festivals. So, no one from the general public was seeing them, it was only other professionals. (Museum Professional)

Another participant observed how the popularity of digital immersive exhibitions had inspired a boom of companies looking to collaborate with museums on developing similar experiences, defining a market with "promises of large crowds" (Provider). In the co-production model—where projects were initially hosted in museums but were then distributed to various sites by the coproducer—, high attendance levels to both the museum and future installations could allow companies to earn back more than their initial financial investments through ticket sales. Companies working on high profile digital projects could also benefit from the resulting media coverage, bringing "lots of eyes on the brand's tech, the story of the brand, and photos" (Provider). Such projects could also facilitate contacts with potential clients:

> For example, with [a digital project for a temporary exhibition], we did a lot of PR, and there are a lot of people who came to see the exhibition. There are a lot of museum representatives from around the world who came to see it, and then contacted us afterward because they had tried the experience, and then wanted the same thing in their museum. (Provider)

As in this example, other participants also described how these partnerships could open up new markets for companies through networking with other museum professionals looking to develop similar projects. In these cases, museums were seen by companies as sites for adapting and displaying their products, as well as powerful channels for marketing and business development.

Some participants shared how there could be an allure to working with museums that could attract vendors to the cultural sector: "If these companies want to work with us, it is because museums make them dream—there is this glittering image of cultural institutions" (Museum Professional). However, despite the desire of certain companies to enter into these partnerships due to their prestige, not all

vendors chose to remain in the sector beyond an initial project due to the complex realities of working with museums, which will be further developed in 5.3.3 'Clash of cultures'. Many participants described that a major benefit for companies working with museums was the opportunity for their brand to be associated with the reputations of these cultural institutions: "These partnerships can help them to expand their client portfolio [...] because the name of a prestigious institution can make all the difference" (Museum Professional). A participant shared how these partnerships could give companies "political legitimacy and cultural validation" (Provider), and could also help companies manage their own reputation:

> And then, it's great for them, it's an incredible showcase. I'm not going to lie to you, PR is still one of their interests in all this, but it's not only that. It's also about diversifying their image or perhaps appearing differently in the eyes of the general public. (Museum Professional)

Some participants spoke about this dynamic with wariness, characterizing these motivations for partnership as potentially opportunistic: "a one-shot for their image" (Museum Provider) or their portfolio of projects, which could have impacts on the quality of the resulting digital product as well as the availability of the company to respond to the museum's needs. A participant described the importance of museums understanding the business strategy of potential partners, who might leverage the reputations of previous museum partners as social proof to sell their products to new clients. Another participant mentioned a partnership financed by a company where the vendor "benefited from the image of being generous with the museum and got media attention" (Provider) but did not develop a product that was adapted the needs of their museum partner.

The opportunity to benefit from the expertise and knowledge of museums was another reason mentioned for companies to engage in these partnerships. This expertise included access to the "intellectual rigor" (Provider) surrounding museum teams' understanding about, and treatment of, their collections. Museum teams were also reported to be experts in "understanding audience needs" (Museum Professional) and "communicating with audiences in a nontraditional educational setting" (Museum Professional), which could inform the companies' approach to developing the project in the current partnership, but also be applied in future projects. Companies could also benefit from learning about the digital processes of experienced museum digital teams, such as their practices for development, human-centered design, and accessibility.

5.1.3 Preparing for the development process

In addition to sharing their expectations for interpretation projects using digital technologies and the reasons for developing them in partnerships, participants reported various contexts and practices within museum teams before the moment of initiating the development process. These included preliminary efforts to ready the museum to engage with digital projects and collaborate effectively with partners, preparatory collaborations with consultants, and research into both museum audiences and digital technologies.

5.1.3.1 PRELIMINARY EFFORTS

Participants described the preliminary efforts that were undertaken by museum teams before the identification of potential partners that helped shape the direction of eventual digital projects. Several participants mentioned actions on the institutional level of their museums that preceded the current digital project by years. They reported large-scale initiatives including the building of the digital team and the definition of the museum's digital strategy. Staffing museum teams included the work of drafting job descriptions with desired skillsets for the professionals who would be responsible for managing the development of digital museum projects. The foundational work of establishing institutional digital strategies and practices was described by one participant as "building an ecosystem" (Museum Professional) for the development and maintenance of digital interpretation projects.

When describing other efforts that preceded cross-sectoral partnerships for digital projects, participants mentioned actions that involved the professional practices of the museum staff responsible for developing and operating digital projects. One such action was regular and intentional cross-departmental communication, which could include conversations with museum leadership and curatorial colleagues to familiarize them with new technologies, and even demonstrations of digital tools. A museum professional shared their practice of inviting the board of their museum to test emerging technologies as a mode of "acculturating leadership" (Museum Professional) to digital practices, which they perceived as a way to obtain support for subsequent proposals for digital projects, including securing the necessary budgetary allocations. Another modality of internal communication was speaking with colleagues to identify the needs within the institution for which digital projects had the potential to respond. This could include

conversations with leadership, the staff who worked directly with visitors in the galleries, and those responsible for developing educational and cultural programming:

> [These conversations] allow me to have all that in mind, so when I receive [project proposals], I can say, "This is great because it responds to that need." It's so important to be in constant contact with the departments that are on the ground or with the directors. (Museum Professional)

Participants also described preliminary internal conversations that were centered on specific events or projects. For example, a museum professional described how they were approached by their colleagues when interpretive plans were developed for new exhibitions. The subject then offered suggestions about where and how digital could be employed in the experience, including developing the "digital product approach" (Museum Professional) to propose what they thought should happen from a digital perspective in the exhibition. In this approach, there was communication between departments from the outset of an idea for a digital project, which the subject mentioned facilitated internal collaborations: "It's about having conversations early and often" (Museum Professional). Another museum professional described a situation where they were asked to develop an interpretative project using a specific technology. In addition to internal brainstorming, one of their team's first actions was to meet with departments across the institution to "blue-sky" (Museum Professional) with colleagues about their needs and desires for a digital product. When they analyzed their findings from these conversations, the digital team realized that the requested technology could not "deliver what this institution actually wants digitally" (Museum Professional) and that new strategic priorities were emerging, which informed decisions about the design of the digital product.

Another professional practice mentioned by participants in the context of preliminary actions taken before a partnership was the work of staying informed about digital museum practices and use cases of various technologies in museum contexts, as well as researching technology innovations in other sectors. This included both observations of activities and findings in the field, conversations with other professionals, participation in professional networks, and attendance at professional conferences and training sessions. A museum professional described how the part of their role that involves engaging with emerging technologies "requires time, observation, networking" (Museum Professional). The act of communicating with professionals outside of their museum was also mentioned by a museum professional who described their approach to preparing to work with a new technology for the first time. In order to understand what the development process would entail, they reached out with questions to companies that specialized in

the technology or to colleagues from other museums who had worked on similar projects, in an effort “to gather knowledge” (Museum Professional) and to define appropriate budgets.

5.1.3.2 CONSULTANTS

Participants also reported more formalized structures for communicating with external experts. In the work of aligning the initial development of a digital project with strategic objectives, several participants described the practice of museum teams engaging in a preliminary partnership by hiring an external consultant, including the French function of *assistance à la maîtrise d'ouvrage* (AMO). Subjects shared experiences of collaborating with consultants in a large range of approaches, including specific project guidance and more conceptual strategy advising. A provider described the capacity of a consultant to help museum teams define the scope and strategy of a potential digital experience within the institution’s missions and the “budgetary ambition of the project” (Provider). The support of a consultant was perceived by some subjects as important given that, as will be explored in 5.2.1 Modalities for the choice of a partner, the definition of a project could precede the choice of a partner to varying degrees.

A museum professional shared an approach to leveraging consultancy in a strategic capacity to build support from museum leadership. They remarked that the expertise of an outside voice was often “listened to and valued in a different capacity” (Museum Professional) than staff and could be brought in to encourage buy-in from stakeholders: “I knew what I wanted and I couldn't get alignment within the organization, so we hired a consultant to come in and guide a process” (Museum Professional). An external voice could help facilitate internal communication.

Participants remarked that the timing within the project’s development for bringing in a consultant impacted the collaboration. Sometimes when a consultant was brought in at a stage of the process when many decisions had already been made, the consultant may have needed to navigate communicating to the museum that certain aspects should be rethought:

> By the time the museum is ready to engage with a consultant, a whole host of decisions have already been made. And so, a lot of times [a consultant is] coming in to execute a project that a strategic priority has already been decided upon. Sometimes that’s no problem and other times

> it's like, 'Oh, I don't know if this is really the thing that you need and you might need something different'. (Museum Professional)

Subjects shared examples of consulting relationships that took place before the development of a digital project began, as well as those that extended across the development process, including the selection of a technology partner and the development of the digital product. One provider shared examples where, due to the long timelines of projects in many museums, the allocated budget for a project disappeared and the consultant's role shifted to conducting a preliminary study of possible digital solutions stemming from what already existed in the museum, which could help determine a strategy. This more conceptual work of determining an approach for future digital projects was identified as another important function of some work with consultants. A provider shared an instance where this future-oriented approach was supported when their company was engaged in a consulting role with a museum to assist in the hiring and training of a new museum staff member focused on the development of digital projects.

5.1.3.3 UNDERSTANDING AUDIENCES AND TECHNOLOGIES

A participant described the strategic capacity of consultants to act as "provocateurs, there to poke at our assumptions about audience and audience needs, in order to get us out of our modes of thinking and think outside the box" (Museum Professional). This approach underscored the value placed on understanding actual visitor needs and experience within the process of conceptualizing digital tools. The objective of understanding the museum audiences also took the form of visitor studies and evaluation conducted by museum teams. A museum professional shared their institution's mission to both know who their audience was and to understand their experience of the museum through a monthslong evaluation engagement that preceded the development of a digital project:

> We really took a look at: Who are the people that are coming on-site and online? What do they need? How do we start breaking them up into audience segments or motivations? What motivates these different folks to come and interact with us? What is going well? What's not going well? What should we start doing? What should we stop doing? What are we failing to do? What could we be doing? And really understanding what those visitor journeys look like on-site and online, and starting to identify the pain points. (Museum Professional)

The results of this evaluation project directly informed the subsequent development of digital projects, as well as the design work of colleagues in other visitor-facing departments within the museum.

In addition to the stated importance of understanding their visitors, participants also mentioned how experiences with previous digital projects could inform their approach to future partnerships. The insights gleaned from these projects contributed to a more comprehensive understanding of the institutional realities surrounding the development and reception of digital interpretation tools within the contexts of their museums. One participant, when describing the context for a specific digital project, explained that "its origins go back pretty far, first from our intention to engage with digital interpretation, and from [the experiences of] having already been doing that for a long time at [the museum]" (Museum Professional). Through the work of developing various digital projects within the institution, the subject described how these experiences facilitated a deep understanding of how the museum functioned and how digital interpretation projects could be developed for its collections:

> I really got to know all the curators in the institution. I worked with all the collections and all their fundamental and transversal themes. This allowed me to have a pretty clear vision of the institution, of its processes, but most of all of our collections. [...] Let me tell you, without this history of understanding the collections, understanding the actors, the museum staff, the subject matter, without understanding leadership, I would not have been able to do [the digital project]. (Museum Professional)

While deepening an understanding of the institution, experiences from previous digital projects were also reported to inform the direction for choices of both specific technologies and partnership models for future initiatives. Smaller scale projects were also mentioned as the foundation for potential larger projects. For example, one museum professional described how their institution's effort to digitize their collection had the benefit of populating one digital platform, while also creating content that could be used in future projects: "That was always the plan when we started creating these digital assets, that we can then turn them into things to use for experiences" (Museum Professional).

The preliminary efforts described in this section show a vast range of efforts that were undertaken within museums before forming a partnership with an external provider to collaborate on a digital project. In the midst of these actions, an element that arose from participant responses was the importance of timing. Even when there was a desire to move forward with a digital project, many factors often needed to converge in order to proceed with a partnership:

> Everything needs to be aligned, kind of like magic. You need the providers to be available along with the museum staff, and at the same time you need a willingness within the institution to do something, on a particular theme, and for the money to be available right then. And if all that

> comes together, then an ambitious project can happen, but even then, it can be complicated. (Provider)

The elements mentioned by this provider—including staff availability, stakeholder buy-in, institutional priorities, and budgetary allocations—had the potential to impact the feasibility of a digital project. When there was alignment within these factors, museum teams had to decide if they would develop the digital project in collaboration with an external partner. Reflections on why vendors are brought in for collaborations is explored further in the following section.

5.1.4 Summary

As explored in this section, the first category of the conceptual and analytical structure, *Before the collaboration*, was composed of three analytical subcategories. In the first subcategory, *Relevant uses of digital tools for museum interpretation projects*, participants described their perspectives on the capabilities of digital interpretation projects to support institutional objectives for accessibility, welcome, communication, and visit experience. They also shared the contexts for these projects, and the tensions and strategy at play in this moment of the process. In the next subcategory, *Reasons for entering into a partnership*, participants described the impact of the internal capacity of museums on this decision, as well as the perceived benefits of collaborations for each partner. Lastly, *Preparing for the development process* presented the preliminary efforts undertaken by participants to prepare for collaborations, including engagements with consultants and research into audiences and technologies. The summary of this section can be found in Table 5.2:

Before the collaboration	Relevant uses of digital tools for museum interpretation projects	External and internal contexts
		Accessibility and welcome
		Communication
		Experience
		Tensions and strategy
	Reasons for entering into a partnership	Museum capacity
		Benefits of partnerships for museums
		Benefits of partnerships for companies
	Preparing for the development process	Preliminary efforts
		Consultants
		Understanding audiences and technologies

Table 5.2 *Before the collaboration:* first category of the conceptual and analytical structure of the research findings.

When describing the process of engaging in cross-sectoral partnerships, many participants detailed the contexts and efforts that had preceded the collaborative process. Their responses addressed the wide range of objectives for digital interpretation products, the reasons for entering into partnerships to develop these tools—for both museum professionals and providers—, and the institutional practices that preceded the development process, sometimes by years. Once the museum team had come to the decision to engage in a collaboration with a technology company to develop a digital project, they then had to make the selection of their partner. The following section explores the themes that emerged in participant responses regarding the pivotal phase of evaluating and engaging potential partners.

5.2 Selecting a partner

The act of choosing an external partner was described by several participants as a vital step in the development process. As one provider observed, “If you pick the wrong people, all the other stuff actually doesn’t matter because you’ve already made a mistake” (Provider). Subjects described the perceived necessity for discernment in this process, including the museum’s capacity to “make decisions on the right reasons” (Provider) and to select partners who were “aligned” (Museum Professional) with the museum team. Some participants extolled the benefit of being selective about the choice of partner, especially when museum teams had the agency to do so. As one provider shared: “I think about museums that have their own funding or even funding from someone like [a major donor], and there’s definitely value in interrogating who you’re going to work with” (Provider). This section explores the modalities for identifying and selecting potential partners, including the ability to evaluate proposals from partners and the reasons reported for their choice of collaborator.

5.2.1 Modalities for the choice of a partner

When discussing the choice of a partner, a reoccurring theme in participants was the variety of modalities for connecting with potential partners for a collaboration. These ranged from informal avenues grounded in dialogue, to more formal procurement procedures.

5.2.1.1 INFORMAL AVENUES

Some participants mentioned informal avenues for initiating contact with potential partners. One such avenue was through already established connections, including recommendations from their network of professional contacts. This ‘word of mouth’ approach was commonly reported by both museum professionals and providers within the field: “The world of museums is a pretty small world; people talk” (Provider). This dynamic could present in the form of introductions from mutual contacts, conversations with partners from previous collaborations, inquiries to larger companies about “philanthropically minded support” (Museum Professional), and connections established through networking at professional events

such as conferences and trainings. These informal modes of connecting were at times mobilized by companies as a form of business development, including initiating conversations with museum professionals about their upcoming exhibitions or digital project needs so that the company could adapt pitches and proposals to these reported needs. Some providers reported employing staff in sales and marketing roles, which involved contacting museums either to propose a specific use case of their technology in the museum or with the intention of establishing a collaborative relationship. This work involved keeping track of developments within specific museums as well as the larger museum sector, participating in industry conferences, festivals, and salons, and being in conversation with museum professionals. Forums for informal communication ranged from phone calls, conversations over coffee or a meal, and demonstrations of digital projects:

> We bring people back to our studio and we have a prototype here in one of our workshops. People will come have some food in the office and try [a digital tool] and then we talk to them about what they want for their organization. (Provider)

> Often where these partnerships start is over coffee [...]. And so [this partnership] started over coffee and then a series of coffees and then it turned into an MOU[1] and then it turned into a project. (Museum Professional)

In these contexts, cross-sectoral connections and the beginnings of partnerships were gradual and grounded in dialogue. Some participants mentioned that this process could be slow, even taking years, for reasons including waiting for an externally proposed project to demonstrate a relevant link with an upcoming temporary exhibition, for the digital team to obtain support from leadership, or for the appropriate budget to be allocated. While the eventual selection of a partner may have, in some cases, been required to occur in the context of a more formal process (as will be discussed further on in this section), relationality was still mentioned as a frequent element of the beginning of collaborations.

The dynamic of identifying potential partners through informal avenues could also occur through relationships between businesses, where a company known by, or contracted to, a museum would make recommendations of other providers for the museum to contact for specific aspects of the project:

> A lot of the recurring revenue for us comes through partnerships that we have developed, where they might recommend our team to be on a project when a museum institution is coming up with a short list of firms to issue a Request for Proposal. For example, the partners that we have worked

[1] Memorandum of Understanding.

> with historically might be the ones that would put forward [to a museum]: 'Here are relevant companies that we worked with before that we would recommend you work with'. And we would be one of those names and then we can respond. (Provider)

This dynamic was reported by several participants to result in a "limited network" (Provider) where it seemed that the same group of companies often worked on museum projects.

5.2.1.2 FORMAL PROCEDURES

Given the context of strict financial controls present in many museums, formal avenues were often utilized to select technology partners, especially for projects with budgets that exceeded specified amounts. For instance, there were defined procedures for how certain museums, including public or federal intuitions, could enter into financial agreements with service providers. And while these procedures were not legally obligatory for all museum collaborations, there were often institutional standards to ensure appropriate uses of funds for projects with substantial budgets. Many participants described the procedure of museums putting plans for a digital project out to market through a procurement process. In this approach, the museum team identified a digital project to be developed, and initiated the process of finding and engaging an appropriate partner.

In certain instances, museums would reach out to companies to invite them to submit a proposal, and occasionally invited them to submit as part of a short list of firms. Several providers mentioned that this was their company's preferred mode of initiating museum projects, due to the intensive nature of the bidding process:

> We often don't propose for work because it's so onerous to do. It costs a lot of money to write the proposal, and sometimes there are so many questions, which you feel are 50% irrelevant but probably forced upon [the museum] to ask. (Provider)

Another provider echoed this statement, characterizing the work of crafting a proposal as a "huge opportunity cost" (Provider), given the significant amount of staff time and resources that proposals required. This subject observed that publicly available Requests for Proposal tended to receive many bidders, so submitting a proposal without being invited by a museum didn't "feel worth our time" (Provider). Both of these providers mentioned that much of their museum work originated with museums

reaching out to them, either from existing clients who wanted to work with the company again or from contacts within their professional networks. Another provider mentioned the difficulty of submitting proposals as a reason their company does not often work in the museum sector: “It’s a lot of work to often not win the project” (Provider). This participant also mentioned entering museum projects through their professional relationships, including with other businesses.

The requirements of formal procurement processes had implications for the degree of definition for digital projects when reaching out to potential partners:

> There's a lot that has to be defined about a particular project by the institution before any funding can be allocated to it. A lot of times, certainly at [the museum], where we have very strict financial controls for good reason, we have to go through competitive bid processes or request for proposal processes. And the project has to be really quite defined in order to engage at that point. You have to have a scope of work. You have to know what you're doing. You want to know who your audiences are. You have to know the production timelines you're working with. (Museum Professional)

Subjects reported conducting preliminary tasks before engaging with partners, including beginning to define the project’s specifications, outlining production timelines, researching audience needs, determining a budget, and obtaining funding allocations, including grants. This work of defining a project before engaging with a partner was reported as preparation for formal procurement procedures such as the Request for Proposal (RFP) process. When museums initiated these processes with external vendors, they often already had a clear idea of the type of experience they were aiming to develop. A museum professional described how, before initiating an RFP process, their team would typically develop a “media treatment” (Museum Professional) for the proposed digital project in collaboration with interpretation and curatorial colleagues. This document would explain the exhibition, the key messages, the general type of digital experience they wished to develop, the key audience group to be targeted, and inclusive measures to support accessibility. Subsequently, when going to market with the RFP, this document would give potential vendors “a good sense of what kind of space we want to explore” (Museum Professional). The level of definition for digital projects could be very detailed at this initial stage, including the precise subject matter and technical specifications for each element of the digital project.

5.2.1.3 FACILITATING FUTURE COLLABORATION

Some participants expressed frustration with this need to define projects in the initial stage of development. A provider explained their perception that the specificity required for the RFP process could hinder certain types of collaborations:

> The barrier [to a prototyping approach] is procurement. Because if you go through procurement, an RFP is written and they're saying this is how you're supposed to do it. They actually define the process. So, you have to follow the process. And as much as possible, we try to suggest otherwise. But sometimes you can't. So, you need good museum partners. [...] In the government context of museums, they have a lot of procurement requirements. To be completely honest with you, these requirements create a lot of barriers to innovation. Procurement is looking up the same process for a plumber as they would for a technology firm. (Provider)

In the view of this provider, an openness in the development process was seen as to benefit the resulting digital projects, as it could allow for a prototyping approach and, subsequently, innovation. Other participants also described this tension between the institutional or legal necessity to define a project and its development process, and a desire to leave room for the innovation and creativity that could potentially occur in these cross-sectoral collaborations. Several subjects remarked on the perceived importance of leaving room in the development process for providers to contribute their unique expertise and ideas:

> Producers are bringing their own creativity to bear, so you want to leave space for innovation to occur. Innovation isn't necessarily about the newest and greatest technology. Often innovation is just the combination of concepts. (Museum Professional)

> We are mostly looking for partners that would go along with us for the ride. Because there was a lot of ambiguity and stuff we didn't know at the time. We wanted to make sure that we had creative partners that could help us come up with the ideas. [To] think through: this is the story we want to tell, how do we tell that story? We're the content experts, they're the storytelling experts. Help us tell that story. (Museum Professional)

Participants reported that this openness to "deep collaboration" (Provider) could be achieved through the structuring of the RFP. For example, a museum professional described being flexible as to the choice of specific technology frameworks in providers' proposals for a digital project "because we understand that there's all sorts of different technologies that may be leveraged in order to build experiences" (Museum Professional). A provider described a situation where the RFP included detailed specifications for the technology to be employed but also included a lot of "creative openness" (Provider). When determining the level of definition, a museum professional viewed the process as communicating the boundaries of

the project to the company, including the need for digital projects to be interoperable with existing technical infrastructure: “We try to be specific, but not too specific that it’ll hinder good ideas or creativity” (Museum Professional). Some participants also mentioned being explicit in the RFP that the project would evolve through the design process, including through a prototyping approach:

> We have an exhibition right now that's opening [next year], and given the theme of the exhibition, we are anticipating we are going to want to have a similar type of [digital project]. We do not yet know exactly what form that will take. But we feel relatively confident that we're going to need to lean on partners in the private sector to be able to achieve the vision, because it's not been thought out yet. To help us ideate and execute on this right. So as part of this exhibition, we'll put out an RFP saying we don't really know what we want to build, here are some guidelines as part of this process. What we're going to ask of you is to ideate and collaborate with the project team in order to define and then execute on what this experience will be. (Museum Professional)

This subject described an intentional mode of crafting RFP language to allow for a design process that would foster collaboration and a prototyping approach. A provider described a similar approach in a museum partner who expressed the desire to engage in “prototyping from day one” (Provider):

> And so even as you move through [the design phases], a prototype is evolving at every stage. There's a lot more looseness to the ask, in recognition that things will change: ‘We're not going to specify every single thing. But there is a framework, this is what we need to achieve, these are our must-have requirements.’ So, it's still rigorously constructed. (Provider)

While this subject describes a museum team’s flexibility around some specifics of the final digital project, there was still a rigorous framework for how the process of collaboration and development would proceed, as well as clear objectives for the resulting digital product. As in this particular instance, other participants also described how adapting the more closed RFP language was often based on previous experiences working with providers and on a defined institutional strategy regarding the processes for working on digital projects.

Communication could also play an important role in facilitating future collaborations. Some participants described a period where museum teams communicated with potential vendors in interviews to discuss the project, including meeting in real life to get a feeling of what a collaboration could be like:

> They had a mindset of wanting us to understand what it would be like to work with them. So, there were a lot of conversations, there was a lot of brainstorming even in the pitch meeting, just to give us a feeling of what that was like. (Museum Professional)

This communication could also occur asynchronously, such as when museum teams asked companies for complementary information or in the context of negotiations surrounding scope and budget. These interactions were a time for both parties to ask questions of each other. A provider remarked that these preliminary conversations and demonstrations were important to avoid situations where the museum didn't understand the product or services they were purchasing or where the production timelines were unclear:

> Sometimes during the sales process, we can get a feeling that the person doesn't really understand certain aspects of the product. And that can unfortunately lead to problems right away that make the development process super complicated. [...] So we usually try to make sure [the museum team] understands the product in the sales phase. There really is a pedagogical phase about what the product is, what it does, what it doesn't do, etc. (Provider)

This "pedagogical" approach demonstrates how providers could intentionally approach cross-sectoral communication, through language and product demonstrations, to facilitate mutual understanding. The provider reported that this practice was the result of learning from previous negative experiences with museum teams.

5.2.1.4 VARIATIONS ON THE PROCUREMENT PROCESS

Subjects mentioned other approaches to incorporating a more open approach to collaboration with external partners within the context of procurement processes. A museum professional shared their digital team's practice of inviting companies to apply to be on a standing offer list for different types of projects, such as on-site and online digital tools. This practice originated in response to their institution's strict rules for procurement for projects over a certain budget, which often entailed a three-month process from sending out the RFP to the beginning of development. The standing offer list was created using the same rigorous process as an RFP, and this practice enabled the museum to send out a statement of work to at least three pre-vetted companies from the list that possessed relevant expertise for projects within a larger budget. The standing offer list had a time limit; after two years they would have to do another call, which gave other companies an opportunity to apply to join the list. This museum professional shared that the process of creating these lists has allowed their team to be more "agile" and "nimble" (Museum Professional) in initiating the production of digital projects in the context of strict procurement rules. A

provider shared another museum approach to connecting with companies before putting a digital project out to market that involved inviting providers to a meeting where a museum professional shared the stories their digital team wanted to tell with the collections, as well as the formats for these projects and the budget. Providers could subsequently propose solutions, mentioning if they were already financed or if they had existing projects. The museum professional could then determine a direction for the solution to their digital need, as well as decide on an appropriate model of partnering together. According to the participant, this approach allowed them to shape the direction of the project through a procurement process that allowed for both "co-creation" (Provider) and a potentially broader community of partners: "[It's an approach that] opens more perspectives, because otherwise it's too restricted—there'd always be the same providers as partners" (Provider).

The approaches described by these two participants also demonstrated an approach of engaging with partners before the objectives and specifications of a digital project were fully defined. As mentioned previously, the stage of development when a partner joins the project was seen to impact the design process. One provider described an evolution in this practice in museums, where traditionally a company like theirs would not have been brought in until the plans "have more or less solidified, and then they're looking for a firm who can take those ideas and bring them to life, execute on the vision" (Provider). However, in recent years, the provider had observed that companies were being invited to the table sooner, which mirrored the subject's experience working with clients in other sectors:

> I have seen a degree of evolution of those more traditional roles, and a company such as ourselves being invited in to the table sooner, so that we can bring in the expertise and perspectives that we have as the people who are closer to the digital experience, and the technologies, to inform the ideas earlier on in the process. (Provider)

Another provider reported observing a similar trend with museum projects in the practice of museum RFPs stating that interpretive master planners should have professionals with digital skillsets as part of their team, whether in the company or as a subcontracted partner: "And I'm seeing that more and more, which suggests to me that there's a growing recognition of the importance of bringing digital experts on as partners" (Provider). Several participants expressed the view that cross-sectoral collaborations benefitted from sustained engagement by digital partners from the very beginning of the project's development.

While many participants described processes where a technology company was selected directly through an RFP procedure, others mentioned a scenario where the vendor developing the digital project was

subcontracted by another provider in a “one-stop shop approach” (Museum Professional). Engaging with a firm (such as architects, exhibition designers, or fabricators) that managed the subcontracting to various vendors was framed as a way for the museum to “minimize the management overhead” (Museum Professional). In some cases, participants described how the museum’s digital team was involved in the choice of the vendors and could weigh in on the providers or the proposals for a digital project. However, some participants described situations where their colleagues in other departments would select the firm, meaning that the museum’s digital team was not directly involved in selecting the digital provider. A museum professional described a new approach their team was implementing in response to this dynamic, in an attempt to facilitate the selection of appropriate technology partners. Instead of crafting an RFP for an entire on-site project—which involved coordinating more actors than online products, such as exhibit designers, fabricators, and painters—, the project was divided into two processes: digital and physical. In this new practice, the digital team was “involved in both conversations” (Museum Professional), which was reported to enable integration between all parts of the project, as well as bringing together the reflections of different museum departments. The participant reported the perceived internal benefits of structuring the project processes in this way:

> It's definitely opened the eyes of my colleagues to the value we can add to things if we're embedded in the project from the start. The new procurement avenues that we've brought in have also opened their eyes that they don't need to package everything together, and that they can parcel out different aspects. And I think we're building trust with them that we can handle the development side of things, with external help obviously, and can handle more of that work in the future. (Museum Professional)

This perspective echoes earlier mentions of the impact of early integration of external partners into the development of digital projects, by emphasizing the importance of early integration of the museum’s digital team into the internal development of exhibitions and other museum projects that feature both digital and physical elements.

Some participants described another model of partnership that had the potential to require an adaptation of the procurement process. In the co-production model, which had origins in the audiovisual industry, a museum and their coproducing partner developed a digital project that was initially hosted in the museum and then later distributed to other sites by the coproducer. In the projects described by participants, co-production projects in museums often began relationally, with a company approaching a museum to propose a project or with a museum team deciding to collaborate with a specific production company.

However, some participants mentioned that the legal department within a museum could find that it would not be juridically viable to directly initiate a project with a company without putting it to market. In these cases, some museum teams "imagined a new model" (Museum Professional) of partnership, including adapting already existing processes such as the RFP model and the logic of an exhibition curator. In these cases, innovation in digital projects could also be found in the modalities of partnership. One participant described experimenting with various types of projects "to see the advantages and disadvantages of different models" (Museum Professional) as part of their professional practice.

5.2.2 Reasons for the choice of a partner

When evaluating proposals for partnerships, subjects reported their reasons for making their choice of collaborator, including the desired qualities and qualifications in a partner. If this selection took place in the context of a procurement process, there were often pre-established systems and "rigorous standards" (Museum Professional) to score the bids received from vendors, to enable an analysis based on criteria that were "structured and legal" (Museum Professional). The information requested in an RFP generally involved both the vendors' proposals for how they would approach the digital project as well as their capacity to deliver that project:

> So, there is always a set of areas defined beforehand that the vendors will be judged on. Things like reputation, relevant past experience, technical competencies, etc. And then based on the submissions, they will be scored against those criteria. (Museum Professional)

> [An RFP] is about showing what your capabilities are. So being able to demonstrate that you've done similar exhibits before, or that you have expertise and capabilities in the areas that they're looking to focus the work on. (Provider)

When evaluating proposals, a participant shared how even the presentation of vendor responses could be taken into consideration, to determine if the vendor followed the RFP instructions and thoroughly addressed each question in the manner requested:

> Did you address all of the points in our statement of work that you were meant to address and how you will deliver it? So, when we say something like, 'You need to deliver a website, please

> respond with your technical approach to that', if they answer, 'We will build you a website'—that is not a technical approach. (Museum Professional)

This perspective demonstrated both a need for providers to explain their technical approach and how they were capable of responding to the proposed project, as well as the necessity for a certain level of capacity within museum teams to evaluate these claims. This internal capacity will be discussed in the following section, 5.2.3 Capacity to evaluate partner proposals.

5.2.2.1 TECHNICAL PROPOSAL AND CAPACITY

Whether or not the selection of a partner took place in the context of a formal procurement process, many participants reported the importance of evaluating the vendors' technical approach to developing proposed digital projects, including the perceived strengths and feasibility of these products. Some RFP structures also requested a creative submission as part of the bid, which provided materials to enable museum teams to evaluate the qualities of the vendors' proposed approaches to the digital tool. Several desired qualities in proposals that were mentioned by museum professionals included the demonstrated capacity for the digital tool to support the museum's objectives surrounding exhibition communication and visitor needs, an innovative approach to employing digital technologies within museum spaces, and a perception of low risk for the technology to achieve its objectives. Providers mentioned choosing to work with museum partners where there was a clear overlap between the institution's needs and what they perceived that their company's digital product or internal expertise could accomplish. Additionally, several museum professionals mentioned weighing their team's ability to support and manage the proposed digital product "on a sustainable basis" (Museum Professional):

> But at the end of the day, given my job, we have to make sure that whatever is delivered can last more than a couple of months. It has got to be a thing that we can sustain. (Museum Professional)

The theme of sustainability and maintenance will be further addressed in 5.4.3 Operations and lifespan.

Beyond these specifications, a major consideration in choosing a partner was the perceived capacity of the vendor to execute and deliver on the proposed project. A commonly reported method for museums to gauge this capacity was through reviewing the companies' previous experiences working on similar

projects. This could include previous projects that resembled the proposed project in scope, budget, objectives, technological approach, targeted audience, and type of client. Some museum professionals mentioned testing their potential partners' projects online, at professional conferences, or by visiting them on-site in other museums as a method for evaluating the company's capability to deliver high-quality museum digital projects. Several participants reported that these comparable projects could act as a mode of "demonstrating technical fluency" (Museum Professional), including when museum teams asked vendors to "speak in detail about not just the way in which they arrived at the solution, but how the solution was architected" (Museum Professional). The responses to these prompts were perceived to clarify the working methodologies and development processes within the companies, which some participants mentioned to be important considerations to their choice of partner. Relevant professional practices could include the contingencies for support at the end of a project, such as quality assurance. Another reported mode to evaluate the soundness of the working process of vendors was to review their certifications, including for project management:

> What [a management certification] tells me is that it's not some fly-by-night operation. Those certifications are hard to get, and it means that organizations are very structured in how they deliver projects. I'm not saying that's necessarily what I'm looking for, but that could be a +1. (Museum Professional)

Some museum professionals reported evaluating the credentials and experience present in vendor teams and in some cases requiring the inclusion of team members with certain digital skillsets or technical functions, even if they needed to be subcontracted. Beyond the profiles of vendor staff, the evaluation of these teams could also include the size of their team, as an insufficient amount of staff members could be an indication that the vendor would not be capable of delivering the promised product in the agreed upon time and budget. The maturity of the company could be a factor taken into consideration to gauge their capacity to deliver on a project, including both how long they had been in operation as well as asking them to share their "strategic development projection" (Provider) for the upcoming years. This was perceived to help ensure that projects are being built for "long term stability and security" (Provider).

5.2.2.2 COMMUNICATION AND UNDERSTANDING

Another area of evaluation was the perceived capacity of the vendor to collaborate well with the museum team. Subjects mentioned the value of companies who could "communicate succinctly and clearly about what they're bringing to the table" (Museum Professional) regarding a collaboration in a museum context, including when there was a lower degree of digital capacity in museum teams or leadership. This cross-sectoral communication was conceptualized by some participants as translation work, and the capacity of a company to employ the language of museums was seen by some as an important aspect of collaboration, with implications for the quality of the experience for future visitors:

> Sometimes museums want to develop something but aren't able to clearly communicate their needs to the company, and so the results aren't satisfactory for visitor experience, or for the museums who let these projects come in without being able to improve them. (Museum Professional)

Subjects reported gauging companies' fluency in the language of museums through previous experience working with museums, as well as the language present in their proposal. For example, one museum professional described how a company's proposed economic model could demonstrate their understanding of the specificities of working with the cultural sector—or a lack thereof. This familiarity with the internal workings of museums was reported by some participants as "highly desirable" (Museum Professional) for visitor-facing digital projects, as this could indicate that the partner may have the capacity to perform well in the constraints of the museum context. As one participant remarked, "You can feel a little bit like these people get it: they may not know us today, but they get the world that we work in" (Museum Professional).

Another museum professional mentioned how they valued companies who put emphasis on user experience and research because it demonstrated an understanding of the importance of museum audiences in the design of digital projects:

> What are you doing to understand my audiences? What are you doing to understand me as a client? A lot of clients often have difficulty in articulating what exactly it is that they want, and a good partner is one who can listen to what they're saying and reframe it back to them in a certain way. They say, 'Is this understanding correct?' That's somebody who knows how to listen both to you, but more importantly to your audiences. (Museum Professional)

Other participants remarked that a familiarity with audience-facing projects was relevant, even if their previous clients were in other sectors. For example, companies who had completed projects in retail contexts were seen by some subjects as interesting partners for museums due to their expertise in creating experiences for the public and "capturing people's attention" (Provider). These museum-adjacent projects could be seen as relevant when the missions of digital experiences were comparable:

> One [potential vendor] was really strong in working with retail companies to reimagine what it's like to visit a store. Because anyone can buy anything online, why would you go to a store? So retail is becoming much more experiential. And there were a couple of companies who had done big retail flagship stores and had a really interesting digital integration with that experience, which aligns with how we're integrating digital into our gallery spaces. (Museum Professional)

By looking for partners with diverse approaches to designing for audiences, some museum professionals remarked that this was a way to work with new companies that may bring different perspectives and innovative solutions to visitor-facing digital projects.

Beyond an understanding of museums and their audiences, some museum professionals mentioned choosing partners where the interpersonal communication was fluid and where the vendor's team felt "like a great fit, like they understood what we were trying to do, and we liked their approach" (Museum Professional). In some cases, participants described a more "informal" (Museum Professional) approach to the selection process, where decisions were informed by "a good vibe" (Museum Professional) or "a gut feeling" (Museum Professional) that the partner understood the project and its context:

> It's ultimately about who we feel would be a good fit. I'm interviewing these people face to face: what do I feel like it might be to work with them and what have they done in the past? [...] They get us, they understand us, we like their work, their price is fine. (Museum Professional)

This dynamic was mentioned particularly, though not exclusively, in the case of projects where a procurement process like an RFP was not necessary. For example, a museum professional described a project that began relationally from conversations they had with a vendor, remarking that if different people had been in their respective roles, it was probable that the collaboration would not have occurred: "Without those humans, the institutions couldn't have lined up in that way" (Museum Professional). Other museum professionals mentioned continuing to work with vendors from previous experiences together, because they felt comfort and trust with their partner.

Another consideration for selection mentioned by participants was gauging the intentions of a potential partner from another sector. This capacity within museum teams to understand the motivations of their partners was framed as an important aspect of cross-sectoral communication:

> When you work with a tech company or a funder or a new foundation or a corporation—if you're working with anybody—you need to understand what their aims are, and what their intent is, and the languages that they speak. (Museum Professional)

Understanding vendors' intentions was reported to be an important capacity in order to make an informed choice of partner and engage in a project that "aligns with what we're trying to achieve" (Museum Professional). This dynamic could also facilitate projects that were mutually beneficial to each party, as well as mitigating risk from these collaborations through museum professionals making informed choices. Some participants spoke to their wariness about the motivations of certain vendors to work with museums, which may have been fueled by "opportunism, for their image" (Museum Professional). Museum professionals repeatedly mentioned the value of selecting partners with "mission and values alignment" (Museum Professional), including those who "demonstrate a desire to improve the public service that is a visit to a cultural institution" (Museum Professional). Some providers also described selecting partners to work with who had "something interesting about their content or mission" (Provider) that aligned with the companies' values of supporting cultural stories.

5.2.2.3 FINANCIAL CONSIDERATIONS

The budget of potential projects was also an important factor mentioned by museum teams when choosing a partner, including in the analysis of bids in a procurement process. Many participants clarified that while the price of a project was important, it was not always the decisive factor in their selection process:

> [The choice] is based on their ability to deliver and how they responded to the proposal. And if we can support their proposed solution. [...] So it's not always about the cheapest proposal, it's a combination of factors. (Museum Professional)

Some participants described communication around the budget in this selection phase, which could include requesting that companies set prices for various aspects of the project and commit to them for a

defined amount of time, as well as negotiating what could be included in the scope of the project for the declared budget. One museum professional described informal preliminary discussions with a potential provider where they felt reassured that the vendor would respect the agreed upon budget, and that this was an important factor in their decision to work with this partner. The participant also mentioned that these "frank discussions" (Museum Professional) about pricing helped ensure that the budget would be high enough for the partner to be motivated to allocate sufficient time and resources to the project, and to help smaller companies continue to stay in business. Providers also reported considering the project budgets and institutional funding structures within museums when making their choice of partner. Another consideration for providers included the potential for the collaboration to lead to future opportunities to work in the cultural sector.

The proposed economic model of potential partners was another financial consideration taken into consideration. For example, in the co-production model of partnership, the coproducer could arrive with a project that would largely be financed by the vendor or another party. This partner was also responsible for distributing the digital project beyond the walls of the museum: "The choice of a producer is also a choice of how far they will take you" (Museum Professional). Beyond the implications for the potential reach of the museum's communication, this aspect could impact the museum's future revenue from the project. The choice of economic models also had implications for the perceived level of risk for potential collaborations. Partnerships where the digital project was funded philanthropically by a large company were often judged to have low risk due to structural limitations on the allocations of budget and staff: "If it hadn't worked, we just would have stopped and they would have stopped, and it would have been fine" (Museum Professional). This delineated approach contrasted with projects that involved big investments from both partners, including "staff and time and resources and messaging" (Museum Professional). Such partnerships were often viewed to carry financial and "existential" (Museum Professional) risks for both partners, including with intellectual property and reputation at stake. The choice of partnership model and the sources of funding were also perceived to have implications for the power dynamics between the partners in the following collaborative process.

5.2.3 Capacity to evaluate partner proposals

Beyond the reasons for selecting a partner, a reoccurring theme in participant responses was the capacity of museum professionals to evaluate partner proposals: “There is something to be said about how museums pick who they work with, how do you judge a potential commercial partner?” (Provider). Participants spoke about the perceived difficulty of choosing an appropriate technical provider if there was not adequate expertise within the museum team to be “an informed consumer” (Provider). In a broad sense, this expertise could include understanding the larger trends of the entrepreneurial shift in the cultural sector and the motivations of companies to work with museums. An awareness of these factors was seen to play a role in being an informed consumer: “If you don’t understand the political economy that a [collaboration] is circulating in, you can get exploited by it” (Museum Professional). In another sense, this expertise could also include an understanding of the technical aspects of developing digital projects as well as their associated economic models. These capacities were seen as important elements in being able to evaluate the feasibility and relevance of proposed projects, as well as in assessing a potential partner’s ability to deliver on their promises. In the absence of this knowledge, choosing an appropriate partner could “be a bit tricky, like trying to get your car fixed when you have no idea how cars work” (Provider).

5.2.3.1 RISKS

Without the internal capacity to skillfully evaluate proposals, subjects reported how museum teams could be “left to trust the external agency, and that can be a good or bad situation” (Museum Professional). A participant described dynamics that could lead to “bad” situations in the context of a lack of expertise within museum teams:

> I was shocked to see how some technology partners were taking advantage of museums. I think they rely on the fact that museums don’t know what they don’t know, and don’t know how to evaluate. I think executive directors are very interested in the shiny new objects. I’m generalizing obviously, and there are exceptions [of museum professionals] who really understand technology, but generally the kinds of stuff that companies get away with is really distressing. (Museum Professional)

This participant described how the perceived risk of not being able to skillfully evaluate potential partners could be heighted by pressure from leadership to deliver projects using trendy or emerging technologies, often referred by participants to as 'shiny objects', as described in 5.1.1 Relevant uses of digital tools for museum interpretation projects. This demand for flashy experiences could lead to situations where museum professionals were not in a position to make strategic decisions:

> There are specific technical competencies that are important to understand what is or isn't possible when anyone you work with says, "Anything's possible, it's tech! It's magic!" And if you don't know what's an illusion and what's real, it's very easy to get duped. (Museum Professional)

Participants also mentioned the potential for certain partners to mislead museum teams; several described observing such instances of companies proposing projects that were not feasible, whether or not this was intentionally done. For example, a provider described the experience of witnessing museums select companies as partners that the subject did not judge to be capable of delivering on the promised project:

> But sometimes it just feels so obvious that [a project] is not a good idea. [...] There are definitely times when I know that competitor cannot do that job. And I don't even mean because they're not a great agency. I mean because they don't have enough people, for example. Something really obvious and boring. (Provider)

The risks of selecting an inappropriate partner could include, as in this example, a compromised development process. But participants also mentioned more nuanced consequences of museums not being able to choose a relevant partner, including for the quality and sustainability of the resulting digital tool. As one subject described this dynamic: "Maybe [museums] are not making decisions for the right reasons, maybe they're not making decisions for all the reasons that are possible" (Provider). The participant went on to describe situations where a museum might collaborate with a creative agency to create a digital project that is "amazing" (Provider) on the surface, but not well-designed regarding the ease of maintenance or the technology infrastructure that would allow for modifying the content. Or, on the other hand, the museum may opt to develop projects that are "out of date" (Provider) or "cookie-cutter" (Museum Professional) because the museum team does not have the internal knowledge to feel secure enough to risk pursuing a more innovative technology solution.

5.2.3.2 SUPPORT

Participants reported several approaches taken by museum teams to support their capacity to evaluate potential partners and project proposals. The first and most commonly reported source of this expertise was through the presence of professionals within museum teams who had solid understandings of technology and the development process. This could come from previous experience working for technology companies, including those that worked with museums. These museum professionals who had worked "on both sides of the table" (Museum Professional) reported having an in-depth understanding of their potential partners' development processes, communication styles, motivations, and constraints when evaluating project proposals. A reported benefit of this expertise included mitigating the risk of choosing an inappropriate partner; as one participant observed, "Having a more technological background, I'm able to cut through BS when I see a firm that's overpromising" (Museum Professional). According to this participant, their professional experience in the technology sector gave them skills to make a strategic and informed decision about the choice of a partner. Participants also reported that technological expertise could come from years of experience working with digital projects within the museum field. In such cases, in addition to the benefits of having relevant expertise and experience to guide the choice of a partner, some participants also described how "having a track record of delivering digital projects" (Museum Professional) helped justify their choice of partners internally with museum leadership.

While the presence of technical expertise within museum digital teams was reported to be an important element of evaluating potential partners, many participants also mentioned that the capacity of leadership to understand and support project proposals had an impact on museum professionals' ability to select appropriate collaborators and digital solutions. One provider observed that issues could arise when there was a lack of digital literacy with museum leaders "who just don't understand technology" (Provider). This subject elaborated on the perceived importance of leadership possessing a general understanding for how digital projects could support institutional missions:

> Everybody needs to understand technology and digital. They don't need to be able to code. They don't need to be technical. But, at leadership levels in museums, they need to know how to think about how technology enables their mission, and they need to be able to understand what technology can do. (Provider)

When the capacity of leadership to skillfully evaluate project proposals was absent, participants described several resulting outcomes. One such impact was a tendency for leadership to be interested in "shiny new

objects" (Museum Professional), which could result in a strategy that prioritized attention-grabbing projects at the expense of a reflexive and sustainable approach to digital practices. Another reported result of a lack of digital knowledge in leadership was a general wariness of engaging with digital projects, especially those that were perceived to involve risk for the institution. In these dynamics, participants described situations where museum digital teams tried to advocate for their desired choice of a partner or project with leadership, but "lacked the means and political power to enact action" (Provider). These discussions could be difficult, even heated, as one museum professional described when they approached their museum's leadership to propose a project utilizing an emerging technology:

> Leadership was not on board. And to be frank, it has always been extremely complicated to discuss [this emerging technology]. There were all sorts of debates and disagreements—even hostility to these new formats that were viewed as competitors to exhibitions and more standard digital experiences. [...] It was easier when [a curatorial colleague] was at the table, who had a lot of influence with leadership. (Museum Professional)

As seen in this response, one possible modality employed by museum leadership to evaluate potential partners was through internal communications with trusted colleagues. Another source of expertise for museum leaders in understanding the implications of digital projects for institutional missions was through professional trainings and demonstrations of use cases involving new technologies. Museum professionals reported their practice of facilitating on-going internal communications between their museums' stakeholders and digital experts around these topics as a mode of educating and "acculturating" (Museum Professional) leadership. Participants also mentioned the value of external training programs geared directly towards museum leadership to support both their understanding of best practices for developing and incorporating digital technologies within their institutions, as well as their ability to evaluate potential partners when deciding whether or not to approve proposals.

Another source of capacity to skillfully choose external partners mentioned by participants was the early integration of a museum's in-house digital experts or digital team into the planning and decision-making processes. As discussed in previous sections, some participants described situations where external technology partners were selected by colleagues from other departments, rather than the museum's digital team. In the view of one provider, "museums have not been very good at engaging all the perspectives that they need" (Provider) to make informed and strategic decisions on technology partners. Several participants described the "value" (Museum Professional) of engaging a museum's internal digital expertise in these decisions from the very beginning of planning new museum spaces and experiences.

Modalities for this engagement could include conducting consultations and conversations, bringing the digital experts to the table for—or putting them in charge of—the selection of technology partners, and even adapting existing procurement and development processes to facilitate the identification of partners and digital projects that best supported institutional missions.

Lastly, participants described the practice of museum teams hiring consultants as a mode of augmenting their capacity to evaluate project proposals. Supporting internal processes with the expertise of "an external perspective" (Provider) was framed by some participants as a method to mitigate the risks associated with selecting an inappropriate partner:

> If institutions are not supported, if they engage directly with service providers by themselves, I think there are risks if they don't have an external perspective. Because providers are selling their solution—like a car salesman, they're going to sell you the 'perfect' car. It's kind of the same with some providers, who are going to sell you a solution even though sometimes what they're selling isn't exactly what they can actually offer. (Provider)

Participants described consultants supporting museum teams in various ways, including defining qualities that potential partners should possess, identifying skills that should be developed internally within staff, informing museum teams about relevant evolutions in the technology sector in the context of cultural projects, assisting in the procurement process, suggesting potential partners, and even managing the selection of a provider. Participants described positive results from these collaborations with consultants in the choice of technology partners:

> We have definitely had good experiences when a museum or an art gallery has somebody there with them to help them choose. I feel like there's value in that. Because it is a really hard thing to do, and you have all these things to consider: the cost and the proposal and all that. [...] How helpful to have somebody standing alongside them. (Provider)

Engagements with consultants were described in both the context of supporting specific projects with a previously untested technology or economic model, and as a regular practice for selecting external technology providers. While consultants were not permanent members of in-house museum teams, they had the potential to increase internal expertise through offering their services on a project-by-project basis, as well as providing training and strategic advising that could be incorporated into museum teams' practices and priorities for selecting relevant partners on future projects.

5.2.4 Summary

This section explored the second category of the conceptual and analytical structure, *Selecting a partner*, which was composed of three analytical subcategories. The first subcategory, *Modalities for the choice of a partner*, presented the forms that the selection process could take, including informal avenues, formal procedures, and variations on the procurement process—as well as strategies for facilitating collaborative practices in the subsequent development process. The next subcategory, *Reasons for the choice of a partner*, gave an overview of the range of qualities in partners that participants reported as important for their decision-making process, such as the potential partner's technical proposal and capacity, communication skills and understanding of the partner, and financial considerations. The last subcategory, *Capacity to evaluate partner proposals*, explored the risks described when museums did not possess the adequate capability to select relevant partners, as well as the sources of support for museum teams to augment this capacity. The summary of this section can be found in Table 5.3:

Selecting a partner	Modalities for the choice of a partner	Informal avenues
		Formal procedures
		Facilitating future collaboration
		Variations on the procurement process
	Reasons for the choice of a partner	Technical proposal and capacity
		Communication and understanding
		Financial considerations
	Capacity to evaluate partner proposals	Risks
		Support

Table 5.3 *Selecting a partner:* second category of the conceptual and analytical structure of the research findings.

The importance of selecting an appropriate external partner for digital interpretion projects was a recurring theme in participant responses, from both museum professionals and technology providers. Many diverse factors impacted the selection, including the structures available for making the choice—from informal relational dynamics to formal procurement processes—, the range of reasons for the choice of a specific partner, and the internal capacity to choose a relevant partner. Many participants stressed how vital the initial phase was to the success of a cross-sectoral relationship, and how the beginning of a collaboration could have major impacts on the subsequent development process and the resulting digital interpretation project. The following section explores the perspectives and practices of participants regarding the collaborative work of designing and developing digital interpretation projects in partnerships.

5.3 During the collaboration

After the preliminary work of defining prospective digital tools and selecting appropriate partners, museum teams and technology companies began the active process of collaborating to design and develop digital interpretation projects. The following section addresses the themes that arose when participants described their practices for this moment of the partnership, including strategies for communicating across sectors, phases and dynamics in the development process, and points of tension caused by differing structures and motivations between partners.

5.3.1 Communication strategies

Establishing open communications channels and practices was reported to be an important element in the early stage of collaborations to lay the groundwork for the subsequent working process. Several participants emphasized the importance of interpersonal communications, suggesting that the success of a collaboration could partially depend on "managing the human side of the project" (Provider). Participants from both museums and companies shared that facilitating communication and finding solutions to conflicts were integral parts of their roles within the development of digital projects.

5.3.1.1 ESTABLISHING COMMUNICATION

Depending on the modalities of the process that initiated the collaborative relationship, the teams from the museum and the company could have different degrees of familiarity with their partners. Participants described how strategic communication practices at the beginning of the development process could open channels of dialogue to launch the partnership. While these initial dialogues were important for *what* was communicated, including important procedural issues as will be discussed in 5.3.2 Development practices and processes, they also laid the foundations for *how* communication between the partners would occur in the collaboration.

Several participants described collaborative workshops as an example for a format of this initial communication. For projects with large budgets and scopes, or those that involved more collaboration with the vendor to define and design the digital tool, the partnership could commence with events that brought together professionals for workshops that were "blue sky and going through the visioning process" (Provider). A museum professional described a partnership with a company that started with two full days of workshops with both the vendor team and the museum team, including museum professionals from across diverse departments such as digital, collections, education, exhibitions, as well as the executive team. Attendees to these initial workshops also included representatives from other firms associated with the project. The museum professional described how their technology partners asked questions of the museum team, such as "What do you want to say as a museum? What is the voice of the museum?" (Museum Professional), and the museum team expressed their perspectives on the use of digital tools for their visitors. In these in-person encounters, the participant shared that the communication was open and that there was room for the partners to react to each other. This was viewed as an important step in setting a foundation for the collaborative process: "We're going to be in a very big project together. Let's start getting to know each other's viewpoints" (Museum Professional). A provider described early kickoff conversations as important for laying the groundwork for a shared vision for the digital project:

> There are two main goals for this: to get everyone together and to starting creating a collective understanding of what the project is. [...] It means everyone is aligned on what the high-level North Star is for the project. In this case, the museum director was there, but also the people that will manage the operations in this space. Everyone said, 'OK, this is the direction of the project.' (Provider)

To help facilitate these objectives, the participant described leading creative exercises to understand the museum team's motivations and conceptions for the digital project, as well as to initiate conversations with the objective of laying the groundwork for continued open communication in the subsequent collaboration. Another provider also mentioned using initial exchanges as a way to assess if there are differences in opinion within the museum team, and for the company to help facilitate an aligned way forward on the project. The participant shared their team's practice of investing in these relationships throughout the process, which could also involve tailoring communication modes to different people:

> The human side of things is so important in what we do because my experience has been that everybody who's working in in this sector cares deeply about the work that they're doing. [...] We definitely place a high priority on relationship development from the very beginning and really understanding the people in the room, not just the project requirements. Because it's people that

> are making all of these decisions. And so, you need to understand their motivations and how they prefer to work. It's about establishing a rapport and a way of working together. [...] And as much as we need to sometimes have meetings where there are ten people there to work through a creative challenge, we also need to make sure that there are one-to-one opportunities for connections, so that we get to know each other on a personal level, and can have that sense of trust and ease of working through difficulties together. (Provider)

This investment in relationships was reported to have the potential to cultivate trust between partners, the importance of which was a repeated theme in participant responses, especially in regard to museum teams having trust in their technology partners.

5.3.1.2 CULTIVATING TRUST AND BUY-IN

Museum professionals reported having trust in their partners due to their perceptions of their partners' motivations for collaborating, their own digital capacities formed during previous professional experiences, the partners' expertise as demonstrated through previous projects, as well as through conversations during the collaborative process. Several providers shared communication practices they used to help develop this trust, such as active listening to make sure their partners felt heard and understood, using accessible language that demonstrated an understanding of the museum's context, and explaining the reasoning behind their suggestions. Additionally, participants reported that successful collaborations could occur when museum professionals had confidence in their technology partner's working process, despite the challenges that arose. Several museum subjects reported feeling comfortable enough with the presence of skilled partners to "let go" (Museum Professional) and commit to the collaborative process between actors with complementary expertise:

> There was a lot of ambiguity and stuff we didn't know at the time. We wanted to make sure that we had creative partners that could help us come up with the ideas. […] We're the content experts; they're the storytelling experts. Help us tell that story. (Museum Professional)

This trust between collaborators was reported to facilitate working processes where, for example, museum professionals who did not possess the internal capacity to thoroughly assess the technical merits of a digital tool felt comfortable trusting their partners to develop relevant digital experiences. It was also an essential element in partnership models such as co-production, where the museum may not always have had the authority to control all aspects of the development process beyond inaccuracies surrounding

the subject matter. A lack of communication and trust between partners—or in the process itself—was reported to be a cause of tension in the collaborative process. Some subjects reported that mutual trust could take time to develop: “It’s like any relationship, right? No matter how much you want to trust somebody at the beginning, they have to earn it” (Provider). Longer working relationships were occasionally reported to correspond with ease of collaboration and trust between partners.

Trust and open communication were also reported in regard to cultivating institutional buy-in for digital projects and practices. By knowing how to communicate effectively with leadership, and at times “reassure them” (Museum Professional), a technology partner could help digital museum professionals advocate for the development and implementation of digital projects and practices. A provider described their approach to early communications with museum professionals, including stakeholders, to understand the objectives behind specific requests and move forward on the project in an aligned manner:

> Buy-in is so critical. And it’s really important to make sure everyone is included in the process. It’s easy to have stakeholders with opposing points of view. [...] Because lots of times, they'll say they want something which is a tactical expression of a bigger strategic thing that they're looking for. And so, what they say is “We want NFTs”, but what they really want is to feel like they're on the cutting edge. To feel that they're part of this bigger conversation. And so, if you break it down, if you get back to: What are they actually asking? What's their actual problem? What are their actual goals? And start there. And it's actually much easier to agree on things like goals and challenges. And then from there they feel like they’ve been heard. And so, when you start building from that very, very foundational level, then you have that buy-in throughout the process. If you jump right into talking about tactics, people will have very set ideas of what they want, and they're never going to be happy if you're not doing exactly what they're asking for. (Provider)

This approach of centering communication in the development process around the museum’s digital strategy, and the value of a digital project in supporting institutional objectives, was also shared by museum professionals who had worked to establish digital governance initiatives within their institutions to guide the professional practices and processes surrounding work with new technologies.

Facilitating this larger buy-in could also be accomplished through practices such as interdepartmental meetings and institution-wide communication around digital projects. This inclusionary approach of communicating with diverse museum colleagues and “having a lot of cooks in the kitchen” (Museum Professional) was framed by some participants as a way to cultivate a wider sense of ownership in the project. The capacity to communicate effectively was also evoked when digital projects resulted in changes to museum professionals’ working practices, such as asking them to do their work in a new way or by

giving them more work to do. In this dynamic, a provider described their practice of fostering buy-in from these professionals by being mindful of this impact on their jobs and respectfully "explaining the benefits and what the point of it is" (Provider). This participant reported that people were more willing to adapt their practices when they understood the reasons behind the change. However, participants described conflicts in the collaboration when actors involved in the process felt "that their respective territories were not being respected" (Provider) and that their established ways of approaching their work should not need to change in the context of the current project. The role of the digital expert, whether on the museum staff or in the technology company, was reported to require skills in compromising and being tactful with colleagues. There could be consequences for the project's development if museum colleagues were not willing to support the efforts: "Because if the subject matter expert feels antagonized, then the subject matter will be inaccessible" (Museum Professional). In other instances, one museum department may have chosen to work on a digital project while another department resisted working with the new technology, potentially leading to tensions or even "departmental wars" (Provider). Intentional communication and trust in the digital experts—both internal and external—could play a significant role in finding ways to foster mutual understanding and adapt institutional working processes, especially in regard to professionals who were resistant to embracing the evolving nature of digital technologies and practices.

5.3.1.3 COMMUNICATING ACROSS SECTORS

Another element of communication that several providers reported as being important when launching a collaborative process was centered on assessing the levels of digital capacity within their museum partners. One provider shared their practice of asking partners in a preliminary workshop to situate themselves on a spectrum from *completely uncomfortable* to *highly fluent and comfortable* working with technology. This provider shared an example where, if all the museum partners reported feeling uncomfortable, they would "ask them to dig into what it is that makes them uncomfortable" (Provider), which could include negative past experiences with unreliable digital media or unavailable digital partners. This allows the participant to address their fears and explain how this collaboration could be different:

> That is an opening for us to then communicate our philosophy about how we work with clients and that we are a very relationship-driven organization, and that we would be meeting them where they're at, to help them feel comfortable and ready to maintain their exhibits. (Provider)

This practice of respectful inquiry and active listening was also reported as an impactful practice to cultivate a feeling of safety and openness within museum partners who felt "a lot of fear, uncertainty and doubt about technology" (Provider). Several participants reported that, despite the presence of more digital fluency in the larger society, working with digital tools could still be a source of discomfort in some museum contexts. By "not assuming fluency with digital experiences" (Provider), digital experts could adapt their communication practices to foster a shared understanding of the objectives and specifications of the digital project.

To cultivate active participation within museum teams with less experience working with new technologies, another reported practice was to encourage conversations that helped museum professionals realize how much they already knew about digital tools, both in museum contexts and their daily lives:

> Because when people come into a project and work with a team like us, they might think "Oh, they know so much more about tech than we do, I'm a little nervous to participate in this workshop, I don't feel super comfortable talking about these things". But we remind everybody in the room that we are all visitors who have experiences, both good and bad, in the museum context. And we get people to think about what was a positive experience that was done through digital technology, whether in a museum or anywhere, asking "What was so positive about that, and what was it that made that experience feel innovative?" And that can demystify innovation and what we do and make it more about an experience that a visitor gets to receive. (Provider)

This practice could also include the use of non-technical language, as well as offering examples of digital tools that their partners were familiar with and digital practices that were already part of their professional practices within their museum roles. Several participants shared that this could help calm anxieties and fears about working on these projects, and even help museum professionals in other departments to "realize that they too can dream about ways to highlight their collections with digital" (Museum Professional).

A provider described their practices of communicating with museum professionals who were not familiar with the reality of working with specific technologies through the use of a pedagogical approach that included both an adapted language to explain the technology in terms of the resulting visit experience, as well as through the practice employing visual elements. The strategy of using visual elements to support

cross-sectoral communication was commonly reported by participants, as a method of "beginning the conversation and bridging the gap between what they want to say and the strategy by which we'll say it" (Provider). To ensure that museum partners understood the realities of an emerging technology, another provider found examples of existing projects similar to the type of work they would be creating, mocked-up visuals of what the experiences would look like, developed primers that explained the basics of the technology, and referenced research papers. The provider reported that these visuals contributed to a communal understanding of the direction of the digital project: "It can be so abstract, so it's really important to do some education so we can be sure we're all speaking the same language" (Provider). Another provider shared how important they considered it to be for museum teams to have at least a basic understanding of the specific technology being used, so that they could adequately participate in, and understand, the brainstorming ideas.

The practice of adapting language to foster communication in cross-sectoral collaborations when discussing digital projects was broadly reported by participants. When working with museum professionals with less digital expertise, participants described shifting their language to correspond with the skillsets and interests of their collaborators. This could include centering conversations on visitor experience, storytelling, and museum objectives rather than starting with technical specifications—a practice that could start communications with the reasons "why are we doing this, not how are we doing it" (Provider). A provider described their approach to making the collaborative process accessible to partners with varying levels of comfort working on digital projects:

> We come into any engagement with clients using layman terminology. We make sure to show examples of things, we try to educate our clients along the way. So they feel empowered to make decisions based on our advice and guidance. And then they can, through the relationships we've developed with them, also trust that if we're recommending something, that we're coming at it from a place of really understanding their needs as an organization, that it's actually informed by understanding their comfort with technology, what their goals are, who their visitors are. We need to make what we do as approachable as possible. (Provider)

Beyond making technology practices accessible through intentional communication, this participant described how their team demonstrated an understanding of their museum partners' capacities and institutional context, which helped support a relationship of trust and open communication.

Many participants described the value of each partner possessing an understanding of working with their collaborator's area of expertise. Regarding the understanding of museums within provider teams, several

museum professionals reported ease of communication with companies that had extensive experience working on cultural projects or had “museum people on staff” (Museum Professional):

> The companies that we seem to get better products from understand some of the challenges we have, and how to communicate our topics through the product to audiences in a non-traditional educational setting. They seem to get it more. (Museum Professional)

This understanding of museum contexts was also reported to result in an ability of providers to shift their language when talking to different profiles of museum professionals, including curators, leadership, educators, and in-house developers. As one provider shared, “We understand what they're talking about, and we can engage with them in that way” (Provider). Conversely, a museum professional described how they struggled in a collaboration to get their technology partners to understand their institution’s interpretation practices, which were in conflict with the commercial interests of the company. A provider described how technology companies needed to be aware of, and sensitive to, the ways of communicating in museum contexts that may differ with communication in the private sector. The presence of digital capacity and culture within museum teams was also reported to be a factor that facilitated communication in collaborations. This in-house digital knowledge could facilitate mutual understanding, as well as supporting the museum team’s capacity to ask relevant questions and actively participate in the development process. A provider shared about a successful collaboration with museum professionals who had previously worked for digital agencies; these museum partners had understood that the company’s proposed ideas were rooted in the design process and not just pulled out of the air. This increased the museum team’s receptivity to their partner’s ideas and their trust in the process. The lack of in-house understanding of the specificities of either museum contexts or digital practices was mentioned by several participants as a factor that could complicate the development process.

Regardless of the expertise of their collaborators, many participants evoked the importance of the presence of a professional in the role of facilitating cross-sectoral communication within the process. This role could take the form of a museum professional with digital expertise, a provider with experience working with museums, or an external consultant brought in to facilitate a collaboration between a museum and a technology company. The skill to be able to communicate effectively with diverse professionals was compared by several participants to the work of a translator:

> I see my role as comparable to two other professions. First, my role is like an orchestra conductor, where the goal is to make all the different instruments harmonious, to make everyone’s

> contributions harmonize to create a project for the public. I also see my role like a translator between two universes, two ecosystems, that each speak their own language. I need to make sure that they understand each other, that they understand the needs, specificities, and languages across these two universes, that of the museum and that of digital. (Museum Professional)

This role required coordination between various needs, objectives, and abilities in order to facilitate communication across sectors. Within the museum, this translation work could also foster cooperation across museum departments by developing "internal partnerships [in] the ecosystem of the museum" (Museum Professional), which was reported to be essential because digital projects "need the support of all these roles to exist and function well" (Museum Professional). Several participants shared the importance of having both the support of leadership and motivated colleagues in other departments for the success of the development process:

> For example, if the person at the head of an establishment—or with a lot of power in an establishment—is pro-digital and actually wants all the teams to work for this project, then the teams are strongly on board. There's either a willingness coming from the teams, or there's a sense of obligation from the people thinking about the museum's strategy for working with digital. [...] But if management says, "Do this project" and the other departments are not particularly motivated, they may very well abandon the digital team when I want everyone to be invested; so that changes the whole dynamic. (Museum Professional)

The capacity to translate between sectors was considered to play an important role in maintaining smooth progress within the project and enabling active participation between professionals with different skillsets and knowledge.

When there was a shared set of references and mutual understanding, participants observed that the final design for projects often resulted from "conversations with all these different experts" (Provider), indicating that a strategy to communicate across sectors could facilitate the collaborative process. Because the museum teams possessed the expertise in their visitors and their institutional context, a provider shared their view that, in order to make a digital project that would provide the best experience for visitors, their museum colleagues needed to feel empowered to participate actively in the collaboration: "They know their visitors better than anyone, and so it needs to be that partnership between us and their team to make the best experience for their visitors" (Provider). Building trust and a shared language was reported to help support a deeper collaborative partnership and result in more relevant tools for museum visitors.

5.3.2 Development practices and processes

In the course of describing the specificities of their practices for cross-sectoral collaborations, several participants reflected on *process* as a tool that could facilitate the design and development of relevant interpretation tools for museum visitors. Several providers described how they had developed a "well-established process for working on projects with clients" (Provider), which some believed to be a quality that motivated some museum teams to choose to work them. Museum professionals also described the details of, and reflections behind, the processes they had developed to facilitate their digital work. There were several established working methodologies and phases that participants reported employing and adapting in these collaborations, such as Agile, waterfall, design thinking, co-creation, and a human-centered approach.

Participants described the mechanics of collaborating with partners in terms of working processes that were comprised of several key steps, with various degrees of definition and adaptability. In some cases, these processes began with an initial phase of defining the project's objectives and scope, as well as gathering contextual information about museum audiences and digital infrastructures. Several approaches were mentioned for managing the design and development of these digital tools, including through the integration of the needs of potential users. In describing these development processes, participants outlined variations in the roles of each partner and their strategies for collaborating across sectors.

5.3.2.1 DEFINITIONS AND DISCOVERY

The initial steps of the collaborative process were reported to depend on several factors, including the scale of the project, the working methodologies of the museum and company, the level of definition of the project's design, and the stage of the tool's development when the partner entered the collaboration. The beginning of the development process was a moment of transition, bringing professionals from different sectors together for dialogue to establish the modalities of the collaboration. Beginnings were also reported to be a moment of reconciling the approaches and practices of the museums and companies, which may have already begun in the procurement process.

A commonly reported approach to beginning the collaboration process involved "goal setting, visioning, making sure that we've established all of the parameters on the project at a high level" (Provider). This was sometimes referred to as the *discovery phase*. Several participants reported that this step could play a larger role in collaborations with projects with larger budgets and scope, as well as in instances where external partners were brought in earlier in the design process. As outlined in 5.3.1 Communication strategies, collaborative workshops were one possible format for this dialogue, though a provider shared that some museum teams tended to be "more prescriptive" (Provider) and were not open to engaging in these participatory events. Another provider observed that the process of conducting an intensive discovery phase, including sessions with professionals from different museum departments, was "easier to do with a large institution that has the staff and budget to support it" (Provider). However, another provider shared their observation that digital projects with smaller budgets often necessitated intentional reflection at the beginning of the development process, in contrast to projects for larger museums with more robust digital ecosystems that "have the budget to support it, they may have met with consultants, they may have people on staff who have done this before, so it's not so precious" (Provider). This period was often characterized by communication between teams, research into audiences, understanding the context of digital and institutional objectives, and defining the mission of the project:

> That discovery phase is when you're doing a lot of the communications upfront, you are talking to different parts of the organization about what's important to them, who your audience is, you are prioritizing the goals. You're workshopping with them, and then you're also doing that with members outside of the organization [such as surveys with potential visitors]. (Museum Professional)

The initial phase was reported to be a time for sharing information between partners, including other companies who might also be engaged with the museum team. A provider described their practice of asking their museum colleagues for a brief describing a clear mission statement for what they hoped to achieve with the digital project, including target audience, experience specifications, existing digital infrastructure and visual identity guidelines, success metrics, and desired learning outcomes. Many participants also described their intention to understand the motivations and needs of the digital tool's targeted audiences as the basis for subsequent design work:

> The first steps are really to immerse ourselves in the needs of the public. So often we go to the galleries or the environments where the tools will be used. We put the contexts and the experience of the visitors first, and then respond to what is missing in the space to meet the desires of the public. (Museum Professional)

These efforts were also reported include surveys of potential visitors, interviews with representatives of communities for whom the tool was being designed, reviews of visitor studies, the creation of visitor personas, and consultations with visitor-facing museum professionals. Several participants emphasized the importance of designing digital tools with specific visitor needs and behaviours in mind:

> My colleagues would come to me and say, “We want to build this thing”. And I would say, "Why? Who's it for?” And they would say, “Everybody”. I said, “No, it can't be for everybody, you need to tell me exactly who it's for. What kind of audience? And who are the folks that are asking for this, and what problem does it solve?” (Museum Professional)

In this approach, digital tools needed to be “rooted radically in the needs of our end users" (Museum Professional), which involved the strategic identification of which audiences to target based on the museum’s organizational priorities and available resources. A provider mentioned encouraging museum teams to be explicit about sharing their expertise surrounding museum education and visit experience, as their company did not have educators on staff. Some participants also mentioned museum professionals educating their technology partners on the content that would be communicated through the digital projects, such as “a mini masterclass on the artist, because we can’t create interesting experiences without knowing the content of the exhibition” (Provider).

Another provider described the practice of conducting documentary reviews to understand how the project fit into the larger aims and systems of the institution:

> It's very easy to get an RFP and it says, “Build an X” and you could just build it and send it back. But we want to make sure that [the digital project] has as big an impact as it can have. So, depending whether or not this is a big enough project, one of the first things we will do is get under the skin of an organization. [...] We'd look at all the collateral they already have, particularly anything that has the word ‘strategy’ in it. So, if they already have a digital strategy, we'll read and review that. We also want to see the organizational strategy, what are their aims for the coming years. And then we think about how the work we're doing can have an influence on delivering the goals of the organization. (Provider)

The participant reported that this approach of beginning a project by considering the museum’s larger goals, as well as imagining future applications of the digital tool across departments, facilitated the creation of sustainable projects that helped “un-silo content” (Provider) and supported the organization’s digital infrastructure. This “deep dive on documentation and then deep investment in relationships” (Provider) was also described by another vendor in the context of joining a museum team later in the

development process when there was already an “established way of working and established scope of work” (Provider):

> A really important step for our team to get into the project is to review and catch up on all the work that has been done to date. And establish relationships with the partners and client team members in such a way that we can discover both what is written down in terms of project requirements, but also some of the legacy information that we may have missed by not having been a part of the foundation setting aspects of the project. [...] This might look more like us echoing back to the team our interpretation and understanding of the documentation as it’s written. (Provider)

The participant explained that the motivation for this approach was that often what was written down was the result from the end of a decision-making process, but it was important for the company to understand the “stakeholder dynamics and the history of the decisions” (Provider) when entering into a collaborative partnership.

This beginning stage was also reported by several participants to be a moment of identifying the actors involved in the project from both the museum and vendor teams, and defining their roles for the development process. These preliminary efforts also included intentional alignment on the logistics of the working process, to foster mutual understanding and shared definitions:

> It's really important to understand where everybody is coming from, and to align on a process. [...] Understanding what the goals of the project are, understanding their expectations of how communication should be happening in the process of working together. Expectations for how tech should be organized. Expectations around standards. Common understanding of inclusive design and accessibility. It's really important from the outset that these baseline definitions are articulated and agreed upon, particularly for teams that have never worked together before. (Provider)

The importance of these procedural understandings was also mentioned in contexts where there was a change in personnel in the respective partner teams. A provider described how, after a contract was signed with a museum, there was a staff transition from the sales team to the project team for client interactions as a regular part of their collaborative practices. However, they described the complications when a change in personnel happened within the museum team, where a museum professional who was not present during the sales process began managing the project, and might subsequently make requests for the design of the digital tool that were not included in the purchased project agreement. This situation could also potentially necessitate repeating the explanations from the sales process for how the

technology works, including through the use of demonstrations. Another provider described their approach to aligning with museums in this early phase as intentional “overcommunication” (Provider), where they were very direct and concrete in their communication about what the company needed from the museum team, as well as what they could and could not do for the museum. This explicit communication style was described as a method for achieving a shared vision for both the upcoming partnership and the resulting digital tool.

Beyond aligning partners, another benefit of defining the objectives for the direction of a project was that they could be used later on in the development process to help ensure that subsequent design decisions supported these missions:

> What comes out of that is a vision for the project. So, when we come up with some awesome idea in the middle—or a really terrible one—we can read that thing and say, ‘Is this crazy idea gonna get us a bit closer to that thing?’ And if it isn't, then we don't do it. So, it’s like a guiding star. [...] Everyone would have agreed with that. That would be one of the main outcomes of any discovery work. (Provider)

In such cases, once a shared vision for the design objectives had been agreed upon by all parties (with varying levels of detail and definition), the process could transition into the next phases of building the project: "You've laid the groundwork to start really sprinting” (Provider). Another provider shared their perspective that if this beginning phase of the partnership was done well and with intentionality, the project was often set up in a position to proceed smoothly.

5.3.2.2 DESIGN AND DEVELOPMENT

When collaborative process began with an extensive initial period of communications and requirements gathering, many participants described a moment in the project that transitioned the development process from defining broad objectives and into the more concrete work of design planning. When describing initial design work, many participants mentioned using visual tools such as storyboards, vision boards, diagrams, and video mock-ups to lay the groundwork for the direction of the design and functionalities for the digital project. This work could include evaluating the possible directions that the project could take: “We put everything on the table, we evaluate the different aspects, advantages, disadvantages of all the systems—then, we choose” (Provider).

For some projects, the design phase involved defining the specificities of the digital project to be developed: “We take the high-level vision and goals, and translate it into a detailed plan on what every step of the experience is going to look like” (Provider). This work would act as the guide for the following development process by plotting out “the best recipe or mixture to support this specific messaging or this lesson or this idea” (Provider), in a process similar to developing a physical interpretation project. For other digital tools, participants employed an approach centered on prototyping where the particularities of the product’s design were refined over the course of the collaborative process: “We didn't know early on what the experience would actually look like or feel like; [the company] was very good about doing prototypes and they tried a lot of initial experiments” (Museum Professional). While these iterative approaches to product design allowed for more flexibility in the direction of the final result, they still needed to ensure that the digital interpretation tool fell within the parameters of the defined objectives and budget. A provider described how their prototyping approach began by sketching out “loose ideas [where] the experiences are a little bit more fleshed out" (Provider), and then moving into more comprehensive designs that enabled them to estimate the budgets for the design ideas:

> This is what it looked like for us: really trying to marry content, space, media, graphic design. All into concepts that actually started having budgets assigned to them at locations, scales, and so on. So actually, having estimates are also big outputs of this [phase of the process], which is the bane of everyone's existence. Also very necessary, because you start understanding what the actual monetary value of something is, versus what you could get out of the experience. (Provider)

These design iterations could facilitate the validation of certain concepts and the budget associated with them, which would enable subsequent prototyping, testing, iterating, and conversations. The prototypes of the project could be “very, very low fidelity prototypes to demonstrate what the interaction could look like” (Provider), which allowed for the partners to test “something real from the outset” (Provider) and validate the form of the experience before it was concretized and thus too late in the process to make significant changes. Another provider described their practice of making “an agreed minimal viable product, something we’re aiming to get to relatively quickly that would tick all the boxes for everyone, and then we improve it and improve it” (Provider). Creating prototypes was reported to help foster mutual understanding of the direction of the project between partners with different areas of expertise: “It's important that each step along the way, everyone who is a decision-maker or somehow informs the experience can see what it actually feels like” (Provider). Testing the iterations of the project across several stages of the development process was a method to ensure that the resulting digital tool corresponded as closely as possible to the original ambitions of the project.

Some participants reported successfully utilizing existing development processes within museum contexts, including those that had originated in the technology sector. For example, the Agile process was mentioned by several participants as an effective approach for developing digital interpretation projects between museums teams and service providers. This method involved regular communication, continuous decision-making, an iterative approach, stakeholder management, and a trusting collaborative relationship:

> So, in the process of Agile software development, which is what we use, you have to be communicating constantly. You can't just wait for a big reveal. You're making decisions about what you will do. Some old requirements may become obsolete; some new requirements may pop up. There may be a phantom stakeholder, there always is, who has some political clout: “But where's the green button?” And you scramble to build the green button. And we're constantly we're holding each other accountable for what we will deliver. (Museum Professional)

However, other participants described museum contexts where the exact same methodology was impossible to apply. In the example of the Agile process, some institutions were not conducive to this iterative approach due to the existence of strict administrative and financial requirements as dictated in formal procurement procedures:

> It’s anti-Agile. The budget is locked down before the design has been done practically, which means we don’t really know where we’re going, but we already have the budget. We’ll have to make do with it. We must respect the phases and do exactly what is written in the specifications. [In museums like these], we have the same project management process. (Provider)

Some participants described applying their learnings from collaborative experiences in order to adapt existing methodologies to museum projects. A provider described how, in collaborations with museums, their company had tested both the standard waterfall process with defined phases that was often used for exhibition design, as well as the iterative Agile approach often used in the technology sector. They were not satisfied with either approach in the museum context: waterfall processes were not seen to be adaptable to evolving objectives, while the Agile approach was not considered conducive to the financial realities of museum procurement processes with fixed bid projects that defined “a finite budget and a finite set of requirements, which is antithetical to Agile” (Provider). Inspired by experiences collaborating

with museum partners, they developed a hybrid iterative approach for working with museums that was both structured and heavily prototype-driven:

> Museums are really into prototyping; it's like *the thing*. We found that for tech projects, where we can provide a lot more wins for museums is when we do a lot of the prototyping really quickly, up front. And not have such a strong separation between technology and design phases of projects. [...] So we're iteratively creating and working, designers and technologists together, from the outset, and getting to real things quickly. And now with the tools that we have, it gets easier and easier to actually create interactive prototypes relatively quickly. And a developer can look at that and go, "OK I get it", and a client can look at that and go, "I get it", and there's no miscommunication. And things go a lot faster. The prototyping approach allows us to break the barriers between design and technology, and that's exactly what where we feel that the museums benefit. (Provider)

In this process, design occurred from the beginning of the process through the use of simple prototypes, so all participants could understand the project from the outset, bringing together the design and technology phases. This vendor's team used their experiences in museum partnerships to adapt their working processes, which they continued to do on each new collaboration, based on the specific needs of institutions and projects:

> It's always more strategic to get into a project and understand how processes need to be tweaked and need to be adjusted. [...] Process is important, but process shouldn't get in the way either. (Provider)

This contextual approach adapted the working process to each project's circumstances and each partner's needs, valuing relationships over process.

Human-centered design approaches were also a common theme in participant responses. Creating digital tools with the needs and experience of future users in mind was a frequently reported practice in these collaborative processes: "All these experiences were developed and designed for human beings to be in the spaces and experience them" (Museum Professional). This work could involve applying interpretation best practices and human-centered design approaches to the design of the digital experiences, as well as "giving design an equal voice at the table to interpretation and curation" (Museum Professional). As described in the previous section, these efforts could be grounded in research into audiences from early phases of the process, and could be used to guide reflections on user experience and user journeys. For example, a museum professional described a situation where, after receiving content for a digital tool from their curatorial colleagues that they considered to be much too long, they put themselves in the position

of a visitor who was not a subject matter expert in order to determine which information was essential and what could be removed. Several participants reported that the practice of simplifying and designing information to be legible to readers across various interpretive formats could lead to disagreements with specialists. The practice of prioritizing visitor needs in the design process could also impact the successful progress of the development of these tools. A museum professional mentioned experiencing obstacles when their technology partners did not possess expertise in designing for accessibility, which was a mandate of the museum's mission:

> There's still project management that plays into that: how can we get to a successful outcome on time and on budget, if some of their developers aren't quite up to speed on the actual constraints of [inclusive practices]. (Museum Professional)

To ensure that a project's design would meet objectives for interpretation and user experience, participants reported the practice of testing project prototypes with users during the development process. A participant described how user testing of the projects in the museum galleries could inform design decisions, both through looking for problems with the technology's functioning as well as improving the quality of the resulting visit experience:

> What we want is to make sure that the experience is meaningful. So, we really have two tests: there's ergonomics, but there's also experience—the research and evaluation of the visitor experience. (Museum Professional)

In some cases, user testing was also used regularly when there were disagreements about design decisions between partners, especially around more "subjective" (Provider) aspects, and the feedback from users was reported to be considered as "definitive" (Provider). Another modality of designing for the experience and needs of future visitors was to conduct accessibility testing with prototypes of the project, including with the expertise of organizations specializing in inclusive design for various populations. Some participants mentioned that it was not always possible to conduct user testing, even if it was seen as valuable. A museum professional described a collaboration that occurred during the early stages of the COVID-19 pandemic, where it had not been possible to test the project's prototypes with users beyond the teams of the museum and technology company due to the constraints of the health crisis: "We didn't really have a good opportunity to put the stuff in front of actual human beings—if anything, that was a deficit in the process" (Museum Professional). Other participants mentioned a lack of user testing due to limitations on time.

5.3.2.3 MANAGEMENT STRATEGIES

A recurring theme in participant responses was the perceived importance of the presence of strong project management to guide the process, especially for projects that had large scopes and tight deadlines. The work of project management could include leading partners through the procedural structures to keep the project on track, such as managing deliverables and approvals, monitoring the budget and deadlines, facilitating communication and practicing “diplomacy” (Museum Professional), and ensuring the delivery and quality of the final product. This role could take the form of a professional from the museum or technology company—or the responsibilities could be shared between interlocuters from both entities, such as project managers from the company and product leads from the museum. In the contexts of museums, some participants described certain institutional structures with in-house project management groups; in these cases, the in-house project manager may not even have been an expert in digital or interpretation, but would be utilized in the development process “to coordinate the activity of all these various functions" (Museum Professional). As mentioned previously, consultants or even an external project management firm could also be brought in to accompany museums through the development process in these partnerships. This management work could also be supported by the existence and deployment of a defined and highly structured working process.

Some participants mentioned that access to strong project management capabilities within vendor teams could be a benefit for museum teams when working with technology companies. These external partners could help museums manage the development of a digital project and achieve procedural objectives:

> External entities tend to be a little bit more rigorous in terms of keeping everybody on track. They have their own timelines and deadlines. From a project management perspective, they will have their own methodology and their own ways of working, which tend to be a little bit more rigorous than some of what I've seen in the museum space. There's a tendency in museums for things to slip. It can be effective when there is external pressure to meet. (Museum Professional)

Beyond assuring the progress of the development process, highly skilled project managers within vendor teams could also facilitate the communication between collaborators. Similar to dynamics discussed in 5.3.1 Communication strategies, these professionals could cultivate understanding between sectors and help museum teams trust the process:

> It was all about trust. There really was a central person who made sure everything happened, and who saw very clearly where we were going, and who actually enabled everyone, [the company] but also us, to understand each other and move forward. (Museum Professional)

On the museum side, some participants remarked that having skilled project managers within museum teams could be beneficial for the collaborative process. One such advantage was the ability to effectively communicate internally with museum curators and leadership: "They can help engage the curatorial teams when most appropriate and help to manage the expectations" (Provider). In some museum contexts, the professional in the project management role could be tasked with merging museum objectives with entrepreneurial approaches:

> And thinking not just about how to deliver a project from a project management standpoint—that is to say, making sure that the project ends on time, on budget and in scope—but rather that it's rooted in thinking about: who are our users and what do they need? What are our business goals and objectives? And what kind of technology can we use to help solve that user problem? (Museum Professional)

The presence of strong project management skills was also reported to be helpful in projects where there was a high number of actors participating the development process. Within museum teams, this work could involve collaborating with, and soliciting and managing the contributions of, a large range of professionals, both from the team in charge of the digital project and other departments. As an example, the production of digital tools for a temporary exhibition might involve coordinating the in-house exhibitions team leading on the scenography, the curatorial and education colleagues charged with the creation of content to populate the digital experiences, and, as will be explored in 5.3.3 'Clash of cultures', the stakeholders who must be engaged for feedback and decision-making. On larger projects, this work could also involve coordinating with multiple vendors who had been contracted to develop the digital product, as well as those who may have been collaborating on related projects such as architecture and branding firms. Participants described instances where one of these companies could act as "essentially a general contractor for us, as well as managing their own scope of work and fabrication" (Provider); in these situations, it was possible that certain individual vendors could have limited or no access to the museum team.

Many participants described how development processes often featured regular dialogue and meetings between different actors. As described in 5.3.1 Communication strategies, creating channels for communication was seen as an important element of maintaining the progress of a project: "Establishing

a regular cadence of check-ins is absolutely critical, because things just have a tendency to drift" (Museum Professional). These communications could take the form of conversations, participatory workshops, virtual correspondence, and online project management platforms. A museum professional described how they had experienced issues in the past with vendors when these practices were not defined:

> Where I've seen it go sideways is where communication channels are not clear and open and responsive. Where [the company is] waiting for us for something, or we think we're waiting for them for something. [...] Identifying both internally, and from the vendor side, where the communication is supposed to flow is important. So that people are not getting overwhelmed with things that they may not need to weigh in on. (Museum Professional)

A participant described how professionals in management positions could utilize these communication channels as a modality to strategically "bridge the expertises" (Provider) across partners, by "meeting with the right people at the right time" (Provider) and making sure the information flowed where it was needed.

5.3.2.4 COLLABORATION DYNAMICS

A large variety of collaboration dynamics for the development phase were described, ranging from projects with minimal interaction between partners, to processes that mobilized co-creation practices to integrate the work of the collaborators: "We really became one team during the whole design phase" (Provider). Many participants mentioned that they preferred working with partners who were willing to engage in active collaboration: "We want them be active participants in the creation of experiences, we want them to have opinions and to collaborate with us on how to make decisions" (Provider). This posture facilitated the merging of expertise and capacity across experts who each came to the collaboration with their own skillsets and backgrounds:

> [Some companies] don't understand some of the challenges we have, around accessibility but also communicating sometimes challenging topics to certain audiences in a nontraditional educational setting. [...] They're learning as much from us as we are from them. They're bringing different backgrounds and viewpoints from the work that they've done in the past, and so we're learning from them, too. (Museum Professional)

Bringing together these understandings of museum contexts and digital technologies was reported to create an environment conducive to developing projects that were relevant for institutional missions,

adapted to visitor needs, and potentially innovative. Several participants also mentioned how important it was for the collaborators to respect the knowledge and strengths of their partners:

> Obviously, when we work with any agency, they're experts. They do specifically this thing over and over for lots of people, so I definitely want to let them take the lead. I lean on them to help deliver that experience. I feel like I can provide some value with input on things that we found in our experience based on what we've built. And my job is to help guide to make sure that the experience is through the lens of [our museum], that it's telling the story the way that we tell stories. [...] I definitely have ideas, and I'll throw them in the pot, but it's more to make sure that we're delivering for our museum visitor a very consistent [Museum] experience. (Museum Professional)

> We're not coming in saying [to the museum], "Hey, we're the experts and we're going to tell you what you need!" Instead, I see our role as being facilitators of how to bring a client's vision into life, and experts who can advise on what is a good idea or not a good idea based on our experience. But ultimately, it's the client decision what they think is going to work for them in their space. (Provider)

These exchanges could be supported by an open posture that required communication and trust, as well as a willingness to engage with new ways of working and to compromise. Additionally, participants mentioned the benefits of each partner having learned from previous experiences working on digital museum interpretation tools, and possessing an understanding of their collaborator's sector. For example, several providers mentioned how experience with digital technology within museum teams could make the process more fluid, whereas otherwise there could be reluctance to engaging with new practices: "The more experienced they are, the more ambitious they will be and take risks" (Provider). Other participants described the tension that occurred when museum teams were not receptive to guidance from their technology partners, such as when subject matter experts were hesitant to trust the recommendation of digital experts to simplify academic language into shorter, more accessible text when integrated into a digital tool.

Clearly defining the roles at the beginning of the collaboration could be an effective practice for managing the dynamics of collaboration between sectors. This could include establishing the power dynamics of the process. In partnership models where museums engaged technology companies as service providers, the museum was the client with the authority to make decisions in the development process and who owned the rights of the resulting content:

> We workshop issues and compromise where we need to, but at the end of the day, we're paying for the product and we're the clients. So, it is a relationship that we're building, but it's also a bit transactional as well. We need to come out of it with the best possible product for our audience on the floor of the museum. (Museum Professional)

However, some participants mentioned factors that could complicate these dynamics: “A balance of power that takes place between service providers and institutions, which can be very cordial, or it can be a struggle, depending on the intention, depending on the teams” (Provider). For example, a lack of familiarity with the development process within museum teams, or a large difference in size and economic force between partners, could result in a “power disparity” (Museum Professional) where technology partners had more power and control in the project. As mentioned in 5.2.3 Capacity to evaluate partner proposals, these museum professionals would be left to trust their vendor partners which could be “a good or bad situation” (Museum Professional). This was a dynamic where the services of an external contractor were reported to be beneficial to help ensure that the resulting digital tools would be relevant for museum contexts.

Other models of partnership had implications for the collaboration dynamics, such as when the development of the digital projects was funded by external entities, including by the technology partner itself. A commonly mentioned example was the co-production model, where the co-producer would bring a significant financial contribution to the partnership. This was reported to potentially translate into more “legitimacy and autonomy on the part of the producing company” (Museum Professional), shifting the power dynamics between museum and partner. While the specifics of these partnerships varied between projects, the co-producer was often reported to be in the position of leading the process and making choices:

> When you work with a service provider, you have the last word. At worst you pay a little more, you make an amendment to the deal if your request really exceeds the initial framework, but it's you in the end. Whereas [with co-production] that’s not the case. If there’s text, the museum will certainly reread it, but ultimately, it’s up to the partner to decide, or to modify the text until both parties agree. [...] However, the museum's considerations must be taken into account because the experience will take place in the museum, because it is the image of the museum that comes into play, because there is subject matter expertise shared by the museum. However, if the authenticity of the subject matter is not at stake, ultimately it is more the partner company that’s in a position of strength. (Museum Professional)

Even with this shift in the power dynamics, the scientific veracity of the content and the reputation of the museum were still important factors in the development process. Other participants mentioned different

co-production dynamics where the power in the relationship was more balanced, with each side sharing the risks and their expertise: “the expertise of cultural establishments is involved in the production in the same way as the expertise of the studios or producers” (Museum Professional). This partnership structure was described as being a relatively new model within museum contexts that “fundamentally changes the relationship between companies and museums, moving from service providers to partners” (Provider). This was reported to mean that the dynamics for these collaborations were “in the process of stabilizing” (Provider) as professionals sought out the best ways to utilize this collaborative structure to employ the strengths of each partner to produce relevant projects.

5.3.3 "Clash of cultures”

When describing their experiences within the collaborative process, a reoccurring theme in participant responses was the potential for a "clash of cultures” (Provider) between museum institutions and technology companies. Beyond the contrasts in communication styles that were described in 5.3.1 Communication strategies, tensions could result from procedural and structural differences between the partners. While these dynamics were reported to bring challenges, some participants also framed these constraints of developing digital museum interpretation projects as opportunities for innovation: “You just have to lean into it and not expect that a process that you applied for [a multinational technology company] is going to work for this museum” (Provider). Reported areas of tension in these cross-sectoral partnerships included differing conceptions of time, complex decision-making procedures, and limited resources.

5.3.3.1 CONCEPTIONS OF TIME

A major difference between the cultures of museums and their partners was reportedly the “clash of temporalities” (Provider), or the differing conceptions of time. A provider described how their longevity as a company was dependent on continuously completing projects and receiving income, while museums were often operating on a longer scale of time:

> As a company, we are often in a hurry, because we have to finish projects and develop [our offer]. But a museum is usually made to last for centuries, so they have a longer timeline in mind. [...] Sometimes a museum will say to me, "Great, let's do this in two years" as if they're saying, "in two months". But that doesn't make sense for us. Museums are used to planning their exhibitions so long in advance, and it's complicated because museum time is not the same as the time in a business like ours. We need make sure that we last that long: if a museum takes three years to decide to work with us, we still need to be around in three years. (Provider)

In contrast to this slow pace within museums, participants observed that technology companies operated on a more rapid timeline. As a museum professional observed, "For the design firms, it was really about: get the thing launched, get the photographs taken, get the design magazines, and then go on to the next project" (Museum Professional). This potential tension arising from contrasting priorities between innovation and sustainability, or "the design process versus the operational process" (Museum Professional), will be explored further in Section 5.4.3 Operations and lifespan.

This difference in temporality also had impacts on the types of digital projects that were possible to develop in certain contexts. For example, a museum professional reflected on how the evolving professional practices of their digital department were a reflection of those in the technology sector, though not at "comparable pace or scale" (Museum Professional) and often arriving to the museum through downstream impact. Museums, they remarked, "are slower spaces to change, but are in a continuous cycle of transformation" (Museum Professional), where factors such as timeframes are in tension with the technology sector:

> Exhibitions work at least three years out. And in the case of some projects, we're working on five-year timelines. So, we have commitments for our time and resources for years ahead of us and that is antithetical to the pace of technology, and emerging technology. (Museum Professional)

The slow pace of "museum time" (Provider) could also have impacts on project budgets. A provider shared how, because the stages of development for digital projects in museums could occasionally be stretched over a long period of time, in some instances the funds dedicated to such projects could be reallocated to other institutional priorities over the course of the collaboration, putting the digital project on pause or ending it altogether.

Beyond the overall length of museum project timelines, the difference in speed between cultures was also reported to present challenges during the development process itself. For example, a museum professional remarked that their institutional objective of ensuring that visitor needs were centered in the

design process could be at odds with some technology partners' motivations to finish the project as quickly as possible for financial reasons:

> Sometimes a vendor will want to start going with the digital solutions right away to make progress on a prototype that can be put on the market, and they try to accelerate the process. So, it is our job to slow that pressure down, because we are not working for the needs of the market, but the needs of the visitors. (Museum Professional)

Another museum professional described this temporal tension in terms of how the development process could be slowed down due to their external partners' lack of familiarity with the constraints of inclusive design. While inclusivity was an integral part of their museum's mandate, this participant remarked that private industry was typically only motivated to perform the bare minimum in accessibility design as required by legislation "because ultimately it is about budget" (Museum Professional). However, despite the implications for timelines and budget, some providers mentioned that requiring inclusive practices was "an opportunity for innovation" (Provider). Beyond the needs of visitors, participants also highlighted the particularities for the design of digital tools in the context of museum interpretation; as already explored, the guiding objectives for these interpretive projects could include helping visitors facilitate new understandings of the museum's collections and knowledge, as well as ensuring authenticity in the presentation of the subject matter. The time necessary to support these interpretation goals could create tension between partners: "There's a conflict with that authenticity and a commercial interest in just getting the job done and designing it well, and I think it's hard to marry those two" (Museum Professional). A participant described how this approach to developing digital projects was a different dynamic from creating a commercial product where "the goal to make every click profitable, leading to a purchase—of course we want visitors to come to the museum, but the goal is for them to learn something" (Museum Professional).

Yet another major manifestation of tension relating to different conceptions of time was reported concerning the slowing impacts of the museum approval processes and "stakeholder management" (Museum Professional). A provider shared how "complex chains of responsibility" (Provider) for validating the phases of development for digital projects within museums could impede the progression of the process. They reported a desire to maintain the momentum of the development work on a digital project: "We want somebody to make decisions with us relatively quickly; if they can't make decisions and they have to check all the time, that slows everything down" (Provider). A museum professional mentioned conversations with previous technology partners who had reported that these factors—differing

conceptions of time and complex validation processes—could mean working borderline at a financial loss as a way of operating.

5.3.3.2 DECISION-MAKING STRATEGIES

Participants reported that the structures for decision-making varied widely between different museums and could at times prompt internal tension within museum teams. A provider described the potential confusion surrounding their museum partners' approval processes:

> It is never the same decision-making process or the same role who makes decisions, and fundamentally can be pretty political. So sometimes you're working with the head of a department, but actually they've been sidelined and have no actual power even though they have the title of someone who could make decisions, so you end up needing to approach another person who will actually make the decision. (Provider)

For some museum projects, participants reported that there could even be multiple stakeholders in a project, making the management of these professionals an important issue in the development of digital tools. This issue was reported in various contexts, including in museums that were large in scale, supported through government funds, or operating under the umbrella of several different managing organizations. A participant described how managing stakeholders was one of the most complicated parts of working on digital projects within museum contexts:

> Who needs to know what, and when, and what exactly are you asking for in terms of feedback? What context do they need to have in order to feel informed on the decisions that they are contributing to? Every project that I have worked on has been different. And it is the hardest part of the job. (Museum Professional)

In highly bureaucratic contexts, the "structural and hierarchical obstacles that come with having so many actors [...] can make even something like installing Wi-Fi absolutely Kafkaesque" (Provider). Such institutions were compared to "heavy machinery" (Provider) that interfered with the working process. Therefore, participants reported that having the support of museum leadership and stakeholders for the both the digital project and its development, as well as the existence of systems for streamlining decision-making, had a positive impact on facilitating the collaborative process.

Given the effects on the collaborative process of complex validation requirements and stakeholder management, many participants shared their strategies to mitigate the potentially cumbersome impacts of these factors during the collaboration. These efforts could include early and regular communication with museum leadership and stakeholders to foster buy-in and to align priorities and objectives for the project, as described in 5.3.1 Communication strategies. While decision-making was reported in certain instances to happen in these conversations, some participants described the balance of maintaining regular communication with stakeholders while also not always wishing to solicit feedback or approval:

> But there are times where you have to manage a large number of stakeholders. But what we are decidedly not doing is we are not asking for permission a lot of times. We reserve the right to say no. We still want our colleagues to feel heard and understood. But again, resources are finite, and we have to decide, how does the work that we deliver match up with the organizational priorities? [...] Oftentimes some places will have steering committees. I'm often wary of design by committee. (Museum Professional)

Such approaches involved clear communication to manage expectations about the purpose of these conversations, as well as defined processes for making decisions in the development of digital projects.

The development process was often reported to include key milestones that were designated for engaging with leadership with the aim of obtaining their approval on the direction of the project, including regarding decisions about design and content. For some projects, this decision-making process consisted of the technology company submitting the current version of the project to their museum partners for review at previously defined phases of the development process. While allowing the project to progress forward, these validations could also correspond with payments to the companies for service provided at each phase of the project's development.

Some participants from museums reported implementing new administrative processes within their institutions to accommodate the development of digital tools through the streamlining of decision-making. A museum professional described designing a system where a group of stakeholders, including executive leadership, approved the digital project as a whole and its general direction. After this broad approval, the project could move forward with "tighter teams" (Museum Professional), because involving the executives in every decision would reportedly slow down the process. In this model, the participant described still holding weekly meetings with the stakeholder group to share the project's status updates, including what the digital team was making decisions on that week, and to gather the group's feedback; then the participant would present this information to their technology partner's team. They remarked that this

approach “instills trust and responsibility and ownership” (Museum Professional) and thus fostered favorable working relationships internally. Another museum professional echoed the benefits of the development of trust across departments: “We don’t just want a decision-making process; it’s really more about cooperation across all levels” (Museum Professional).

Other participants described approaches to project management that clearly defined the decision-making roles of the various collaborators on a project. For example, the RACI project management matrix was mentioned as a tool that helped the various actors associated with the project more clearly understand their roles: whether they were responsible, accountable, consulted, or informed. Such a structure clarified who was responsible for doing the work, accountable for making the decision, consulted for feedback about upcoming decisions, and informed about the decisions that had been made. Because different digital projects could each bring different collaborators into the process, these flexible working processes could facilitate the management of stakeholders across a range of projects.

On a broader scale, efforts were also described by museum professionals on structural level to standardize the process of managing collaborative projects:

> What are the systems that we have to build in order for us to do more storytelling and do less figuring out where this draft needs to go for approval? Especially at a big place, where there's just tons of stakeholders and every project is slightly different in who has a stake in it and why. So, we’re trying to standardize workflows, standardize internal communication, and standardize contracts. (Museum Professional)

This work of adapting internal infrastructures to facilitate these projects was perceived as a method to “professionalize our practices” (Museum Professional). This participant noted that their colleagues on other digital teams within their museum, such as those who managed on the collection databases, had “been very professionalized for a long time” (Museum Professional), in contrast to the evolving practices in the work of developing digital interpretation projects. The implementation of structures and systems was reported to be necessary “to better support the creative work that we’re doing” (Museum Professional), and to contribute to the professionalization of the field. This work could also require the potentially complicated work of merging previous systems; a museum professional described a situation where their team’s attempt to make a change in their working process brought up legal and contractual complications:

> This new idea, that is coming from a very necessary change, has created a mess—a knot of systems that have to be untangled—in order to do this more efficiently. And we still haven't figured it out. We've been doing this for years, and we're still working to figure out how to make this process more smooth. (Museum Professional)

While defining processes and roles inherently added structure to the development of digital tools, another participant described how this strategy was also flexible enough to sustain innovative developments as new challenges arose: "The point is not to hinder good ideas or innovation; it's just to ensure that those good ideas are fully supported and we can deliver the best possible product in the end for our visitors" (Museum Professional).

While the previous responses centered the interventions of museum professionals, providers also shared practices for facilitating the decision-making process when possible within the constraints of their collaborations. A provider described holding weekly meetings with their museum colleagues that included both discussions and decision-making, which reportedly helped the development of the project to advance quickly and steadily. This approach of regular feedback throughout the development process was also mentioned by another provider as a method to avoid situations where stakeholders requested major changes in the late stages of the project:

> But mainly we have to get the right people in the room at the right time, show our work early and often. [...] And so all our work in progress, all the backlog of tasks in the project management system, that's all visible all the time to our clients. They can go in, and they can read it, and click around on our work to date because we deliver it every two weeks in increments. And they can give feedback any time they like. [...] We record every demo we do. Everything is there for people to see. And we welcome feedback because without it, then you do get into trouble, because you're just getting it all at the end and there's no time left to do anything about it and nobody's happy about that. (Provider)

By making the current versions of the work accessible for review every two weeks, and by encouraging regular partner feedback, this partner worked to facilitate an aligned advancement of the development process. Another provider shared how they had adapted their practices to accommodate the challenges associated with working with museum professionals with such heavy workloads in their roles that it was difficult for them to be fully invested in the project's development:

> In most museums, the people that we're working with directly already have a job. And the projects we're doing are usually of a scale that could be somebody's job: they're big and long and complex and public. That's a tricky thing. So, if somebody doesn't have time, what we do then is agree with

> them that we're going to take on even more of this than them, and we'll make it basically so they just say 'yes, yes, yes, no'. (Provider)

Through the facilitation of their partner's ability to make decisions, the provider adapted their working process to maintain the project's momentum in light of the realities of working with diverse museum teams with varying degrees of resources available to dedicate to the collaborative process.

5.3.3.3 LIMITED RESOURCES

The perception that museum professionals working on digital projects often had limited resources in terms of time and capacity was prevalent in many participant responses. Managing these digital projects could be complicated due to the heavy obligations and responsibilities of museum staff: "People who work in museums have tons of work and are under a lot of pressure" (Provider). As mentioned in the previous section, some providers described how they worked to support museum teams by facilitating the decision-making process and streamlining the development process. A provider described how the flexibility inherent to the structure of their company gave them more capacity than their busy museum partners to adapt the development process to enhance the digital project, such as by integrating the company's work with that of another vendor collaborating on a separate project for the same museum:

> And so sometimes in these organizations, they're big, there's lots of people, and funding comes in quite traditional ways sometimes. For some projects, you get project-related money, and it has to go to that project, which can mean there isn't always that ability to take advantage of two [digital project collaborations] that might be happening at the same time. We try and find out basically what's happening and how we could maybe influence or benefit other people because we're doing a lot of work anyway. And we as a company can probably be more flexible sometimes than people who are on staff. (Provider)

The limitations of time that museum staff could dedicate to these projects also had implications for the types of digital tools that were developed; a museum professional mentioned that the projects they took on needed to support defined institutional objectives because "we are not there to do digital for digital's sake, there aren't enough of us for that" (Museum Professional). As explored in 5.2.2 Reasons for entering into a partnership, limitations in internal capacity to develop digital tools could directly impact how much museum teams needed to depend on external partners.

Several participants described how museum teams could modify their approaches to the collaborative development process based on these realities. For example, a museum professional described how, due to the small size of their team, the speed of the development process could require an adaptation of the project's scope:

> There's push and pull based on what the scale and scope is. Sometimes we need to make faster, and the whole thing shrinks. But often for us it spreads, because we only have so many people to create that content and they're also doing other work. Our schedules get longer to do the same work. (Museum Professional)

The limitations on "internal bandwidth" (Museum Professional) within museum teams could also be accommodated by restructuring the development process, such as by separating it into distinct phases that could be spread out over time. Conversely, the presence of a well-resourced team within museums was associated with the capacity to move more quickly, due to a relative lack of administrative barriers. A museum professional described how experimentations with digital technologies were facilitated by the structure of their digital team, including its size, lack of complex validation requirements, and subsequent rapidity: "We manage everything, we don't need to get everything approved. It all moves pretty quickly, but also follows a structure. We have a small team, so things move fast" (Museum Professional). Several participants described how such museum teams often featured both internal cohesion and flexibility in terms of roles: "It's smaller teams where they wear a lot more hats than usual—once things get functionalized, then process starts to get in the way" (Provider). These adaptations that enabled museum teams to be well-resourced were often reported to be possible due to support from institutional leadership. However, museum professionals in leadership positions were also reported to have limited capacity due to large workloads, making it difficult to focus on a wide range of institutional issues at any given time:

> Basically, a CEO can do four things at once, maximum. And so, if you're going to say, 'Let's do innovation', particularly in the tech and digital space, one of the current four things has to go and be replaced with that. So, what is it going to be? Is it going to be labor issues? Is it going to be capital works? Is it going to be relationships with stakeholders? What one are you going to drop? And that is really tough. (Museum Professional)

As seen in previous responses about the impacts of funding structures on the ability of museum teams to adapt during the development process, several participants described how financial limitations could inhibit the progress of these collaborations and cause stress between partners. A provider shared their experience working on museum projects with lower budgets, sharing how the work required for these

projects had often been underestimated from the beginning. In such cases, the lack of in-house expertise or the requirements of strict funding structures impeded their museum partners' flexibility to adapt:

> When you have these low budgets, that usually ends up meaning projects take longer. There's a lot more back and forth between the agency and the museum. And you might not have the people on-staff at the museum who have the depth of experience and understanding. Or they do have the depth, but they have a very set budget. Usually these are fixed fee. Almost all the work that we do is on a time and materials basis. So, we give good faith estimate of what it's going to cost, but oftentimes we have to go back to clients and say, 'Hey, because of this, this, and this, it is going to cost more'. Or 'You asked for something that was different than what's in the proposal, and we can do that, but it's going to be another X amount of money'. And typically, with smaller organizations, it's a fixed fee contract. And so, what often ends up happening is that it becomes less profitable for the agency, and it becomes a real struggle for that relationship, just trying to get everything that they need from a small budget. (Provider)

These dynamics caused by differing financial structures could lead to tensions between partners, both by increasing the time these projects could take and subsequently decreasing the potential financial gains of the technology partners. Underestimated and inadequate budgets could also impact the quality of the resulting digital tool: "Sometimes a company realizes they can't make it how they wanted to because the costs are too high, and then the museum can't go where it wanted to go" (Museum Professional).

In addition to limitations in time, finances, and capacity, participants also described limitations in agency for some museum professionals. If these professionals did not have the support of their institution to be empowered to make decisions about digital strategy and practices, challenges could arise when trying to advocate for their positions during the development process. For example, a participant described how complicated it could be for certain museum professionals to argue for strategic uses of digital tools when their leadership requested 'shiny objects' and trendy technologies: "Fighting back against stupid ideas when you're a low agency digital worker in a big institution is super hard" (Museum Professional). These dynamics could also impact museum professionals on an individual level. A provider observed that a museum professional's willingness to take risks with emerging technologies could depend on "how the person is positioned in their institution and the internal HR culture" (Provider). If failure came with negative professional consequences, certain professionals could be wary of taking risks. In these contexts, participants noted that the fear for their job security could influence museum professionals' decisions in the development process.

Some participants mentioned how the limited capacity of technology partners could also impact the collaboration. A museum professional described experiences working with companies that were engaged in many projects at the same time without adequate resources. If the museum's budget had not been set high enough, this participant observed that these partner companies might not have enough time or motivation to devote themselves to the collaboration. Besides making the museum team feel like their project was not valued or prioritized by their partner, this dynamic could also lead to wasted resources: "The whole project will be a struggle because the company won't spend time on it, and then we'll have to spend time asking for modifications" (Museum Professional). Additionally, limitations on the capacity of professionals within vendor teams could have an effect on the development process. For example, a participant described a situation where a museum wanted to make adjustments to work delivered by their partner, but the only employee in the small company who was qualified to make the modifications was unavailable due to their involvement in another project.

5.3.4 Summary

As explored in this section, the third category of the conceptual and analytical structure, *During the collaboration*, was composed of three analytical subcategories. The first subcategory, *Communication strategies*, explored the importance of establishing communication practices in the initial phase of development, cultivating trust and buy-in both between partners and within the larger context of museum colleagues, and approaches to communicating effectively across sectors. The second subcategory, *Development practices and processes*, presented the various phases of project development—including definitions, discovery, design, and development—, as well as strategies for managing these projects and the dynamics that occurred during the collaborations. Lastly, *"Clash of cultures"* explored commonly reported areas of tension in these partnerships, such as differing conceptions of time, the complexity of museum decision-making structures, and the impacts of limited resources on the development process. The summary of this section can be found in Table 5.4:

During the collaboration	Communication strategies	Establishing communication
		Cultivating trust and buy-in
		Communicating across sectors
	Development practices and processes	Definitions and discovery
		Design and development
		Management strategies
		Collaboration dynamics
	"Clash of cultures"	Conceptions of time
		Decision-making strategies
		Limited resources

Table 5.4 *During the collaboration:* third category of the conceptual and analytical structure of the research findings.

The work of developing digital interpretation tools for museum visitors involved the strategic implementation of processes and practices to effectively integrate the skillsets and knowledge of each partner. Participants shared the approaches they utilized to facilitate communication and 'translation' across sectors, cultivate trust and buy-in, design and develop digital tools that met the needs of visitors and institutions, and manage all the actors and tasks that were involved in the process. However, there were still major foundational differences between museums and technology companies that could cause tension between partners in the development process. The practices for collaboratively working in partnerships could have impacts on the relevance and quality of the final digital tool that was developed. The following section explores the themes that arose in participant responses concerning the final phase of the collaboration, when the project was launched for visitors after the completion of the design and development process.

5.4 After the launch of the digital project

The active work of collaboration during the development process of the digital product was followed by the operations phase, where the project was launched and available for use by museum audiences. Participants described different areas of reflection and configurations for collaboration occurring in this phase, including continuing the working relationship through various structures, building internal capacity to manage these projects within museum teams, planning for the operational phase, and supporting the lifespan of digital projects over time.

5.4.1 Collaborating after the launch of the digital project

A reoccurring theme in participant responses was the changing structure of the collaborative relationship between the museum and the company after the digital product was launched. Participants reported diverse configurations for how these relationships could continue in the operational phase.

5.4.1.1 ON-GOING SUPPORT

Several participants described how at the beginning of the collaboration, when the museum and provider entered into their initial agreement, a warrantee or a provision for maintenance services was included in the contract for a period after the project's launch. Such an arrangement prolonged the working relationship between the company and the museum after the product's delivery, detailing how the company's team would be available to provide certain levels of support, and specifying the duration and scope of included services. Several subjects mentioned that the inclusion of this warrantee period was often a standard part of many of their collaborations: "There's always some sort of duration guarantee in terms of hardware, software, and how long we'll provide support" (Provider).

The scope and duration of support after the project could depend on the institution's needs, objectives, and budget. For some projects, the operations phase included regular and active involvement from the company:

> We monitor according to a specified timeline. So pretty close monitoring at the beginning. And after that, we monitor at certain intervals, depending on the size of the institution. For [a large art museum], the intervals are very short. (Provider)

Other participants described companies that were retained to provide support as needed if issues arose with the functionality of the project. These interventions could even take place remotely when the company was equipped to manage the product from a distance: “We can reboot the system if something's not working, our programmers can help them on the technical side of things” (Provider). This provider specified that remote continued support work was facilitated by clear communication and established working relationships with the museum staff on the ground.

Beyond support for problem mitigation and on-going modifications to the product, providers also mentioned participating in media communication around launched projects:

> Afterwards, for the marketing communication to publicize the experience, we did interviews. We went to the museum often to talk about the [project] for TV, radio or broadcasts, often in collaboration with [the museum]. So, there was this aspect of creating visibility for the exhibition and for the experience we'd created. (Provider)

The provider expressed the importance of marketing and communication in this later phase of the collaboration, and the notion of “creating visibility” (Provider) for the project. Other participants echoed the importance of publicity for the digital tool, including a museum professional who described communication efforts as a “huge aspect of the project” (Museum Professional), contributing to the success of the digital experience that had been produced. In this perspective, the project’s *visibility* was seen as a benefit for the objectives of both the museum and the company, in alignment with the discourses of digital imaginaire surrounding the potential of digital tools to participate in marketing efforts, as explored in 5.1.1 Relevant uses of digital tools for museum interpretation projects.

The operational phase could have the potential to contain ambiguity around issues of responsibility for dealing with issues, including when a project involved collaboration with a group of companies who were subcontracted. According to one subject, communication around these issues amongst providers could be complicated:

> It isn’t a phase that’s perfect yet with all the different players involved, because there are often gray areas. For example, who is responsible for the physical installation of the equipment? [...] We often have service agreements with the institutions, but again, when it comes to who is at fault,

> it's hard to have the agreement accepted or respected. And sometimes there's more time spent figuring out who is responsible, rather than repairing the issue in five minutes. (Provider)

This dynamic resulted from a lack of clear structure that defined which actor was responsible for which part of the operations work or problem remediation, resulting in communication efforts that could take more time than it would have taken to repair the actual issue. In these cases, coming to a decision could require reaching an agreement between different providers without a clear process to guide the choice.

Evaluation was another modality for a continuation of the collaboration between companies and museum teams. However, while several participants mentioned the importance of conducting evaluations of launched projects to determine their success in meeting objectives and to gauge the impact on visitors, and other participants described their informal evaluation of these products, most responses did not address this area in the context of collaboration with their partner. One provider described how their company's team includes a role within projects where an employee is responsible for overseeing the project once it is launched, tracking how it has been used, making recommendations, and creating evaluation reports. In their process, there were different phases of evaluation, including six months to a year after the launch, to track the previously identified performance indicators as way to measure the success of the project. Another provider mentioned how visitor evaluations conducted by their museum partner had led to the museum team requesting an update from the company of the user interface in the digital product. Yet another provider remarked that in their experience, their company would often only conduct an evaluation of a project if the experience wasn't performing well with visitors. However, while they didn't have their own standard evaluation practices, their team would often ask their museum partners to share any evaluation results with them.

5.4.1.2 FINANCIAL FACTORS

A unique structure that involved continued partnership after the launch of a digital project was the co-production model. Subjects described two main phases in this model when used in museums: the initial context where the project was presented an in-situ experience in the museum, and the second phase of distribution of the project outside of the institution. A museum professional explained how when the digital experience was hosted at the museum, the company and the museum shared the revenue based

on their contributions. However, when the project was hosted elsewhere, a third partner was brought in to manage the hosting responsibilities, and all three parties shared in those revenues:

> When the two of us are operating this project—[the company] and [the museum] during [the exhibition at the museum]—we will share the revenue between us, based on the percentage of our contributions in production, communication, security, the coat check, scientific expertise, headsets—we divided all that up. And so, when it goes elsewhere, for example in another city, we are not going to do the scenography, we won't be doing the security, the coat checks. We will look for an operating partner and then there will be three of us. And the operating partner will invest in the functions and positions that I just mentioned, and will receive the revenue. And as co-producer, we will receive a percentage of the content license. Because we are co-owners of the content with [the company]. (Museum Professional)

The latter phase of the co-production model involved a transformation in the partnership between the museum and company, with different modes of engagement and roles, and included the need for additional partners. Another museum professional mentioned that this phase required the museum to put trust in their partner to understand the potentials for the production, because this co-producer managed the distribution of the project to other sites which also determined the revenue and communication potentials for the project.

In other models of partnership, the financial implications of the companies' continued support in this phase could also impact the nature of the collaboration. For example, some providers mentioned that their companies offered a standard warranty period for these projects; however, as one museum professional remarked, any work done by the company in that context could be seen as a financial loss to the company:

> There's no economic incentive for [the company] to really think about that [maintenance] because they're getting paid for their ideas. They're getting paid for design. They're getting paid for launching. At this point, we're a liability for them because we're in the warranty period with them, but every hour they spend on this now, we're not paying them anymore, so it's a loss for them. (Museum Professional)

The subject's remark that the museum may be seen as a "liability" (Museum Professional) by the company if the project needed maintenance support communicates the potential for a transformation of the collaborative relationship in the operations phase, where a company's perception of the standing of their museum client could shift from *partner* to *liability*.

Several participants mentioned that continued support by the company was a service that could be acquired with a continued financial engagement. One provider mentioned offering a subscription plan, where museums could choose to sign up for continued support fixing issues and giving feedback after the product was launched. At the end of the first year, the company and museum would have a meeting to assess if the museum was satisfied with the service and if they wanted to renew the subscription. The participant reported that, in their experience, museums often renewed this service. Another provider shared that when their company worked with larger museums on projects, there was often an expectation that the company would be retained to support the product on an ongoing basis after the launch. These maintenance efforts could take hours of billable work a month, and they could also include new development work, which this provider suspected could be too expensive for smaller museums. Continued financial engagement could potentially prohibit museums with limited budgets from accessing sustained support from companies.

While most financial arrangements for continued support by companies involved payments from the museum, a provider mentioned a project that their company had been developing for a museum that they hoped could be a prototype to be adapted for future museum clients. In this case, the participant reported that the company was providing ongoing improvement work to fine-tune this project in a manner that was different from other launched products.

5.4.2 External support and internal capacity

When discussing the collaboration in the phase after the launch of the digital project, participants described diverse approaches to the role of the partnership. While some participants extolled the benefits of prolonged relationships between museums and technology companies, others emphasized the importance of developing the internal capacity within museum teams to manage the maintenance of digital projects.

5.4.2.1 CONTINUED COLLABORATIONS

Participants described the modalities of continuing collaborative relationships past the development and launch of a digital project. Several providers mentioned their companies' mission to continue nurturing the relationship with their museum partners, even beyond maintenance agreements and formal partnerships. One provider mentioned that their company offered a standard one-year warranty with their projects, but they were open to creating structures to support museums in addressing their changing needs within their particular budgets. They spoke about a museum team who came back to the company almost a decade after a collaboration on a digital project. The company provided the museum with a digital strategy consultation, helping the museum determine how to refresh their digital project which required replacing old equipment and updating experiences, deciding what could be kept, and how to re-envision the space at this stage within their organisation:

> We don't see it as a one and done. It's about nurturing a long-term relationship with the clients. And they don't always have the money to do another big project, but they still need to be supported, and they might have little bits of money along the way to upgrade an experience, to update the content. (Provider)

This theme of maintaining a relationship between companies and museums was echoed by certain other participants, both providers and museum professionals. Several participants mentioned the informal communications that took place between projects, including conversations with former and potential partners. One provider described the activities related to their business development work, which included checking in with clients to see if there were new projects coming up and assessing how they felt about their current projects. Another provider mentioned that while the majority of their company's collaborations with museums for large projects continued with maintenance agreements that lasted over many years, the company retained detailed knowledge about different museum projects and was open to sharing it with museum teams even beyond the scope of their active collaboration:

> To be honest, we're never not going help somebody out if they ring us. Probably the longest one I remember is about eight years later, somebody said, "Hey, I'm trying to change this thing" and I had to dig out my notes to try and remember. That kind of thing happens from time to time. In some ways, I'm convinced we know more about the [digital product] than anyone else who works there. Because our people haven't gone anywhere and our retention rate for our staff is high, so people remember all these things, and we have all the right backups. So, we we've definitely handed over things that museums don't have anymore, that we did have. (Provider)

Due to the stability within this company and its personnel, the provider was able to provide museum teams with elements and knowledge that the museum team may not have conserved internally. The participant's notion that they were "convinced we know more about the [digital product] than anyone else who works [at the museum]" (Provider) illustrates how emmeshed companies and museums can become when collaborating on digital projects. As explored in 5.1.2 Reasons for entering into a partnership, these sustained cross-sectoral collaborations could create hybrid spaces:

> All these companies have worked with museums for quite a long time. A lot of them, they basically work in museums, effectively. I don't know how many [museum digital projects] I've built, a lot, and probably more than anyone who works in a museum. (Provider)

This dynamic was described by a museum professional whose institution had an ongoing partnership with a company that had lasted over several digital projects: "Honestly, it really felt like [the company] became our extended team, and I think that's one of the reasons that we continue to work with them" (Museum Professional). This conceptualization of partners as an *extended team* reveals how integral these collaborations could be to the roles of museum professionals and the infrastructure of digital departments. On-going collaborative relationships between museum teams and technology companies were perceived by some participants as highly beneficial:

> There is definitely a magic to partnerships, and I think that might be why we work with people for a long time. If you find somebody you work well with, that's worth more than a lot of the other things you might try and figure out along the way [with a new partner]. (Museum Professional)

However, many participants observed that this dependence on external partners was not without risk. On the most basic level, the company may cease to exist: "If you have a highly engaged type of digital solution, the provider must continue to exist. And today, the majority of solutions involve stronger engagement than before" (Provider). This provider's observation that many collaborations involved stronger commitments with partners than in the past, including some cases where part of the digital solution belongs to the company, meant that these relationships must last over an extended period for the project to continue. Other participants mentioned situations where companies did not prioritize their customer support after the project's launch and were not responsive to museum teams, leaving them with projects they could not maintain. And if the company was no longer available to continue their support—for example, if it shifted its operations, changed its systems, increased its pricing, was acquired, or ceased to exist (including closing due a pandemic)—, the museum team could find itself in a position of needing to obtain support elsewhere or, in some cases, risk the elimination of the digital project altogether. A

museum professional described their experience with this latter dynamic: “We did it in a way that we weren't deciding its future. And so [the product] disappeared; it splashed, left ripples, but sunk” (Museum Professional). Being dependent on an external partner could remove varying degrees of control and autonomy from museum teams regarding their visitor-facing digital interpretation projects.

5.4.2.2 BUILDING INTERNAL CAPACITY

While the previous section shared participant perspectives on the modalities for a continued collaborative relationship between the museum and the company in the period after the project’s launch, another theme that arose with participants was the internal capacity of museum teams to maintain and operate the digital product without depending on the on-going support of their external partner. This theme was mentioned by participants regarding both projects that anticipated a continued collaboration and those that did not.

In some project agreements, there was no provision for continued collaboration in the operations phase. One provider described how the launch of a project for a large museum with a robust digital team marked the end of their formal partnership: “They were always going to take that over as soon as we finished, so we didn't have a maintenance agreement with them. They have a big internal team with developers, so they have the capacity to manage that” (Provider). This approach could depend on the modalities of the ownership of the work, whether that be digital assets or code. For example, one provider mentioned their company’s practice of including joint ownership of projects that were built in collaboration with museum partners in their contracts: “So [the museum partner] can do whatever they like with the thing we make, and we can do whatever we like with it” (Provider). In this structure, museum partners theoretically had the capability to sustain the life of a digital product beyond partnership with a vendor because the technology was not solely owned by an external company. Other participants described situations that involved licensing fees, both one-time and on-going.

Cultivating internal digital capacity within museum teams was seen as essential by many participants. One provider remarked that a “good provider” (Provider) helps museums implement new ideas that museum teams are subsequently capable of maintaining in-house afterwards:

> Museums have to build the skills in-house to be able to run those things once they're alive. Because what often happens is the museum runs out of money, or they're not necessarily funded for the long term beyond that project. So, the thing, by default, will die, very quickly. And if you create a crutch which requires you to pay a firm to keep something going, you quickly resent that. And then it doesn't take very long before those things ultimately get retired. So, the better way is to use firms for new ideas, for implementing new ideas, and then building the capacity in-house for running and operating. (Provider)

A strategic use of collaborations with service providers was proposed by this provider, where these partners brought new ideas that the museum team then operated and maintained. And long-term reliance on an external partner was seen as a "crutch" (Provider), in a perspective similar to the wariness of dependence on external support expressed at the end of the previous section. Other participants shared this hesitancy to depend on partners "in perpetuity" (Museum Professional) to maintain digital projects that were designed to last for years. However, as already explored, building sufficient in-house capacity to manage digital projects had major financial, personnel, and infrastructure implications for museums.

Several subjects shared how service providers could contribute to building their museum partners' internal capacity to maintain specific digital projects through a transfer of knowledge, either at the moment of handing over the project for the museum team to operate or at the beginning of the warranty phase of a continued collaborative relationship. These participants described how a knowledge transfer entailed the company training the museum on how to maintain and operate the digital product and/or providing relevant documentation, such as training manuals, licences, and warranty information. One provider described these steps as the final phase of their collaborative process with museum partners:

> We're putting together operations manuals; we're training the clients on operating the experiences. And if they have a content management system to update content, making sure that they know how to do those things. Providing any of the closing documentation such as assets and licenses related to photography. (Provider)

The knowledge transfer was described as adapting its form to meet different levels of capacity within museum partners to remediate and operate digital projects, from a "manual for [the museum team] to follow to fix the main things" (Provider) to training sessions where a company's developers would meet with a museum team to "train them and educate them on how things were done, how they were built, but also processes used, like Agile, or code development management via GitHub and software version control" (Museum Professional). Without this transfer of operating knowledge, museum teams could find themselves in situations where they lacked sufficient understanding to continue maintaining their projects;

a provider described a situation where a museum had not been informed by their partner that they needed to validate their mobile application in an app marketplace each year, resulting in the removal of their app from the online platform.

Another museum professional remarked that this knowledge transfer could also be seen as a method of avoiding dependence on external partners:

> By and large, what we do is a knowledge transfer, written in as part of the engagement, where all relevant documentation and training materials get handed over to our team so that we can remediate as we need to going forward—and not have to be at the mercy of calling the vendor six months from now to figure out who's there who can help us. (Museum Professional)

In the case of this museum professional's institution, a knowledge transfer was included in the initial contract with the provider as part of the museum team's standard practices for collaborating with external partners on digital products. While this perspective again demonstrates a hesitancy to be "at the mercy" (Museum Professional) of a vendor's availability to support the museum team on a long-term basis, it also shines light on another reoccurring theme in participants' responses: the importance of planning and designing for the operational phase from the beginning of the collaborative process.

5.4.3 Operations and lifespan

Participants described strategic approaches to the operational phase and an intentional approach to the lifespan of digital projects, including reflections on sustainability.

5.4.3.1 OPERATIONAL STRATEGIES

Both museum professionals and providers commented on their practices for planning the operational and maintenance phase from the beginning of their collaboration process. This was the case in both partnerships that extended beyond the project launch and those that ended with a hand-over of the product management to the museum team. Plans for the project's sustainability at the beginning of

product development were seen by some participants as an inherent part of the process of collaboration, as one museum professional stated: “Any vendor worth their salt is helping a client think through [maintaining the product]” (Museum Professional). The successful maintenance of these projects, including rapid remediation of any issues that arose, was also reported to be an important element of cultivating institutional support for digital projects and practices, including by building trust with museum leadership: “They trust us because nobody has patience for tech that doesn’t work, so we make sure the experiences work” (Museum Professional). This approach was also described by a provider as a form of “risk mitigation” (Provider): while there may have been additional costs initially, such as running wire to connect a digital installation to the internet rather than relying on the institution’s Wi-Fi, these efforts helped ensure that these digital products functioned properly. A museum professional described the potential tension between designing digital projects that were innovative and experimental, but also sustainable over time in the operational phase:

> My job is to make sure that all the crazy stuff that we built keeps going, doing its job. It’s a maintenance thing. It's not super fun or sexy to think about, but that's the kind of thing that, for an operating museum, we have to care about. And so, the design process versus the operational process, I think those are at conflict sometimes. Because the decisions that are made just to get the thing done and launched and moving forward might be in opposition to making sure that it's stable and continues to work. (Museum Professional)

In this context, the tension between “the design process versus the operational process” (Museum Professional) was also occasionally reported to be a contrast in motivations and temporalities between museum teams and technology companies.

The two main types of considerations for this phase were described by one provider as “operational requirements” and “infrastructural requirements”, both of which were taken “very seriously at the outset of the project” (Provider). Some participants identified these requirements through a discussion of the museum’s needs and capabilities for managing the project after its launch, including the “day-to-day reality of what this will be like for them to maintain five years from now” (Provider). These realities could include the budget (for example, salaries for the staff members operating the product or the costs of replacing equipment) and digital infrastructure (for example, in-gallery internet capabilities):

> If an organization is really small and doesn't have an IT person and doesn't have a very big operating budget, then I would hesitate to recommend an immersive room full of projectors because I know that is going to be difficult for them to maintain. I might make a recommendation to create an experience that is based on tablets, because tablets are inexpensive to buy originally

> and then they are inexpensive to buy additional ones if they need to continue to buy more equipment. (Provider)

Another operational reality mentioned by participants was the museum's in-house capacity to manage digital products. This aspect was mentioned by both museum professionals and providers as an important consideration for the design of the project, with some subjects describing the need to design digital tools with the needs of both visitors and museum staff members in mind:

> Sometimes there can be a tendency to focus on just the visitor needs. But you've got an audience over here of the staff, and they are absolutely an audience that we need to work with, understand their needs, and make sure that what we're recommending and suggesting are appropriate to their needs. They are going to be the ones that will be holding this at the end of the day and will help what we create be successful or not. (Provider)

One approach mentioned by participants for designing a digital project that would be sustainable for museum teams to manage was to make maintenance "as easy and automatic as possible" (Provider), which could include building systems that facilitated the acts of rebooting screens and updating content. This latter aspect—designing for the easy updating of content by museum teams—was seen by some participants as important for the operational sustainability of these digital tools:

> If you didn't make your interactive or experience easily updateable, that's an issue that should have been a conversation initiated by the vendor from the outset. I think that's our responsibility to say, 'We need a CMS[1]'. (Provider)

The ability to update and modify content in digital projects was often associated by participants as a modality to prolong the tool's lifespan, both by creating new experiences using the same tool and by maintaining the content's relevance and accuracy. This could require the allocation of staff time and resources to create a "production pipeline" (Museum Professional)—or the "internal infrastructure to be able to generate content" (Museum Professional)—after the launch of a digital project, or the allocation of funds to outsource the production of new content to an external partner.

[1] Content Management System.

5.4.3.2 PROJECT LIFESPAN AND SUSTAINABILITY

Despite some exceptions, such as certain products developed specifically for time-bound events like temporary exhibitions or as experimentations, many participants described sustaining the longevity of museum digital projects as an important objective:

> Because in the museum industry, the ask is often to have a very long lifespan for the exhibit that we're creating. They want them to last for 6 to 10 years. And that is a long time for an exhibit to exist in the field and to be heavily used by visitors throughout that time. (Provider)

One reason mentioned for this objective was the realities of museum funding structures. A provider described how their museum partners would often "get funding once and then they have to operate with that for a couple of years" (Provider), which motivated the provider to build digital products that were both innovative as well as "stable and scalable over time" (Provider). Another reason for aiming for longevity within digital tools was to support the broader guiding mission of museums; a provider noted how the 2022 ICOM definition of museums (ICOM, 2022) added the term "sustainability" as an essential objective for these institutions to foster.

The term *lifespan* was used frequently in regard to these digital projects. Several participants described digital products as "living things" (Museum Professional). This was mentioned in the context of the continued potential to update and augment digital projects after their launch: "We're not publishing a catalog. We will continue to build refined things, experiment and measure and respond accordingly" (Museum Professional). However, this *aliveness* was also described in relation to the need to constantly monitor and update these digital projects as they evolved and changed over time:

> We are going to have a project which we will absolutely need to update for many reasons: security reasons, reasons of obsolescence- but not only technical obsolescence, it could also be obsolescence of design because design habits have changed. [...] And if we want there to be life, we have to remove all the parts that we don't know how to manage. So having equipment that can last a long time, standard screen formats, and all sorts of things that allow you to have a sort of view for ten years, which is already good. (Provider)

According to this perspective, sustaining the lifespan of digital projects involved planning, design, and the internal capacity of museums to maintain these products. The various perspectives on the *aliveness* of digital projects highlighted the inherently evolving nature of digital technologies, and the need to think about their future, including through potentially allocating a significant portion of the project's budget for

maintenance and modifications. This work could also be complicated if there was a continued reliance on external solutions to support the digital project's lifespan: "Like a hammer that changes a little bit every day, and you are renting it so you can't really do anything about it" (Provider).

A provider described product lifespans from three perspectives: technical, content, and replicability. Technical lifespan included the longevity of the project's hardware and software, while at the same time keeping in mind that "issues are inevitable" (Provider) over the course of years. Content lifespan covered the ease of updating and modifying the content of a digital tool, such as with the inclusion of a content management system. Lastly, replicability increased the lifespan of a digital project when the framework allowed it to be repurposed for different applications within the museum, so that the digital tool "can endure" (Provider). Participants shared practices for designing tools that could last over long lifespans, ranging from avoiding elements that were "too bespoke" (Museum Professional) that might be difficult to replace years later, "steering away from emerging technologies" (Provider), developing easy-to-use content management systems, and aiming to avoid "trendy" designs and instead focus on "timeless" experiences that wouldn't "look very outdated very quickly" (Provider). A provider mentioned how the digital content they produced often provided important information about collections that could be stored in museum archives; their company thus chose to produce digital assets at a higher quality than current devices were able to display, anticipating that as time progressed the content would still be relevant for more powerful tools in future projects. Maintaining and augmenting the lifespan of digital products was also seen as a financially responsible approach: "If we think about the costs of physically producing a new exhibit versus repopulating a content management system, there are solutions that can be really responsive to visitor needs" (Museum Professional). This approach to digital projects was compared by a provider to having an architectural, rather than purely aesthetic, perspective:

> The challenge is when [museums] just focus on that surface layer, what I would call the 'paint layer', and not on: What's it going to cost me to run it? How am I going to run it? How am I going to maintain it? Can I change it out to be different content? [...] It's like a house. If you just buy a house based on its interior decoration and the paint and the ambiance, and you can't see the possibilities for changing that, that's not enough to buy a house. For example, if you don't maintain the garden, guess what, the garden gets overgrown, so it only looks like that for 5 minutes. (Provider)

The provider noted that the tendency in museums to gravitate towards "shiny experiences" (Provider) was a point of tension when working with some technology companies that they did not see when working with other industries. They encouraged museum teams to partner with technology architects to build

projects with a focus on maintaining and re-using digital products, which required an understanding of technical infrastructures that could facilitate a longer product lifespan.

This long lifespan had implications for the museum staff responsible for managing the digital project over time. Even when there was a warranty period after the product's launch, or when the partnership between museum and company was anticipated to continue for many years, the museum team was ultimately responsible for maintaining the project in the long term on behalf of the institution. According to one museum professional, it was imperative that their team be able to give input on the design of a digital project that would subsequently be under their management:

> Generally, there's a warranty period after the final product is delivered to us, so that [the partners] are still around to provide support. But it's really on our team to maintain and manage the product long term once it's delivered. So that's why it's important that, at the outset, we have input in software or the hardware that's being delivered. (Museum Professional)

For this museum professional, the ability for their team to provide input on practical considerations was a recent development following a shift in the organisation's infrastructure. Previously, the design of digital projects had been embedded in other departments, and the digital team would "just get handed the thing after it was completed by an external firm" (Museum Professional). The ability to participate in the design process and give a voice to sustainable practices for in-house maintenance was seen as a valuable part of the development of digital products.

Some participants reported that it was not always possible to work towards optimizing the sustainability of a digital project. For example, a provider shared how they were not always able to intentionally integrate practices that would support the longevity of a digital project over time, despite believing that this would add value to the museum, "because we're trying to meet the goals of the immediate project at hand" (Provider). Other participants mentioned the substantial financial and infrastructure requirements needed to support a digital project over time:

> Museums need to have a substantial enough budget to keep things going. To keep things fresh. To have that infrastructure to maintain it over this amount of time. And things change very quickly. I think the team supporting it really understands the investment that's required. But that may not be understood by people higher up in the organization. Digital is everything right now. It's how we communicate, it's such an integral part of museums right now. But still the investment isn't there, coming from the top. (Provider)

This perspective highlights the perceived importance of having support and investment from museum leadership in sustaining digital projects and practices. This view was shared by multiple participants, including a museum professional who worked with the executive level of their institution to "build up the internal capacity of the organization to do this work and align our resources efficiently" (Museum Professional). This approach also entailed being strategic with the allocation of investments in financial resources regarding staff salaries and vendor fees:

> In museums, they treat everyone they're paying as a vendor outside as 'expensive'. As though they don't pay their people, which of course they do, but they don't look at it that way. [...] So it manifests in a number of different ways: they're not paying enough, so they're losing people, therefore they actually have to pay more to go with other companies. But they're also not making the right decisions about where they spend their investments. So, they might see something that's, say, $10,000, and be like, 'Oh, I'm not spending that'. But meanwhile, they might be paying $80,000 to a staff member to do it manually. (Provider)

The priorities defined by museum leadership regarding the division of labor between museum staff and external partners were reported to inform the structure of digital teams and the decision of how to engage in external partnerships, as well as the sustainability of digital projects.

Additionally, in regard to the adaptations within museum teams to facilitate the development and maintenance of digital products, several participants observed that these changes and learnings needed to be integrated into institutional infrastructures to make projects and practices truly sustainable. In this approach, digital projects should not be built that were dependent on the current team or current partners for their on-going existence. A museum professional described their colleague's perspective on sustainability through infrastructure:

> Something they talk about with some regularity is: we must not build a car only we can drive. They've had experiences where they've built institutions or structures 'in their own image'. And then they moved on and the experiences disappear or fall over. Or they've had things that are built so closely around certain personalities or certain partnerships that when those partnerships fall over, there's damage to the momentum of the institution. (Museum Professional)

This dynamic was also described by a museum professional in an institution where many established digital projects were no longer operational after a large turnover in the staff of the digital team: "The culture hadn't been embedded, and subsequent people didn't have the specific technical competencies needed" (Museum Professional). As explored in 5.4.2 External support and internal capacity, there could be a risk in depending on individuals or external partners to ensure the future of the digital projects. Beyond

building internal capacity within museum teams, this perspective advocated the strategic development of digital projects that built institutional agency and sustainability:

> So now we're in the process of building things that have never been built before. And I'm really mindful that they are built in such a way that we're not dependent on other entities and their continued interest, or dependent on specific individuals or moments in time. I'm now doing change slower and more methodical, and on a 10-year horizon, rather than on a 'one year, how fast can we go' horizon. So, it has really changed how I work on something that is transformative. [...] So where it might make sense in other moments to just put [a project] in the cloud—it's slightly cheaper—in our institution, in this moment, we've decided not to do that and specifically to spend more money and more time, but do it in a way where there's no dependencies. (Museum Professional)

This strategy of avoiding dependence on specific actors by approaching digital projects "slowly and methodically and through the lens of a 10-year sustainability view" (Museum Professional) empowered museum teams to engage with innovative projects and partnerships in a sustainable way over time. The institutional change, however, happened on much longer timelines than technical innovation in the private sector and could require greater initial financial investments. This museum professional explained that the rationale behind this strategic priority was ultimately centered on allowing the museum to ensure that they could continue serving their audience's needs on a sustainable basis.

5.4.4 Summary

This final section explored the fourth category of the conceptual and analytical structure, *After the launch of the digital project*, which was composed of three analytical subcategories. The first subcategory, *Collaborating after the launch of the project*, gave an overview of the modalities that technology partners could offer on-going support to museum teams and the financial factors that impacted this phase. The next subcategory, *External support and internal capacity*, presented participant perspectives on continued partnerships after the project launch, as well as the practice of building internal capacity within museum teams. The last subcategory, *Operations and lifespan*, explored strategies to maintain digital projects in the operational phase, as well as to support product lifespan and sustainability. The summary of this section can be found in Table 5.5:

After the project launch	Collaborating after the launch of the project	On-going support
		Financial factors
	External support and internal capacity	Continued collaborations
		Building internal capacity
	Operations and lifespan	Operational strategies
		Project lifespan and sustainability

Table 5.5 *After the project launch*: fourth category of the conceptual and analytical structure of the research findings.

The phase after the launch of the digital project consisted of important areas for decision-making and reflection, including if and how external partners would support the digital project or the digital capacity of the museum team. In the instances where the collaborative relationship between museum teams and technology companies continued into this phase, the respective roles evolved and priorities shifted. Museum teams had to balance their dependence on their external partners for continued support with their own internal capacity to operate and maintain their digital projects over time. Digital tools were conceptualized as “living things” (Museum Professional) with lifespans to be supported and charted, as the evolution and obsolescence of digital technologies over time were perceived to be inevitable.

5.5 In summary

A detailed summary of the conceptual and analytical structure can be found in Table 5.6:

Before the collaboration	Relevant uses of digital tools for museum interpretation projects	External and internal contexts
		Accessibility and welcome
		Communication
		Experience
		Tensions and strategy
	Reasons for entering into a partnership	Museum capacity
		Benefits of partnerships for museums
		Benefits of partnerships for companies
	Preparing for the development process	Preliminary efforts
		Consultants
		Understanding audiences and technologies
Selecting a partner	Modalities for the choice of a partner	Informal avenues
		Formal procedures
		Facilitating future collaboration
		Variations on the procurement process
	Reasons for the choice of a partner	Technical proposal and capacity
		Communication and understanding
		Financial considerations
	Capacity to evaluate partner proposals	Risks
		Support
During the collaboration	Communication strategies	Establishing communication
		Cultivating trust and buy-in
		Communicating across sectors
	Development practices and processes	Definitions and discovery
		Design and development
		Management strategies
		Collaboration dynamics
	"Clash of cultures"	Conceptions of time
		Decision-making strategies
		Limited resources
After the project launch	Collaborating after the launch of the project	On-going support
		Financial factors
	External support and internal capacity	Continued collaborations
		Building internal capacity
	Operations and lifespan	Operational strategies
		Project lifespan and sustainability

Table 5.6 Conceptual and analytical structure of the research findings.

This chapter utilized the conceptual and analytical structure to communicate the results for the analysis of thirty-one semi-structured interviews conducted with experienced professionals from museum teams and technology companies.

The first category of the conceptual and analytical structure, *Before the collaboration*, explored the relevant uses of digital tools for museum interpretation projects, including the perceived capabilities of digital interpretation projects to support institutional objectives for accessibility, welcome, communication, and visit experience, as well as the tensions and strategy at play in the initial phase of the process. This category also presented the reasons reported for entering into partnerships, the impact of the internal capacity of museums on this decision, and the perceived benefits of collaborations for each partner. Lastly, the preliminary efforts undertaken by participants to prepare for collaborations were examined, including engagements with consultants and research into audiences and technologies.

In the next category, *Selecting a partner*, diverse modalities were reported for choosing partners—from informal avenues to formal procedures, with variations on these processes—, and strategies were described for facilitating collaborative practices in the subsequent development process. A wide range of qualities in partners were reported to be relevant in the decision-making process, such as the potential partner's technical proposal and capacity, communication skills and understanding of the partner, and financial considerations. Risks were described when museums did not possess the adequate capacity to select relevant partners, but several sources of support were mentioned for museum teams to augment this capability.

The third category, *During the collaboration*, explored various strategies for establishing communication practices in the initial phase of development, cultivating trust and buy-in both between partners and within the larger context of museum colleagues, and approaches to communicating effectively across sectors. This section also described development practices and processes across various phases of project development—including definitions, discovery, design, and development—, as well as strategies for managing these projects and the dynamics that occurred during the collaborations. Commonly reported areas of tension in these partnerships were also examined, such as differing conceptions of time, the complexity of museum decision-making structures, and the impacts of limited resources on the development process.

Lastly, the fourth category of the conceptual and analytical structure, *After the launch of the digital project*, gave an overview of the modalities for on-going support from technology companies and the financial factors that impacted this phase. Diverse perspectives were presented on both the continuation of partnerships after the project launch, and the practice of building internal capacity within museum teams. This section also explored strategies to maintain digital projects in the operational phase, as well as to support product lifespan and sustainability.

Following these four broad phases of collaborative partnerships, the conceptual and analytical structure facilitated a comprehensive presentation of the data by describing the practices and perspectives of professionals across the collaborative process. This detailed structure was developed from the analysis of the data, and thus the form communicated the themes and areas of reflection that recurred across participant responses. Examples of these emergent and emphasized themes included the maintenance and sustainability of digital projects, the choice of a relevant partner, communication channels and strategies, and the tensions that could arise from the "clash of cultures" (Provider). The structure also presented commonly reported points within the collaboration process that required decision-making and strategic reflection for participants: these moments included structuring the procurement process, establishing the dynamics for the collaboration, defining approval systems, and determining the level of dependence museum teams would have on their technology partners for the lifespan of the project.

While the presentation of the findings in this chapter followed the linear phases of the development process, there were also transversal themes that appeared and interplayed across these collaborations. These were themes related to the concepts identified in scholarly literature and the preliminary study (Chapter Two)—and then developed within the theoretical framework of this study (Chapter Three)—as well as those that emerged over the course of conducting the interviews. The following chapter continues the interpretation of the results presented in the conceptual and analytical structure through a discussion of these transversal themes within the context of museum professional ecosystems, structured by the foundational concepts identified in the theoretical framework that guided this research project.

CHAPTER 6
DISCUSSION

In the previous chapter, the results of the research project were communicated through a conceptual and analytical structure that facilitated a comprehensive presentation of the data obtained from interviews with museum professionals and technology providers. This approach enabled the analysis of detailed descriptions of these professionals' perspectives and declared practices regarding cross-sectoral collaborations—spanning the phases before, during, and after the development process. Through the in-depth mapping of the critical areas of reflection, decision-making, tension, and strategy, it became apparent how much complexity and variations existed across different partnerships between museum teams and technology companies. A wide range of factors was reported to impact the effectiveness of these collaborations and the relevance of the digital interpretation tools that were created, from the input of individual actors to the structures of organizational environments. Beyond the particularities of each partnership, many participants positioned their engagements with these professional practices within the postdigital context, where museums were striving to stay anchored to their core missions amidst the currents of ever-changing technologies, precarious financial situations, and major societal changes.

This chapter will deepen the interpretation of the data through an examination of the transversal themes that were present in participant responses. These themes included both the concepts identified in the preliminary study (Chapter Two), as well as the concepts that emerged in participant interviews through the use of an inductive research approach in this research project. While the previous chapter was structured around the linear progression of cross-sectoral collaborations, the following analysis of the transversal themes will be guided by the structure of the theoretical framework that acted as the foundation for the research project (Chapter Three). The three sections of this chapter will thus explore how these theoretical concepts were mobilized through the professional practices and reflections of research participants in the following thematic areas:

- **MUSEUM INTERPRETATION**: Developing visitor-facing interpretation projects using digital technologies to achieve institutional objectives;

- **DIGITAL CAPACITY:** Assessing the ability of museum teams to work effectively with digital technologies within the context of cultural institutions;
- **CROSS-SECTORAL COLLABORATIONS**: Understanding the dynamics of introducing external partners and cultures into museum professional ecosystems.

The structure of the theoretical framework integrated these emergent themes to facilitate the analysis of cross-sectoral collaborations between museums and technology companies by positioning them as ecotones within the broader functioning and dynamics of museum professional ecosystems. These metaphors could facilitate the examination of several levels of interactions: between diverse museum colleagues, between these museum professionals and the particularities of their institutional environment, and between the museum professional ecosystem and adjacent ecosystems. Reflections shared by research participants suggested the relevance of applying the metaphors of museum professional ecosystems and ecotones as frameworks for understanding cross-sectoral collaborations between museum teams and technology companies: these frameworks center around the relational dynamics and strategic practices of diverse professionals within environments defined by specific organizational cultures and resources. The study of these "*edgy*" (McNicholas, 2004, p. 57) relationships in ecotone contexts facilitated a broader exploration of the capacity of museums to support their institutional missions within the postdigital context.

Through an examination of these core conceptual threads, this chapter will explore the interplay and tensions between these theoretical concepts when operationalized in the process of collaboratively developing digital interpretation tools for museum audiences that aimed to support broader institutional objectives. Grounded in the perspectives and declared practices of research participants, this approach facilitated further explorations into what these concepts revealed about the capacity of museum teams to harness digital technologies to support museum objectives, their impact on the dynamics and porosity within museum professional ecosystems, and their participation in the unfolding of the larger transformations within museums—digital, entrepreneurial, and social.

6.1 Interpretation tools for museum audiences using digital technologies

When museum teams and technology companies came together to engage in cross-sectoral collaborations to develop digital projects for visitors, they were operating within the paradigm of museum interpretation. This research project aimed to assess how experienced practitioners conceptualized digital museum interpretation and its role within museum contexts. This is especially relevant in a context of ever-evolving digital technologies that can directly shape the communication dynamics between museums and their audiences:

> Le numérique constitue un défi majeur pour le musée car en 20 ans, il est devenu le lieu visible de l'innovation de la technologie numérique par excellence, tout à rebours de l'image du musée poussiéreux. Il s'agit bien pour l'institution muséale d'avoir une approche critique du numérique et d'en exiger qu'il se mette au service de son discours, de sa narration et de son point de vue sans lui déléguer la construction de sens. (Schmitt & Meyer-Chemenska, 2015)

Participants shared their perspectives on the capabilities of digital technologies to support their objectives relating to museum interpretation and visit experience, the motivations for creating digital tools for museum visitors, methods for incorporating audience needs and desires into design and development processes, professional practices for implementing interpretation objectives in digital projects, and the possibilities that arose from integrating digital and physical elements in museum environments.

6.1.1 Mediating connections, facilitating experience

The digital imaginaire in the context of museum interpretation is comprised of the expectations held by museum professionals for digital tools, especially in regard to the possible effects on visitors and the degree of confidence these professionals have in the promised impacts of new technologies (Sandri, 2016). When analyzing the discourses of digital imaginaire present in participant responses, it was possible to identify several conceptions of, and objectives for, museum interpretation projects that used digital technologies. These areas included the perceived capacities of digital projects to meet institutional objectives and various descriptions of desired impacts on museum visitors.

Digital interpretation tools are fundamentally *interpretation* tools (Larouche et al., 2019); and, as such, they participate in shaping the visitor experience and the resulting construction of meaning in the museum context (Davallon, 2000; O'Neill & Dufresne-Tassé, 2010). As discussed in Chapter One, the word *interpretation* is rooted in the Latin *interpretatio* and has several meanings, including explaining information, unveiling (or imposing) meaning, translating between languages, performing a role or musical score, and creating based on theme (Meunier & Jacobi, 1999, p. 3). These nuanced dimensions of the mobilization of interpretation were apparent in participant descriptions of their objectives for how digital projects could help visitors understand and engage with institutional objects and knowledge. For example, these tools could act as *explainers, translators*, or *meaning-unveilers* by offering "keys to visitors" (Museum Professional) that supported different visitors in developing their own connections with the collections:

> The concept of interpretation is very important [for our museum], and not just digital interpretation: the way in which we construct a journey within a museum, but also how the content is understood by a visitor—and different types of visitors. (Museum Professional)

> It's the technology's job to meaningfully connect the collection to the audience. (Museum Professional)

These *keys* that unlock meaning are framed as bridges, facilitating connections between visitors and collections. Digital interpretation projects were also conceptualized as tools to potentially help visitors personalize their experience based on needs stemming from language, age, accessibility requirements, or desired type of experience. They thus had the potential to shape museum visits by "add[ing] another layer of experience that having a written card in front of an artifact can't always bring" (Museum Professional), and by complementing physical design to construct the visit through adding different modes of engaging with content—including passive, active, interactive, and immersive. This process of connection is participatory, characterized by "a reciprocal relationship between the museum and the visitor" (Rao, 2019, Rozan, 2016; as cited in Rodley, 2025, p. 20). Understanding the nature of the interactions that occur within these relationships is fundamental to the mobilization of interpretation within these digital projects. Berard (2017) proposes applying Deleuze's (1994) conception of *encounter* for a phenomenological approach to understanding museum experiences:

> I was surprised to read that he defines encounter beyond the simple act of 'coming against'. Indeed, for Deleuze (1994) an encounter happens when one meets something, someone, an idea,

> a concept, anything that is not an object of recognition, and this "something in the world forces us to think" (p. 139). (Berard, 2017, p. 43)

Interpretation interventions participate in the interaction between an individual's subjectivity and the objective physical and social conditions of the environment where the experience occurs (Dewey, 1938; Montpetit & Bergeron, 2009). In Deleuze's perspective, interactions with the unfamiliar and the unknown can be catalysts for new thought. Digital interpretation tools can offer visitors *keys* to enter into new ways of connecting with collections. These projects can also be conceptualized as *hooks,* pulling visitors' attention into encounters with the unfamiliar: "The very pieces that seemed to merit scant attention can become fascinating sensory or cognitive explorations" (Samis & Michaelson, 2017, p. 10). Such mediated interactions can alchemize the unknown into something new.

Encounters, according to Deleuze, are mobilized "through experimentation and experience (as a verb and process)" (Berard, 2017, p. 38). The braiding together of educational and experiential qualities was described by many participants as an inherent characteristic of digital interpretation projects, that "makes them specifically museum experiences" (Museum Professional). Within participant responses, there was a strong emphasis on the importance of interpretation projects in facilitating and shaping visit experience (Packer & Ballantyne, 2016). In *Technology as Experience,* McCarthy & Wright (2004) propose centering understandings of technology around the lived experiences of the people using it. Experiences with technology can be seen "as creative, open, and relational, and as participating in felt experience" (McCarthy & Wright, 2004, p. x). The importance of the direct experience lived by a visitor in the context of museum interpretation was commonly reported by participants as an important factor when developing digital tools, including how they could help shape the feeling of, and flow through, a museum space (or an online site). This could involve a design approach that centered the human experience of technology: "Experiential means that you're not just thinking about the logic or the content, but really how a person experiences that over time, how they engage with it" (Provider). This experiential-focused approach relates to the concept of médiation sensible, as developed by the dedicated Special Interest Group within the ICOM International Committee for Education and Cultural Action (CECA):

> Cette approche considère l'individu-visiteur dans sa globalité d'être humain, capable d'éprouver une œuvre non seulement par son intellect mais également par son corps, ses émotions, ses sensations, son imaginaire, son intelligence sensible. (Grassin, 2022)

The CECA Special Interest Group developed a framework that illustrates the main concepts associated with a holistic approach to understanding visitor experiences in museums (Figure 6.1).

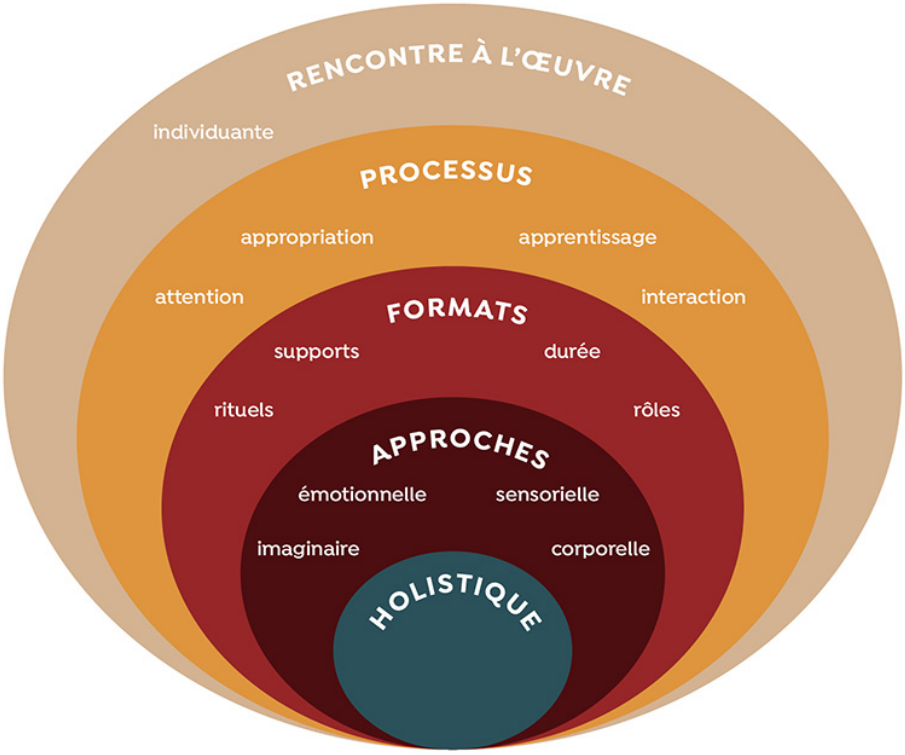

Figure 6.1 "La médiation sensible selon le groupe d'intérêt spécial dédié, au sein de l'ICOM CECA et piloté par Anne Sophie Grassin (2021)" (Grassin, 2022).

Similar to Berard's (2017) application of Deleuze's concept of encounters, this framework references the "rencontre individuante" (Morizot et al., 2018): beyond describing the relationship between a visitor and an object, this concept also characterizes the effect: "l'œuvre vient transformer notre expérience, notre manière de sentir, de percevoir, d'agir" (Grassin, 2022). As with Deleuze's encounters, the rencontre individuante also results in new perspectives, in this case through "une découverte de soi et du monde, par l'œuvre" (Morizot et al., 2018; as cited in Grassin, 2022). The approaches identified by the CECA SIG as facilitating such encounters (emotional, sensorial, embodied, imagination-stimulating) were mentioned across participant responses as important elements for cultivating meaningful interpretation experiences. The power of digital tools to evoke emotional responses and sensorial engagement—including through designing "wow moments" (Provider) that incited numinous experiences in visitors (Latham, 2013)—was

mentioned as an important characteristic for cultivating meaningful museum visits. They were also reported to have the potential to impact audiences beyond their visit, including by helping visitors retain what they learned after their time in the museum: “If we involve all five senses, we anchor the visit in the visitor’s memory—and so we serve our main mission which is the transmission of knowledge around our collections” (Museum Professional). The central role of visitors’ embodied experience acknowledges the role of the body in creating meaning: "concevoir le monde et interagir avec autrui trouvent leur origine dans l’expérience corporelle” (Grassin, 2022). Design that prioritized the approaches associated with médiation sensible was often conceptualized as a method for serving interpretation objectives, helping visitors create their own relationships with museum collections through facilitating active, full-bodied engagement.

Active engagement was frequently referenced as a desired result of visitor interactions with digital interpretation projects. In *Designing for Playful Engagement in Museums*, Rodley (2025) offers a definition of ‘playful engagement’ within the context of informing design work for museum practitioners:

> Playful engagement is an intrinsically motivated process where a person directs their conscious, focused attention to a satisfying experience which triggers an emotional response, leads to the creation or reinforcement of a memory, and influences their behavior afterward. (Rodley, 2025, p. 25)

The qualities inherent to engaging encounters facilitated by digital projects echo the process that occurs within narrative. Indeed, Rodley (2025) proposes four elements as fostering engaging museums experiences that have parallels with masterful storytelling: sensory immersion, emotional evocation, narrative transportation, and gameful participation (Rodley, 2025, p. 25-26). Storytelling was a commonly reported method for supporting visitor meaning-making and facilitating satisfying encounters in museums. Some participants even mentioned using storytelling as a guiding principle for the design of digital projects: “It isn't tech-led—it's story-led, it's experience-led and visitor-led. And then the tech is the way to enable that. (Provider). In the context of digital projects, the deployment of diverse narrative modes could shift interpretative content to being structured “non pas en tant que message à transmettre, mais comme un « bricolage » réussi d’objets, de paroles, d’images s’inscrivant dans la tension des attentes et des savoirs mobilisés par les visiteurs” (Schmitt & Meyer-Chemenska, 2015, p. 57). Additionally, the processes that are mobilized through médiation sensible interventions also characterize the narrative process:

> Ils favorisent un processus induisant une autonomie et une attention potentiellement augmentée face à l'œuvre, des interactions précises, afin de créer une expérience optimale au service de l'appropriation et de l'imprégnation des œuvres. (Grassin, 2022)

Narrative approaches support the conceptualisation of interpretation as a modality to build bridges between audiences and collections through active visitor engagement in constructing meaning, experiencing emotion, focusing attention, and engaging their imaginations (Bedford, 2014; Wong, 2025). The autonomy of the visitor to shape museum experiences is emphasized through the lens of narrative theory, where "telling a story is a process of providing material for an *audience to tell the story itself*" (Wong, 2025, p. 2). Participants described digital experiences that were intentionally played with this dynamic, facilitating experiences where meaning-making could move in many directions, with "museum informing visitor, visitor informing the museum, and then ultimately, visitors informing other visitors, creating a full circle" (Museum Professional). The interactivity inherent to digital projects could empower audiences and foster a participatory environment by facilitating "l'instauration d'une relation de réciprocité entre l'institution culturelle et ses publics et, par conséquent, permet la mobilisation de savoirs citoyens" (Bélanger et al., 2021, pp. 191-192). This dynamic granted authority to the visitor.

However, despite the positive discourses of digital imaginaire that this evoked for many participants, some described certain situations where museum leadership was hesitant to share the control of the narrative with visitors in their digital tools (Adair, 2011). Because these projects participated in the communication dynamics between museums and their audiences, many participants described how these tools needed to uphold museum standards for visitor-facing initiatives. This included defining pedagogical and experiential objectives, ensuring authenticity and scientific accuracy, upholding high standards for the quality of the tools, and supporting the unique voice and approach of the institution—"bringing that [Museum]-ness into that experience" (Museum Professional). In some cases, finding new balances of "scholarly authority and the authority of individual experience or community values" (Franco, 1994, p. 152) was perceived an institutional risk due to the potential of threatening museum practices for crafting and communicating institutional discourses.

Digital interpretation projects could also support interpretation objectives and "positively impact visitor meaning making, by [...] extending the experience beyond the temporal and physical boundaries of the museum visit" (Falk & Dierking, 2008, p. 27-28). This was particularly present in participant responses regarding the objective to inspire audience behaviour after a visit (whether on-site or online). Digital tools

were seen as methods of encouraging visitors to become engaged in their communities around important societal issues related to what they learned during the visit:

> An objective is to inspire our visitors to act. This can happen by transforming how our visitors think. The idea is to reconnect them with [the subject matter of the museum], because we can only protect what we know. (Museum Professional)

In this perspective, interpretation can act as a "revelation and unveiling which leads visitors to understand, and then to appreciate, and finally to protect the heritage which it takes as its object" (Desvallées & Mairesse, 2010, p. 48). This mission could be supported through several approaches, including evoking emotional responses through storytelling, sharing information and context, and suggesting modes of engagement after the visit "through understanding what the visitor might need in the moment to then create change" (Museum Professional). The experiential qualities of human interactions with technology—characterized as "creative, open, and relational" (McCarthy & Wright, 2004, p. x)—could also contribute to fostering an openness to attempt enacting change: "There is always room for surprise when action is seen as situated creativity and when each moment has potential. [...] We have a hand in giving shape to a world that is always open and unfinished" (McCarthy & Wright, 2004, p. x). In this perspective, engaging digital projects in museums had the capacity to empower visitors to become engaged community members—a positioning that demonstrated a conception of museum interpretation as a modality to support larger institutional missions surrounding the museum's role within the larger sociocultural context.

6.1.2 Welcoming visitors, meeting expectations

As seen in the ICOM definition of museums as "accessible and inclusive" (ICOM, 2022), a museum must work to "be widely accessible to attract visitors, and it should be able to overcome barriers to access" (Fissi et al., 2025, p. 2). Designing for inclusivity and accessibility was described by many participants as vital elements in supporting their broader mission of communicating information and stories about their collections to a wide audience. Beyond the themes outlined in the previous section relating to the conceptualisation of digital museum interpretation, participants shared areas where they perceived that digital technologies could support broader museum missions, including broadening and diversifying their

audiences, making a large range of visitors feel welcome, and managing increased expectations for the presence of digital experiences.

As outlined by Fissi et al. (2025), *accessibility* and *social inclusion* are distinct concepts. *Accessibility* is concerned with the mobilization of interventions that facilitate access across different types of visitors, with particular attention to disability. In museums, this can be "interpreted as removing physical barriers and as the design of products and services usable by disabled people to create an environment where they can move in a complete, safe, autonomous and comfortable way (Eardley et al., 2022)" (Fissi et al., 2025, p. 4). Participants mentioned how certain accessibility measures were mandated by governmental regulation, while some museum teams worked with local communities to ensure that digital interpretation projects went beyond the legal minimum and instead responded to the lived experience of their disabled audiences. These design objectives could require institutions to reevaluate how they measure the success of a digital project, as certain accessibility measures might only serve "a percentage of a percentage" (Museum Professional) of the total visitors who were using these tools. In this case, meaningful success was reported to focus on the "quality of experience and meeting the visitor where they are at" (Museum Professional), rather than centering on the total number of users. This in shift in priorities could sometimes result in a tension between the objective of accommodating as many users as possible, while also supporting institutional accessibility missions: "Yes, of course, we want to reach the maximum amount of people possible—and we do that—but we can do that while also being focused on diversity, equity and inclusion" (Museum Professional). Several participants characterized this tension as both fruitful and ripe for innovation. As these practices often required significant resources and different approaches to working, they were often framed by participants as stemming from larger museum mandates.

Beyond (and including) accessibility, *social inclusion* is a broader umbrella concept that concerns "the transformation of a traditional museum into an inclusive one characterized by a greater sensitivity to diversity in the relationships with its stakeholders" (Fissi et al., 2025, p. 3). It is related to the movement in museums from being centered around collections and towards a more social role (Brown & Mairesse, 2018), a situation that fosters "la dualité dialectique des missions d'un établissement de conservation et d'un établissement recevant des publics" (Ramond et al., 2017, p. 143). Thus, social inclusion can be understood as a process (Fissi et al., 2025, p. 4) with can impact ways of working within museum ecosystems. To be inclusive, museums must "increase accessibility and engage visitors, communities and people" (Fissi et al., 2025, p. 3). This concept has several dimensions, including the physical aspects of

accessibility previously mentioned. Social inclusivity also encompasses efforts to "eliminate cultural barriers" (Fissi et al., 2025, p. 4) between museums and their audiences, including by creating and nurturing relationships through digital technologies (Marini & Agostino, 2021). Across participant responses, social inclusion was a significant element of their digital interpretation practices. This included reflections about designing for the needs of different types of visitors: "How do we make it as least exclusive as possible, so that it accommodates the most users?" (Provider). At a basic level, the inclusivity of technology itself was mentioned, especially regarding emerging technologies. Several participants described their approach of creating digital tools that were simple and intuitive to use, in order to accommodate visitors with different comfort levels around technology. Related methodologies prioritized design that enabled visitors to access the functionalities of a digital tool (and even the museum building itself) across a spectrum of languages, cultural backgrounds, disabilities, and ages.

These considerations were often described by participants in the context of making museums feel inviting to people who might feel uncomfortable in these institutions. By offering appealing digital projects such as immersive experiences, or familiar technologies such as video games, these tools could potentially act as a form of social inclusion and cultural democratisation—making the museum institution appear less elitist and more welcoming for certain visitors (Champagne-Poirier & Luckerhoff, 2023). These different entry points could offer keys to a variety of visitors, meeting their individual needs for processing information and sustaining experience, and thereby "unlocking meaning and value for diverse people in your community" (Simon, 2016, p. 22). In this way, museums could build enduring relationships with new audiences and foster diversity (Güneröz & Yanar, 2023).

These efforts to encourage the attendance of a wider range of visitors could also participate in the marketing approaches that originated in the commercial shift within cultural institutions (Bautista, 2014; Davallon, 1997), where offerings are designed based on visitor needs and expectations rather than trying to convince the public to "buy" traditional museum experiences (Weil, 1999). Museums participate in society's cultural and leisure industries, and potential visitors make choices about how to spend their leisure time from amongst a diverse array of proposed experiences (Schiele, 2016, p. 7). Digital activities have the potential to enhance the "organizational attractiveness" (Palumbo, 2022) of museums for their audiences. Several participants mentioned "using digital as the driver" (Museum Professional) for encouraging on-site visitation, with digital projects that were novel and attractive, and adapted to visitors' digital practices. While such initiatives were sometimes described as having the potential to "democratize

culture" (Provider) and diversify museum visitor bases, other participants observed that these projects were not always economically inclusive (Fissi et al., 2025, p. 4). When a digital experience was only accessible by paying a high-ticket price, "Who is it really aimed at? Does it really broaden audiences?" (Provider). Visitor evaluations and reflexive professional practice were mentioned as methods for verifying that objectives for audience diversification were being achieved, and that there was not a misalignment between mission and reality.

These intersections of marketing approaches and interpretation practices were met with cautiousness by certain professionals, especially in a context characterized by constant demands for producing new digital experiences without adequate time for reflection (Rosa, 2010). Some feared that these novel methods of communication could diminish the communication of museum content and distract visitors from meaningful encounters with collections (Damala et al., 2016). Participants described efforts to "surf between not denying their core missions and following some trends" (Museum Professional), between education and entertainment, between rigorous standards and splashy technologies—a dynamic that has been a challenge for museums since the nineteenth century (Roberts, 1997)—, as they balanced their mission to educate visitors with their need to cater to these audiences in order to survive. This dynamic was particularly apparent in the wariness that many participants expressed around tools they categorized as *shiny objects*—digital projects that utilized flashy or emerging technologies for the sake of novelty. These professionals reported favoring an intentional and reflexive approach to the use of digital projects, grounded in larger institutional missions for interpretation and visit experience:

> We don't go to digital for digital's sake. Digital should be used very strategically and very opportunistically in terms of sparking the imagination of the visitor, and creating encounters where visitors are forming a relationship with [the museum's] subject matter. And then also using digital to achieve inclusivity. (Museum Professional)

This perspective describes a reflective approach to digital practice where, "rather than immediately adopting the next emerging technology, it is more effective to reflect on the motivation behind initiating any new digital initiative and how it can contribute to the museum's goals or central mission" (Price & James, 2025, p. 35). Even if flashy digital projects attract new audiences to "walk in the door" (Simon, 2016), they are only relevant interpretation initiatives if visitors find something of value within—that sustains both their engagement with the visit and their relationship with the institution. To avoid engaging with technology for technology's sake (Bautista, 2014, p. 222), several participants described the need to determine if a digital format was the best solution to address the needs of the target audience before

deciding to enter into a digital project. This could also include determining if a digital format was even the best solution: “If you can do it with analog ways, then do it that way” (Museum Professional). This perspective was not reported to be incompatible with innovation or engaging experiences—“il est possible d’être pertinent sans être innovant et d’être innovant sans passer par des technologies" (Sandri, 2020, p. 109)—but rather revealed a different conceptualisation of relevant approaches to visitor-facing initiatives. This work could also include broader strategic reflections on the role of technology within the larger communication and experiential context of museum spaces.

However, despite parallels between the increased demand for entertaining digital projects (Appiotti & Sandri, 2020) and the paradigm of ceaseless novelty and innovation described as “la tyrannie de l’exposition” (Jacobi, 1997), several participants noted that the novelty of emerging forms of technology could be harnessed strategically to support larger missions. As with tourism, museum visits can fulfill a felt need to have experiences that are out of the ordinary (Montpetit & Bergeron, 2009, p. 3), and digital tools can respond to “the modern search for authenticity, which is increasingly sought in the non-mundane, the non-ordinary" (Graburn, 1977, p. 2). Some participants framed strategic engagement with emerging technologies as an important consideration when deciding which digital projects to pursue: “I didn’t want, in 2019, to do more augmented reality, we could go beyond that” (Museum Professional). The associated objectives with emerging and attractive technologies could include facilitating meaningful experiences, supporting learning and inclusivity, upholding institutional standards for the quality of visit experience, generating marketing opportunities and revenue, increasing visitation, attracting future partners and donors, satisfying visitor desires and expectations, and building institutional relevance and participation within their larger sociocultural contexts. The case of the differing perspectives surrounding novel technologies demonstrates the wide range of approaches taken by museum professionals to determine the appropriate use of digital tools to support institutional objectives.

6.1.3 Centering audiences, implementing objectives

As seen in the reflections around inclusion and accessibility, the capacity to design for the needs and expectations of diverse visitors in museums is a significant element of designing relevant digital projects: “All these experiences were developed and designed for human beings to be in the spaces and experience

them” (Museum Professional). The orientation towards understanding museum audiences reflects the communicational shift in museums, where there is an emphasis on the subjective process of meaning-making and the individual differences in what visitors bring to their museum visits (Hooper-Greenhill, 2000). In a human-centered design approach (Buchanan, 2001), digital tools are “rooted radically in the needs of our end users" (Museum Professional). However, while audience needs were prioritized by many participants, they were often reported to be understood through the lens of museum interpretation and visit experience:

> The first objective [for digital interpretation projects] is to respond to the desires and needs of the public, but in the perspective of offering them experiences that are meaningful and inspiring. (Museum Professional)

Across participant responses, a commonly reported strategy for supporting interpretation objectives with digital tools was weaving visitor needs and perspectives throughout the creation process. This approach consisted of two main dimensions: the means to develop thorough understanding of how their audiences responded to museum visits, and the capacity to effectively utilize digital technologies to create relevant interpretation offerings.

Participants described how museum teams could conduct audience research to learn more about who their visitors were, what was important to them, and how they might connect with content presented in an exhibition (Eidelman et al., 2007; Schiele, 2016). For example, before work on developing specific digital tools even began, preliminary efforts within museum teams were reported to potentially consist of visitor studies and visit evaluation, as well as engaging with external consultants as “provocateurs, there to poke at our assumptions about audience and audience needs” (Museum Professional). This often included the definition of visitor segments based on the museum’s organizational priorities and available resources, which facilitated the creation of projects that responded to diverse expectations and modes of engagement (Falk & Dierking, 2013). During the development process, some projects began with a discovery phase that included directed research into the motivations and needs of targeted museum audiences, including surveys of potential visitors, interviews with representatives of communities for whom the tool was being designed, reviews of previous visitor studies, the creation of audience personas, and consultations with visitor-facing museum professionals across departments. The practice of testing project prototypes with users also allowed professionals to adapt the development of the digital tool based on their findings from assessments of user experience, relevance, and accessibility. In some of these

cases, visitor studies were conducted *with* the public, rather than *on* them, a dynamic that created a partnership between museum and audience (Moeschler, 2023, p. 57).

Despite the fact that the questions surrounding the institutional impact of digital interpretation do not differ from other interpretation initiatives, research on "ces nouvelles pratiques est attendue pour accompagner les décisions des acteurs du monde muséal et affiner les retours d'expérience" (Schmitt et al., 2023, p. 230). Evaluating projects after they were launched could help professionals determine if their interpretation objectives were achieved and support the development of institutional best practices for future work on digital tools, especially when resulting visitor experience was considered as the determinant of the success of the communication process (Lalancette, 1998). While participants described a range of institutional approaches to evaluation, many museums had minimal or nonexistent evaluation practice for digital projects, whether because of limited resources or differing priorities.

The efforts undertaken to understand specific groups of visitors were often used to inform the design of digital projects. Interpretive strategies operate in the complex realities of individual visitors in physical space at precise moments in time, where different factors impact visitor experience (Falk & Dierking, 2013). Skillfully designing the experience of using digital interpretation projects was often framed as a method of meeting audience needs and supporting institutional missions:

> User experience doesn't just mean the visual look and feel of it. It also means, [for a museum website], the information architecture and how information is laid out on the page. It's also things like navigation. If you're just creating navigation based on departments—which is not how end users think—, you're doing a disservice to both those end users and to the organization. So, the emphasis is on user research (Museum Professional)

This represents a radical shift in institutions, because "a visitor-centered approach puts collections/exhibitions and visitor experience on equal footing" (Samis & Michaelson, 2017, p. 4). The level of expertise in creating and implementing interpretation strategies through digital tools could have significant impacts on the project: because, while the *digital* did not automatically change the role that *digital interpretation* projects played for visitors, they were still operating with new communication technologies that had their own codes and languages that needed to be mastered by museums if they were to optimize communication (Sandri, 2020, p. 87). This work required understanding how different interpretation projects shaped visit experience, knowing how to effectively communicate content through a digital format, defining relevant learning and experience outcomes, and adapting based on visitor

evaluations. Museum teams, and their partners, needed to possess diverse skill sets for development, design, production, and operationalisation (Davallon, 1992). When selecting partners for cross-sectoral collaborations, several museum professionals mentioned that they valued proposals from companies that put emphasis on user experience and audience research, as this was perceived to demonstrate the partner's understanding of museum contexts and the importance of centering the design of meaningful experiences for visitors. Other participants remarked that it was beneficial for museums to engage companies familiar with developing audience-facing projects; even technology partners with experience working on such projects in other sectors could be seen as bringing relevant perspectives and innovative solutions to creating digital interpretation tools for museum visitors.

When describing the development of digital interpretation tools, many participants mentioned how institutional objectives and priorities regarding their audiences could impact the process—and even create tension with external partners when these values necessitated divergence from technology sector working processes. For example, when designing for the realities of the operational phase and project lifespan was framed by many participants as a practice that helped museum teams ensure that they would be capable of continuing to serve their audience's needs on a sustainable basis. However, this strategic priority could be a potential source of tension between the temporalities of museum teams and technology companies. Taking the time to prioritize visitor needs in the design process was reported to occasionally be at odds with some technology partners' motivations to finish the project as quickly as possible for financial reasons: "The decisions that are made just to get the thing done and launched and moving forward might be in opposition to making sure that it's stable and continues to work" (Museum Professional). Others reported instances of these differences in temporalities included delays in production schedules due to external partners' lack of familiarity with the constraints of inclusive design or underestimating the time and budgetary resources necessary to ensure the authenticity of museum digital tools and their content. The ability to cultivate practices and approaches that supported interpretation objectives and centered audiences within the development process was often reported to depend on the capacity of museum teams to strategically work with technology companies, as well as the openness of these external partners to adapting appropriately to museum contexts.

6.1.4 Integrating physical and digital elements

In the postdigital era, the boundaries blur between *digital* and *nondigital* (Parry, 2013, p. 35), with museum interpretation offerings "anticipat[ing] a blend of the two, an embodied augmentation of one with the other" (Parry, 2013, p. 37). Echoing the conceptualization of the postdigital museum where "digital is a dimension of everything" (Stack, 2013), this perspective was present across participant descriptions of the design and development of visitor-facing digital interpretation tools. While this posture mostly pertained to discussions of digital tools within physical museum spaces, participants also described the physical implications of projects that were adjacent to the exhibition media (such as interpretation content available on museum websites)—and even those that were their own versions of exhibition media (such as simulated museum visits offered in completely digital formats, like virtual reality experiences). While these latter digital formats allowed cultural institutions—which have traditionally been "by nature place-based organizations" (Museum Professional)—to extend the museum experience beyond their physical premises, most participants framed such tools as a form of outreach that invited remote users to subsequently come on-site (Fissi et al., 2025, p. 6) rather than digital offerings that excluded or replaced physical visits:

> We are convinced that [online interpretation experiences] inspire [virtual] engagement without preventing the visitor from coming on-site. On the contrary, they make our collections known more broadly. (Museum Professional)

In some cases, however, participants described the benefits for museums of this capacity to extend their reach beyond physical buildings in order to serve audiences who might not otherwise be able to visit the facility for diverse reasons, such as illness, incarceration, and distance. Virtual experiences are not, of course, "fully virtual, simply given the fact that it is approached and experienced by people who have bodies and sensory capacities and who need to manipulate some kind of device in order to activate it" (Ciolfi, 2021, p. 75). Again, the boundaries between conceptualizations of *digital* and *nondigital* are irrelevant:

> There is, therefore, no opposing dichotomy of virtual versus material; rather, they exist on a continuum of possible embodied experiences of digital and indeed virtual heritage, with varying degrees of overlap and interrelationship. (Ciolfi, 2021, p. 75)

In tools designed to be used beyond the physical walls of the institution, however, the digital elements were tasked with delivering the institution's objectives for interpretation (Marty, 2008) regarding the

communication of knowledge and of the museum's unique experience, while also meeting audience needs in diverse locations (Palumbo, 2022).

When designing interpretation projects to be used on-site, participants evoked the possibilities that were presented by merging digital and physical elements to support interpretation objectives. Digital projects can play important roles in shaping visit experience and communicating discourses in physical exhibition spaces (Gross-Hoy, 2014), and some participants even perceived in-gallery tools as being "as important as the artifacts themselves or the spaces, [...] a really significant component to the expression of the story" (Museum Professional). Given the blurred distinction between gallery displays and digital interpretation, on-site digital projects were often reported to be expected to adhere to institutional standards for "exemplarity" (Museum Professional) in the presentation of interpretation elements:

> We have an obligation to scientific accuracy, and to impeccability and aesthetic standards when we are in a cultural institution—whose mission is to present things with a certain materiality, that we display, using scenography, in the space. This aesthetic dimension is very important: there also are requirements for the rendering of the graphics—physical and of the digital object. (Museum Professional)

There were diverse approaches to the "aesthetic dimension" of digital tools within museum galleries: from discrete tools that did not "overshadow" (Provider) the collection or create the sensation of being "bombarded with screens" (Provider)—an "in-gallery aesthetic where technology (though present) is ever more ambient" (Parry, 2013, p. 37)—, to larger-scale interactive and immersive incorporations of technology into the scenography. Additionally, the ability to easily modify content within digital projects was often associated by some participants as a powerful approach for maintaining relevance and accuracy in exhibition communication—as well as being significantly less expensive than updating physical displays. This capacity to quickly adapt to evolutions in language and societal shifts around content was framed by some participants as another method for being responsive to visitor needs and voices.

Many participants argued that these on-site digital projects should take advantage of the materiality of museum spaces to satisfy the expectations of visitors who had "invested the time and the energy to go to physical space" (Provider). This could include an expectation that digital projects "add value [...] by offering something extra in their space, [...] to differentiate themselves from what can be experienced at home while just looking at the screen of one's own laptop or smartphone" (Calvi & Vermeeren, 2023, p. 345). This emphasis on the power of experiential digital tools to encourage on-site visitation also had parallels

with reflections from the commercial sector, where retail companies were trying “to reimagine what it's like to visit a store. Because anyone can buy anything online, why would you go to a store?” (Museum Professional). This posture took a holistic approach to the lived experience of museum visitors that merged interpretation missions with digital strategy.

Another area of professional reflection around bridging digital and nondigital elements is the movement towards hybrid design (Bannon et al., 2005). This current was reflected in participant descriptions of “low tech” (Museum Professional) approaches to design. For example, several projects were shared where digital technologies were imbedded into tangible objects that “do not offer any virtual experience per se, but that become part of one at some point by virtue of an underlying narrative of interactivity” (Ciolfi, 2021, p. 73). Understated and intuitive, these tools could facilitate powerful experiences:

> Low tech [products] create opportunities for either social interaction, or pedestrian interfaces that allow people to be less focused on—they might be interacting with technology—but if it's pedestrian interface, then they're actually not focused on the technology. They don't even realize that they're interacting with it. Because they're very much present in their experience within the museum. (Museum Professional)

Because these digital projects often utilized technologies that were similar to those that visitors used in everyday life (such as tools using RFID, similar to tap-to-pay credit cards), they could create opportunities for intergenerational interactions across digital ability levels. This approach to design sought to “rendre la technologie davantage bienveillante pour les visiteurs, la rendre moins visible, plus ordinaire, moins fascinante” (Schmitt & Meyer-Chemenska, 2015, p. 57; as cited in Sandri, 2020, p. 109). Materiality plays a significant role in this dynamic of shaping museum interactions and making meaning (Dudley, 2013; Falk, 2009), encompassing how aspects of the visit are “experienced, understood, and felt” (Ciolfi, 2021, p. 68), and the material aspects of these tools was reported to shift visitor focus from the device and instead facilitate deeper engagement with the visit experience. Participants shared other considerations surrounding the development of digital tools that facilitated embodied experiences for visitors in physical spaces—such as designing digital devices that provoked sensorial and emotional responses in visitors, guided them in engaging with objects on display, helped them navigate through the space, integrated displays into digital experiences, facilitated social interactions between visitors, remediated “pain points” (Museum Professional) within the visit, or created new immersive environments. In this hybrid positioning, the inclusion of digital projects in physical museum spaces is framed as an integration rather than an imposition.

A strategic approach to merging physical and digital elements could have implications for the development of digital interpretation tools created to be parts of new exhibition spaces—especially given the commonly reported perspective that "the distinction between exhibition design and media design is extremely artificial" (Provider). When selecting vendors for such large projects, museums sometimes engaged in a "one-stop shop approach" (Museum Professional), where a managing firm (such as architects, exhibition designers, or fabricators) responsible for the whole project would make the choice of which technology partner to subcontract, rather than the museum's digital team. Participants described several approaches to adapting this process to facilitate the strategic selection of a relevant technology partner, such as by dividing the work for on-site projects into two RFP processes—digital and physical. In this example, not only was the museum's digital team able to directly select the technology provider, but this approach also was reported to enable a larger integration of the *digital* and *nondigital* aspects of the project (while also fostering collaboration across museum departments), due to the fact that the digital team was "involved in both conversations" (Museum Professional). This practice highlights a perspective shared by several participants of the importance of integrating digital experts—whether from the museum's digital team or external partners—early into the process of developing exhibitions and other museum projects that featured both digital and physical elements. Additionally, it shows how these blended experiences can foster internal dialogue between colleagues in different departments within museums. Beyond supporting specific projects and creating greater cohesion between digital and physical elements shaping museum visit experience, this interdepartmental communication was also reported to contribute to changes in working processes across museums. A participant shared an example of encouraging coworkers to adapt a digital approach to evaluating visitor experience:

> Sometimes I would ask a curator colleague about an exhibition that would be opening up and I would say, "How do you know if the exhibition has been successful? How do you measure that?" And they'd say, "Well, it opened." [...] And I understand that, but that's rooted in delivering a project but not really thinking about what that means for the people who are coming through the doors. And we're trying to change some of that mindset. (Museum Professional)

The blurring of the distinction between physical and digital was reported to extend beyond design practices, and could even contribute to a broader shift across the institution towards audience-centered approaches and the integration of digital culture. As will be explored in the next section, strategic working processes and the interventions of digitally skilled professionals play significant roles in achieving institutional objectives for interpretation, as well as supporting the capacity of museums to be conducive environments for digital activities.

6.2 Capacity of museum teams to work with digital technologies

To understand the impacts of cross-sectoral collaborations within the broader functioning of museums, the metaphor of museum professional ecosystems was determined to be a relevant analytical construct. Within participant responses, the metaphor of ecosystems arose both when describing the internal workings of individual museums, as well as the larger sociocultural contexts in which these cultural institutions and their technology partners operated. In one such example, a museum professional characterized the process of formalizing an institutional digital strategy as "building an ecosystem" (Museum Professional) that could nurture the development and maintenance of digital interpretation projects. The application of the ecosystem metaphor in this context also mirrors Vargas's (2019) conceptualization of digital maturity as being achieved, in part, "when all aspects of the digital ecosystem are understood and operate as a system; maintained and optimized" (Vargas, 2019, p. 222). And, like digital work in the postdigital museum, this metaphor described an ever-evolving context where survival required adapting to constant changes and relational shifts (Suteau, 2022). This focus on sustainability had parallels to themes evoked in participant responses regarding sustainable digital practices, the lifespan of digital projects, and the continued relevance (and even survival) of museum institutions themselves within their sociocultural contexts.

A major objective of this study was to understand the factors that could impact the capacity of museum teams to develop relevant digital interpretation projects that supported museum interpretation objectives. The metaphor of museum professional ecosystems framed the interactions between professionals and their environment as sustaining the *life* of museums:

> L'écosystème considéré est à comprendre ici comme une unité fonctionnelle (le musée) dont la vie et le développement n'est possible que grâce aux interactions des professionnels qui le composent. (Suteau, 2022, p. 14)

The following section explores how these dynamics were operationalized to support and maintain the digital capacity of museums. Research participants shared their perspectives on the impact of museum digital literacy and skills on cross-sectoral collaborations, the potential of working processes and systems to support the work of museum digital interpretation professionals, the mobilization of sustainable systems and institutional infrastructure as an indication of digital maturity, the influence of digital team models on the operationalization of strategy, and the role of museum leadership in facilitating digital practices and empowering staff. In these professional ecosystems, the capacity of museum teams to develop digital projects was often described as resulting from the strategic interplay of individual capabilities and institutional structures.

6.2.1 Digital skills and digital literacy in museum professionals

As presented in the theoretical framework (Chapter Three), the question of measuring digital skills and literacy in museum workers has been the subject of research in the field of Museum Studies, including through the University of Leicester's 'One by One' project (Malde et al., 2019; Parry et al., 2018). In "Contextual, Holistic, and Purposeful: A Re-framing of Digital Skills for Museums" (2025), Parry et al. present the findings of the multiple phases of this multiyear, multinational research program. Rather than compiling a list of skills necessary for museum teams to work effectively on digital projects, they argue for "a new integrative approach to building digital confidence within the sector—one that distinctively gives primacy to context (of the individual and the institution), and that encourages a holistic and institution-wide approach" (Parry et al., 2025, p. 7). This conceptualization resonates with the imagery in the museum ecosystem metaphor, where the particularities of the environment (institutional structures, cultures, and resources) and actors (individual workers, teams, and organisations) are essential factors for determining effective and sustainable processes and dynamics.

To offer "co-ordinates for discourse, practice, and purpose around digital technology" (Parry et al., 2025, p. 8) within the complexities of diverse museum contexts, the authors present a series of conceptual framings. They are structured as "a guide for thinking, the means to initiate and lead a structured

conversation, rather than a set of predetermined competencies to be met or completed" (Parry et al., 2025, p. 12). Three of these framings[1] are summarized in Figure 6.2:

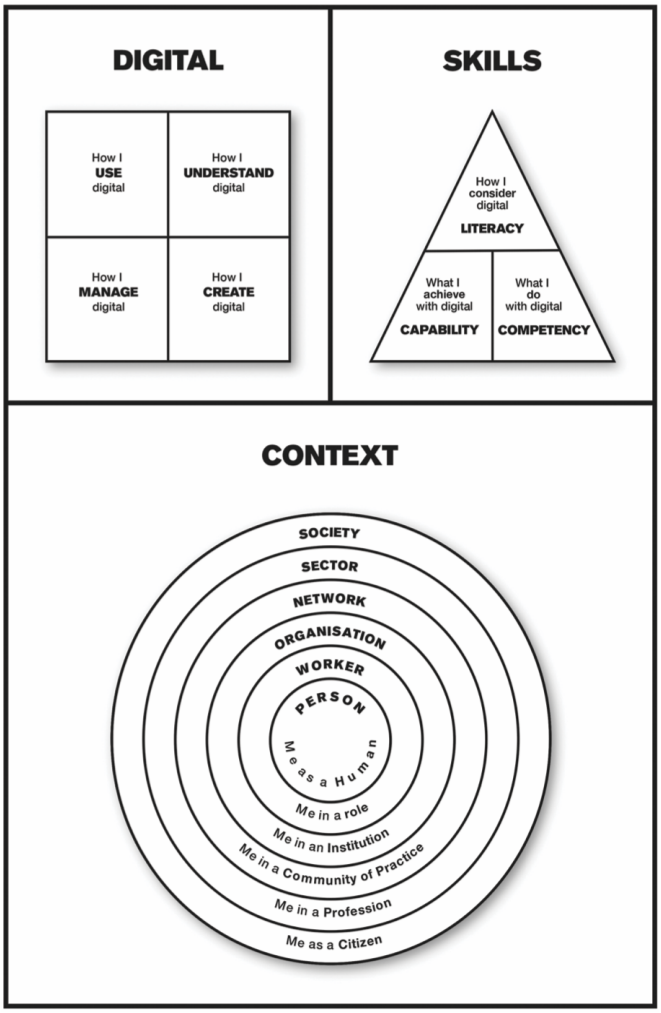

Figure 6.2 Framings For Building Digital Skills And Confidence, One by One Research Project, 2025. (Design: Vince Dziekan). (Parry et al., 2025, p. 13).

In this conceptualisation of digital capacity, the 'Skills' framing is related to, and inseparable from, the characteristics of the 'Context' and 'Digital' framings. *Digital skills* are separated into three elements:

[1] The fourth framing, regarding the affective dimension of digital confidence, is not illustrated in the figure. This dimension is addressed later in this chapter: 6.3.2 Interaction and translation within ecotones.

- Digital COMPETENCY (what a person can do with digital, their action; developing the ability to undertake an activity)
- Digital CAPABILITY (what a person might achieve with digital, their intention; using their competency to enable them to complete a specific task in a given context)
- Digital LITERACY (how a person might consider digital, their reflection; judging their competency and capability within a wider setting of practice by themselves and by others) (Parry et al., 2025, p. 15)

This understanding of digital skills was largely reflected across participant responses. On the individual level, digital capacity was often described as the presence in museum teams of both specific competencies and capabilities, along with broader notions of literacy. While the existence of specific digital competencies and capabilities within these professionals was often reported to be beneficial to their capacity to develop and maintain digital projects—particularly when museum teams included programmers and "hard technologists" (Museum Professional)—the presence of literacy within museum teams was often referenced as a vital factor for effectively facilitating the development process, especially given the inevitability of technological change inherent to the postdigital museum (Parry, 2013; Vargas, 2019). Participants described how access to experts possessing high degrees of digital literacy—whether in museum teams or brought in as external consultants—could help protect institutional interests in cross-sectoral collaborations. Such efforts could include verifying that project funds were being allocated responsibly, delineating appropriate uses of the museum's intellectual property, ensuring the quality and relevance of the final product, and designing digital tools in ways that would support their operational sustainability. Digital competency and capability were also reported to empower museum teams in having more agency in determining the structures and dynamics of their collaborations with external partners. In these circumstances, in-house digital capacity enabled museum teams to take a strategic approach in determining the appropriate objectives and positioning for these partnerships. Digital skills within individual museum professionals were reported to stem from diverse sources, including significant experience within the museum field of working on digital projects, participation in relevant training sessions, and engagements with consultants. Several participants mentioned that it was not uncommon for museum professionals to have previously held roles within technology companies (including those that worked with museums), an occurrence that was reported to give these professionals an in-depth understanding of potential technology partners' development processes, communication styles, motivations, and constraints when evaluating project proposals.

The importance of selecting appropriate external partners for cross-sectoral collaborations was an emergent theme in participant responses, and the presence of competency, capability, and literacy was

described to be an essential factor for museum teams to be capable of choosing appropriate partners. This phase was reported have significant impacts on the subsequent development process and resulting digital tool because, as one participant observed, "If you pick the wrong people, all the other stuff actually doesn't matter because you've already made a mistake" (Provider). Digital skills could present as expertly engaging in informational conversations with potential partners through informal avenues or strategically defining project proposals for formal procurement processes. The strategic choice of external technology partners could empower museums to support their missions "ethically, sustainably, and in the least extractive manner possible" (Chan, 2022). Participants repeatedly emphasized that museum staff needed to be able to discerningly evaluate the capabilities of potential collaborators and the feasibility of proposed projects in order to be responsible stewards of museum resources and informed consumers.

The more expansive conceptualisation of *digital skills*—understood in the 'Skills' framing through competency, capability, and literacy (Parry et al., 2025)—echoed reflections within participant responses about their understandings of the role that digital literacy played in sustaining professional ecosystems. Beyond the "awareness, attitude, and ability of individuals to appropriately use digital tools" (Martin & Grudziecki, 2006), a museum professional nuanced the concept of digital literacy to also evoke the expansive possibilities that were inherent to attaining fluency:

> I don't really talk about it as a 'literacy' now, I talk about it as 'capabilities' and 'imagination'. [...] When you learn a language and you start to become fluent in it, you dream differently. You dream in that language. So that's why I think technological imagining needs you to have fluency and capability. It's not just a functional literacy, it's beyond that. It's actually: Can you dream in it? Can you imagine futures? (Museum Professional)

This conceptualization of digital literacy recognizes the importance of merging capability and imagination to achieve fluency. *Imagining futures* for museums, in this perspective, becomes a verb of digital literacy. Moreover, when discussing literacy in the context of developing digital interpretation tools, several participants emphasized the perspective that *museum digital literacy* was a distinct form of digital literacy, with its own unique particularities and requirements, braiding together literacies in both digital technologies *and* museum contexts. The realities of the conditions within museum professional ecosystems could be characterized as a state of "complexité ordinaire, avec ses rapports de pouvoir internes, ses attachements et ses engagements, qui font apparaître la pratique de médiation comme un art de l'ajustement, de la compensation, et de l'expérimentation" (Le Marec, 2020, p. 14). Fluency in this particular dialect of digital literacy was reported to be especially important to supporting the

interpretation work of museum professionals, who were constantly expected to harness ever-evolving digital technologies to create projects for museum visitors that aligned with larger institutional objectives and effectively stewarded staff and financial resources (Marty, 2006b).

One example of the mobilization of museum digital literacy—braided into the associated elements of competency and capability—was the strategic work that was conducted within museum teams even before cross-sectoral collaborations began. Participants mentioned that professionals with *fluency* in museum digital skills were more empowered to intentionally lay the groundwork for these interpretation projects, ranging from the ability to discern and imagine relevant directions for the use of digital tools in the specific context of their museums, to the professional practice of conducting preliminary research and experimentations that informed a strategic approach to working with digital technologies. Several museum professionals began their descriptions of the development process for specific digital tools by detailing efforts that had preceded the project by several *years,* demonstrating how the production work for individual digital tools was often held in a larger web of intentional digital practices and reflections guided by museum practitioners. Initial partnerships with consultants were also described as a method for augmenting internal digital skills before beginning collaborations on digital projects: both in contexts where knowledgeable museum digital staff brought in external experts to refine and provoke their established ways of working, and in museum teams where there were lower levels of internal digital capabilities among staff members. In this latter situation, museum digital literacy was demonstrated through these teams' awareness of the importance of including experienced and knowledgeable experts in museum digital work, whether to assist in defining digital strategy, determining relevant uses of digital tools for museum interpretation, or guiding the beginnings of collaborative relationships.

These digital skills were mobilized for activities taking place in an environment defined by ambiguity and change (Price, 2020, p. 113), where "no matter how much confidence is imbued, this process is never stabilized because digital transformation is always ongoing" (Holcombe-James et al., 2023, p. 11). Many participants described how individual expertise could be translated by museum teams into new processes that augmented institutional capacity for developing digital interpretation tools in ever-shifting circumstances—and contributed to the professionalization of digital museum work.

6.2.2 Process as professionalization

As seen in the previous section, the presence of digital skills (including museum digital literacy) within museum professionals was reported empower the creation of different relationships with digital technologies, supporting both effective collaborations with external technology partners and the development of relevant digital tools that supported institutional objectives. These considerations around the particularities of museums engaging with digital technologies overlap with the elements in Parry et al.'s framing of 'Digital', which understands *digital* both through the identification of a specific technology within museums and through the modalities of "defining their relationship with digital" (Parry et al., 2025, p. 14). As with the categorization within the 'Skills' framing, *digital* is separated into four different elements:

- USE (how digital technology is used within the museum – the hardware, the software, the tools, systems, platforms, and devices);
- MANAGE (how digital technology is managed within the museum – the process of digitalisation, the strategizing of digital change and transformation, the processes, policies and workflows for adopting and delivering digitally- enabled and digitally- supported practice and provision);
- CREATE (how museums create digital things – the production of digital content, outputs, interactives, experiences, and interfaces; but also, how museums might collect digital things from the world in their role as memory institution);
- UNDERSTAND (how, somewhat uniquely compared to other sectors, museums make sense of society's digital condition, – the responsibility museums have for interpreting and narrating our dataful, networked, connected age) (Parry et al., 2025, p. 14)

These four elements identify the "relationships with digital technology distinctive to museums– dimensions that characterize how digital is used particularly within the museum sector" (Parry et al., 2025, p. 14-15). The authors argue that, while the first two elements can be found in other sectors, the latter two (*creating / collecting digital things* and *understanding / interpreting digital in and for society*) are more specific to the museum field. Indeed, they can relate directly to the interpretation work of museums with their audiences. But the first two elements (*using* and *managing* digital technologies) were the most prevalent within participant responses. Their reflections revealed an understanding of digital that encompassed more than skills and infrastructure, but that also required "a substantial shift in thinking—not just about digital, but about logics, ways of being, and the funding models that underpin these" (Holcombe-James et al., 2023, p. 12). An integral characteristic of the postdigital era is the "continuous" unfolding of change (Parry, 2013; Peacock, 2008) and, within museum professional ecosystems, this translates to the continuous adaptation of relationships between actors and their environments. When describing the *use* and *management* of digital technologies in museums, especially in the context of

shifting towards new ways of working, participants often spoke about relationships with digital technologies on a scale beyond the individual. So, even while participants described how the digital skills of museum professionals had the potential to support the capacity of their institutions to develop digital interpretation projects, there was also a structural characteristic of museum digital work that was commonly referenced as having enormous influence to augment (or hinder) the use and management of digital technologies over time: *process*.

Since the introduction of new communication technologies into museum interpretation offerings, institutions have been faced with decisions about organizational change, often involving the employment of professionals with specialized expertise—and even the creation of new staff positions to oversee digital operations (Eidelman, 2017; Marty, 2006a; Price & James, 2018). Digital roles are thus more recent additions to museums than other professions and departments, such as curatorial or education. A museum professional described the dynamic of initial digital teams being formed by assembling museum employees from adjacent departments, including education, marketing, communications, and information technology:

> So, these digital departments were formed from these other more established areas, and each with their own way of working, with different sets of professional experience and training and education, et cetera. And so, it became a professional melting pot. There weren't any systems, the systems didn't exist. (Museum Professional)

Some participants even described how the development of the museum digital profession within their institutions was interwoven with practices borrowed from other departments or sectors. This could result in internal infrastructures that consist of "a whole potpourri of different systems that are tacked together" (Provider), a configuration that was reported to complicate efforts to implement intentional methodologies for working on digital interpretation projects—as well as costing museums time and money due to inefficiencies. Several participants described how the lack of cohesive structure could also translate into outdated technology infrastructures:

> We've kind of run out of runway with the infrastructure we already have. For so many museums, the technologies that they're running are still the ones they started thinking about in the late 1990s or the early 2000s. The capacity to innovate at the speed they need to do it is constrained by the technology infrastructure they have. So even if they have the imagination now, they need to do a few years of infrastructure investment to modernize what is effectively their digital plumbing. (Museum Professional)

The laborious and complicated work of optimizing museum *digital plumbing*—updating technology infrastructures and untangling "a knot of systems" (Museum Professional)—was often described as a vital part of the process of implementing streamlined structures that were both effective and flexible enough to support professional practices as new technologies, challenges, and opportunities arose (Finnis & Kennedy, 2020). These considerations were also reported to be relevant in the cases of more recently inaugurated museums or digital teams; while there may not have been existing institutional systems or infrastructure to modify, participants mentioned how knowledge of the realities of digital work in museum contexts informed the subsequent procedural structuring.

The work of imagining new systems, developing institutional infrastructure, and establishing professional practices for digital museum activities resulted in a wide range of approaches to working with these technologies—both across institutions and the sector. Even within the same institution, the evolving nature of digital practices surrounding interpretation projects was reported by several participants as contrasting with the more established digital practices of museum roles that had advanced in the professionalization of their working processes, such as the information technology systems surrounding collection database management and foundational technical operations. Reflections around implementing process were mostly situated within the 'manage' relationship with digital technologies:

> How digital technology is managed within the museum—the process of digitalisation, the strategizing of digital change and transformation, the processes, policies and workflows for adopting and delivering digitally-enabled and digitally-supported practice and provision. (Parry et al., 2025, p. 14)

Participants described diverse systems that had been implemented internally by museum teams to support digital work, through both creating original procedural methodologies and adopting those that already existed. For example, participants described diverse systems that had been implemented related to administrative processes aiming to streamline decision-making during project development. One museum professional described creating a procedure where a group of stakeholders initially approved the general direction for a digital project which allowed the subsequent development process to move forward with smaller, more efficient teams—which was also reported to have the benefit of "instill[ing] trust and responsibility and ownership" (Museum Professional). Another museum professional shared how their team had adopted an existing project management matrix that clearly defined the decision-making roles of the actors involved in digital projects while having the flexibility to be adapted across a range of projects

with different configurations. On a broad level, this work of defining and standardizing processes was reported to allow museum teams to allocate staff resources more strategically:

> We really need systems to better support the creative work that we're doing. [...] What are the systems that we have to build in order for us to do more storytelling and do less figuring out where this draft needs to go for approval? (Museum Professional)

And beyond facilitating the work of digital museum professionals, these systems were also described as having the potential to shape the dynamics and mechanics of cross-sectoral collaborations—both internally among colleagues across museum departments and externally across partners.

The effort to implement systems and standardize working processes for the development of digital interpretation tools (whether produced internally or in partnerships) participate in the professionalization of digital work in museums (Dingwall, 2008; Larson, 1977; Macdonald, 1995; Parry, 2018). While some of these changes to working processes stemmed from broad strategic mandates to optimize procedures, many participants also described instances where new systems originated as a direct response to remediating problems or tensions experienced by museum professionals in the course of exercising their roles. To develop more effective ways of working, these professionals utilized their capabilities and imaginations to find solutions, often engaging in an experimental approach that contributed to the definition of their profession:

> To come back to professionalization [...], digital has meant so many different modes of operating, and so many different types of products, and so many different ways of engaging, that I think it's taken a lot of experimentation in these spaces to even figure out what we're doing and why we're doing it. (Museum Professional)

This experimentation was taking place in museum contexts where there was constant pressure to produce new digital interpretation tools while often operating with limited resources, tangled systems and potentially outdated technology infrastructures—conditions that could deprive museum professionals of adequate space for critical reflection on the long-term implications of their digital practices and the relevance of the digital interpretation tools they created (Appiotti & Sandri, 2020; Rosa, 2010). However, despite the inherent challenges, many participants described intentional efforts to work strategically and efficiently within the reality of these constraints. This dynamic reportedly contributed to defining a core characteristic of digital museum roles: "There's just been a scrappiness to digital, that maybe has always existed because of that cycle of demand always outstripping the ability for museums to resource it"

(Museum Professional). Inhabiting a posture of determination and resourcefulness in the face of constraints was reported to play a role in fostering environments that were conducive to professionalization and innovation: where processes born from the imagination and ingenuity of museum professionals could contribute to the development of institutional infrastructures and increased levels of digital maturity.

6.2.3 Digital maturity and digital strategy

The presence of digital literacy in museum staff and the implementation of working processes were reported to play major roles in supporting the capacity of museums to effectively develop relevant digital interpretation tools. However, in order for the expertise and contributions of museum professionals to be integrated into their institutions in a sustainable way, the innovations stemming from individual professional practices needed to be translated into digital infrastructure and strategy. Several participants emphasized the importance of merging digital strategy and operational infrastructure in order for digital projects and processes to operate without dependence on specific actors for their continued existence. The risks that could result for museum digital work without the codification of these procedures into the larger institutional culture included the discontinuation of launched digital projects after staff turnovers rendered them no longer feasible: “The culture hadn’t been embedded, and subsequent people didn’t have the specific technical competencies needed” (Museum Professional). Sustainability in process (and not just in digital project lifespan) was frequently described as an essential objective for the digital activities of museum teams, though this was often reported to be more realistic in contexts where digital workers had institutional support for this work.

The strategic integration of digital systems into larger institutional infrastructures played a role in supporting digital maturity in museums. As outlined in Chapter Three, the concept of digital maturity reflects an institution's ability to work with digital technologies in an efficient and reflexive manner, including a “systematic preparation to adapt consistently to ongoing digital change” (Knight Foundation, 2023, p. 6). The path to digital maturity varied across institutions and was achieved, in part, when museum digital work was conceptualized as an interconnected ecosystem where “all aspects [...] are understood and operate as a system; maintained and optimized” (Vargas, 2019, p. 222). Vargas’s proposed definition

of digital maturity emphasizes the importance of sustainable systems that were grounded in institutional missions, diverse perspectives, and an acceptance of the inevitability of change—all of which were themes that arose in participant responses. The holistic grounding of digital maturity in structure, missions, and functioning (Martins et al., 2021) was reported to manifest within museum digital activities as an intentional braiding of individual expertise, systems of professional practices, and formalized digital strategy.

Many participants described the pivotal role that defining and implementing a digital strategy could play in building a robust infrastructure and sustainable practices—as well as in the work of developing and maintaining digital interpretation tools. Different approaches to developing museum digital strategies were mentioned by participants. These included the formal definition of the priorities and practices for the digital work of the museum, departmental best practices for processes and roles, and the inclusion of broad objectives for working with digital technologies within the larger strategic plans of an institution. Despite the variations, there were commonalities amongst participant responses concerning the components of digital strategy, including alignment with mission, delegation of responsibilities, definition of processes, and allocation of resources. These elements are reflected in Morrison's (2019) definition of digital strategy:

> The goal of digital strategy is a statement of vision with objectives for the organisation's digital programs, based on evidence, 'owned' by leadership, backed up by adequate resources and used as a guide by management and operations. (Morrison, 2019, p. 15)

The foundational work of establishing a "statement of vision" for museum digital activity involved bringing together institutional objectives, the means to put them in operation, and the resources that would sustain them—efforts which were reported to lay the groundwork for the subsequent development and maintenance of digital interpretation projects. Several participants described how the definition (or re-definition) of their museum's digital strategy necessitated assessing the current realities of the institution "in terms of its capacity, as well as its aspirations and frustrations" (Museum Professional). Additionally, this work could require reconciling the museum missions with business model considerations: "A lot of [redefining] the digital strategy was about: what are the core infrastructure things that we need as a museum to be able to operate in the 21st century as a business?" (Museum Professional). Strategic digital practice and transformation can impact a museum's organisational structure (Gatelier et al., 2022), inviting

new opportunities to support institutional longevity by reconfiguring business models through engagement with digital technologies (Taormina & Baraldi, 2022).

When describing the processes and responsibilities defined by digital strategies, several participant responses evoked the concept of digital governance: “a framework for establishing accountability, roles, decision-making, and change management authority for an organization’s digital presence” (Welchman, 2015). Based in the holistic perspective of a digital strategy, these participants shared their efforts to establish digital governance initiatives as a method to ensure adequate resourcing and mission-alignment for museum digital activities—including innovation and experimentation. Cross-divisional integration and communication was mentioned as an important aspect of digital governance initiatives:

> How do we solve a number of different challenges, but also ensure that everyone's on board and working together towards the same goals? And that's really what [the new digital strategy] was all about: getting some defined processes, some defined roles and responsibilities. (Museum Professional)

Governance structures could enhance—and cultivate new avenues for—internal conversations across museum departments by establishing channels for “continual conversation” (Museum Professional). They could also cultivate buy-in from colleagues and museum leadership for new digital practices and projects by “being articulate about how it’s governed and what value it’s going to bring” (Museum Professional). Digital governance strategies were reported to give digital teams and museum leadership access to shared objectives, language, and systems to support effective communication and decision-making regarding the development of digital projects (Dodge, 2023)—which was also considered to be beneficial to the quality of the resulting interpretation tool (Petrelli et al., 2016).

The existence of digital strategy or governance structures within museums did not always translate into their implementation. When the Knight Foundation (2023) developed a Digital Maturity Framework with an assessment rubric for cultural institutions, three functional categories of digital maturity (Planning and Development, Operations and Implementation, People and Culture) were characterized according to the degree that they had been integrated into the institution:

> The Framework sets forth statements that describe the degree to which the dimension has a **presence** in an organization; whether **process** ensures consistent implementation of the dimension; and, finally, identifies ways in which that dimension informs ongoing organizational **strategy**. (Knight Foundation, 2023, p. 8, bold in original)

In the Framework's Digital Maturity Assessment Rubric (Knight Foundation, 2023, p. 9), the implementation of museum digital strategy was categorized across these three levels of integration (Figure 6.3):

	PRESENCE	PROCESS	STRATEGY
Digital Strategy	A digital strategy or plan for integrating digital into the organization's approach to its work is in place at the organization.	Digital strategy is fully integrated as part of organizational strategy.	The organization adjusts its strategic goals and methods based on the results of its digital work.

Figure 6.3 Digital Maturity Assessment Rubric[2]: Digital Strategy (Knight Foundation, 2023, p. 9).

This distinction between these degrees of institutional integration of a digital strategy was present in participant responses when describing the dynamics of developing digital interpretation tools. In museum cultures where digital strategy and organizational strategy were more integrated, participants described how governance structures and formalized digital strategies could be used as working tools to support intentional decisions regarding where and how to allocate the often-limited resources of museum digital workers in ways that were aligned with larger institutional missions:

> In contrast to the last [digital interpretation project], which was "So, what does everybody want?" and everybody got what they wanted... [...] We are now saying "No, I need to focus on this, because this is what our organizational priorities say I should focus on. [...] And that means that you may not get the thing that you wanted. Because in the priority list, there's only so much time and money, and other resources. So that's a new way of thinking for [the museum]. (Museum Professional)

The benefits of formalized strategy were often mentioned in the context of communication with museum colleagues with varying levels of digital literacy and understanding of the institution's digital strategy: "People get distracted by the shiny thing and the thing that stops you getting distracted is clear, articulated governance" (Museum Professional). Beyond supporting digital interpretation objectives, these structures were also reported to alleviate the complexity of decision-making procedures and to empower low agency digital workers when engaging with museum leadership.

[2] The full Digital Maturity Assessment Rubric can be found in Appendix G.

Participants also described the impacts of lower levels of digital strategy integration on the dynamics of working on digital activities within museums, including variations in practices and priorities across an organization. Disconnection between museum departments could lead to discrepancies in digital literacy levels:

> On the strategic level, there needs to be a tighter integration with understanding digital in the context of the work that curators or content developers do. And there are some museums where those are bridged, but there are others where they're not. (Provider)

For example, a museum professional described a situation where colleagues in another visitor-facing department had developed a digital interpretation project without involving their team of specialists; and, despite the tool's functionality, the participant described how they would have approached the project differently based on their team's established practices for designing relevant digital interpretation experiences. Another participant described a siloed museum environment where the staff outside of the digital department were often aware of the existence of a digital strategy (from information shared during meetings) but were not familiar with the particulars. This was reported to result in a wide range of digital priorities across the museum: "What might be important to the digital department as a digital project would be very different than what it might be for curatorial and what it might be for the education division" (Museum Professional). This professional remarked on the level of support that digital teams needed in order to implement "a strategy that everybody would take up in the building" (Museum Professional). The complexities involved in the transition from *process* to *strategy* (Knight Foundation, 2023) demonstrate the scale of organizational changes and investments that can be necessary in order to adequately resource effective digital practices.

6.2.4 Digital teams and external structures

The work of intentionally establishing digital strategy and implementing systems was often described by participants as correlating with evolutions within the structure of digital teams and the definition of digital roles. Several museum professionals mentioned that their institutions had recently reorganized their digital departments, including the creation of new roles, changes in staffing, and adjustments in structures. The operations of several different digital team models were described as having varying levels of strategic

oversight and institutional integration, as well as being housed within varying departments within museum organizations (such as digital, marketing, education and interpretation). The models mentioned by participants, either explicitly or implicitly, broadly corresponded with those illustrated in Figure 6.4:

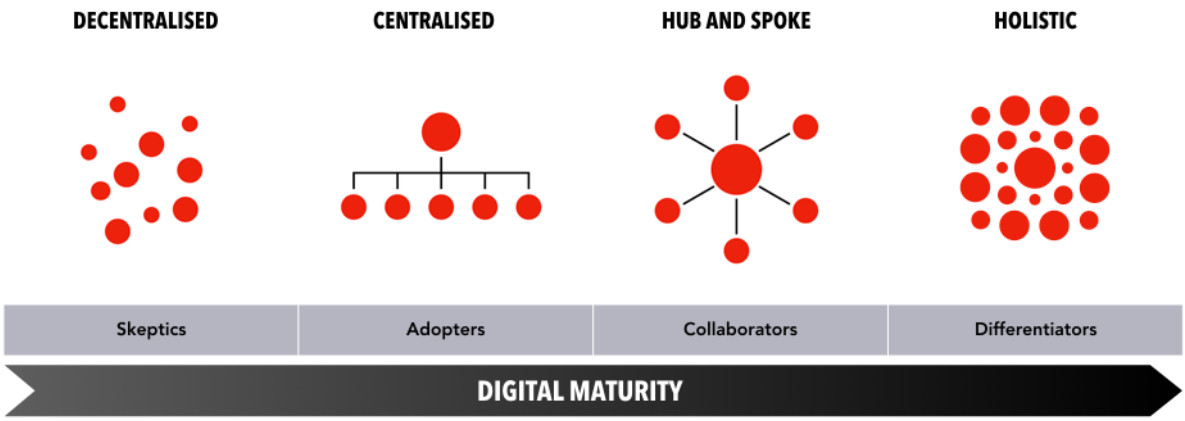

Figure 6.4 "Digital team models mapped to the four segments of digital maturity in Forrester Research's Digital Maturity Model 5.0" (Price & James, 2018).

Based in their findings from a global survey surrounding museum digital teams, Price and James (2018) identified five structural models[3] of digital teams in arts organizations: *outsourced* (one digital staff member manages external service providers), *decentralized* (digital staff scattered across different departments), *centralized* (digital staff located in one department with oversight of museum's digital activity), *hub and spoke* (a small central unit coordinates digital activity across museum departments), and *holistic* (digital activity is strategically distributed across the museum). The authors determined that "the structure of a digital team, or digital responsibility, is an indicator of the level of digital maturity of an organization" (Price & James, 2018), and proposed mapping of these team structures to Forrester's (2017) digital maturity model comprised of four dimensions (culture, technology, organization, and insights). In this conceptualization of digital teams, movement towards digital maturity corresponded with the wider embedding of digital activity and responsibility across the organization by museums who were "willing to invest more in, and experiment with digital" (Price & James, 2018), with the guiding objectives centered on function rather than form: "The end goal is not to have a digital department, but for an institution to use digital effectively to achieve its mission" (Tallon, 2017). This understanding was present in many

[3] The fifth model, Outsourced, is not illustrated in the figure.

participant responses surrounding the rationale for the decisions regarding digital team models, where evolutions in practices and structures were frequently described in terms of the strategic objectives that motivated them—often in response to "the changing expectations and habits of our audiences, new practices within the digital sector, and the strategic priorities of the Museum" (Sreenivasan & Tallon, 2015). For example, one participant described how a major outcome of formalizing a digital strategy within their museum was a transformation of their digital team model from the previous configuration of "institutional, bureaucratic, hierarchical structures with people not necessarily knowing who to go to" (Museum Professional):

> If we're serious about [the newly formalized digital strategy], we need to build up the internal capacity of the organization to do this work. We already have a lot of the resources there—they're just maybe not aligned as efficiently as they could be. I believe in the hub and spoke model, where digital can act as the nexus point where people from across the organization can be plugged into the group to work on various things. But that model only works if those internal digital resources are already centralized. So, the work was to centralize a lot of the digital activity in terms of staffing into this department. (Museum Professional)

Other participants described digital team transformations that were aimed at centralizing digital expertise and the management of digital projects within the organization, connecting complementary expertise and practices across departments, broadening digital literacy and awareness across the institution, shifting digital teams to marketing departments to drive on-site visitation, and establishing digital roles in executive leadership to anchor digital expertise within the larger organization.

However, several participants described how not all museums had access to the significant resources and institutional support that were often necessary to implement certain digital team models, especially in smaller museums. In many cases, this was reported to result in less efficient digital practices and fluctuations digital capacity resulting from reliance on grants to fund digital projects or temporary staff positions. These factors could translate into an increased dependence on external technology partners for core digital activities, including fulfilling the objectives related to digital interpretation projects. In other cases, participants described the creation of independent structures that acted as externalized digital teams to support cultural institutions in their digital activities (Eidelman, 2017). A related structure was explored in the preliminary study (Chapter Two) that analyzed PRISM, the digital innovation laboratory at the Montreal Museum of Fine Arts (MMFA) created within the Quebec's Ministry of Culture and Communications' *Plan culturel numérique du Québec* to support digital interpretation work in museums across the province. Similar to PRISM, the external structures described by participants were created with

the express purpose of supporting the digital work of specific groups of cultural institutions. Unlike the innovation lab, however, these structures were often responsible for the management and budgets of the digital interpretation projects within their network. This resulted in digital team models resembling exoskeletons: while the digital expertise and working systems imposed by these external structures were distinct from the operations of each affiliated institution, the mandates and funding of the external structures were intimately entwined with their partners. Smaller museums were reported to especially benefit from this access to digital expertise, project management frameworks, and funding to augment their capacity to improve the working processes of their staff and to offer their audiences relevant digital interpretation tools (Ramond et al., 2017).

The composition of professionals in digital teams was also reported to vary largely across museums—and even within individual institutions over time. For example, a museum professional described a departmental restructuring that shifted the responsibilities of the in-house digital team from solely information technology to also including digital content creation, technical and design aspects of presenting that information, and the underlying technology. They mentioned that the digital team was frequently augmented through interdepartmental collaborations with the curatorial, exhibitions, education and interpretation teams—and, for larger projects (such as for temporary exhibitions or gallery installations), they worked within the frameworks of the museum's project management group, the staff of which "will not need to be a subject matter expert on any of this, but just to coordinate the activity of all these various functions" (Museum Professional). Other participants shared examples of digital teams creating new roles adapted from the private sector, including product management:

> Organizations, especially with the rise of apps and with software as a service, started seeing product management really grow. And trying to think not just about how we deliver a project from a project management standpoint—that is to say, making sure that the project ends on time, on budget and in scope—rather that it's also rooted in thinking about: Who are our users, what do they need, what do we want to deliver? What is in our business goals and objectives? And what kind of technology can we use to help solve that user problem? So, we're looking at the Venn diagram of all three of those things. (Museum Professional)

This approach to digital projects incorporated process with an audience-centered approach and business objectives with the aim of supporting the museum's digital strategy. Some institutions established roles for expert technologists on their digital teams, which demonstrated a perceived importance of digital skills as well as digital literacy:

> The lack of technical specificity [in discussions of digital skills] makes everyone a digital content person, not actually a hard technology person as well. And I think you need hard technologists in your institution. [...] You need engineers. You need a culture that is able to talk with engineers. (Museum Professional)

In this perspective, the capacity to engage internally with *hard technology* was valued as much as the skillsets necessary to work on design, user experience, and content production. However, not all museums employed in-house digital teams that contained technical, content, and management expertise—whether by strategic choice or logistical constraints. Some participants described museum digital teams that managed the technical aspects of digital teams while their colleagues in other departments led the digital content: “It’s not our job to dictate content, that's an area of expertise that we don't have, and so we don't get in the way with the content expertise” (Museum Professional). Other participants mentioned museums where the digital team more heavily focused on content production or product management with support from collaborations with external providers and colleagues across departments.

This flux of forms in digital team models translates into a wide variety of operational infrastructures, professional roles, and reporting structures across museums (Nikolaou, 2024; Ramond et al., 2017), which prompted some providers to remark on the lack of consistency across their museum partners in terms of roles, digital literacy, development approaches, approval processes, and overall ability to effectively collaborate. More broadly, however, evolutions in digital team models were seen by some participants as intrinsically linked to the inevitability of change within the postdigital museum (Parry, 2013; Peacock, 2008)—where digital maturity is achieved, in part, when “persistent paradoxes of change are accepted and viable options explored and baked-into the museum strategic goals” (Vargas, 2019, p. 222). In this posture, digital team models became an extension and operationalization of institutional digital strategy: "Most digital leaders understand that their teams are part of a process—a shifting culture—rather than a permanent structural fixture within their organizations” (Price & James, 2018). Due to the significant resources and organizational change that these changes could require, participants described how the transformations of digital team structures and strategies were only possible with meaningful support from museum leadership.

6.2.5 Support of museum leadership

A recurring theme in participant responses was the significant impact that museum leadership had on the capacity of museum teams to strategically and sustainably develop digital interpretation tools. In order for museums to cultivate efficient digital ecosystems, many participants described how museum leadership and stakeholders needed to actively support and invest in the efforts to “build up the internal capacity of the organization to do this work and align our resources efficiently" (Museum Professional). Without adequate buy-in from leadership, the “momentum of the institution” (Museum Professional) to effectively work on digital projects could be severely hindered.

A key characteristic of supportive leadership was reported to be a certain level of digital literacy. Participants mentioned that this literacy did not necessarily need to consist of an extensive knowledge of working with technology or digital skills (Price & James, 2025) but rather could take the form of “digital confidence and understanding” (Finnis and Kennedy, 2020, p. 18) around how digital projects could support institutional missions. Due to the ever-evolving nature of digital technologies, participants described the importance of leaders adopting a growth mindset: “You need to always be learning and open to learning new things, [...] because in technology, it changes every twelve months, not even that, and it can be hard to keep up” (Provider). This willingness to engage in a practice of continual learning—and to navigate the vulnerability of asking what may feel like “dumb questions” (Museum Professional)—could increase the effectiveness of leadership support by making them “more ambitious but more strategic, and building a common language” (Museum Professional). These efforts were also reported to equip leaders with more agency and contextual awareness when determining how to engage with partners from the private sector, as well as instilling a sense of trust in their digital staff (Price & James, 2025). Participants also mentioned various approaches to encouraging leadership to support and approve digital activities, including formalizing digital strategies, designing efficient decision-making procedures, obtaining external funding for projects, and engaging contractors to facilitate dialogue.

Participants shared how the actions of museum leadership could facilitate or impede digital working processes in every phase of cross-sectoral collaborations—from before the selection of a technology partner to after the launch of the digital project. Without a baseline of digital literacy and trust in their in-house digital experts, tensions could arise from unhelpful stakeholder interventions, including: imposing pressure to pursue *shiny objects* and trendy technologies without strategic rationales, expressing wariness of digital projects and partnerships due to a perception that they were inherently risky for the institution

or interfered with the collections, limiting the agency of museum professionals in making decisions about digital strategy and practices, threatening staff with negative professional consequences when engaging with innovation, failing to motivate colleagues in other departments to contribute to digital projects, and complicating the decision-making and approval processes. Participants described how the digital capacity of museums could also be negatively impacted when leadership did not adequately invest in building and sustaining qualified digital teams. A successful approach was reported to require the strategic allocation of financial resources regarding personnel when determining the division of labor between museum staff and external partners, as well as manageable expectations for the capacity of these professionals:

> Our research reveals that budgets are not large enough to serve our organizations' digital ambitions. This supports Nesta's (2017) evidence that a lack of funds and lack of staff time remain the most significant barriers to organizations achieving their digital aspirations. [...] At the same time, [digital leaders] need to manage organizational expectations of what is realistic with existing budgets, as well as with future budgets. (Price & James, 2018)

Many participants mentioned the stress and burnout that could result from fast-paced digital museum work, "which has a heavy workload and involves collaboration with many 'personalities'" (Museum Professional). Well-resourced and structured digital team models were reported by some participants as strategic interventions to support sustainability within digital museum professionals. Beyond staffing concerns, difficulties could also arise within digital teams when leadership did not provide sufficient funding for the development, maintenance, and updating of both digital products and digital infrastructures. The decisions made by museum leadership regarding the allocation of resources were reported to have direct impacts on the structure of digital teams, their capacity to achieve institutional objectives for interpretation experiences, the sustainability of digital activities, and the decision of how to engage in external partnerships.

A dynamic of internal disconnect was revealed across many participant responses, where digital teams understood the investment that would be required to support digital interpretation projects more clearly than institutional stakeholders: "Digital is everything right now. It's how we communicate, it's such an integral part of museums right now. But still the investment isn't there, coming from the top" (Provider). One possible reason for this tension was reported to be the scale of the organizational change that a strategic approach to digital activities required, especially in the broader context of limited financial resources across the sector: "The conceptual leap is so large that there's been no time because they've been putting out fires, the arts and culture sector has been stripped of money" (Museum Professional).

While several participants described examples of advances in digital practices and strategy that originated at the level of digital workers and were subsequently approved by leadership, other participants emphasized that meaningful change and innovation could not originate from the efforts of digital teams, but rather could only be sustained with initiatives at the level of museum leadership:

> I realized that the problem is no longer in the middle of the institution. The problem is at the top and the board and the ability for an authorizing environment to be created, with a full understanding of what an authorizing environment for innovation means. [...] You could hire people who were technically literate, competent, all those things, to come in and set up your thing and do innovation. But they would need an environment where they could make change. (Museum Professional)

Respecting the recommendations and expertise of digital workers, and strategically granting staff "the autonomy to lead and innovate" (Price & James, 2025, p. 34), could augment the digital capacity of an institution by allowing these professionals to create efficient working processes and design relevant interpretation tools, even in institutional contexts without integrated digital strategies or defined governance structures. Moreover, the presence of "pro-digital leaders" (Museum Professional), with "a managerial receptiveness to experimentation" (Black, 2018, p. 316; as cited in Holcombe-James et al., 2023), can facilitate digital innovation. As one participant shared, "We proposed this project [using an emerging technology] that no one in the museum understood yet, but the director said, 'I trust you'" (Museum Professional). Such authorizing environments can create professional conditions where internal "agents of change" (Finnis & Kennedy, 2020, p. 19) are well-resourced and empowered to implement new systems. Without distributing authority to make changes to digital practices and processes, it can be difficult for museums to retain the necessary qualified digital experts who could otherwise find employment in the private sector, which generally offer higher salaries and value digital approaches. High turnover rates within digital teams and restrictions surrounding innovative practices can limit the potential impact of museum digital activities, "like being presented with this great motorway to get another city but you only have a Stone Age car" (Museum Professional). Adequately supporting museum digital activities involves strategic adaptations of working processes, management culture, and resource allocation, which can result in significant changes to professional environments.

Digital leadership in the postdigital age requires diverse skillsets. Balancing constantly evolving organisational configurations, while supporting museum missions, necessitates "more than just digital literacy; digital leaders need business literacy" (Price & James, 2025, p. 36). Some participants described

this organisational knowledge as another reason that sustainable digital practices could only occur when stemming from initiatives at the leadership level (Holcombe-James et al., 2023), as executive professionals had direct access to boards and governments and could strategically steer conversations about funding. Additionally, working within the rapid change inherent to the postdigital era involves becoming acquainted with uncertainty. To strategically face transformations, museum teams must develop "greater tolerance of ambiguity, instability, and unpredictability" (Janes & Sandell, 2007, p. 6; as cited in Holcombe-James et al., 2023). An important skill for digital leadership is thus "the ability to guide teams and the museum organisation in leveraging new technologies while navigating they uncertainty they bring" (Price & James, 2025, p. 35). This work involves anchoring the activities of the professional ecosystem in institutional mission, while also nurturing adaptation. As will be explored in the next section, creating environments within cultural institutions that are conducive to digital work can require significant change within museum organizational cultures—and can impact how museums collaborate with external partners in the technology sector.

6.3 Cross-sectoral collaborations within museum professional ecosystems

The previous sections of this chapter have broadly addressed the structures and dynamics within museum professional ecosystems that shaped their collaborations with external actors to develop digital interpretation projects for their visitors. These discussions focused on internal interactions and characteristics, including guiding missions for interpretation and visit experience, degrees of digital literacy within museum teams, professional practices and strategies for working with digital technologies, organizational digital infrastructures, and team models. The conditions that resulted from the interactions and interdependencies across museum colleagues, as well as between these professionals and the structures of their museum environment, were reported as having major impacts on how museums positioned and engaged in their ecotone activities—as well as the effectiveness of these collaborations in producing digital interpretation tools that were aligned with institutional missions for museum audiences.

The following section centers these collaborations themselves, examining them as ecotone spaces—the distinct areas of intersection between separate professional ecosystems (Ryberg et al., 2021; Suteau, 2022). When museum teams and technology companies partner on the development of digital interpretation projects, the encounters brought together entities and actors with different languages, motivations, and working processes. These hybrid spaces have unique characteristics and dynamics, blurring sectoral boundaries and weaving together "the seemingly contradictory and irreconcilable into a new whole" (Ryberg et al., 2021, p. 408). The activities and relationships "on-the-edge" (McNicholas, 2004, p. 57) of professional ecosystems often undergo rapid adaptations and produce innovation: "their changes may be a useful barometer of societal and business trends, and may enable swift response to our rapidly changing environment" (McNicholas, 2004, p. 67). Analyzing cross-sectoral collaborations as edge phenomena could reveal shifts (such as those relating to digital culture, organisational functionality, audience needs) both within cultural institutions and without—and could inform relevant directions for the sustainable futures of museums.

In order to examine what these cross-sectoral collaborations could reveal about the capacity and needs of museum teams to work strategically on digital projects that serve institutional missions, this section utilizes the framework of museum professional ecosystems—and the associated concept of ecotones—as analytical constructs. Research participants shared their perspectives on strategic approaches for positioning the role of these partnerships within museum digital infrastructures, the particularities of the

dynamics that occurred as these cultures joined together in partnerships, the importance of interpersonal communication and trust, the necessity for translation to facilitate understanding of partners across sectors, instances of adaptation within the hybrid space that resulted from these collaborations, and the paradoxes inherent to digital change within museum professional ecosystems. Many participants evoked determining the degree of dependence on external partners as a vital issue of reflection for museum teams when considering how (or whether) to enter into these collaborations.

6.3.1 Positioning the role of external partnerships

When collaborating with technology companies to develop digital interpretation projects, museum teams must determine how to situate cross-sectoral ecotones within the overall functioning of their professional ecosystem. In participant responses, these positionings were largely discussed in terms of the capacity and availability of internal resources within museum teams, the specifications of institutional digital strategy, the professionalization (or externalization) of digital museum roles, and the degree of dependence on outside partners. Even within an individual museum, the modalities of positioning ecotone collaborations within museum professional ecosystems could potentially change from project to project.

The choices surrounding whether, and how, museums should enter into cross-sectoral collaborations are situated within the larger question of strategically implementing "branchements" (Ramond et al., 2017, p. 165) with external partners and networks to support institutional sustainability. When balancing internal resources with expectations for production (especially in the context of increased demand for digital interpretation tools), many museums decide to augment their digital capacity through ecotone collaborations with technology companies (Cao, 2025; Li & Ghirardi, 2018). Participants described how many factors were involved in the choice of which external relationships to welcome into their museums' professional ecosystems—and to what extent. In "How might we work better/together?", a 2024 panel conversation about the future of collaborations in the cultural sector, Kate Fielding differentiated between the broader benefits of external partnerships and the necessity of ensuring that specific collaborations are institutionally relevant:

> Working together in different ways allows us to do things that are not possible when we work alone. It allows us to access expertise, perspective, resources, insight, understanding, context that

> we don't hold in our own selves, we don't hold in our own organisations. [...] And I think sometimes when we approach partnerships, or we're working together, the idea that collaboration is a worthy thing can plaster over the more interrogative questions that are useful in terms of why is this a purposeful collaboration, why is it purposeful for us to work together. Because not all collaboration is purposeful, not all collaboration is the best way to do something. (Fielding, 2024)

In this perspective, collaborations have the potential to be "purposeful" but are not inherently so. Field's remarks demonstrate the different modes for engaging with the question of institutional approaches to purposeful partnerships: encompassing both large scale reflections on overall institutional strategies, as well as zoomed in decisions about specific projects or partners. These considerations are prevalent in the context of digital museum work, where cross-sectoral collaborations can be a significant element of professional practice. Across participant responses, diverse modalities and rationales were described for positioning partnerships that allowed museum teams "to do things that are not possible when we work alone" (Fielding, 2024).

Cross-sectoral collaborations that augmented overall institutional capacity were often reported to be purposeful, despite the fact that this approach was sometimes determined by constraints rather than strategy. Participants evoked several reasons for utilizing ecotone collaborations as integral components for sustaining digital activities within museum professional ecosystems. One commonly reported cause for seeking collaborations was a lack of adequate technical competency within museum staff. As explored previously, this dynamic could result from a lack of investment from museum leadership in building the qualified digital teams and supportive work environments that could foster strategic digital practices (Finnis & Kennedy, 2020). These contexts were impacted by institutional decisions about the creation of specialized roles within museum teams and the professionalisation of digital workers:

> Tous les nouveaux métiers n'ont pas a priori vocation à être intégrés de manière pérenne dans les cadres d'emploi et dans les équipes des établissements. Il semble important de penser l'évolution en fonction de plusieurs critères : la durée des missions pour lesquelles ces nouvelles compétences sont nécessaires ; l'aménagement de la formation des corps existants ; la professionnalisation des personnels en place. (Ramond et al., 2017, p. 156)

These strategic considerations around digital team models and roles could thus impact the ability of museums to have agency in determining how to best engage with ecotone collaborations. Participants described several similar reflections on how the structure of digital teams was related to decisions about externalizing digital roles for project-based needs. For example, partnerships could augment institutional

capacity when a specific project's level of complexity was beyond the internal capabilities of the museum team:

> We built [a digital project at a large museum] about 10 years ago. But they were always going to take that over as soon as we finished. [...] They have a big internal team with developers, so they have the capacity to manage that. But maybe not to do the big build, which would almost have to double their team, and then get rid of everyone again. (Provider)

In this case, bringing in partners for a collaboration was actually a method of maintaining consistency in the structure of internal museum teams over time. Participants also described structural reasons for engaging with external partners, such as supporting the internal capacity of museum teams to respond to the increasing expectations for digital interpretation tools (regardless of the digital competency within staff members): "The demand for digital content and digital products far outstripped the ability to resource for it inside museums" (Museum Professional). Partnerships could allow busy and (often overworked) museum professionals to strategically allocate their time and knowledge across an institution's digital activities. Different models of collaboration were also described as methods for supporting the digital capacity of museum professional ecosystems, by allowing museum teams to access the strengths of actors from different sectors. For example, co-production partnerships could bring in specialized digital expertise and extend the distribution of digital interpretation projects beyond museum sites to new locations (Duchange & Roland, 2024), which potentially created opportunities for continued revenue and increased visibility.

However, on an existential level, some participants warned that externalizing significant digital expertise to technology companies (without the internal capacity to ensure the relevance of their practices) could result in delegating institutional strategy to actors from external professional ecosystems:

> Le risque consiste à recruter des entreprises privées qui font à la place du musée ce qu'il souhaite faire. Cela soulève la question des limites et des périmètres de l'externalisation, ainsi que celle de la délégation de service public. Il paraît fondamental de maîtriser ce que l'on externalise : ne pas externaliser parce qu'on ne sait pas faire, au risque de déléguer in fine des pans entiers de la stratégie de l'établissement… (Ramond et al., 2017, p. 145)

In this perspective, a strategic approach to structuring digital roles is required to ensure that ecotone collaborations are purposeful and not parasitic. Several participants warned that completely outsourcing digital expertise to technology companies would leave museum teams ill-equipped to act as empowered partners, including in situations where the externalization of technically-oriented tasks shifted the

composition of museum digital workers towards project management or content production roles (Parry et al., 2018). However, sustaining digital staff positions requires financial resources and institutional openness to digital change (Finnis & Kennedy, 2020). Adequate levels of internal expertise (and the resources to support them) may be necessary in order to ensure that the digital activities that occur in these ecotone spaces are compatible with the core functions and missions of museum professional ecosystems.

Sustaining partnerships over time was reported by some participants to be a purposeful approach to collaborations. An area of strategic importance when determining how ecotone collaborations would be positioned within museum professional ecosystems was the degree of dependence that museum teams would have on their external partners for the sustainability of digital practices and projects—particularly in the phase after the digital project was launched. In some contexts, collaborations between museum teams and technology companies were reported to continue beyond the development process and into the operational phase—and even to extend across many projects. While dependence on external entities was often reported to be obligatory in museum contexts that lacked sufficient in-house capacity to independently sustain digital activities (Li & Coll-Serrano, 2019), some participants described instances where museum teams partnered with technology companies over extended periods of time by choice. In these cases, the merging of ecotone activities into the ecosystem's functioning was viewed as beneficial: "Honestly, it really felt like [the company] became our extended team, and I think that's one of the reasons that we continue to work with them" (Museum Professional). Similarly, a provider described a situation where, due to the stability within their company's personnel, they were able to offer their museum partners information about previous projects that the museum team may not have conserved internally: "In some ways, I'm convinced we know more about the [digital product] than anyone else who works there" (Provider). Several participants extolled the potential for prolonged relationships between museums and technology companies to foster conditions that were conducive to developing relevant projects and processes: "There is definitely a magic to partnerships, and I think that might be why we work with people for a long time" (Museum Professional). These perspectives illustrate the degree of enmeshment between partners that was possible when collaborating on digital projects within cross-sectoral collaborations (Ryberg et al., 2021). In these museum professional ecosystems, the ecotones were expansive and blurred the boundaries between internal teams and technology partners.

However, many participants described the risks associated with reliance on technology companies for the development and continued operations of digital projects. This wariness echoed the guiding missions behind the France 2030 technology investment project, which responded to the vulnerabilities and foreign dependencies exposed during the pandemic with a plan to foster a more robust national digital ecosystem, including through the objective to "maîtriser les technologies numériques souveraines et sûres[4]". Relying on external ecosystems was also perceived by some participants as posing a risk to cultural institutions. In order to maintain digital interpretation activities that depended on sustained involvement from external partners, on the most basic level, "the provider must continue to exist" (Provider). But the continued existence of technology companies, as seen in the case of the SFMOMA App in the introduction to this dissertation, is not guaranteed:

> I think we need to be honest that the business models that support many things that we do are not the same as the business models that support most commercial enterprises and they are very, very fragile. (Chan, 2020, p. 130)

This entrepreneurial *fragility* could also cause museum teams to lose control of the future of their digital projects in other ways, such as if their external partner decreased its customer support services, shifted the scope of its operations, changed systems or staff members, increased pricing, or was acquired by another entity. Over time, these challenges could entail financial complications for museums, as well as potentially impeding their ability to serve their audiences.

In an approach to purposefully positioning cross-sectoral partnerships, participants described museum teams that sought to avoid dependence on external partners by prioritizing clear delimitations between the activities taking place in ecotones and the core sustainability of museum professional ecosystems. These practitioners worked to create digital projects and practices that were "sovereign and secure" within their institutions. One such strategy was the practice of only engaging service providers to support the implementation of new ideas and projects that would subsequently be operated and maintained by in-house teams. This was not a viable option for all institutions: while many participants advocated for the importance of building sufficient levels of internal capacity to manage digital projects within museum teams, many institutions lacked the resources, infrastructure, or willingness to make the institutional

[4] "Discours du Président de la République à l'occasion de la présentation du Plan France 2030", *Élysée.* Delivered: October 12, 2021. Retrieved: September 6, 2025. Available https://www.elysee.fr/emmanuel-macron/2021/10/12/presentation-du-plan-france-2030

changes (Finnis & Kennedy, 2020) that would be necessary. Other strategies employed by museum teams to mitigate potentially negative dynamics arising from reliance on external partners included designing digital projects for sustainability, retaining the rights of the digital product or obtaining joint ownership, engaging with external partners only for time-bound digital projects, and conducting knowledge transfers with the technology company at the end of the collaboration.

In a similar conception of purposeful collaborations, partnerships were framed as a modality to develop internal digital practices and competencies—without resulting in on-going reliance on external actors for the sustainability of digital infrastructures. A museum professional described how their institution's digital team intentionally engaged in collaborations with partners when developing experimental digital projects in order to conduct institutional research that would be slowly and sustainably integrated into the museum's digital infrastructure, as defined across three poles: digital practices or structures, staff capacity and skills, or interpretation and content about the collection. This posture framed cross-sectoral collaborations with external partners as opportunities to take risks, conduct experiments, and innovate (Krakowski et al, 2023), and thus utilized them as a modality to *inform* sustainable core digital practices rather than *as* core digital practices. In this perspective, the dependence on ecotone activities and actors for the survival of institutional digital activities was viewed as a potential threat to the capacity of museum professional ecosystems to sustain the efforts necessary to serve the needs of their audiences over time. However, when positioned strategically, engagements across sectors could augment the vitality, creativity, and resilience of museum digital practice.

6.3.2 Interaction and translation within ecotones

The vital role that interactions played in ecotone activities was a theme that arose repeatedly in participant descriptions of partnerships between museum teams and technology companies. These cross-sectoral engagements brought together diverse professionals for collaborations that "gather diverse professional expertises into the design process [which] in turn interweave with wells of expertise present in museums" (Krakowski et al., 2023, p. 562). A large variety of collaborative dynamics were reported to occur in these ecotones, ranging from projects developed with minimal interaction between partners, to processes that mobilized co-creation practices to integrate the contributions of the collaborators. Many participants

reported a preference for active collaboration within partnerships, which was a posture that facilitated the merging of expertise and capacity across professional ecosystems. Concerning the factors that could impact "the strength of the interactions between adjacent ecological systems" (Holland, 1988; as cited in McArthur & Sanderson, 1999, p. 3) within the unique dynamics of cross-sectoral collaborations (Austin, 2000; Stafford, 1994), participants described professional practices and perspectives that were related to the concepts of mutual understanding, intentional communication, emotional labour, translation work, boundary objects, and power dynamics.

The success of the development process (and of the resulting digital interpretation project) was often reported to be impacted by the degree of mutual understanding between partners. This was described on two levels: an interpersonal sense of trust and cooperation between individuals, and a broader comprehension of the processes, languages, values, and constraints of a partner's sector. Cross-sectoral understanding could reportedly be enhanced through intentional communication practices. Communication channels could be employed as a modality to strategically "bridge the expertises" (Provider) and ensure that information was available across partners. One such example was the practice of running participatory workshops to launch the project development process, where teams could "start getting to know each other's viewpoints" (Museum Professional) and "creating a collective understanding of what the project is" (Provider). Quality communication between partners could subsequently foster trust and buy-in, the importance of which was a repeated theme in participant responses—especially in regard to the willingness of museum teams to introduce new applications of, and working processes around, digital technologies in museum spaces:

> And as much as we need to sometimes have meetings where there are ten people there to work through a creative challenge, we also need to make sure that there are one-to-one opportunities for connections, so that we get to know each other on a personal level and can have that sense of trust and ease of working through difficulties together. (Provider)

Fostering trust and cooperation could reportedly cultivate conditions that led to feelings of safety and openness for engaging with new ways of working—including for museum professionals with negative discourses of digital imaginaire who felt "a lot of fear, uncertainty and doubt about technology" (Provider). In "Digital Labour is Emotional Labour," Sophie Frost argues that digital work in cultural institutions only be fully understood through "articulating the affective, emotional dimension" (Frost, 2025, p. 42). Before the heightened circumstances of the COVID-19 pandemic, Museum Studies scholarship had consistently overlooked the emotional labour that occurs within these contexts, "noticeable only in the margins of daily

activity, and, on occasion, understood as a more 'feminine' characteristic of digital work (and thus less worthy of explication)" (Frost, 2025, p. 42). The vocabulary around this work is often differentiated, even diminishing: for example, discussions of so-called *soft skills* like "persuasion, empathy, and compassion" (Finnis & Kennedy, 2020, p. 16). But the emphasis within participant responses on the importance of emotional labour and strong interpersonal dynamics within cross-sectoral collaborations suggests that the success of the resulting digital tools could actually depend, in part, on "managing the human side of the project" (Provider). This is consistent with the focus on relational networks within the museum professional ecosystem framework, which is characterized by "une interdépendance vitale par interaction constante et d'une dynamique de mouvement perpétuel, entre individus membres et habitat, entre habitat et marges/lisières [écotones]" (Suteau, 2022, p. 12). Further, the ecosystem metaphor's concern with creating and maintaining relations (and environments) mirrors the definition of care proposed by Berenice Fisher and Joan C. Tronto in *Toward a Feminist Theory of Caring* (1990):

> On the most general level, we suggest that caring be viewed as a species activity that includes everything that we do to maintain, continue, and repair our 'world' so that we can live in it as well as possible. That world includes our bodies, our selves, and our environment, all of which we seek to interweave in a complex, life-sustaining web. (Fisher & Tronto, 1990, p. 40; Tronto, 1993, p. 103)

Caring, in the context of ecotone collaborations, can be a force that sustains the *life* of the museum professional ecosystem. When emotional labour is framed within this conceptualization of care, the work of fostering open and trusting relationships between partners must be understood as vital to sustaining digital activities within museum professional ecosystems and their ecotones. Resources are required to sustain emotional labour, which is work that "calls for a coordination of mind and feeling, [... which] sometimes draws on a source of self that we honour as deep and integral to our individuality" (Hochschild, 1983, p.7; as cited in Frost, 2025, p. 44).

Participants described how engaging openly with the affective and relational dimensions of cross-sectoral collaborations (including anxiety, vulnerability, conflict, curiosity, empathy, frustration, excitement, and fatigue) demands skill, energy, time, support, bravery, and trust. Various practices were reported for investing in relationship development between partners, including active listening to make sure their partner felt heard and understood, using accessible language that demonstrated an understanding of the partner's context, and explaining the reasoning behind their suggestions:

> We come into any engagement with clients using layman terminology. We make sure to show examples of things, we try to educate our clients along the way. So, they feel empowered to make decisions based on our advice and guidance. And then they can, through the relationships we've developed with them, also trust that if we're recommending something, that we're coming at it from a place of really understanding their needs as an organization, that it's actually informed by understanding their comfort with technology, what their goals are, who their visitors are. We need to make what we do as approachable as possible. (Provider)

The critical role of effective interpersonal communication practices was evoked by participants in their descriptions of all phases of the collaborative process—from the choice of a technology partner, to the continuation of support during the maintenance phase.

Within the museum itself, this communication work could also foster institutional cooperation across museum departments by developing "internal partnerships [in] the ecosystem of the museum" (Museum Professional). Museum professional ecosystems already brought together colleagues with diverse modes of operating that spanned across professions (Tobelem, 2011), such as those charged with conducting curatorial, managerial, education and interpretation, and digital activities. Many professionals described the perceived importance of internal collaborations to the success of digital interpretation projects: "Digital needs every profession to function, [...] it needs so many hands to exist and keep improving" (Museum Professional). The presence of interpersonal skills and emotional intelligence within museum digital staff and technology partners was reported to encourage the participation of museum colleagues in the development of digital projects and practices, which was framed as a major factor for creating favorable conditions for digital activities (Tallon, 2017). As previously discussed, communication channels across museum departments were reported to foster internal buy-in and ownership of digital activities, including those with external partners.

Additionally, many participants emphasized how encouragement (and even pressure) from museum leadership could play a significant role in facilitating internal collaborations within museum professional ecosystems while engaging with external collaborations with technology companies. For example, as examined earlier in this chapter, adequate levels of trust by leadership in the expertise of digital workers were reported to streamline work processes and support innovation: "It's up to [leadership] to decide where is the priority so it's very relational" (Museum Professional). Several participants also described how personality, soft skills, and emotional labor could play significant roles in digital decision-making: for example, a museum professional shared how they had strategically incorporated a colleague from a different department into their digital project proposal: "It was easier when [my colleague] was at the

table, who had a lot of influence with leadership so we were able to do [the project]" (Museum Professional). Internal interpersonal dynamics could thus impact ecotone conditions even before the introduction of external partners.

Positive interpersonal dynamics between individuals were also described as beneficial for facilitating translation work between partners coming from sectors that were potentially operating with differing practices, languages, values, and constraints (Finnis & Kennedy, 2020). Many participants described how these ecotone collaborations often featured at least one professional engaged in the role of translator:

> I also see my role like a translator between two universes, two ecosystems, that each speak their own language. I need to make sure that they understand each other, that they understand the needs, specificities, and languages across these two universes, that of the museum and that of digital. (Museum Professional)

This conception of the role of translator has parallels with the various orientations of the concept of interpretation, a word that (in both English and French) can mean explaining information, unveiling (or imposing) meaning, translating between languages, performing a role or musical score, and creating based on theme (Meunier & Jacobi, 1999, p. 3). Before comparing their role to a translator, this participant compared their work to "an orchestra conductor, where the goal is to make all the different instruments harmonious, to make everyone's contributions harmonize to create a project for the public" (Museum Professional). The interpretive work of "explaining, translating, creating" (Meunier & Jacobi, 1999, p. 4) was thus active to guide the very process of creating digital museum interpretation project for visitors.

Translation could entail facilitating cross-sectoral communication both externally (between museum teams and service providers) and internally (across museum departments) (Ramond et al., 2017, p. 149), and it could occur before, during, and after the development process. Diverse configurations were described for the role of translator, such as museum professionals with digital expertise, providers who had experience working with museums, or external consultants who were engaged to facilitate collaborations. Participants reported a wide range of approaches to supporting this translation work, many of which were communication practices centered around adapting language and creating shared reference points: "It can be so abstract, so it's really important to do some education so we can be sure we're all speaking the same language" (Provider). Concretely, examples of translation practices included: adapting technical language to correspond with partner digital literacy levels and interests; presenting examples of familiar use cases of digital tools; describing proposals for digital projects in terms related to the cultural

sector, such as visitor experience, storytelling, and museum objectives; discussing interpretation and inclusivity objectives in terms related to the digital sector, such as user experience and accessibility legislation; and employing visual elements, such as mock-ups and prototypes. These translation practices could result in the creation of boundary objects and processes (Arrigoni et al., 2019; Bjögvinsson et al., 2012; Star, 2010; Star & Griesemer, 1989; Wenger, 2000) that took "the form of a common language or mode of discourse; [...] or an assembly of shared processes" (Krakowski et al., 2023, p. 564), enabling active collaboration between professionals with different skillsets and knowledge, and conceptual frames of reference. Effective translation practices could contribute to a communal understanding of the direction of a project, a shared language, and a mutual trust—factors which were reported to help support a deeper collaborative partnership and result in more relevant interpretation tools for museum visitors.

Lastly, participants described the power dynamics within cross-sectoral collaborations partnerships as an interpersonal factor that could have significant impacts on ecotone dynamics. Because museum teams possessed expertise regarding their visitors and their institutional context (including the objectives for serving their audiences and collections)—and because their missions were not always shared by their technology providers (Arcon, 2018)—, museum professionals were ultimately the partners responsible for ensuring that digital interpretation tools responded to the needs of their audiences and met institutional communication standards for interpretation initiatives. Therefore, in order to protect museum interests and support the quality of the resulting tool, the interpersonal dynamics in the collaboration reportedly needed to empower museum professionals to contribute to the development process and make decisions aligned with institutional objectives. Several approaches to overcoming potential power disparities between partners were described, such as outlining appropriate collaborative structures in partnership agreements, fostering open channels of communication and trust across teams, engaging a professional in the role of cross-sectoral translator, and augmenting internal capacity through trainings or the support of an external consultant. Participants also described how the presence of sufficient levels of digital literacy and skills within museum staff, as well as the integration of an institutional digital strategy, could help ensure appropriate levels of participation by, and agency within, museum teams.

6.3.3 Adaptation and hybridity within ecotones

The ecotones that were created when diverse professional ecosystems joined together for cross-sectoral collaborations could feature unique dynamics (Austin, 2000; Scheff & Kotler, 1996; Stafford, 1994). In “Ecotones: a Conceptual Contribution to Postdigital Thinking,” Ryberg et al. argued for the relevance of applying the metaphor of ecotones as conceptual lenses for understanding the dynamics within postdigital environments that aimed to weave together "the seemingly contradictory and irreconcilable into a new whole” (Ryberg et al., 2021, p. 408). They identified two major dimensions of ecotones for consideration:

- *Affective and conceptual* dimensions that are characterized by *tension and diversity;*
- *Spatial and material aspects* that have *generative or innovative properties* (Ryberg et al., 2021, p. 417).

These aspects revealed ecotones to be sites that were conducive to “not only tension, conflict and struggle but also richness, potential and diversity” (Ryberg et al., 2021, p. 410). Participant responses reflected these themes within cross-sectoral collaborations, including through descriptions of the dynamics that resulted from potential differences between museum teams and technology companies in areas such as working processes, conceptualization of the visitor experience, understanding of the technology, resources and expertise available, and guiding priorities. These differences brought the potential for a "clash of cultures” (Provider), which could result from communicational, procedural, and structural differences between partners. Reported areas of tension included differing conceptions of time, complex decision-making procedures, limited resources, and the lack of a shared language or mutual understanding. These struggles were described potential threats to both the effectiveness of collaborations and the relevance of the resulting digital projects. While these dynamics could bring challenges, participants also framed the particularities of ecotone interactions as opportunities for adaptation and innovation: “Although fragile and mutable, ecotones are also zones of struggle, defiance, cohesion and reinvention. Novelty and innovation emerge in the ecotone at the edges of ideas, beings, contestations, potentialities” (Hubbell & Ryan, 2016, p. 7; as cited in Ryberg et al., 2021, p. 411). Both museum teams and technology companies were reported to engage in adaptations—of professional practices, working process, and even organizational structures—, in order to facilitate interactions during these partnerships.

While the adaptations undertaken within museum professional ecosystems have been explored throughout this chapter, many participants also described how technology companies could adapt

themselves to enhance their participation within the ecotones created during collaborations with museum partners. Through experiences working on different projects with museums, some service providers reportedly developed fluency in the particularities of *museum digital literacy,* a concept explored earlier in this chapter that described the capacity to effectively engage with digital technologies in museum contexts. Possessing a strong understanding of the realities of collaborating with the cultural sector was viewed as beneficial to these partnerships, as they could differ greatly from partnerships with clients in the entrepreneurial sphere: "You just have to lean into it and not expect that a process that you applied for [a multinational technology company] is going to work for this museum" (Provider). Beyond these sectoral differences, there was a wide diversity across museum partners themselves, each featuring diverse professional ecosystems with variations in organizational structures, levels of digital capacity, and staff cooperation. Adaptations to these different partners could reportedly include technology companies making modifications to the structure of their collaborative processes, the shape of communication channels (including with museum leadership), and the language used to discuss technology. And, depending on how technology companies positioned these ecotones within the functioning of their own professional ecosystems, the need to adapt for museum collaborations could have profound impacts on their guiding missions and organizational structure. Some participants described technology companies that centered their business models around partnerships with museums as acting with certain values that mirrored those in the cultural sector, such as sustainability and accessibility:

> We love technology and what it can do, but we work with museums and art galleries and archives for what they do. If you build a cool [digital] experience, you might be able to get a couple hundred people on it, but it won't exist the next year, because the thing won't work. So what we do is build a solid base for our clients to influence or engage thousands and thousands of people over many years. [...] I actually met [a previous museum client] recently, and I asked them, "Is any of [a project from a previous collaboration] still running?" It was from a long time ago, and they're like, "Yeah, it is still running." They're not paying license fees every year for it or anything like that. We build the thing and it works. (Provider)

Beyond the guiding missions that informed working processes, another commonly referenced adaptation within technology companies that could have a significant impact on business operations was the composition of roles within their professional ecosystems. Several participants described technology companies that specifically hired staff members with expertise related to the cultural sector, such as museum interpretation or education, digital museum work, or the subject matter represented in museum collections. This adaptation of roles mirrors the ecological definition of ecotones, where an "ecotonal community commonly contains many of the organisms of each of the overlapping communities...and

organisms characteristic (or) restricted to the ecotone" (Odum, 1971; as cited in McArthur & Sanderson, 1999, p. 3). The presence of professionals characteristic to cross-sectoral collaborations could be seen in this example of specific roles within technology companies focused on facilitating partnerships with cultural institutions.

Sustained practices of engaging in cross-sectoral collaborations were often described as fostering hybridity across professional ecosystems. Like the concept of ecotones, hybridity is also a metaphor adapted from biology that has been utilized to facilitate understanding the impacts of weaving separate entities together: "Hybridity is about the moment of play, in which the two sides of the binaries begin to dance around (and through) one another before landing in some new configuration" (Stommel, 2012; as cited in Ryberg et al., 2021, p. 421). As described in the spatial and material dimensions of ecotones, the boundaries between sectors within cross-sectoral collaborations could be defined by various degrees of distinction and enmeshment, characterized by "overlappings, gradients and fluidity" (Ryberg et al., 2021, p. 411). In some cases, the boundaries delineating sectors could blur for certain professionals with extensive experience working within these ecotones:

> All these companies have worked with museums for quite a long time. A lot of them, they basically work in museums, effectively. I don't know how many [museum digital projects] I've built, a lot, and probably more than anyone who works in a museum. (Provider)

A recurring area of hybridity within participant responses was working processes. Diverse efforts were described to develop effective and strategic practices and processes that were adapted to cross-sectoral collaborations and dynamics, which could vary widely across ecotones. An example of this could be seen in the case of adapting the Agile process, originally from the technology sector, within these partnerships. Several participants shared successful introductions of this methodology in cross-sectoral collaborations, while others described museum contexts where this exact same methodology was impossible to apply due to the existence of strict administrative and financial requirements as dictated in formal procurement procedures. Still others reported combining various existing methodologies to create something new, such as developing a hybrid approach that weaved together the iterative Agile method with the standard waterfall process with defined phases that was often used for exhibition design. This contextual approach was described as being adaptable to different project circumstances and partner needs, while also allowing flexibility to prioritize interpersonal dynamics over rigid processes.

The blurring of sectoral boundaries was also present in many participant descriptions of the functionality of museum professional ecosystems. Across institutions with differing internal resources and levels of digital maturity, participants often described cross-sectoral collaborations as integral components of the professional practices of museum teams and the infrastructure of digital departments: “I would say there aren't really all that many projects that we don't work with an external vendor, in one way or another” (Museum Professional). The essential role these ecotones played in the viability of digital practices within museum professional ecosystems was reported to have implications for the composition of museum digital teams. For example, a museum professional shared their reflections on deciding how to configure a digital team model that would optimize the contributions of internal staff and external partners:

> I suspect that we're going to go with a hybrid approach, where we will have on-site staff who can manage this. I think these days it's kind of worth it to have on-site people. But also with external staff augmentation, external support. [...] And so you're bringing people in and working as a team. (Museum Professional)

This approach demonstrates a strategic approach to adapting museum teams to sustain (and be sustained by) ecotone collaborations over a long period of time. In these hybrid environments, the roles of the museum staff charged with managing the development and maintenance of digital projects can also be impacted, including through a potential shift from technically-oriented work towards roles more focused on project management or content production (Parry et al., 2018). But several participants argued that such an outsourcing digital expertise to external actors is to be avoided, “au risque de déléguer in fine des pans entiers de la stratégie de l’établissement” (Ramond et al., 2017, p. 145). Without in-house professionals who are fluent in museum digital literacy, including hard technologists, the capacity of museums to engage in relevant and sustainable digital practices may be compromized.

In collaborative contexts, the digital activities of museums are perpetually being shaped by the dynamics and interactions between cultural and entrepreneurial professionals collaborating and adapting to each other. In the midst of hybridity, museum teams must know how to identify the difference between what can be adapted and what must be preserved.

6.3.4 Working with paradox in museum professional ecosystems

Cross-sectoral collaborations between museums and technology companies in the postdigital age consist of weaving together teams from seemingly contradictory professional ecosystems in order to develop digital interpretation projects that support institutional objectives. The tension in this dynamic is far from the only paradox at play within museum organisations. In *Inventer des musées pour demain : Rapport de la Mission Musées XXIe siècle* (Eidelman, 2017), the findings of the working group charged with exploring '*museums as creative professional ecosystems'* were introduced through a description of the "paradoxe fondateur" (Ramond et al., 2017, p. 143) within museums:

> Ce paradoxe est inhérent à l'identité même du musée, et plus encore du musée au début du XXIe siècle. La dualité dialectique des missions d'un établissement de conservation et d'un établissement recevant des publics est bien connue. (Ramond et al., 2017, p. 143)

This tension within institutional missions between conservation and communication—between protecting collections across time and giving access to these collections to as many people as possible—positions the museum as "un univers à la fois fermé et ouvert, un organisme centripète en même temps que centrifuge" (Ramond et al., 2017, p. 144). This paradoxical duality has already been evoked through discussions of the impacts of the broader communicational and commercial shifts on museum practice, particularly regarding the tension between the mission of educating visitors and the need to cater to these audiences in order to survive financially (Roberts, 1997). Participant reflections on relevant uses of digital tools for museum interpretation demonstrate efforts to support pedagogical and experiential objectives (Ilsley et al., 2024), to avoid using digital for digital's sake (Bautista, 2014), and to propose attractive offers that could welcome more visitors through the doors (Simon, 2016). But, on a broader scale, this research project revealed an additional nuance of this "paradoxe fondateur" (Ramond et al., 2017, p. 143), illustrating how the pull between conservation-oriented and communication-oriented missions resonated across museum professional ecosystems themselves: through institutional adaptations and transformations that occurred in reaction to the introduction of practices and cultures from the technology sector.

The metaphor of ecotones has been demonstrated to be well adapted to examining the intersections and interactions between apparently contradictory forces. And, indeed, the use of concepts like boundaries and translation to examine cross-sectoral collaborations could potentially frame *museum* and *digital* as isolated sectors that only converged within ecotones. Participant reflections, however, framed this as a

false binary. As explored earlier in this chapter, museum professional ecosystems are themselves already shaped by, and in response to, the broader influence of the technology sector, even before entering into partnerships with technology companies:

> I think that digital in museums tries to reflect what's happening outside of museums, to a degree. I don't think that any of us have the idea that we're working at a comparable pace or scale as the tech sector, at all. But I do think that the changes that happen in the tech sector have a downstream impact on change and transformation in museums—which are slower spaces to change, but are in a continuous cycle of transformation. (Museum Professional)

The impacts of the technology sector on museum professional ecosystems could be seen across participant descriptions of diverse areas of reflection, including: the conceptions of relevant uses of digital tools in interpretation projects, the integrations of digital and physical elements, the evolutions of digital professions and processes, the structuring of digital strategies and team models, and the development of digital literacy within organizations. The use of ecotones as an analytical construct facilitated an examination of the broader impacts within museum professional ecosystems of the interactions and adaptations that resulted from the cross-sectoral integration of digital practices and cultures into museums—including, but not limited to, partnerships with technology companies. In participant descriptions of ecotone dynamics, a major operational paradox was revealed to be the tension between conservation and change.

The inevitability of constant change was noted to be an inherent quality of the postdigital museum (Parry, 2013; Peacock, 2008). The institutional ability to strategically adapt to changes could correspond with higher degrees of digital maturity within museums, where “persistent paradoxes of change are accepted and viable options explored and baked-into the museum strategic goals” (Vargas, 2019, p. 222). Many participants, however, described how adopting a change-oriented approach could appear to be in opposition with the conservation-oriented missions of museums:

> The museum is conceptually at odds with digital in a way. The function of a museum is to hold physical things in stasis. And digital itself has evolved so much. [...] A museum's mission is not to lead in technology, it's to collect and preserve and conserve and study physical objects. It's a very fruitful and very interesting tension between these two things. It’s fascinating to watch that struggle continue to evolve. (Museum Professional)

Undergoing the institutional digital transformation that would be necessary to create conducive conditions for strategic digital work in museums could require significant investments of resources, as well as a

broader institutional openness to modifications in infrastructure and working processes (Carding & Paul-Chowdhury, 2015; Finnis & Kennedy, 2020; Nikolaou, 2024). Paradoxically, this embrace of change is not necessarily antithetical to the conservation-oriented missions of museums. In "Digital Is More Than a Department, It Is a Collective Responsibility," Loic Tallon (then Chief Digital Officer at the Metropolitan Museum) proposed a conceptualization of digital transformation within museum professional ecosystems as a marriage of digital culture and museum missions:

> If the underlying success of a digital department is delivering transformation, then as transformation is formally expanded across an institution, that institution would do well to recognize the benefits of that [digital] subculture and proactively marry it—or a derivative therein—to the cultural values of the institution. It is then incumbent upon institutional leadership to support and protect that marriage of cultures, establish the success indicators for digital transformation at an institutional level, and ensure the organization is focused on achieving that transformation collaboratively. (Tallon, 2017)

In this approach to digital transformation as a cross-sectoral "marriage of cultures" (Tallon, 2017), core museum missions were positioned as "l'ancrage fructueux de toute réflexion" (Ramond et al., 2017, p. 144). Indeed, strategically implementing effective digital processes and fostering digital literacy throughout organizations could offer museum professionals across departments new tools and approaches for supporting institutional objectives:

> We have continued to educate our colleagues around the organizational change which has been happening—and not just in digital but a lot of other ways, because of [the new director's vision]. It's a very difficult thing to do. An organization doesn't change cultures overnight, but we have been making strides in helping our colleagues better understand a user-centered approach to delivering visitor experience. (Museum Professional)

When led by museum digital experts with the support of leadership, collaborative engagement with the paradoxes inherent to digital transformation within cultural institutions could thus guide museum professional ecosystems towards broader organizational change with increased integration and interdependence across departments (Ramond et al., 2017, p. 163). The impacts of institutional openness, or resistance, to engaging with the paradoxes within museum digital transformation were apparent in descriptions of cross-sectoral collaborations between museum teams and technology companies. Beyond the factors that have been addressed in this chapter, the ecotone dynamics regarding institutional engagements with change that reflected currents of tension and generativity (Ryberg et al., 2021, p. 422) were largely centered around the concept of innovation.

Through the lens of innovation, it was possible to examine how postdigital museum professional ecosystems operationalized their response to the paradox of change. In *Museum Innovation and Social Entrepreneurship: A New Model for a Challenging Era*, Haitham Eid defines the concept of *museum innovation* as "the new or enhanced processes, products or business models by which museums can effectively achieve their social and cultural missions" (Eid, 2019, p. 7). In this conceptualization, Eid contrasts the innovation in the commercial sector (which is motivated by increasing revenue) with social entrepreneurship in museums (Dees, 1998; Defourny & Nyssens, 2009; Weil, 2002), wherein these institutions largely operate with a "hybrid nature [...] which utilizes business strategies and market tools to achieve social goals" (Eid, 2019, p. 70). Eid thus frames museum innovation as a relevant tool in these cultural institutions when it is "closely tied and integrally driven by the museum's mission" (Eid, 2019, p. 25). Innovation, however, required museums to engage in experimentation and exploration—which involved the potential for failure. This posture could be difficult to sustain in museum contexts: "Delivering change [...] is inherently risky, but cultural institutions are relatively risk averse" (Tallon, 2017). Participants mentioned several strategies regarding culture shifts aimed at helping museum teams to develop tolerance for the discomfort inherent to museum innovation, as innovation was often perceived as occurring on the individual level: "It isn't organizations that struggle to adapt to digital change, it's the people within them" (Finnis & Kennedy, 2020, p. 19). For example, a digital strategy could define objectives and delineate areas for experimentation. Participants described how procedural guardrails could help museum leadership feel more comfortable with innovative practices, such as when digital teams committed to only launching projects that met institutional standards at the end of their development process. Cultural shifts within museum professional ecosystems could include the framing of *risk-taking* instead as *experimentation*, where the success of innovation was not measured in whether or not the project launched but rather in gaining knowledge. The safety to take risks without negative professional consequences for failures was also reported to impact the willingness of professionals to engage in museum innovation practices on the individual level (Finnis & Kennedy, 2020).

The Knight Foundation's Digital Maturity Framework reflected the importance of organizational cultures welcoming and learning from experimentation: higher levels of digital maturity were associated with cultural institutions where "organizational strategies encourage innovation and experimentation across the departments and programming" (Knight Foundation, 2023, p. 9). As discussed earlier in this chapter around formalizing processes, implementing innovation through organizational strategies could help ensure sustainability and relevance. Similarly, the implementation of broader digital transformations

within museums were also framed in terms of sustainability and relevance—and even survival—, where an "institution's success in a digital age is contingent on changes to existing practices and workflows" (Tallon, 2017). However, these internal adaptations to facilitate work with ever-evolving digital technologies were occurring in professional ecosystems that were themselves inherently in flux: "Nos métiers et nos organisations vivent des modifications de façon quasi permanente" (Suteau, 2022, p. 14). The critical necessity of a strategic relationship with organizational change within museums, therefore, went beyond digital processes, to the core functioning of these institutions. In *Museums and the Paradox of Change: A Case Study in Urgent Adaptation,* Robert R. Janes echoed the urgency for museums to engage with the paradoxes of organizational transformation through the practice of questioning practices and imagining new ways of working: "It is essential that this questioning become an urgent task for all museums, if we are to find a path through this paradox of sustainability before events overtake us" (Janes, 1995, p. 214; as cited in Vargas, 2019, p. 197). This perspective demonstrates the existential threat hovering over museum professional ecosystems as they navigate institutional change. Despite the ever-evolving working conditions that could deprive museum professionals of adequate space for critical reflection on the long-term implications and relevance of their digital practices (Appiotti & Sandri, 2020; Sandri, 2016), strategy, collaboration, and imagination were largely reported to play crucial roles in developing successful cross-sectoral marriages between digital transformation and institutional missions:

> But what is certain is that the postdigital era will require two things: a museum that has an internal robust innovation ecosystem and a museum that has a strong and clear sense of purpose—how it intends to contribute to society. (Eid, 2019, p. 158)

The healthy union of these elements could foster resilience within museums as they faced uncertainty and the unknown in the midst of constantly changing contexts—whether digital, financial, or societal. Proactive adaptations within museum professional ecosystems could support the development and maintenance of *life*, or continued relevance, for museum institutions within their sociocultural contexts.

6.4 In summary

This chapter deepened the interpretation of the results that were presented in the conceptual and analytical structure (Chapter Five). While that structure followed the linear phases of the development process, this chapter explored the transversal themes that interplayed and clashed across participant descriptions of the dynamics within the cross-sectoral collaborations that occurred between museum teams and technology companies when partnering to develop digital interpretation projects for visitors. The transversal themes were related to the concepts identified in the preliminary study and the theoretical framework, as well as those that emerged over the course of conducting interviews with research participants. This chapter was structured around three foundational concepts identified in the theoretical framework that guided this research project:

- **MUSEUM INTERPRETATION**: Developing visitor-facing interpretation projects using digital technologies to achieve institutional objectives;
- **DIGITAL CAPACITY:** Assessing the ability of museum teams to work effectively with digital technologies within the context of cultural institutions;
- **CROSS-SECTORAL COLLABORATIONS**: Understanding the dynamics of introducing external partners and cultures into museum professional ecosystems.

The theoretical framework utilized the metaphor of museum professional ecosystems (Eidelman, 2017; Suteau, 2022) as an analytical construct for examining the interplay and tensions between these emergent themes when mobilized in partnerships between museum teams and technology companies when developing digital interpretation tools for visitors.

Grounded in the perspectives and declared practices of research participants, this chapter explored what these core conceptual threads revealed about the capacity of museum teams to harness digital technologies to support museum objectives, the dynamics and porosity of museum professional ecosystems, the impact of ecotone activities on museum digital capacity, and the paradoxes inherent to the larger transformations within museums—digital, entrepreneurial, and social.

The first section of this chapter examined interpretation practices as mobilized through cross-sectoral collaborations, assessing how experienced practitioners conceptualized digital museum interpretation and its role within museum contexts. The perspectives shared by participants regarding the capabilities of

digital technologies to support institutional objectives relating to museum interpretation (Larouche et al., 2019), visit experience (McCarthy & Wright, 2004), and storytelling (Wong, 2025)—well as the motivations for creating digital tools for museum visitors—were reflective of the themes identified in the theoretical framework. These included mediating connections between visitors and collections, offering options to personalize the visit, facilitating meaningful and embodied experiences, increasing on-site attendance, and impacting visitor perspectives and actions beyond the museum visit. These objectives could be translated into professional practices through fostering accessibility and inclusivity across diverse dimensions (Fissi et al., 2025; Simon, 2016), audience-centered development processes (Buchanan, 2001; Samis & Michaelson, 2017) and visitor studies (Schiele, 2016). The realities of the postdigital museum led to reflections on the false binary between *physical* and *digital* in interpretation projects (Ciolfi, 2021; Løvlie et al., 2022), both conceptually and tangibly. Woven across these reflections were repeated warnings from participants regarding the risks to these digital projects of inappropriate applications (Bautista, 2014) of digital within museum contexts (as seen, for example, in fears about *shiny objects*), including through engagements with ill-suited technology partners who were incapable of implementing relevant interpretation objectives.

The second section of this chapter explored the factors that were reported to impact the capacity of museum teams to work effectively with digital technologies that support institutional objectives. This capacity was often described as resulting from the strategic interplay of individual capabilities and institutional structures within the context of museum professional ecosystems (Suteau, 2022). On the individual level, despite variations within participant responses on the importance (and feasibility) of digital competency in museum teams, there was a broad consensus on the critical nature of digital skills and *museum digital literacy* within professionals across cross-sectoral collaborations (Malde et al., 2019; Parry et al., 2025). This latter concept was described as a fluency of working with digital technologies within the realities and missions of museum contexts. The work of museum digital interpretation professionals could be supported by working processes and systems, which was also perceived as participating in the professionalization of these roles (Dingwall, 2008; Parry, 2018). This implementation of professional practices was also framed as an indication of digital maturity (Martins et al., 2021; Vargas, 2019), where strategically mobilizing procedural systems and institutional infrastructures supported the sustainability of digital activities by avoiding dependence on individual actors. The relevance of these efforts was reportedly enhanced by formalizing institutional digital strategy and governance (Morrison, 2019; Welchman, 2015)—and structuring digital team models that were capable of effectively

operationalizing that strategy (Price & James, 2018; Raymond et al., 2017). Fostering museum environments that were conducive to digital activities could require significant investments and institutional change (Finnis & Kennedy, 2020), which highlighted the importance of digital literacy and openness within museum leadership (Holcombe-James et al., 2023; Price & James, 2025). The digital capacity of museums was thus impacted by a wide range of factors with a diversity of scope: the fluency and imagination of professionals, the minutiae of developing effective working processes, the major shifts of restructuring team models, and the visioning work of defining institutional strategy.

The third section of this chapter explored cross-sectoral collaborations as ecotones (Ryberg et al., 2021; Suteau, 2022)—the transitional areas between distinct ecosystems that created hybrid environments of exchange and adaptation—in order to examine what the dynamics within these "*edgy*" (McNicholas, 2004, p. 57) spaces could reveal about the capacity and needs of museum teams to work strategically on digital projects. When describing strategic approaches for positioning the role of these partnerships within museum digital infrastructures (Fielding, 2024), the degree of dependence on external partners (Winesmith & Anderson, 2020) was evoked as a vital issue of reflection for museum teams when considering entering into these collaborations. Similarly, the considerations surrounding the decisions whether to internalize or externalize expertise (Ramond et al., 2017) could impact the structures within museum professional ecosystems. Unique dynamics were reported to occur when distinct cultures joined together in partnerships (Austin, 2000; Scheff & Kotler, 1996), which were enhanced by interpersonal factors like communication, trust, emotional labour, and 'soft skills' (Finnis & Kennedy, 2020; Frost, 2025). The success of these ecotone interactions often depended on the ability of certain professionals to offer 'translation' across partners from different sectors—and across professionals within the same institution (Krakowski et al., 2023; Tobelem, 2011). Adaptation and hybridity between sectors (Ryberg et al., 2021; Stommel, 2012; Taormina & Baraldi, 2022) were commonly reported as effects of repeated collaborations that facilitated working processes. Lastly, the paradoxes (Janes, 1995; Ramond et al., 2017) inherent to museum digital transformation were framed as a conceptual tool that offered a broader understanding of the impacts within museums of engaging with practices and cultures from other sectors. This included reflections on organizational change (Nikolaou, 2024; Peacock, 2008), experimentation and risk-taking (Holcombe-James et al., 2023), and museum innovation (Eid, 2019).

The analysis of these transversal themes in this chapter, especially when considered with the comprehensive presentation of the data within the conceptual and analytical structure (Chapter Five),

provided a wealth of perspectives into the practices and reflections of professionals regarding the development of digital interpretation tools, the capacity of museum teams to engage effectively with digital technologies, and the issues at play when introducing external partners into museum professional ecosystems. This reflected a postdigital positioning (Parry, 2013), where discussions about digital technologies were inseparable from material considerations (Knox, 2019), such as interpersonal dynamics and working processes.

The diversity of factors and postures that were reported to impact cross-sectoral collaborations, on both individual and institutional levels, demonstrated the complexity of strategically engaging with digital practices in order to appropriately support museum missions (Appiotti & Sandri, 2020; Rosa, 2010). There was no consensus on a shared definition for relevant uses of digital technologies in museum interpretation projects nor a single strategic approach for sustaining digital activities in cultural contexts. Instead, participant responses revealed a range of conceptions and processes as diverse as the organizational particularities between museums themselves. The thread that bound these complexities together, however, was a dynamic posture where professionals balanced reflexivity and proactivity in order to strategically adapt to changes in their environments (Parry et al., 2025). As seen in metaphor of the museum professional ecosystem, the capacity of museums to effectively work with digital technologies in mission-driven ways depended largely on the health of the interactions between professionals, and between professionals and their environment (Finnis & Kennedy, 2020; Suteau, 2022). And, when positioned purposefully, interactions with external networks in ecotone collaborations could increase the health and resilience of these museum professional ecosystems. But maladaptive ecotone boundaries and incompatible (even parasitical) external partners could potentially threaten both individual digital interpretation projects and broader institutional capacity to achieve audience-centered missions.

The stakes could be perceived as being high for the digital activities and collaborations undertaken by these professionals. Visitor-facing digital projects, and the efforts required to maintain them, were often framed as participating in the societal and financial sustainability of museums (Economou, 2016; Sandri, 2020; Taylor & Gibson, 2017)—which is to say, their survival as institutions. Sustainability was a major current woven throughout participant responses, reportedly guiding decisions around strategy, procedure, and design (Nikolaou, 2024). The metaphor of the museum professional ecosystem facilitated a nuanced understanding of the larger purpose pursued by this driving force: the development and maintenance of *life*, or continued relevance, for museums and their core missions.

CONCLUSION

This dissertation began with a broadly defined line of inquiry: what could the development of interpretation projects using ever-changing digital technologies reveal about the capacity of museums to support and sustain institutional objectives regarding communication with their audiences? The nature of this research area, however, complicates meaningful analysis: this is a field in movement, composed of elements that are difficult to stabilize and isolate within their evolving contexts, both post-pandemic and postdigital. Indeed, this doctoral research project itself spans across three distinct phases in time: initial theoretical analysis conducted in the late 2010s, a preliminary study conducted during the digital pivot of COVID-19 museum closures in 2020, and interviews with professionals about their practices and perspectives conducted in the subsequent years as they grappled with how to integrate post-pandemic realities into strategic approaches to engaging with digital technologies and practices in a "climate of sectoral change" (Parry et al., 2025). Like archeological layers, this doctoral research project contains traces of these distinct eras—as well as evidence of the rapidity with which one moves into the next.

To provide a foundation for this research project, the creation and reception of museum digital interpretation tools were contextualized through an overview of two major museological currents: the changing relationships between museums and their visitors, and museum interpretation in the communication paradigm (**Chapter One**). When *digital interpretation* tools are framed as fundamentally *interpretation* tools, the work of museum professionals responsible for developing visitor-facing digital tools can be understood as operating in the already established paradigm of their institution's missions and practices for designing and facilitating interpretation offerings for their audiences.

In order to sustain the anchoring of this research project in the shifting realities of the developments occurring within museums, a qualitative and inductive methodological approach was adopted. This choice facilitated a responsive posture to the examination of the procedural structures and relational dynamics involved in developing digital projects in museums. Informed by a review of the literature surrounding the evolving phenomenon of digital museum interpretation, a preliminary study was conducted in the field to help determine the most relevant direction at that particular moment in time for the next phase of this doctoral research project (**Chapter Two**). The analysis of a PRISM innovation cell revealed the relevance

of pursing a deeper understanding of the dynamics involved in cross-sectoral collaborations between museum teams and technology companies.

These initial findings, in concert with the literature review, informed the creation of a theoretical framework (**Chapter Three**) that guided the subsequent phase of this doctoral research project. The first conceptual axis of the framework situates cross-sectoral collaborations within the metaphor of museum professional ecosystems (Eidelman, 2017; Suteau, 2022) as an analytical construct for examining the interplay and tensions between emergent themes when mobilized in partnerships between museum teams and technology companies. The associated concept of ecotones—the transitional areas where distinct ecosystems meet and interact (McArthur & Sanderson, 1999; Ryberg et al., 2021; Suteau, 2022)—was expanded in this dissertation to facilitate an understanding of the hybrid spaces created through these collaborations. In the data analysis, the metaphors of museum professional ecosystems and cross-sectoral ecotones proved to be relevant analytical constructs for examining interactions and dependencies across several levels: between diverse museum colleagues, between these museum professionals and the particularities of their institutional environment, and between museum professional ecosystems and adjacent ecosystems. There is much research potential in this approach to conceptualizing the role and impact of external partners on the capacities and sustainability of museum digital functionality, and the use of the ecotone metaphor in the analysis of cross-sectoral collaborations in museums merits further exploration and refinement.

The second conceptual axis of the theoretical framework develops three core themes that emerged from the preliminary study and the literature review, reflecting the complexities within the relationships, procedural structures, and professional practices that are mobilized in the development of digital interpretation projects in museum contexts. The first theme is conceptualized through an examination of the **intersection of *museum interpretation* and *digital***—and through the lens of discourses of the digital imaginaire held by the professionals responsible for these projects. The second theme centers around the notion of **digital capacity within museum teams**, which is approached on both the institutional and individual levels through the concepts of digital maturity, organizational change, and digital skills and literacy. The third theme conceptualizes the intersection of cultures through the **implications of *cross-sectoral* and *collaboration,*** positioning partnerships as ecotone contexts with unique dynamics resulting from differing expertise, languages, motivations, working processes, and guiding objectives.

The subsequent research project was designed to examine the dynamics and structures involved in developing museum digital interpretation projects with technology partners within the broader functioning of museum professional ecosystems (**Chapter Four**). As with the preliminary study, this project adapted a qualitative and inductive methodological approach. Semi-structured interviews were conducted with thirty-one museum professionals and technology providers who had experience working in, and with, cultural institutions in Canada, France, and the United States. When asked about cross-sectoral collaborations, research participants shared their declared practices for working in these partnerships, the discourses of the digital imaginaire they held around museum interpretation tools, and their perceptions of both the collaborative process and of museum professionals' needs for developing these digital projects. The selection of research participants intentionally reflects a large diversity of institutions and companies, countries and funding structures, collections and technologies, professional roles and procedural strategies, partnership models and cross-sectoral understanding. This approach facilitated an exploration of the larger currents impacting the capacity of museums—across different contexts and constraints—to develop relevant digital interpretation offerings while navigating the constant changes of the postdigital age.

Informed by the structure of the theoretical framework and the inductive nature of the study's methodology, the analysis of the data resulted in a transversal and thematic understanding of the research area. One of this dissertation's major contributions is the conceptual and analytical structure (**Chapter Five**), which was developed to examine the interplay of theoretical concepts and emergent themes across the linear progression of the collaborative process (a summary can be found in Table 7.1). Grounded in the analysis of the thirty-one interviews with experienced professionals, this structure intricately maps out four broad phases of collaborative partnerships. The ambitious scope, and high level of detail, facilitates the outlining of a general topography for ecotone environments: mapping out commonly reported points that require decision-making, strategic reflection, or adapted procedures; sketching the realities of the terrain and its inhabitants; highlighting the known paths (and threats) to safe passage through each phase. Given the purview of the research project, including the large diversity of contexts for the research participants, the elements composing this conceptual and analytical structure are by no means exhaustive. More research is needed to delineate and define the dynamics and processes within each of these four phases, including how they vary across different types of partners, partnerships, and projects. These findings should be adapted for the use of practitioners in the field; such a map would be an invaluable tool

for strategically navigating the ever-evolving landscapes of digital technologies, professional roles, leadership mandates, funding sources, and societal expectations.

Before the collaboration	Relevant uses of digital tools for museum interpretation projects	External and internal contexts
		Accessibility and welcome
		Communication
		Experience
		Tensions and strategy
	Reasons for entering into a partnership	Museum capacity
		Benefits of partnerships for museums
		Benefits of partnerships for companies
	Preparing for the development process	Preliminary efforts
		Consultants
		Understanding audiences and technologies
Selecting a partner	Modalities for the choice of a partner	Informal avenues
		Formal procedures
		Facilitating future collaboration
		Variations on the procurement process
	Reasons for the choice of a partner	Technical proposal and capacity
		Communication and understanding
		Financial considerations
	Capacity to evaluate partner proposals	Risks
		Support
During the collaboration	Communication strategies	Establishing communication
		Cultivating trust and buy-in
		Communicating across sectors
	Development practices and processes	Definitions and discovery
		Design and development
		Management strategies
		Collaboration dynamics
	"Clash of cultures"	Conceptions of time
		Decision-making strategies
		Limited resources
After the project launch	Collaborating after the launch of the project	On-going support
		Financial factors
	External support and internal capacity	Continued collaborations
		Building internal capacity
	Operations and lifespan	Operational strategies
		Project lifespan and sustainability

Table 7.1 Conceptual and analytical structure of the research findings.

While the conceptual and analytical structure braids together professional practices and perspectives across the collaborative process, the interpretation of the results (**Chapter Six**) allowed for a deeper examination of the transversal themes that wove their way through participant responses. This discussion was structured based on the three core themes developed within the second conceptual axis of the study's theoretical framework:

- **MUSEUM INTERPRETATION**: *Developing visitor-facing interpretation projects using digital technologies to achieve institutional objectives.*
    - Mediating connections, facilitating experience
    - Welcoming visitors, meeting expectations
    - Centering audiences, implementing objectives
    - Integrating physical and digital elements
- **DIGITAL CAPACITY:** *Assessing the ability of museum teams to work effectively with digital technologies within the context of cultural institutions.*
    - Digital skills and digital literacy in museum professionals
    - Process as professionalization
    - Digital maturity and digital strategy
    - Digital teams and external structures
    - Support of museum leadership
- **CROSS-SECTORAL COLLABORATIONS**: *Understanding the dynamics of introducing external partners and cultures into museum professional ecosystems.*
    - Positioning the role of external partnerships
    - Interaction and translation within ecotones
    - Adaptation and hybridity within ecotones
    - Working with paradox in museum professional ecosystems

The breadth and depth of dynamics and discourses evoked in participant responses (ranging from efforts to integrate physical and digital design elements, the professionalization of the field, the positioning of external partners in museum professional ecosystems, and the challenges of working with paradox) reveal the complexities inherent to visitor-facing digital museum work. If, as John Stack wrote in Tate's digital strategy for 2013–15, digital is becoming "a dimension of everything" (Stack, 2013), then this study's analysis reveals the vast reach of digital museum partnerships, augmented by cross-sectoral collaborations,

across museum organizations. Reflections on these "*edgy*" (McNicholas, 2004, p. 57) relationships touch upon major concepts: interpretation practices, communication missions, resource allocation, digital capacity and strategy, internal hierarchies, professional roles, reliance on external actors, and even institutional relevance and sustainability. In this web of considerations, everything is connected.

The magnitude of interrelated elements supports the relevance of engaging with the metaphors of museum professional ecosystems and ecotone collaborations as analytical constructs for this area of research. These metaphors are robust and complex enough to facilitate a nuanced examination of this field characterized by constant adaptations to changing contexts in service of the development and maintenance of *life*, or continued relevance, for museums and their core missions within a postdigital era (Parry, 2013). As these cultural institutions look to their futures in the face of "challenges raised by increased institutional ambition, evolving visitor, community and public expectation, and shifting socio-cultural circumstances" (Parry et al., 2025, p. 3), the examination of ecotone activities at the edge of museum professional ecosystems provides a fertile opportunity to assess the existential potentials and dangers for the heart of the field.

Provocations

This dissertation produced a map and a web. A general topography of ecotone terrains, and a collection of threads holding them together. The complexity captured within these productions demonstrates the challenges and open questions that characterize this area of research—and of professional practice. It is only fitting, therefore, to conclude this dissertation by using that map and that web to sketch out potential routes for continued explorations of these edge territories. In the guise of provocations, the following five sections will approach some of the major reoccurring reflections and quandaries identified in participant responses—across diverse contexts, institutions, partners, and technologies—with the hope of illuminating relevant lines of inquiry for future research in this ever-evolving field.

"THAT CAN BE A GOOD OR BAD SITUATION"

"[Museum teams could be] left to trust the external agency,
and that can be a good or bad situation."
- Museum Professional

In "Wishful Thinking – A critical discussion of 'extended reality' technologies in the cultural heritage sector" (Cope, 2023), a presentation at the 2023 Museum Computer Network conference, technologist Aaron Straup Cope contrasted the openness of the world wide web—"the technology that most closely aligns, by design and by intent, with the purposes and motivations of the cultural heritage sector" (Cope, 2023)—with the demands of online platforms run by private technology companies. Cope warned of the risks of engaging in digital spaces where the economic and editorial parameters were dictated by vendors rather than museums, especially given the difficulties in the sector of hiring and retaining digital staff:

> The challenge of that relationship lies in the fact that as often as not the motivations of those providers and their platforms are not our own. Yet we continue to make an increasingly Faustian bargain to engage with them because we believe that these places are where our audiences have gone. (Cope, 2023)

Cope followed this warning with a note of hope: "Sooner or later that debt will come due so we would do well to recognize that the alternative, and a good alternative at that, is within our grasp" (Cope, 2023). This alternative involved museums utilizing the web in a strategic posturing to "reframe our relationship and dependence on the providers of those technologies" (Cope, 2023). While cross-sectoral collaborations involving digital platforms were excluded from this research project, the wariness present in Cope's words reverberated through participant responses as a major consideration when determining when, and how, to partner with technology companies to support digital museum work.

The question of finding a balance between building internal digital capacity and outsourcing external expertise arose frequently in participant interviews. While external partnerships were largely reported to be an integral element of museum professional ecosystems across diverse institutional contexts, the findings of this research project revealed the complexities surrounding the decisions of how much to rely on external partners when developing and sustaining museum digital activities that touch institutional objectives for communication and interpretation. There are a myriad of configurations for these cross-

sectoral collaborations, determined both by design and by default. But the core of this question is the role that ecotone activities play within museum professional ecosystems—including the degree to which essential museum functions and strategy are delegated to the private sector (Ramond et al., 2017). What is the scope of these partnerships? And what is their impact on the evolving positioning of museum digital work within these institutions?

There was not a singular conceptualization of *'a good situation'* regarding cross-sectoral collaborations, where digital museum work is consistently bolstered by beneficial partnerships with technology companies. However, certain factors were reported as supporting the relevance of these collaborations, both interpersonal (trust, communication, mutual understanding) and structural (in-house expertise, consultants, defined procedures and strategy). Partnering with providers can increase the digital capacity of museum teams, inform digital strategy, and facilitate experimentation. The differences between partners are not inherently problematic to fruitful collaborations: "While ecotones are sites of tension, we can also view them as places of tranquil and harmonious coexistence" (Ryberg et al., 2021, p. 421). In some cases, ongoing dependence on trusted technology partners can even lead museum teams to frame ecotone collaborations as vital extensions of the professional ecosystem.

However, many participant responses grappled with how to mitigate the risk of a partnership turning into '*a bad situation*'. These dangers are especially treacherous for institutions with lower levels of internal capacity to understand the issues at stake in cross-sectoral collaborations. To protect institutional interests, museums need to be "informed consumers" (Provider) through the acquisition and implementation of digital expertise. On a project level, this can translate to populating museum professional ecosystems with digital staff (potentially augmented by consultants) with the capacity to monitor cross-sectoral collaborations and ensure their relevance: determining strategic moments to externalize digital work, skillfully evaluating vendor proposals, validating the progress of the collaborative development process, and maintaining digital tools across their lifespans. On a strategic level, museum digital workers need to understand the larger digital context surrounding their potential partners—including funding structures, intellectual property issues, and ethical considerations.

Many of these concerns echo the gravity in Cope's categorization of dependence on vendors as a Faustian bargain—with potentially existential consequences. If digital interpretation projects directly impact institutional missions for serving museum audiences, then blindly trusting their quality and sustainability

to unknown actors from the "Wild West" (Provider) of the technology sector can potentially jeopardize museum autonomy. However, cross-sectoral collaborations remain an integral element across many museums professional ecosystems, including those with robust internal digital departments. Instead of accepting the positioning of these partnerships in digital museum work as the status quo, the findings of this research project invite a more serious reflection on the roles and risks of these interactions. What do museum teams in diverse institutional contexts need in order to enter ecotone activities as informed and engaged partners? How can they protect the interests of their institutions while working with colleagues across sectors? More in-depth analysis is needed to understand the interplay of specific museum infrastructures and the ability to partner strategically with vendors. For example, given the impacts of the diverse dimensions of digital maturity on overall institutional capacity to work effectively on digital projects, could this be extended to include the influences of these dimensions on collaborating effectively with technology partners? For example, could the Knight Foundation's Digital Maturity Assessment Rubric (Knight Foundation, 2023) be expanded to include the factors identified in this dissertation that potentially impact a museum's capacity to engage strategically in cross-sectoral collaborations? What dimensions could be assessed to determine a museum's 'Partnership Maturity'? Or a potential technology vendor's 'Partnership Compatibility'?

"VISITORS DIDN'T WATCH IT, THEY LIVED IT"

> *[Describing the capacity of sensory immersion to facilitate engagement]: "Visitors didn't watch it, they lived it."*
> - Museum Professional

This research project framed museum interpretation, and the resulting visit experience, as a form of narrative, composed of "perception, representation, and interpretation" (Wong, 2025, p. 9). Narrative, like interpretation, is an inherently collaborative phenomenon that depends as much on the choices of the narrator(s) as it does on the imaginative construction that occurs within each person who engages with the story. If, as is described through the lens of narrative theory, "telling a story is a process of providing material for an *audience to tell the story itself"* (Wong, 2025, p. 2; Abbott, 2002), then museum

interpretation experiences can only be thoroughly understood through an analysis of the active participation of both the creators of these tools and the visitors who choose to lend their attention.

The lived experiences of museum visitors engaging with digital interpretation projects, however, were not within the scope of this research project. Instead, the traces of these visitors can be found within the perspectives and practices of the research participants, many of whom emphasized the importance of designing interpretation projects to meet the needs and desires of real people. These professionals described various practices for directly connecting with representatives from their publics to learn about their experiences from their own voices (literally or figuratively): from testing prototypes with targeted audiences during the development phase, to conducting visitor evaluations after the tool had been launched. Indirect connections were also described, such as making design decisions based on expertise gained from previous visitor-centered projects and informally observing visitors interact with the interpretation tool. However, these interventions were not always reported to be possible, for reasons ranging from limitations in time or resources, to professional environments that did not value in-depth understandings of the visit experience. While this study examined the interactions between actors from museum teams and technology companies, what would be the impact of bringing visitor voices more directly into cross-sectoral collaborations—both for assessing the relevant design of specific projects and for refining established development processes?

Further traces of the lived experiences of museum visitors can be found within the discourses of digital imaginaire of the professionals charged with designing interpretation tools—a form of imaginative construction on the part of the narrator about the experiences of those who will engage with the story. Many of the objectives surrounding the experiential qualities of relevant digital museum interpretation tools mirror the elements proposed by Rodley (2025) that foster engaging museum experiences: sensory immersion, emotional evocation, narrative transportation, and gameful participation. This holistic perspective reveals a posture of taking embodied experience into account, of playing with intersections of physical with digital, in an effort to guide visitor attention and facilitate satisfying—even meaningful—encounters. But, in order for these experiences to fulfill their role as specifically museum interpretation experiences, another function at play must also be at play beyond visitor attention and satisfaction: learning. Whether positioned as participating in museum pedagogy, or as fostering personal connections with museum objects and knowledge, engagement is framed as a tool for achieving larger museum communication objectives—and not an end in itself. (The term *shiny object* was often uttered in interviews

like a dirty word.) The reverse, of course, is also true: pedagogical projects that lack engaging elements are not positioned to support institutional missions, as visitors will simply not choose to pay attention. Engagement, when seen as a process that "triggers an emotional response, leads to the creation or reinforcement of a memory, and influences their behavior afterward" (Rodley, 2025, p. 25), has the potential to extend visit experiences beyond the walls of the museum and into a person's life.

When considering these conceptions of engagement in interpretation experiences within the context of cross-sectoral collaborations, it would be relevant to compare the qualities sought after by museum professionals across different institutional contexts and by various technology partners. It becomes clear that further inquiry is needed into the role that different technology partners play in the capacity of museums to create relevant digital interpretation projects. When selecting a service provider, museum teams must determine what type of partner is best equipped to support their project, within the bounds of the institution's budget and internal capacities. Participants described instances of choosing between companies with proven expertise in museum interpretation projects, or firms with private sector clients (such as designing retail experiences) that bring new insights into engaging people's attention. In ecotone zones of converging professional ecosystems, what determines whether similar approaches will result in meaningful projects, or simply sustain mediocre practices? Whether differing perspectives will fuel innovation in the field, or fail to achieve museum standards? What combinations and contexts would make the difference between successful experiences and *shiny objects*—and what metrics would determine this?

As evoked at the beginning of this section, the study of museum interpretation as a participatory phenomenon is incomplete without the inclusion of visitor experiences and perspectives. What insights would be revealed through a deeper understanding of the impact of cross-sectoral collaborations on the ability of museum teams to serve their visitors through relevant and engaging interpretation experiences? This would require a methodological approach that braids together the professional practices and perspectives explored in this research project, with the resulting experiences of visitors who engage with these digital tools. If interpretation, at its heart, is a "mediated" story (Wong, 2025, p. 9), communicating institutional knowledge through direct contact with the minds and bodies of museum visitors, then the narrators of these stories have a responsibility to use their voices with care—and to understand the impacts of their storytelling. How, and to what extent, do ecotone collaborations impact the vitality and sustainability of the core museum function of interpreting heritage (ICOM, 2022) through digital tools, as embodied in the lived experiences of visitors?

"THE KIND OF THING [...] WE HAVE TO CARE ABOUT"

> *"My job is to make sure that all the crazy stuff that we built keeps going, doing its job. It's a maintenance thing. It's not super fun or sexy to think about, but that's the kind of thing that, for an operating museum, we have to care about. And so the design process versus the operational process, I think those are at conflict sometimes. Because the decisions that are made just to get the thing done and launched and moving forward might be in opposition to making sure that it's stable and continues to work."*
> - Museum Professional

Across many interviews, variations on a common dynamic emerged. A participant would begin describing the *potentials* of working with new technologies—such as elaborating the innovative features of a certain digital interpretation project or sharing the excitement of creative ideation in the initial design phase of a collaboration. But quickly, these discourses around the visionary possibilities for digital tools would be immediately braided into discussions of the *practical,* of those considerations that were "not super fun or sexy to think about" (Museum Professional)—such as designing for project maintenance or the realities of working with limited resources. A certain protectiveness was palpable as these participants meticulously explained their concerns around ensuring the sustainability of digital tools and practices in the face of demanding technologies; concerns that were often framed in terms of being a responsible steward of museum resources in service of institutional missions. For these professionals, relevant engagement with digital formats required museum teams to translate the potentials of new technologies (and the promises of external partners) into the metrics of staff workloads and institutional capacities.

Joëlle Le Marec addresses this potential "dissociation" (Le Marec, 2020, p. 12) between the lofty intentions guiding interpretation policies and the lived experience of museum digital work, in her preface to Eva Sandri's (2020) *Les imaginaires numérique au musée ?* :

> La « politique » des principes est sensible aux promesses, aux effets, aux « visions », la politique au quotidien crée et entretient des liens et des milieux. Le politique, dans l'épistémologie du *care*, est resitué hors du grand partage entre ce qui ne compte pas (l'ordinaire domestique dont s'occupent les femmes) et ce qui est important (les cadres dits théoriques qui organisent les visions du monde et de sa gestion). (Le Marec, 2020, p. 13)

Through this evocation of the concept of care, Le Marec includes the minutiae of 'ordinary' museum digital work into the broader shift of perspective on the division between *what does not matter* and *what is important*. Here, care is a force that *creates and maintains connections and environments.* As discussed in Chapter Six, there are parallels between Fisher and Tronto's conceptualisation of caring as "everything that we do to maintain, continue, and repair our 'world' so that we can live in it as well as possible" (Fisher & Tronto, 1990, p. 40) and the imagery within the metaphor of museum professional ecosystems. Caring can therefore play a vital role in sustaining the *life* of these institutions. How could this conceptualization of care impact our understandings of the 'mundane' tasks that comprise everyday museum digital work?

While cultivating an ethic of care (Gilligan, 1982) is already within the lexicon of museum practice and Museum Studies research (Bondil & Meunier, 2023), this concept has tended to be applied in the perspective of care extended towards museum audiences and communities. In their role as institutions fundamentally "in the service of society" (ICOM, 2022), museums offer exhibitions and programming aimed at fostering accessibility, inclusion, empathy, and well-being (Bondil & Meunier, 2023, pp. 432-433). More recently, the digital pivot of the COVID-19 pandemic "exposed the role of emotional labour within digital practice in the cultural sector" and "surfaced a new vocabulary of emotion and care specifically within digital museum practice" (Frost, 2025, pp. 42-43). But what if the concept of care in museums was extended beyond efforts aimed directly at visitors (or the emotional labour required to work with digital technologies in museums), and was instead seen as encompassing *all* activities that maintain the "complex, life-sustaining web" (Fisher & Tronto, 1990, p. 40) of museum ecosystems? How does the professional practice of prioritizing *sustainability* in digital interpretation work enter into the theoretical understanding of an ethics of care in museums? And what is the relationship between the maintaining role of care, the constant change of the postdigital age, and the conservation mission of museums?

Sustainability and care had many applications in the practices and preoccupations of research participants. One example of an object of care was none other than digital projects themselves. As mentioned by the museum professional quoted at the opening of this section, digital tools require maintenance. Participants described these projects as "living things" (Museum Professional), with *lifespans* that could be plotted or augmented, and imbued with an *aliveness* characterized by the need to be constantly monitored and updated over time. While some tools were created to only be operational for set amounts of time, others needed to be sustained across substantial periods (including by being renewed with recycled content). This mandated not only that the technology's materiality and functionality must endure, but also required

additional elements like institutional support, budgetary allocations, partner implication, relevant processes, and in-house capacity. This could involve making design decisions that were robust enough to accommodate changing conditions in unknown futures, including changes in staff and partners: “We must not build a car only we can drive” (Museum Professional). Other objects of care described by participants included staff members, working processes, digital infrastructures, partnerships, resources, missions, relevance, visitors, communities, and even the planet. If all sustainability efforts within cross-sectoral collaborations that aim to “maintain, continue, and repair” (Fisher & Tronto, 1990, p. 40) digital objects and processes are framed as care work, further research is needed to understand how the activities carried out in ecotone contexts can support (or threaten) the vitality of museum professional ecosystems.

When care is understood as a verb of ecosystem sustainability and creation, would analyzing cross-sectoral collaborations through this framework change the assessment of their role, impact, or purpose? How could these elements be measured? In “Le caring museum face au défi de l’empathie démocratique”, Bondil and Meunier (2023) adapted Tronto’s (2009) model of care to the museum context, illustrating an active process with four phases: caring about, taking care of, care giving, and care receiving (Figure 7.1):

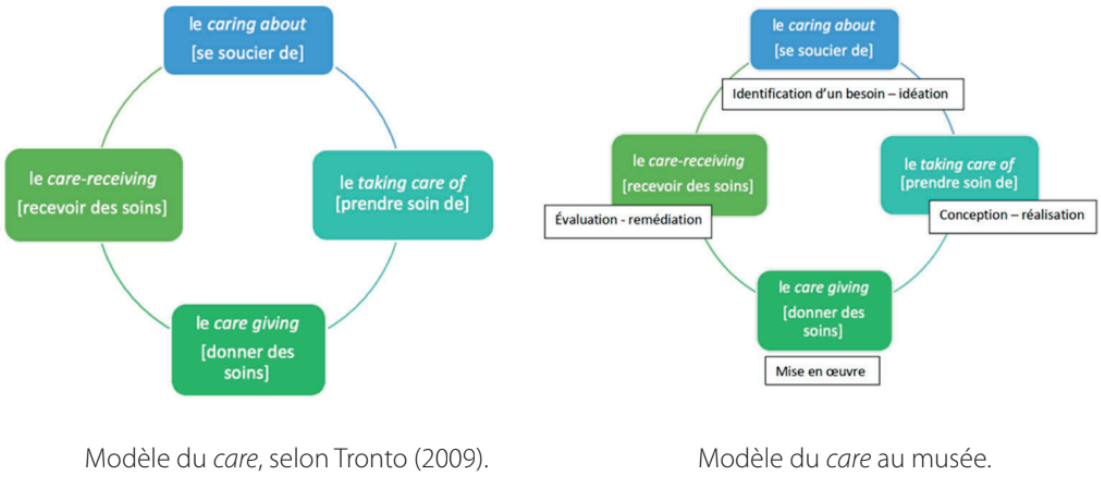

Figure 7.1 Transposed model of care in museums (Bondil & Meunier, 2023, p. 446).

Care-receiving is framed as a moment of evaluation and remediation, where the act of care is assessed through both the intentions of the caregivers and the impact on the carereceivers. What if *care* was the unit of measure for the success and relevance of RFP procedures, partner selections, digital job

descriptions, collaborative design processes? How would the object of care be defined and understood? How would care-receiving be measured? Would this framework have an impact on the division between *what does not matter* and *what is important*?

"THE HUMAN SIDE OF THINGS"

> *"The human side of things is so important in what we do because my experience has been that everybody who's working in in this sector cares deeply about the work that they're doing. [...] We definitely place a high priority on relationship development from the very beginning and really understanding the people in the room, not just the project requirements. Because it's people that are making all of these decisions."*
> - Provider

Filtering digital activities through the perspective of care opens up new approaches to valuing and strategizing museum digital work, such as by revealing the crucial importance of 'ordinary' practice and cultivating an ethos of sustainability. The concern with maintenance explored in the previous section—where care is understood as a modality for conservation and creation—elevates the material considerations of digital work (like the *bodies* of digital tools and the professionals care for them, etc.) to an equal level of importance as more theoretical visions of the potential of digital projects. This blurred distinction between *physical* and *digital* has parallels to conceptual interpretations of the postdigital, which is associated with:

> [...] a growing interest in surfacing the often-hidden material dimensions of the digital, such as the human labour required to produce and sustain technology, and the infrastructures and substances required to produce it. This might be seen as contrasting a predominant understanding of the digital as 'virtual', where technology tends to be viewed as something beneficially intangible, and able to bypass many of the limitations of physical, embodied reality. (Knox, 2019, p. 365; as cited in Ryberg et al., 2021, p. 409)

This dissertation was uniquely positioned to explore the "physical, embodied reality" of museum digital work as seen through "the human labour required to produce and sustain technology". By grounding the research project in a theoretical framework based on the metaphors of museum professional ecosystems

and ecotone collaborations, the *human side of things* became a core thread across the diverse themes and dynamics present in participant responses—and emerged as a relevant perspective for examining the question of cross-sectoral collaborations, digital interpretation projects, and digital museum work more broadly.

While the lived experiences of museum visitors engaging with digital interpretation projects has long been the subject of scholarship (Falk & Dierking, 2013; Schiele, 2016), there has been less critical engagement with the "physical, embodied reality" (Knox, 2019, p. 365) of the professionals responsible for the creation and maintenance of these digital interpretation projects (Frost, 2025). One such embodied reality is *emotion*. Shame from a lack of familiarity with an emerging technology, frustration when trying to coordinate input from many "personalities" (Museum Professional), delight in testing an idea with a low-tech prototype: emotions appeared throughout participant descriptions of their professional practices and perspectives. In *The Cultural Politics of Emotion*, Sara Ahmed reflects on the marginal positioning of emotion across a large range of scholarship:

> I have been overwhelmed by how much 'emotions' have been a 'sticking point' for philosophers, cultural theorists, psychologists, sociologists, as well as scholars from a range of other disciplines. This is not surprising: what is relegated to the margins is often, as we know from deconstruction, right at the centre of thought itself. (Ahmed, 2014, p. 4; as cited in Frost, 2025, p. 42)

As in this dissertation's analysis of ecosystems through the study of ecotones, Ahmed describes an approach of exploring "edgy" (McNicholas, 2004, p. 57) terrains in order to interrogate our understanding of "centre of thought itself" (Ahmed, 2014, p. 4). And, as the lens of care can lead to shifts in determining what work is valuable, a closer examination of the emotional and affective dimensions of digital practice could also have the potential to transform the priorities of the field. Ahmed proposes a cultural conceptualisation of emotion as a boundary phenomenon informed by contact with objects and others, working "to shape the 'surfaces' of individual and collective bodies" (Ahmed, 2014, p. 1). This has stark parallels to the metaphor of ecotones as sites of contact between the boundaries of diverse ecosystems. In the analysis of the textures of these colliding surfaces, emotions are understood as being characterized by movement (within and with bodies) and attachments (Ahmed, 2014, p. 11). These boundary interactions weave a web across bodies:

> Movement does not cut the body off from the 'where' of its inhabitance, but connects bodies to other bodies: attachment takes place through movement, through being moved by the proximity of others. (Ahmed, 2014, p. 11)

If emotions communicate important information about how to move and be moved, where movement is blocked, and what connections are most important, then what would the study of the affective dimension of digital work reveal about relevant directions for the future of museum practice? How could the research being conducted around the sensory and sensorial within *médiation sensible* be applied to the ways of working together on these projects, such as by conceptualizing the *développement sensible de la médiation*?

And, in the face of the new and unknown, could factors of *togetherness* within cross-sectoral *c*ollaborations be leveraged to transform the brakes of fear into the leap of curiosity? Creative engagement with the risk and paradox of digital transformations is work that requires "a zone of psychological safety where discomfort is safe, permitted, and even encouraged" (Tallon, 2017). This dissertation has documented a large range of professional practices that aim to foster and sustain ways of working together. Participants described the intentionally designing clear and regular channels for dialogue between partners, facilitating relationship-building activities from the early stages of collaborations, creating opportunities for colleagues to privately vent their feelings about current projects, and informally sharing information about new technologies. Along with interpersonal communication, a vital element of *togetherness* identified in this research project was translation work. In order for effective communication to occur between people from diverse specialities and sectors, with differing language and ways of working, many participants identified the need for one or more people to act in the role of a cross-sectoral and interdisciplinary translator:

> "I see my role as comparable to two other professions. First, my role is like an orchestra conductor, where the goal is to make all the different instruments harmonious, to make everyone's contributions harmonize to create a project for the public. I also see my role like a translator between two universes, two ecosystems, that each speak their own language. I need to make sure that they understand each other, that they understand the needs, specificities, and languages across these two universes, that of the museum and that of digital." (Museum Professional)

Like an orchestra conductor using sheet music and a baton to lead different instruments through the same music, cross-sectoral translators reported designing development procedures that became tools for "a process of collective sensemaking" (Krakowski et al., 2023, p. 564)—effectively acting as boundary objects. But these processes are not self-sufficient, they "require people to breathe life into them, to contribute ideas, check for understanding, and facilitate their use" (Krakowski et al., 2023, p. 566). This requires emotional labour, as effective translation involves "really understanding the people in the room, not just

the project requirements" (Provider). How might our understandings of cross-sectoral collaborations and digital interpretation development change if they were analyzed through the human-centered metrics of *togetherness*? And could scholarship from disciplines like interpersonal neurobiology and affective neuroscience inform the development of more sustainable digital museum practices?

"CAN YOU DREAM IN IT? CAN YOU IMAGINE FUTURES?"

> *"When you learn a language and you start to become fluent in it, you dream differently. You dream in that language. So that's why I think technological imagining needs you to have fluency and capability. It's not just a functional literacy, it's beyond that. It's actually: Can you dream in it? Can you imagine futures?"*
> - Museum Professional

In the hours before ICOM delegates voted to approve a new museum definition in Prague, members of the international museum community gathered to listen to museum technology keynote where Seb Chan posed a critical question for engaging with digital practices in museums: "What might institutions need to support the creative practices of the future, for the more diverse audiences of the future?" (Chan, 2022). In the face of significant internal challenges—"ageing infrastructure conceived of in the last decade of the 20th century; skills that are expensive and rare" (Chan, 2022)—, museum teams are being asked to operate within waters teeming with new technological possibilities, increased expectations, shifting societal realities, financial strain, environmental consequences, and contexts that require new ways of working in order to stay afloat. To navigate these waves, cultural institutions must also decide with whom they want to partner, and how. Chan ended his ICOM talk with a series of questions inviting museum professionals to reflect on ways to anchor their institutional digital practices in the service of larger museum missions. Because, without this grounding, digital technologies were susceptible to revealing any cracks:

> You need to be able to confidently answer these questions in a manner that speaks to your institution's mission and purpose because every museum technologist with any experience will tell you "technology is expensive, difficult, needs a lot of maintenance, it will break, it will become obsolete, and your vendor will disappear." (Chan, 2022)

Where does such *confidence* come from? In their introduction to *Museums and Digital Confidence*, the editors "position digital confidence as being primarily about people, and emphasize how the digital generates new visions and new ways of working" (Parry et al., 2025, p. 1). Echoing the current in participant responses regarding the impossibility of designing a digital interpretation tool that was "for everybody" (Museum Professional)—and the importance of instead being "rooted radically in the needs of our end users" (Museum Professional)—, the editors argue that there is "no simple step-by-step guide or single route to reaching digital confidence in museums" (Parry et al., 2025, p. 4). The contextual and holistic frameworks that they propose for understanding how to build digital skills and confidence echo the imagery within the museum ecosystem metaphor: where the particularities of the environment (institutional contexts and structures) and actors (individual workers, teams, and organizations) are essential factors for determining the most effective and sustainable processes and dynamics. Given these complexities, the frameworks are offered as "a guide for thinking, the means to initiate and lead a structured conversation, rather than a set of predetermined competencies to be met or completed" (Parry et al., 2025, p. 12). However, these tools do not directly address the specificities of the skills and reflections necessary to engage in effective partnerships across sectors. Could these tools be adapted to create a guide for thinking about cross-sectoral collaborations? Is *cross-sectoral collaboration confidence* an element of *digital confidence*, or does it require different literacies? And what is the differentiation between confidence and hubris?

A common theme that emerged across participant responses was the necessity of developing *museum digital literacy*. This is a distinct form of digital literacy, with its own unique particularities and requirements, braiding together literacies in both digital technologies and museum work. Paradox is an integral element, as the ceaseless change inherent to digital culture comes up against conservation-oriented missions:

> The museum is conceptually at odds with digital in a way. The function of a museum is to hold physical things in stasis. And digital itself has evolved so much. [...] It's a very fruitful and very interesting tension between these two things. (Museum Professional)

The *fruits* of this tension are apparent in the sustainable and strategic approaches to digital work and organisational change described by participants, including the professionalisation of digital roles, the implementation of working processes and institutional infrastructures, the defining of digital strategy, the restructuring of team models, the involvement of museum leadership, the allocation of resources, and, of

course, the design of relevant practices for cross-sectoral collaborations. But there are still so many open questions in the field. In the context of museum digital literacy, the ability to actively "imagine futures" (Museum Professional) requires that fluency be paired with the strategic interplay of individual capabilities and institutional structures. This is not always the reality on the ground:

> There's been a policy failure here, there's a massive gap in imagination and capability. It's not just one or the other: you can't do things if you can't imagine different things, and you can't do things if you can imagine things but don't have the capabilities. That's really the fundamental problem [...]: a lack of imagination and understanding of the future—or actually, of the present. (Museum Professional)

In this perspective, capability and imagination are entwined. Digital confidence nourishes fruitful dreaming. And digital dreaming should be rooted in core missions: "We need to be clear about what change we want our museums to make in our communities before we can appropriately choose the technologies that will help us realize this" (Chan, 2022). When museum digital workers are well resourced, what future worlds could be imagined? What new stories could these interpretation professionals tell to (and with) their communities?

In the flux that characterized the post-pandemic context of the interview phase of this research project, many participants imagined relevant directions for the future of the field, including visions for mission-aligned uses of digital technologies. Several participants described how their work was informed by efforts to mitigate the negative environmental impact of digital technologies, such as practicing digital sobriety through low-tech and reusable designs. Omer Pesquer describes such alternative sustainable approaches to digital work as "autres numériques":

> Ces autres numériques proposent des réponses aux injonctions court-termistes et accélérationnistes. Ces autres numériques mettent l'accent sur la convivialité et la robustesse en tenant compte des diversités et en n'oubliant pas l'importance de la maintenance pour construire d'autres futurs. (Pesquer, 2025)

These *autres numériques* not only respond to the climate crisis, but also to the crisis of attention that runs rampant through societies inundated with infinite access to information and images (Citton, 2014). These other approaches to digital can be framed as a form of care, seeking to "maintain, continue, and repair our 'world' so that we can live in it as well as possible" (Fisher & Tronto, 1990, p. 40). Pesquer argues that museums must imagine new mission-aligned processes for connecting digitally with their audiences going forward: if they don't do this work, "ils seront probablement de plus en plus dominés par d'autres

imaginaires, en particulier ceux des géants mondiaux du web" (Pesquer, 2021). The failure to imagine futures results in outsourcing futures.

Participants also shared visions for how museum teams need to be equipped and structured to be resilient in the face of yet unknown challenges. They imagined ways of supporting the sustainability of museum professional ecosystems, looking both inward and out. Several participants mentioned the importance of bringing together people with diverse identities when imagining viable futures for the field, not least because of the "strong connection between workforce diversity and innovation" (Eid, 2019, p. 126). This practice, however, is hampered by systemic barriers and discrimination within both the museum and technology sectors. These barriers have roots that extend beyond museum professional ecosystems, such as differing levels of access to, and support within, pre-professional pathways and resources like university training and relevant internships: "There are all sorts of gender and race implications. [...] Why aren't there more women software developers? Why aren't there more Black queer women writing AI?" (Museum Professional). But access to museum professional ecosystems alone is not the only factor for overcoming systemic bias. Rather, the organisational culture within museums must actively value and support diverse perspectives and identities in the workforce, and strategies for making these roles more widely accessible must be "au cœur de l'évolution des carrières des professionnels et des dispositifs de formation continue à même de les soutenir" (Ramond et al., 2017, p. 62). Diversity, equity, and inclusion policies must be developed and implemented as part of imagining sustainable working conditions for museum professionals with marginalized identities.

And, of course, participants reflected on the role that cross-sectoral collaborations could play in the future of the field. In an evolving economic context, and as museum digital roles continue to professionalize, interactions between public institutions and private industry are ubiquitous (Ramond et al., 2017, p. 165). But the modalities for these collaborations varied greatly. Some participants described developing clear frameworks to strategically define how ecotone activities would augment the vitality of their professional ecosystems—with minimal risks to survival. Others shared how they were creating new models for partnerships designed to facilitate more relevant practices for braiding digital culture into museum work. As these museum teams grapple with similar questions across diverse institutional contexts, the practice of creating and sustaining connections across larger professional networks becomes essential for increasing sectoral capacity for imagination. Participants described their efforts to define "les 'branchements' qu'il peut ménager vers des partenaires et des réseaux" (Ramond et al., 2017, p. 165),

including connecting through professional associations, communicating informally with colleagues across institutions and sectors, bringing in expert consults, sharing findings through blogs or newsletters, participating in projects with universities or innovation labs, and partnering with other museums to share resources. In this networked perspective, it becomes relevant to explore a variation of the museum ecosystem metaphor mentioned in Chapter Three. In contrast to professional ecosystems, François Mairesse (2011) referenced the work of George Brown Goode to describe museums as being individual actors existing within a larger ecosystem (or community) of knowledge and inquiry. In this framework, the survival of museums depends on maintaining relationships with the outside world: "seule garante de sa survie parce que seule garante de son évolution, de son adaptation" (Mairesse, 2011; as cited in Suteau, 2022, p. 12). Survival demands evolution and adaptation, acts that are dependent on sustainable connections with the larger community.

In conclusion, this dissertation explored what the development of digital interpretation projects could reveal about the capacity of museums to support their missions for serving their audiences. The findings from the research project indicate that the work of imagining digital futures is intrinsically linked to the work of museum interpretation itself. As outlined in One by One's contextual framings for building digital skills and confidence, a unique quality of the relationship between cultural institutions and digital technologies is "the responsibility museums have for interpreting and narrating our dataful, networked, connected age" (Parry et al., 2025, p. 14). The questions facing museum professionals about the role of new technologies (and technology companies) in sustaining *life* are similar to the questions facing their audiences as individuals—and as societies. These are questions around integrating technology into homelife and workflows (and human bodies), the place of the private sector in public services, privacy and surveillance, diminishing attention spans, reliance on digital platforms, assessing the promises (and threats) of the latest emerging trend... If museums are understood as actors within a larger ecosystem, then their engagement with innovation "is necessary not only to cope with the rapid social, cultural and technological changes but also to help shape and influence these changes" (Eid, 2019, p. 5). How can museum teams strategically integrate their interpretation practices into their institutional engagement with the paradoxes of museum digital transformation? How can they foster "digital courage" (Frost, 2020) and a sense of *togetherness* in their audiences, as their communities navigate change and crisis? And, as guardians of heritage and storytellers, how can museums empower their visitors to become informed consumers and engaged citizens, resourced to imagine futures in a postdigital age?

APPENDIX A

Appel à collaborer ! Announcement of PRISM's COVID-19 innovation cells

MUSEE DES BEAUX-ARTS MONTRÉAL

PRISME

APPEL À COLLABORER !

ENSEMBLE, POUR DES SOLUTIONS NUMÉRIQUES ADAPTÉES AU CONTEXTE DE DÉCONFINEMENT POST-COVID

Dans le contexte de la pandémie de Covid-19, la reprise graduelle des activités muséales est amorcée. Avec les nouvelles règles imposées aux musées pour accueillir les visiteurs de manière sécuritaire, de grandes transformations s'annoncent sur le plan des pratiques professionnelles et des modes d'interaction avec les publics. Dans cette situation, le numérique offre des moyens alternatifs d'entrer en relation avec les publics et de faire découvrir les riches collections muséales québécoises..

En cette période de déconfinement graduel, PRISME invite les professionnels de musées à venir imaginer et cocréer de nouvelles médiations numériques adaptées au contexte post-covid.

Quoi ?	Des cellules d'innovation et des sprints créatifs
Pour qui ?	Les professionnels de musées membres de la SMQ
Comment ?	Les stratégies collaboratives du design thinking
Avec qui ?	Des muséologues, des chercheurs, des créateurs technologiques
Quand ?	Cohorte 1 : De juin à septembre 2020 (12 semaines) Cohorte 2 : De septembre à décembre 2020 (12 semaines)
Coûts ?	L'accompagnement est gratuit.

Des cellules d'innovation intensives et des sprints créatifs

La démarche proposée par PRISME mise sur les stratégies de la conception collaborative centrée sur l'humain. Celle-ci, implique la formation de cellules d'innovation intersectorielles et comporte 5 étapes: s'imprégner (du contexte), définir (la problématique), explorer (les solutions), prototyper (des dispositifs ou des médiations) et tester (auprès des publics visés).

Compte tenu du contexte actuel exigeant une adaptation rapide des pratiques, PRISME propose une formule intensive, qui se réalisera sur une période de 12 semaines, à raison d'une rencontre de collaboration à toutes les deux semaines, pour un total de 6 rencontres intercalées avec des étapes de recherche, d'observation et des tests-utilisateurs.

Deux cohortes de projets seront proposées. La première cohorte se réalisera de juin à septembre 2020. La deuxième cohorte de septembre à décembre 2020. Les cellules d'innovation seront formées selon les intérêts, les problématiques et les publics jugés prioritaires par les répondants. Les activités seront toutes offertes à distance, en visioconférence et à travers d'autres outils collaboratifs en ligne.

Afin de soutenir l'exploration des solutions, PRISME fera appel aux membres de son réseau qui mettront leur intelligence collective au service des musées. Il offrira en outre deux événements en ligne de type sprint créatif, l'un en juillet, l'autre en octobre, qui permettront des échanges rapides et l'exploration des solutions technologiques pouvant répondre aux problématiques choisies.

Si vous êtes intéressés, merci de remplir le formulaire d'intérêt d'ici le vendredi 19 juin, 17h.

À PROPOS DE PRISME
PRISME est le laboratoire d'innovation numérique du Musée des beaux-arts de Montréal. Il rassemble quelque 250 collaborateurs (chercheurs universitaires, créateurs technologiques, professionnels de musées) qui mobilisent ensemble les stratégies de la conception centrée sur l'humain pour imaginer, créer et tester de nouvelles formes de médiations numériques muséales. Il contribue au dynamisme du réseau muséal québécois en diffusant largement et en valorisant les fruits de ses innovations et de ses recherches. PRISME est un projet financé par le ministère de la Culture et des Communications du Québec dans le contexte de la mise en œuvre de la mesure 115 du Plan culturel numérique du Québec.

Extract from the announcement of PRISM's COVID-19 innovation cells (Source: PRISM).

APPENDIX B

CERPE Ethical Approval Certificate for the preliminary study

UQÀM | Comités d'éthique de la recherche avec des êtres humains

No. de certificat: 4608

Certificat émis le: 27-10-2020

CERTIFICAT D'APPROBATION ÉTHIQUE

Le Comité d'éthique de la recherche pour les projets étudiants impliquant des êtres humains (CERPE plurifacultaire) a examiné le projet de recherche suivant et le juge conforme aux pratiques habituelles ainsi qu'aux normes établies par la *Politique No 54 sur l'éthique de la recherche avec des êtres humains* (Janvier 2016) de l'UQAM.

Titre du projet:	Le fonctionnement et l'impact d'une cellule d'innovation proposée par PRISME, le laboratoire d'innovation en médiation numérique du Musée des beaux-arts de Montréal
Nom de l'étudiant:	Marina GROSS-HOY
Programme d'études:	Doctorat en muséologie, médiation, patrimoine (profil régulier)
Direction de recherche:	Anik MEUNIER

Modalités d'application

Toute modification au protocole de recherche en cours de même que tout événement ou renseignement pouvant affecter l'intégrité de la recherche doivent être communiqués rapidement au comité.

La suspension ou la cessation du protocole, temporaire ou définitive, doit être communiquée au comité dans les meilleurs délais.

Le présent certificat est valide pour une durée d'un an à partir de la date d'émission. Au terme de ce délai, un rapport d'avancement de projet doit être soumis au comité, en guise de rapport final si le projet est réalisé en moins d'un an, et en guise de rapport annuel pour le projet se poursuivant sur plus d'une année. Dans ce dernier cas, le rapport annuel permettra au comité de se prononcer sur le renouvellement du certificat d'approbation éthique.

Raoul Graf
Président du CERPE plurifacultaire
Professeur, Département de marketing

APPENDIX C

An extract from the analysis table for the innovation cell activities

Session 2: "Define"

Section	Description	R1: Agent Object	R2: Agent Subject	R3: Subject Object
Overview of the session's goals	PRISM's coordinator gave a brief presentation of what to expect for the day, including the goal (prepare to reach out to tech companies)	By summarizing the parts of the Object would be worked on in this session, the coordinator prepared participants to know the structure of what they would be doing that day	The coordinators put the participants in a passive role, so they could all be on the same page of being primed to know the expectations for the structure of the day.	The participants visualized how they would interact with the Object over the course of the session
Entente de collaboration	The head of PRISM talked about the lab's role in this process (support and tools for the group to mobilize for this project) and talked about their expectations for participants. Participants then filled out a Google Doc together about their expectations for a fruitful collaborative process (including actions and values to commit to)	To support participants in fully engaging in the collaborative process, the coordinators designed this step to explicitly define the roles of the Agent and Subject for tackling the Object. They then included the participants in this definition by asking them to actively contribute their words to a vision of what this collaborative aspect of the Object should look like.	The coordinators used two approachs to address the roles of the group. First, the coordinators explicitely explained everyone's roles in the process, saying that the participants should feel empowered to collaborate. Then the coordinators put the participants in an active role of defining collaboration together, by encouraging them to all fill out the form at the same time (so everyone was working actively)	The participants engaged with the collaboration aspect of the Object, both by reflecting on it and by practicing it through using their voices together to define what good collaboration was and how they could support it over the course of the sessions.
Summary of homework	Each participant summarized their interviews from last session's homework; the lab coordinator wrote the main ideas on the Mural board and shared her reactions to each participant which sythesized larger themes and linked it back to the cell ("ce qui reste avec moi...")	The coordinators used this step to extract relevant details from the participants' autonomous work to build into the group's working process. This also modeled to the participants how to extract larger themes from specific examples.	The coordinators empowered the participants by validating their observations and modeling how to distill relevant themes from specific examples	The participants learned about how to work with the Object by watching the PRISM coordinators distill relevant information from the presentations. They also practiced discussing personas and their needs/desires with the group in a highly structured way.
Pause				
Worked through persona activity	The head of PRISM introduced the concept of 'personas', including identity and practices. The participants were split into two groups to each fill out a PDF about a potential visitor persona. Each group assigned a secretary and presenter, and they completed the PDF together.	The coordinators introduced a concept for the Object to the participants, and designed a guided activity to present this concept within the context of their particular project	The coordinators explained what would be expected of the participants and then guided them through a relevant activity. By assigning roles within the group, participants knew what was expected of them. The activity was clearly laid out, so it was simple for the participants to know how to follow the steps.	The participants applied the work of the Object to the specific context of their particular project. They learned what characteristics were relevant to consider when thinking about potential visitor personas.
Shared persona activity	The groups came together and each presenter shared their group's work with the other.	By having the groups share their work, the coordinators ensured that each participant could utilise the work done by both groups for the next steps in the process	The coordinators let the participants lead by sharing their group's work.	The participants practiced discussing the Object process within the context of their own group's work, and hearing the reflections of the other group.
Les intentions de médiation	The group used Mural to write ideas for what quality of experience each persona was looking for in a digital museum programme. After a discussion, each participant used stars to vote for the intentions they judged to be most important to each persona.	Utilizing the work on creating personas for the design thinking process, the coordinators were able to encourage participants to start thinking about tech solutions through the eyes of potential visitors	The coordinators led the participants through the activity, encouraging them to participate by welcoming their responses and guiding the flow of the conversation. The coordinators empowered the participants by letting them vote to determine the priorities.	The participants engaged with the Object by using their work on the personas guide them to reflect on the quality of visit experience goals (which was in the professional expertise of some participants). They also practiced participation and co-creation by voting for the priorities of the project, understanding that their perspective was valued in the process.

Section	Description	R1: Agent Object	R2: Agent Subject	R3: Subject Object
Critères de conception	The group discussed the conception criteria for a digital experience, both for the interpretation experience and for the tool's technology (these criteria would be sent out to tech companies who would propose technical solutions). The lab coordinator read the constraints and opportunities that the group had identified in the first session as a reminder.	The coordinators set up this step (that would be communicated to outside tech companies) in direct relationship to the group's previous reflections on personas and the constraints/opportunities of the current context. This supported the participants in following the process of the Object.	The coordinators guided the participants by focusing the flow of conversation. They helped the participants by reminding them of the personas and of previous work they had done together.	The participants were guided to understand that it was important to refer back their previous work in the process, and that all the activities were connected. They synthesised their work on the personas and the desired experience to move forward with interpretation and technical criteria.
"Homework" and conclusion	The lab director told participants that tech specialists would be at the next session, saying that the specialists would bring ideas, but that the group would be the 'guardians' of the experience they want to design. Participants were then presented with their 'homework' to do independently before the next session: each participant was asked to fill out a PDF activity analysing a digital tool that already exists in a museum.	The coordinator summarized what parts of the Object would be worked on in the next session, to reinforce the roles of each player in the Object.	The coordinators reminded the participants that they were active collaborators, in preparation for new people in the next session, to empower them to fully participate in the Object. The coordinators explained how to access and complete the 'homework' assignment.	The participants were reminded of their stance with the Object: co-creators and guardians. They were given an idea of what to expect with the next steps of homework and the upcoming session.
Homework: "Puiser dans les solutions existantes"	Partipants identified two digital projects (in museums or not) that they found relevant, and filled out a PDF with categories such as a brief presentation, criteria met and how, what they liked, limits, and the conception criteria.	To prepare participants for the "Ideate" theme of the next session, this PDF helps participants practice looking at a tech offering and start putting words to how it can meet certain needs for its organization.	The coordinators were available via Slack or email if the participants had any questions about completing this step	This practice allowed participants to be inspired and to practice evaluating the effectiveness of tech to be a solution to specific institutional needs.

APPENDIX D

CERPE Ethical Approval Certificate for the research project

UQÀM | Comités d'éthique de la recherche avec des êtres humains

No. de certificat : 2023-5007
Date : 2022-08-09

CERTIFICAT D'APPROBATION ÉTHIQUE

Le Comité d'éthique de la recherche pour les projets étudiants impliquant des êtres humains (CERPE plurifacultaire) a examiné le projet de recherche suivant et le juge conforme aux pratiques habituelles ainsi qu'aux normes établies par la *Politique No 54 sur l'éthique de la recherche avec des êtres humains* (2020) de l'UQAM.

- Titre du projet : **Le développement de la médiation numérique au musée : perception et pratiques des spécialistes de la conception collaborative des projets de médiation numérique**
- Nom de l'étudiant : **Marina Gross-Hoy**
- Programme d'études : **Doctorat en muséologie, médiation, patrimoine**
- Direction(s) de recherche : **Anik Meunier**

Modalités d'application

Toute modification au protocole de recherche en cours de même que tout événement ou renseignement pouvant affecter l'intégrité de la recherche doivent être communiqués rapidement au comité.

La suspension ou la cessation du protocole, temporaire ou définitive, doit être communiquée au comité dans les meilleurs délais.

Le présent certificat est valide pour une durée d'un an à partir de la date d'émission. Au terme de ce délai, un rapport d'avancement de projet doit être soumis au comité, en guise de rapport final si le projet est réalisé en moins d'un an, et en guise de rapport annuel pour le projet se poursuivant sur plus d'une année au plus tard un mois avant la date d'échéance (**2023-08-09**) de votre certificat. Dans ce dernier cas, le rapport annuel permettra au comité de se prononcer sur le renouvellement du certificat d'approbation éthique.

Élise Ducharme
Pour **Caroline Coulombe**,
Vice-Présidente CERPÉ plurifacultaire et Professeur titulaire, Département de management

Signé le 2022-08-09 à 16:16

APPENDIX E

Interview Frameworks

INTERVIEW: MUSEUM PROFESSIONAL

Type of museum
Type of digital project

I. Digital museum interpretation

- Tell me about the technology use cases in your museum.
    - How did you determine these use cases?
- What is your museum's experience working with tech companies?
- What is the link between your museum's institutional mission and your museum's digital interpretation projects?
- What is the role of digital in museum interpretation in your museum?
    - What are the relevant uses (or not) of new technologies in museums?
        - ...and the best practices for their production?
        - ...and the types of experience targeted?
        - How did you determine these use cases?
- How has the role of digital in the museum transformed after your collaborations with digital service providers?

II. Declared practices for working with companies

- Walk me through the process of working with a technology partner on a project, from first contact to after the project launches.
- How did you determine this structure?
- Does this structure ever change? If so, why and how?

III. Perceptions

- Can you let me know which elements or resources facilitated best the collaboration process with digital service providers?
- What were the principal difficulties you faced in this process? Are there parts of the process that are places of tension?
- How do the tech companies you work with understand museum experience?
- Do you feel like your museum team is adequately resourced to conceive of and produce interpretation products that use digital technologies?
    - What resources and processes do you use to develop digital interpretation projects? With what actors?
    - In thinking about your practice for designing and producing these digital tools, can you say that your practices have changed after your collaborations with tech companies?
- Do you work with methods that come from digital culture, like co-creation and/or design thinking?

INTERVIEW: TECHNOLOGY PARTNER

Type of company
Type of digital project

I. Digital museum interpretation

- Tell me about your technology and its use cases with museums.
- How did you determine these use cases?
- What is your experience working with museums? (how many museums, what types of museums, for how many years)

II. Declared practices for working with museums

- Walk me through the process of working with a museum partner on a project, from first contact to after the project launches.
- How did you determine this structure?
- Does this structure ever change? If so, why and how?

III. Perceptions

- Can you think of an example of a museum partner that was well-equipped to collaborate on a project with you?
- Can you think of an example of a museum partner that struggled in this process?
- What do the museums you work with say they are looking for?
- Are there parts of the process that are places of tension or struggle for museums?
- If you work with organisations that are not museums: what are the differences you see?

APPENDIX F

Data Analysis Tool

1. **Understanding digital interpretation**

    a. **Digital Imagination**
        i. Possibilities of digital interpretation
            1. Accessibility / welcome
            2. Connecting to remote visitors
            3. Marketing
            4. Support the mission
            5. Storytelling / discourse / communication
            6. Experiential / emotional / personal engagement
            7. Other
        ii. Limits of digital
            1. Digital is not always the best solution
            2. "Shiny object"
            3. Other

    b. **Impacts of COVID**
        i. During COVID
        ii. Post-pandemic

2. **Adapting for cross-sectoral collaboration to design digital tools in museums**

    a. Digital Maturity / "Structures"
        i. Infrastructure
        ii. Funding Structure
        iii. Innovation / risk
        iv. Digital strategy

    b. Digital Literacy / Museum Literacy
        i. Human-centered
        ii. When to use digital (or not), Good uses of digital
        iii. Sustainability
        iv. Ability to evaluate project proposals from partners
        v. Project life cycles
        vi. Ethics
        vii. Other

    c. Professionalization
        i. Team structures / infrastructure
        ii. Reasons for contracting work

d. Adapting to partners

i. Cross-sectoral communication / language
ii. Understanding partner [entrepreneurial /museum] structures and priorities

3. **Collaborating across sectors: Actions and practices**

a. Context for the project

b. Choice of partner

c. Beginning of the process

d. Middle of the process

i. Communication structures

i. After the collaboration

i. Warrantee
ii. Evaluation
iii. Other

4. **Collaborating across sectors: Perspectives on partners**

a. Desired qualities

i. Mutal trust
ii. Shown expertise
iii. Good collaborators / communicators
iv. Understanding of partner
v. Other

b. Tensions

i. Differing motivations
ii. Shiny objects
iii. Understanding subject matter content
iv. Communication
v. Other

c. Benefits

i. Benefits for partners
ii. Benefits for self

APPENDIX G

Knight Foundation Digital Maturity Assessment Rubric

Digital Maturity Assessment Rubric

		PRESENCE	PROCESS	STRATEGY
PLANNING AND DEVELOPMENT	Digital Strategy	A digital strategy or plan for integrating digital into the organization's approach to its work is in place at the organization.	Digital strategy is fully integrated as part of organizational strategy.	The organization adjusts its strategic goals and methods based on the results of its digital work.
	Data Collection and Utilization	The organization collects audience and participation data (for both regular and digital programming).	The organization analyzes audience and participation and shares that data across departments and with board members.	The organization's audience and participation data inform strategies and planning for digital work.
	Budgeting	The organization's operating budget consistently covers current technology needs.	The budgeting process considers emerging technology costs and improvements.	The organization considers the sustainability of its technology investments, including both its long-term maintenance and upgrade expenses and possible revenue and funding models.
OPERATIONS AND IMPLEMENTATION	Systems and Tools	The organization can perform its current work efficiently using its software, systems, and tools, and is not limited by them.	Policies and practices cover regular upgrading, replacement or repair of digital systems and tools.	The organization is able to choose its systems and tools based on an analysis of its operational needs and varying use cases.
	Archives and Assets	The organization has established digital archives of its collections and/or assets.	Practices or policies cover regular digitization of content produced by the organization, and policies inform whether, how and which assets can be shared with audiences.	The organization regularly analyzes the ways it organizes, shares and uses its digital archives and/or assets, and makes adjustments based on learning.
	Access	The organization uses applicable accessibility standards and practices (e.g., WCAG, Smithsonian Guidelines for Accessible Exhibition Design, etc.) for its online and in-person digital programming.	The organization has a process to assess accessibility compliance (e.g., WCAG, Smithsonian Guidelines for Accessible Exhibition Design, etc.) when creating online and in-person digital programming.	The organization intentionally develops accessibility-compliant content and adapts online and in-person digital programming so that diverse participants can equitably access its work.
PEOPLE AND CULTURE	Culture	Innovation and experimentation are welcomed.	The organization has adopted processes to learn from its experimentation.	Organizational strategies encourage innovation and experimentation across the departments and programming.
	Leaders	Leaders prioritize the advancements of their organization's digital proficiency.	Leaders' job descriptions, goals, and performance reviews include components of digital literacy.	Leaders effectively communicate the importance of their organization's strategies and progress toward digital maturity to staff and board.
	Diversity, Equity and Inclusion	The organization's digital programming purposefully engages traditionally underserved audiences	The organization uses metrics to understand whether its digital programming is engaging traditionally underserved audiences.	The organization purposefully adapts its goals and strategies for digital programming in order to engage traditionally underserved audiences.
	Skills and Training	Digital skills and literacy are considered in hiring decisions across the organization.	The organization supports training for employees to develop digital skills and literacy.	The organization monitors its employees' collective digital skills and addresses gaps.

Digital Maturity Assessment Rubric (Knight Foundation, 2023, p. 9)

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