

UNIVERSITÉ DU QUÉBEC À MONTRÉAL

QUATRE ESSAIS SUR LES IMPACTS DES EMBALLAGES ÉCO-CONÇUS
SUR LA PRATIQUE DE CONSOMMATION RESPONSABLE : LE CAS DE LA
RÉDUCTION DU GASPILLAGE ALIMENTAIRE

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LISTE DES ABRÉVIATIONS, SIGLES ET ACRONYMES

A-C-V	Attribut-conséquence-valeur
ACR	Association for Consumer Research
ADEME	Agence de l'Environnement et de la Maîtrise de l'Énergie
BAPE	Bureau d'audiences publiques sur l'environnement
CR	Consommation responsable
CT	Critical theory
CQCD	Conseil québécois du commerce de détail
ÉEQ	Éco entreprise du Québec
FAO	Food and Agriculture Organization of the United Nations
FUSIONS	Food Use for Social Innovation by Optimizing Waste Prevention Strategies
FSC	Food Supply Chain
IFWC	International consumer research & testing
LCA	Lifecycle assessment
MAPAQ	Ministère de l'Agriculture, des Pêcheries et de l'Alimentation
PAC	Participatory action research
TCR	Transformative consumer research
TPB	Theory of planned behaviour
OLS	Ordinary least square
WRAP	The Waste and Resources Action Programme

RÉSUMÉ

Cette thèse par articles (quatre) a pour objectif de fournir une meilleure compréhension par rapport à l'impact des emballages éco-conçus sur la pratique de la consommation responsable à travers une perspective du consommateur. La recherche vise plus précisément à comprendre l'impact sociétal des emballages éco-conçus sur le bien-être individuel (conservation de la nourriture) et collectif (réduction du gaspillage alimentaire) par une illustration du cas de la réduction du gaspillage alimentaire.

L'article 1, via une revue de littérature systématique des articles académiques prenant en compte les concepts clés de la recherche, met en évidence l'état des lieux des savoirs (ontologie, axiologie, épistémologie, méthodologie, évaluation) sur le concept de l'emballage éco-conçu à travers trois perspectives de recherche (positivisme, interprétativisme et « transformative consumer research »). Il vise à mieux comprendre la perspective de recherche sur l'impact sociétal des emballages éco-conçus et à proposer un agenda de recherche. Il identifie ainsi trois voies de recherche qui pourraient avoir un impact sociétal important : (1) la vulnérabilité des consommateurs face aux innovations liées à l'emballage (risques perçus associés aux emballages éco-conçus); (2) l'emballage et le gaspillage alimentaire du consommateur; et (3) l'emballage et la consommation des alimentaires durables.

Se concentrant sur la voie de recherche proposée, soit celle de la vulnérabilité des consommateurs face aux innovations liées à l'emballage, le deuxième article de la thèse s'est intéressé à mieux comprendre les risques perçus des consommateurs envers les emballages éco-conçus ainsi que ses impacts sur le processus de décision de consommation. Via la méthodologie qualitative des chainages cognitifs (« means-end-chain »), l'article 2 offre une compréhension approfondie des consommateurs sur le sujet. Les résultats ont permis d'identifier par ordre d'importance cinq risques perçus des consommateurs envers les emballages éco-conçus (risques fonctionnel, physique, financier, style de vie et socio-environnemental, notamment le gaspillage alimentaire) qui pourraient améliorer les perceptions et la visibilité des emballages éco-conçus.

L'article 3 propose une réflexion sur la relation entre le risque perçu socio-environnemental de l'emballage (gaspillage alimentaire) et la solution potentielle (emballage éco-conçu). Étant donné l'absence de bases théoriques solides par rapport aux effets des emballages éco-conçus sur le gaspillage alimentaire à partir de la perspective du consommateur, le troisième article propose un cadre conceptuel

holistique du sujet à travers l'approche de théorisation inductive top-down. Pour ce faire, il met en évidence les mécanismes sous-jacents des effets des attributs (visuels et/ou verbaux) des emballages éco-conçus liés à l'intention d'éviter le gaspillage alimentaire à travers les performances perçues envers ses fonctions.

L'article 4 teste la relation de causalité entre les perceptions des consommateurs à l'égard des emballages éco-conçus et leurs intentions d'éviter le gaspillage alimentaire à travers des études expérimentales en ligne. Un plan expérimental 2×2 a permis de relever le potentiel des emballages éco-conçus comme solution de réduction face au gaspillage alimentaire. Les résultats ont mis en évidence le fait que les intentions d'éviter le gaspillage alimentaire sont davantage influencées par les attributs visuels (versus les attributs verbaux). L'étude a aussi relevé les effets médiateurs des performances perçues des fonctions des emballages éco-conçus et les effets modérateurs de la conscience sanitaire.

La présente thèse apporte une contribution théorique en proposant une définition conceptuelle de l'emballage éco-conçu en adoptant la perspective du consommateur, ainsi qu'un modèle théorique sur la relation entre les emballages éco-conçus et le gaspillage alimentaire.

Sur le plan managérial, la thèse offre des pistes de réflexion pour de meilleures pratiques de mise en marché et d'éducation / sensibilisation des emballages éco-conçus pour diverses parties prenantes (consommateurs, producteurs d'emballage, marketeurs, décideurs politiques) comme : l'innovation et le développement de l'emballage, l'utilisation des emballages éco-conçus comme outil de réduction du gaspillage alimentaire et de promotion de pratiques de la consommation responsable.

Mots clés : emballage éco-conçu, pratiques de consommation responsable, perceptions du consommateur, risque perçu, gaspillage alimentaire, transformative consumer research, revue de littérature systématique, analyse épistémologique, chaînage cognitif, expérimentation.

ABSTRACT

This four articles-based thesis aims to provide an in-depth understanding of the impacts of eco-design packaging on consumers' responsible behaviors from a consumer perspective. Precisely, the objective of this thesis to assess the social impacts of eco-design packaging on individual (preserving the food and promoting sustainable) and collective well-being (reducing food waste).

Drawing on a systematic review of the literature focusing on eco-design, packaging, and eco-design packaging through three principal perspectives of the topic (i.e., positivism, interpretivism, and transformative consumer research), the first paper aims to delineate the state of the art of previous research (ontological, epistemological, axiological, and methodological assumptions and their evaluation), the suitable way to do research, and then to propose a research agenda for greater societal impacts. The paper highlights three tracks for maximizing the social benefits of eco-design packaging by investigating its role in three social challenges — (1) consumer vulnerability towards packaging innovation (perceived risks associated with eco-design packaging); (2) eco-design packaging and food waste; and (3) eco-design packaging and the healthy eating behaviors.

Based on the research agenda in the first paper regarding consumer vulnerability towards packaging innovation, the second paper of the thesis attempts to explore the negative reactions of consumers (perceived risk) associated with eco-design packaging. Through the means—end chain approach, the second paper provides a complete understanding of consumers' reaction (perceived risk and benefit) associated with eco-design packaging. The findings reveal five perceived risks (functional, physical, financial, life-standard, and socio-environmental risks) which can be used to improve perceptions and visibility of eco-design packaging.

The third paper focuses on the relationship between the socio-environmental risks associated with packaging (food waste) and potential solution (eco-design packaging). Since a lack of consensual theoretical basis focusing on the link of eco-design packaging and consumer food waste, the third paper aims to propose the conceptual framework of the effects of eco-design packaging on consumer food waste avoidance through inductive top-down theorizing approach. The findings reveal that consumer perceptions of eco-design packaging impact consumer food waste avoidance intentions via the perceived performance of its instrumental and communication functions.

Lastly, the fourth paper intent to test the causality relationship between the consumer perceptions of eco-design packaging and consumers' intention to avoid food waste by online experiments. The 2×2 experimental studies show that eco-design packaging is a potential solution to reduce consumer food waste: Consumers are more affected by improvements linking the visual, rather than verbal, attributes of packaging; moreover, the findings reveal the mediation effects of perceived performance of eco-design functions and the moderation effects of health consciousness.

Keywords: eco-design packaging, practice of responsible consumption, consumer perceptions, perceived risk, food waste, transformative consumer research, systematic literature review, means—end chain, experimentation

INTRODUCTION

L'emballage joue un rôle majeur puisqu'il lie le produit et le consommateur à travers ses fonctions (ex. : fonctions physique/instrumentale, sociale et commerciale) (Binninger, 2017). Il faut noter que la perception des consommateurs à l'égard de l'emballage a varié au fur et à mesure du développement de la société nord-américaine. Dans les années 1960, les consommateurs ont mis l'accent sur la fonction de la communication de l'emballage. En d'autres termes, l'emballage était considéré comme le « vendeur silencieux » du produit. Dans les années 1970, les entreprises ont fait des efforts visant à optimiser la fonction du transport de l'emballage. Depuis les années 1990, l'intégration de l'empreinte environnementale dans le processus de conception de l'emballage est devenue une exigence dans le secteur pour faire à face à la pression environnementale, notamment la tendance à la consommation responsable (CR) (Polito, 2000).

Évolution des pratiques de la consommation responsable liée à l'emballage. Dans le contexte québécois, selon une étude ayant observé durant dix ans les pratiques de la CR du consommateur québécois, il s'avère que plusieurs pratiques entretiennent une relation étroite avec l'emballage comme : le recyclage (papier, carton, verre et plastique), la protection de l'environnement (ex. : réduction du gaspillage alimentaire), les pratiques alimentaires durables, l'achat de produits écoresponsables (ex. : achat du produit éco-emballé), ainsi que certaines pratiques de zéro déchet (ex. : privilégier les produits en vrac secs ou liquides, privilégier l'emballage comme le contenant, le sac réutilisable) (Observatoire de la Consommation Responsable [OCR], 2019). De plus, les résultats de la dernière édition du Baromètre de la consommation responsable – Édition Québec 2019 montrent que la réduction du gaspillage alimentaire est une

pratique de plus en plus populaire dans la population : plus de la moitié des Québécois prennent des mesures pour limiter le gaspillage alimentaire (ex. : choisir l'emballage avec une fonction de préservation ou conservation supérieure). Toutefois, les fonctions d'un emballage sont encore mal comprises, voire négligées par certains consommateurs. L'emballage est vu comme une source de pollution. Selon un sondage conduit pour Éco Entreprises Québec, à peine plus d'un quart (27,6 %) des consommateurs pensent que l'emballage est nécessaire pour protéger et transporter le produit. L'impact environnemental négatif de l'emballage s'avère largement surévalué, car il représente moins de 10 % de l'impact environnemental du produit qu'il protège, mais seulement 12,6 % des consommateurs le savent. Par ailleurs, 43,2 % des consommateurs assurent qu'il est nécessaire de minimiser l'emballage (OCR, 2015b). D'ailleurs, l'emballage est vu comme une cause primordiale du gaspillage alimentaire (Waste and Resources Action Programme [WRAP], 2007, 2015).

L'emballage éco-conçu comme la solution stratégique et l'outil des pratiques de la CR. Dans ce contexte, l'emballage fait face à un dilemme entre la « fonctionnalité » (qui se traduit par les fonctions physiques et commerciales) et la « durabilité » (qui se traduit par la fonction sociale). Afin de répondre à ces défis, l'écoconception représente une solution stratégique pour optimiser l'emballage (Lindh *et al.*, 2016; Williams *et al.*, 2008). En effet, un emballage éco-conçu (fait à travers le processus d'écoconception basé sur la technique de l'analyse de cycle de vie « life-cycle assessments » : LCA) doit prendre en compte les impacts environnementaux dans les étapes de cycle de vie : à partir de l'approvisionnement des matières premières jusqu'à la gestion de la fin de vie du produit.

Dans la littérature consacrée aux impacts de l'emballage éco-conçu, celui-ci est principalement appliqué dans le secteur alimentaire puisque ce dernier est considéré comme l'un des secteurs pionniers de l'emballage innovant (Rokka et Uusitalo, 2008). Deux grands courants peuvent être identifiés. Le premier courant regroupe les études

en industrie s'appuyant principalement sur la perspective positiviste à travers laquelle l'emballage éco-conçu est vu comme l'ensemble des attributs (ex. : matériaux écoresponsables, referméabilité) servant à combler différentes fonctions. L'objectif principal de ces recherches est d'améliorer les fonctions de l'emballage (ex. : conservation et préservation) afin de réduire les impacts environnementaux de l'emballage comme la réduction du gaspillage alimentaire (ex. : Lindh *et al.*, 2016b; Wohner *et al.*, 2019) à travers LCA. Or, le deuxième courant de recherche renvoie aux études en comportements du consommateur, notamment le champ de la CR. Ces études adoptent principalement une perspective positiviste ou interprétativiste. L'objectif est d'investiguer la relation entre l'emballage éco-conçu et les comportements du consommateur. Les recherches positivistes visent à examiner les effets causaux entre les attributs de l'emballage éco-conçu sur les comportements et les pratiques de la CR (ex. : consommation du produit écoresponsable (Gupta et Ogden, 2009; Magnier et Schoormans, 2015), les comportements de consommation sanitaire (ex. : réduction de la surconsommation du produit alimentaire (Aerts et Smits, 2019), apport calorique (Van Ooijen *et al.*, 2017)). Or, les études s'appuyant sur une perspective interprétativiste ont pour objectif de mieux comprendre les expériences du consommateur liées à ce type d'emballage et le processus de l'attribution des sens (ex. : Dano 1996, 1998).

Étant donné que ces deux courants indiquent que l'emballage éco-conçu peut réduire l'impact environnemental (ex. : réduire le gaspillage alimentaire) et/ou améliorer le bien-être du consommateur (ex. : promouvoir la consommation d'aliments durables), les impacts sociétaux de l'emballage sont limités pour trois raisons principales :

Premièrement, même si l'emballage éco-conçu suscite de plus en plus l'intérêt des chercheurs en ingénierie et en consommation responsable, les savoirs sur ce sujet sont relativement fragmentés. En effet, le concept a été étudié par diverses disciplines (notamment ingénierie et marketing) ayant des postulats épistémologiques (ontologie,

axiologie, épistémologie, méthodologie, évaluation) éloignés qui causent des problèmes liés à l'évaluation et l'application des savoirs. En fait, les postulats épistémologiques influencent implicitement les étapes principales de la recherche (ex. : design, collecte et analyse de données, interprétation des résultats) qui, à leur tour, influencent l'évaluation et l'application des savoirs (P. F. Anderson, 1986; Ferber, 1977). Ces problématiques liées à la construction, l'évaluation et l'application des savoirs fragmentés peuvent seulement être abordées à travers une étude synthétique sur le processus de construction des savoirs, c'est-à-dire une analyse épistémologique (P. F. Anderson, 1986; Ferber, 1977).

Deuxièmement, plusieurs recherches en ingénierie ont montré qu'il existe un écart entre l'emballage éco-conçu défini selon LCA et perçu par les consommateurs. Autrement dit, l'emballage éco-conçu n'est pas perçu comme il devrait l'être à partir du point de vue du consommateur (ex. : Boesen *et al.*, 2019, Wikström *et al.*, 2019). En fait, les facteurs internes individuels du consommateur (ex. : perception, besoin, connaissance) ne sont généralement pas intégrés au design de l'emballage (Wikström, *et al.*, 2019). Les attributs écoresponsables de l'emballage perçus par les consommateurs sont beaucoup plus limités par rapport à ceux définis par LCA en raison de l'absence de connaissances liées à la technique innovante de l'emballage (Boesen *et al.*, 2019). D'ailleurs, les fonctions d'un emballage sont souvent mal comprises, voir négligées par les consommateurs. L'emballage est vu comme la cause de la pollution (notamment une cause primordiale du gaspillage alimentaire) (WRAP, 2007, 2015).

Troisièmement, étant donné que les études consacrées aux effets directs (c.-à-d. les effets ayant eu lieu pendant la production des matériaux de l'emballage, du transport et du recyclage) de l'emballage sont nombreuses, les effets indirects de l'emballage (c.-à-d. les effets liés aux services proposés pour l'emballage, le produit et/ou les utilisateurs dans la chaîne logistique, y compris les consommateurs comme la réduction

du gaspillage du produit et la réduction du risque lié à la santé du consommateur, l'amélioration de l'efficacité du transport) sont peu explorés dans la littérature. Néanmoins, il s'avère que les effets indirects de l'emballage, notamment la réduction du gaspillage du produit alimentaire, ont les impacts sociaux les plus importants, et ceux-ci sont souvent ignorés dans les études qui se concentrent sur la réduction des impacts environnementaux du système d'emballage (Lindh *et al.*, 2016). De plus, les effets de l'emballage éco-conçu et les comportements de réduction du gaspillage alimentaire n'étaient pas encore testés directement en raison de l'absence de cadre conceptuel holistique sur ce phénomène interdisciplinaire (ex. : ingénierie et le marketing).

De ce fait, l'objectif global de cette thèse est de mieux comprendre les impacts de l'emballage éco-conçu sur la pratique de la consommation responsable dans le secteur alimentaire, à travers une perspective du consommateur, en analysant : (1) le processus de construction des savoirs à l'égard de l'emballage éco-conçu par une revue de littérature systématique sous l'angle épistémologique; (2) les perceptions des consommateurs envers les emballages éco-conçus (bénéfices et risques) et ses effets sur le processus de décision de consommation; et (3) les impacts des emballages éco-conçus sur la réduction du gaspillage alimentaire.

La thèse vise plus précisément à répondre aux questions de recherche suivantes qui sont investiguées à travers quatre articles inter reliés :

- Quels sont les sujets et les problématiques les plus discutés liés au concept de l'emballage éco-conçu ? (article 1)
- Quelles sont les perceptions du consommateur envers les emballages éco-conçus (attributs, conséquences et valeurs individuelles) ? (article 2)

- Quels sont les mécanismes sous-jacents par lesquels les perceptions des consommateurs envers les emballages éco-conçus influencent leurs intentions de réduire le gaspillage alimentaire (les déterminants et les processus) ? (article 3)
- Quelle est la relation de cause à effet entre les perceptions des consommateurs envers les emballages éco-conçus et leurs intentions de réduire le gaspillage alimentaire ? (article 4)

Afin de répondre à l'objectif global de la thèse et aux questions de recherche afférentes, la thèse propose une méthodologie mixte combinant l'analyse théorique (revue de littérature systématique, « theory building »), des approches de recherche qualitative (chainage cognitif) et quantitative (expérimentation). En comparant la méthodologie qualitative ou qualitative simple, la méthode mixte permet d'assurer une compréhension plus complète sur la problématique orientée vers la pratique et visant un changement (Creswell, 2007).

La thèse commence par une revue de littérature systématique des recherches concentrées sur l'emballage, l'écoconception et l'emballage éco-conçu par la perspective épistémologique pour ensuite exposer un agenda de recherche transformative destinée à maximiser les impacts sociétaux (article 1). Elle présente ensuite une étude exploratoire sur les perceptions des consommateurs vis-à-vis de l'emballage éco-conçu et ses impacts sur le processus de décision de consommation (article 2). Basés sur les résultats des deux premiers articles, les articles 3 et 4 se concentrent sur les impacts des emballages éco-conçus sur la pratique de la CR– la réduction du gaspillage alimentaire au niveau du consommateur. L'article 3 vise plus précisément à établir un cadre conceptuel à travers l'approche de théorisation top-down

inductive. Enfin, la démarche de la thèse se veut confirmatoire à travers l'approche hypothético-déductive en s'appuyant sur des études expérimentales.

Le premier article de la thèse, publié dans la revue *Journal of Cleaner Production* (Q1¹ selon le classement 2020 SJR), vise à répondre à la première question de recherche. Il permet d'assurer une compréhension profonde sur la conceptualisation de la notion de l'emballage éco-conçu. Il identifie trois voies de recherche: (1) la vulnérabilité du consommateur vis-à-vis de l'innovation (les risques perçus envers l'emballage éco-conçu); (2) le développement durable (le gaspillage alimentaire et l'emballage); (3) la santé publique (promouvoir les comportements alimentaires durables) à travers l'analyse épistémologique. Ce premier article est axé sur l'état de l'art du concept holistique de l'emballage éco-conçu dans la littérature industrielle et en marketing.

Le second article de la thèse, publié dans la revue *Sustainability* (Q2 selon le classement 2020 SJR), vise à explorer la perception du consommateur au sujet des emballages éco-conçus et ses effets sur la décision d'achat. Cet article poursuit la première voie de recherche transformative identifiée dans l'article 1 en effectuant une analyse plus centrée sur les perceptions des consommateurs envers les attributs et les conséquences négatives (les risques) associées à l'emballage éco-conçu. Il explore les réactions négatives et les préoccupations des consommateurs envers ce type d'emballage innovant qui complète les savoirs centrés sur l'aspect positif (le bénéfique).

Le gaspillage alimentaire ayant été identifié comme un risque socio-environnemental plus important associé à l'emballage pouvant avoir un impact important sur le bien-

¹SCImago Journal Rank indicator: It is a measure of journal's impact, influence or prestige. It expresses the average number of weighted citations received in the selected year by the documents published in the journal in the three previous years.

Quartile rankings: Q1 denotes the top 25% of Impact Factor (IF) distribution, Q2 denotes for middle-high position (between top 50% and top 25%).

être individuel collectif dans les articles 1 et 2, le troisième article de la thèse examine plus précisément la relation entre l’emballage éco-conçu et le gaspillage alimentaire. Cet article a été initialement présenté à la conférence ***Innovation, Entrepreneurship, Knowledge Academy (INEKA)***, à Verona (Italie), en 2019, et ensuite publié dans la revue ***Journal of Promotion Management*** (Q2, selon le classement SJR en 2020).

Le quatrième article répond à la dernière question de recherche. Il a été présenté à la conférence de ***Academy of Innovation, Entrepreneurship, and Knowledge (ACIEK)***, à Madrid (Espagne), en juin 2020. Cet article est publié dans la revue ***Technological Forecasting & Social Change*** (Q1 selon le classement SJR 2020). Ce dernier article a pour objectif de tester le cadre conceptuel établi dans l’article 3 par la méthode d’expérimentation et finalement de proposer un modèle de l’impact des perceptions des consommateurs envers l’emballage éco-conçu sur leur intention de limiter le gaspillage alimentaire.

Plan de la thèse par articles

La thèse est divisée en sept chapitres : le premier introduit la relation entre la CR et l’emballage. Il présente ensuite la conceptualisation de l’emballage par une comparaison entre la perspective industrielle et le consommateur. Ce chapitre aborde également les impacts de l’emballage éco-conçu sur la réduction du gaspillage alimentaire (par le consommateur). Le deuxième chapitre expose la méthodologie de la thèse : le positionnement — « Transformative Consumer Research », le postulat épistémologique, et les approches méthodologiques abordées dans chaque article, soit la revue de littérature systématique, la méthode de chaînage cognitif (« means-end-chain »), l’approche inductive top-down et l’étude expérimentale. Le chapitre trois présente le premier article consacré à la réflexion épistémologique et l’agenda de recherche de la thèse. Le chapitre quatre est consacré au deuxième article qui explore les perceptions de consommateur envers l’emballage éco-conçu. Le chapitre cinq se penche sur le troisième article dans le but de proposer un cadre conceptuel établissant un lien entre l’emballage éco-conçu et le gaspillage alimentaire. Le chapitre six aborde le quatrième article qui vise à tester le modèle. Finalement, le dernier chapitre présente la discussion, les contributions théoriques, les applications pratiques et les voies de recherche futures.

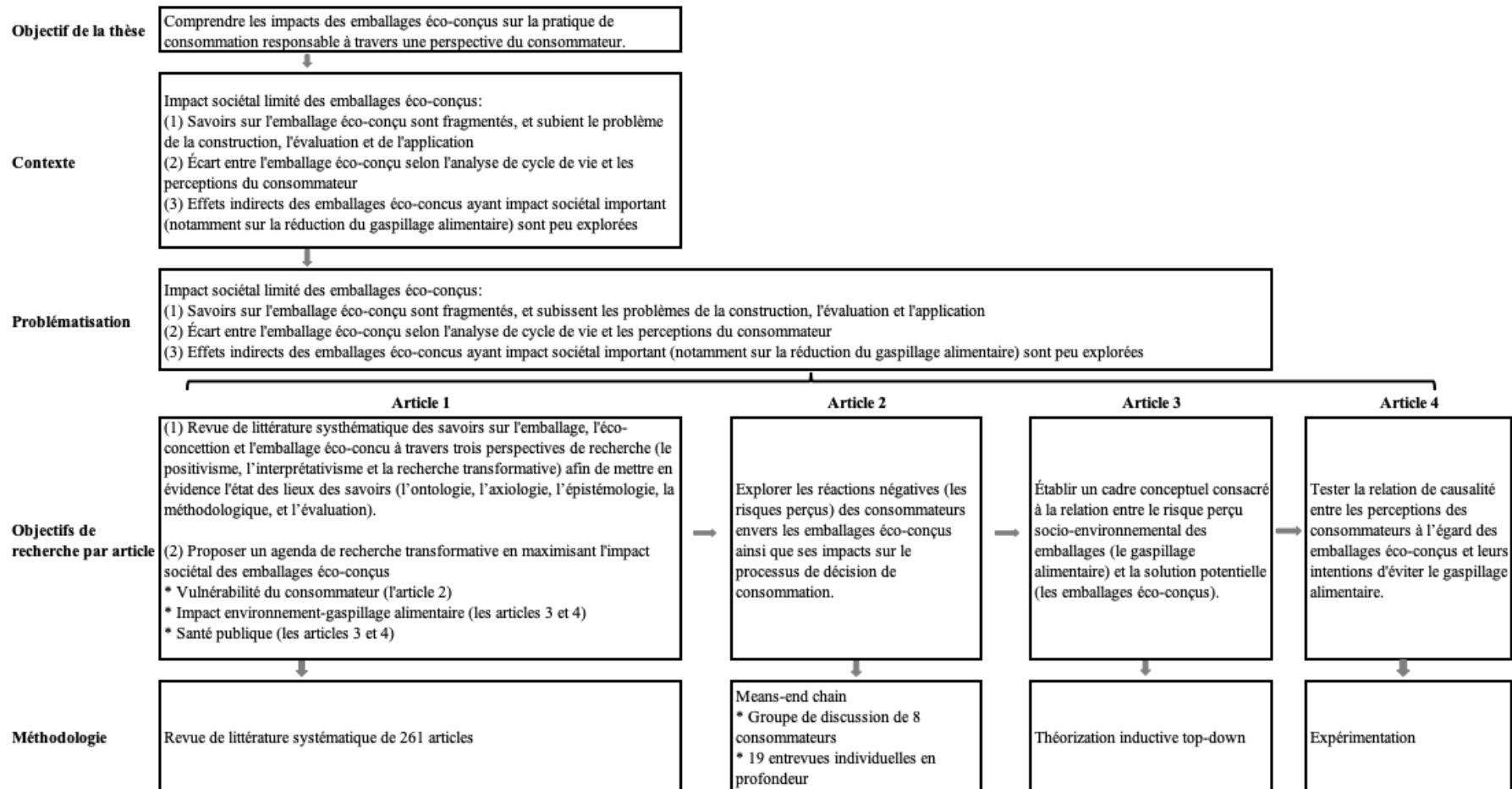
Synthèse de l'introduction générale

Dans ce chapitre d'introduction générale, l'objectif est de montrer une vision globale de la thèse et le lien entre les quatre articles à travers une présentation synthétisée du contexte, de la littérature, de l'objectif et des questions de recherche de la thèse. En effet, avant même de s'intéresser au cœur du sujet de recherche, il semble essentiel d'illustrer le contexte général en ce qui concerne l'évolution du rôle de l'emballage (ex. : « vendeur silencieux », solution de la réduction de l'empreinte environnementale), les défis liés aux exigences environnementales des diverses parties prenantes (consommateurs, fabricants, marketeurs, décideurs politiques) et ses impacts sociaux potentiels sur le bien-être individuel (ex. : promouvoir la consommation alimentaire durable) et/ou social (ex. : réduction du gaspillage alimentaire).

La littérature consacrée à l'emballage éco-conçu révèle que ses impacts sociaux sont limités pour les raisons suivantes : (1) une diversité du processus de construction des savoirs à ce sujet qui génère les problématiques de l'évaluation et de l'application des savoirs; (2) une exclusion des perceptions du consommateur dans le processus de conception de l'emballage; et (3) l'absence d'un cadre théorique holistique au sujet de l'impact de l'emballage éco-conçu et des comportements de consommation responsable.

De ce fait, la présente thèse vise à améliorer les impacts sociaux de l'emballage éco-conçu en investiguant les impacts de l'emballage éco-conçu du produit alimentaire sur les pratiques de la CR, notamment la réduction du gaspillage via une perspective du consommateur. Le chapitre suivant — Revue de littérature, est consacré, en premier lieu, à la relation entre l'emballage et la CR; en deuxième lieu, à la conceptualisation de l'emballage; et enfin, à l'impact de l'emballage éco-conçu sur la pratique de réduction du gaspillage.

Figure 0.1 Design de la thèse : liens entre les quatre articles



CHAPITRE I

REVUE DE LITTÉRATURE

Ce chapitre, consacré à la revue de littérature, se concentre sur la conceptualisation de l'emballage éco-conçu et ses impacts sur les comportements de consommation responsable et la pratique de la réduction du gaspillage alimentaire. Étant donné que ces trois sujets sont analysés en profondeur dans les articles 1 à 3 respectivement, il s'avère nécessaire de fournir une vision globale au sujet de la littérature de la thèse, car cela permet de mieux comprendre les concepts clés de la thèse et la relation entre les quatre articles la composant. La première section présente le concept de consommation responsable et le rôle de l'emballage dans la pratique de la consommation responsable. La deuxième section du chapitre expose la définition de l'emballage éco-conçu par les perspectives industrielles et du consommateur ainsi que les travaux académiques centrés sur l'emballage éco-conçu. Finalement, la dernière partie aborde la relation entre l'emballage éco-conçu et la pratique de réduction du gaspillage alimentaire.

1.1 Consommation responsable et l'emballage

1.1.1 Conceptualisation de la consommation responsable

Le concept de « consommation responsable » est introduit par F. E. Webster (1975). Dans son article intitulé « Determining the Characteristic of the Socially Concious Consumer » publié dans la revue *Journal of Consumer Research*, l'auteur se base sur les échelles de mesure de L. Berkowitz et Lutterman (1968) et W. Anderson et Cunningham (1972), et définit le consommateur (socialement) responsable comme : « *une personne qui prend en compte les conséquences publiques de sa consommation privée, et qui essaie d'utiliser son pouvoir d'achat pour induire des changements dans la société* » (F. E. Webster, 1975, p. 188) (traduction française par François-Lecompte, 2006).

Étant donné la diversité de la terminologie dans le domaine (ex. : consommation responsable (Fisk, 1973), consommateur socialement conscient (Webster, 1975), la consommation socialement responsable (Antil, 1984), consommateur éthique (Vitell et Muncy, 1992)), la CR peut être traduite par trois dimensions de la responsabilité du consommateur, soit : (1) la responsabilité environnementale sociale (intitulée « responsabilité sociale » dans la thèse), (2) la responsabilité environnementale naturelle (intitulée « responsabilité environnementale » dans la thèse), et (3) le bien-être de l'individu (Schlaile *et al.*, 2018).

Au contraire de l'accent mis sur la dimension « sociale » dans le travail du F. E. Webster (1975), Antil (1984, p. 20) se penche plutôt sur la dimension « environnementale » et définit la CR comme : « *les comportements et les décisions d'achat des consommateurs liés aux problématiques des ressources environnementales; motivés non seulement par le désir de satisfaire les besoins personnels, mais aussi par la préoccupation des conséquences de comportements* » (Traduction libre).

Les travaux subséquents (ex. : Roberts, 1993; François-Lecompte et Robert, 2006; Heidbrink et Schmidt, 2011) tendent à intégrer les trois dimensions (protection de l'environnement, amener un changement positif dans la société et le bien-être de l'individu) dans le concept de la CR.

D'après François-Lecompte et Roberts (2006), la consommation responsable se définit comme :

« La consommation socialement responsable inclut l'achat de produits et services perçus comme ayant un impact positif ou moins d'impacts négatifs sur l'environnement physique et/ou l'utilisation du pouvoir d'achat pour s'exprimer au sujet des préoccupations sociales. » (François-Lecompte et Roberts, 2006, p. 52) (Traduction libre)

Heidbrink et Schmidt (2011, p. 36) proposent pour leur part une définition plus synthétisée :

« L'action du consommateur responsable est définie comme l'acte de consommation qui privilégie les préoccupations environnementales, sociales et le bien-être personnel » (Traduction libre).

Malgré les nombreux travaux sur le sujet, une définition consensuelle de la CR demeure toutefois absente. Le tableau 1.1 illustre une liste de travaux se concentrant sur la conceptualisation de la CR, son positionnement dans les trois dimensions de la « responsabilité du consommateur »

Tableau 1.1 Définition de la consommation responsable

Terminologie	Définition (traduction libre)	3 dimensions de la responsabilité
Consommation responsable (Fisk, 1973, p. 24)	L'utilisation rationnelle et efficace des ressources en respectant l'objectif global d'être humain.	Environnementale
Consommateur socialement conscient (Webster, 1975, p.188)	Une personne qui prend en compte les conséquences publiques de sa consommation privée et qui essaie d'utiliser son pouvoir d'achat pour induire des changements dans la société.	Sociale
Consommateur socialement responsable (Antil, 1984, p. 20)	Les comportements et les décisions d'achat des consommateurs liés aux problématiques des ressources environnementales; motivés non seulement par le désir de satisfaire leurs besoins personnels, mais aussi par la préoccupation liée aux conséquences des comportements.	Environnementale
Consommateur éthique (Vitell et Muncy, 1992, p. 298)	Les principes moraux et standards qui guident les comportements (obtention, utilisation, disposition du produit ou service) des individus ou des groupes.	Inconnue. Dépend des «principaux moraux et standards »
Comportement de consommation socialement responsable (Roberts, 1993, p. 140)	La personne qui achète les produits et services perçus comme ayant une influence positive (ou moins d'influence négative) sur l'environnement ou le manager qui tend à aborder un changement social de manière positive.	Environnementale Sociale
Comportement du consommateur éthique (Cooper-Martin et Holbrook, 1993, p. 113)	La prise de décision, l'achat et autres expériences de consommation influencées par les préoccupations éthiques du consommateur.	Sociale

Terminologie	Définition (traduction libre)	3 dimensions de la responsabilité
Comportement du consommateur socialement responsable (Mohr <i>et al.</i> , 2001, p. 47) utilisé par Webb <i>et al.</i> (2008) pour développer les échelles - Socially responsible purchase and Disposal:SRPD)	La personne se base sur l'acquisition, l'utilisation et la disposition de produits motivées par un désir de minimiser ou éliminer les effets négatifs et maximiser les impacts sociaux à long terme dans la société [...] un consommateur socialement responsable va donc éviter d'acheter les produits offerts par les entreprises qui ont des impacts négatifs sur la société en privilégiant ceux qui ont des impacts positifs.	Sociale (explicitement) Environnemental (implicitement : la prise en compte les impacts à long terme)
Consommationnisme éthique (Crane et Matten, 2004, p. 290)	La conscience et la décision délibérée pour les choix de consommation en fonction des valeurs et croyances personnelles (traduction libre).	Sociale
Consommateur éthique (Harrison <i>et al.</i> , 2005, p. 2)	Les consommateurs ont des motivations politique, religieuse, spirituelle, environnementale, sociale ou autres en faveur d'un produit (traduction libre).	Environnementale Sociale
Responsabilité socialement responsable (Devinney <i>et al.</i> , 2006, p. 32)	Avoir conscience de faire un choix de consommation selon ses croyances personnelles et morales [...] la responsabilité socialement responsable se caractérise par deux types de pratique: les comportements d'achat ou de non-achat (traduction libre).	Bien-être ou dépend des croyances personnelles et morales
Consommation socialement responsable (Francois-Lecompte et Roberts, 2006, p.52)	La consommation socialement responsable inclut l'achat de produits et services qui sont perçus comme ayant des impacts positifs ou moins d'impacts négatifs sur l'environnement physique et/ou l'utilisation du pouvoir d'achat pour exprimer ses préoccupations sociales. Cette définition est cohérente avec le concept de responsabilité sociale des entreprises selon lequel le consommateur responsable est une personne qui prend en compte le « bien-être » des parties prenantes influencées par son achat (traduction libre).	Environnementale Bien-être

Terminologie	Définition (traduction libre)	3 dimensions de la responsabilité
Action du consommateur responsable (Heidbrink et Schmidt, 2011, p. 36)	L'acte de consommation qui prend en compte les préoccupations environnementales, sociales et le bien-être personnel (traduction par Schlaile <i>et al.</i> (2018).	Toutes les 3 dimensions et 5 types de comportement
Consommation socialement responsable (Yan et She, 2011, p. 255)	Les comportements qui impliquent que chaque étape du processus de consommation est influencée par les préoccupations liées aux problématiques sociales, morales et environnementales. Donc, la consommation socialement responsable est définie comme la prise en compte de l'intérêt de l'ensemble de la société et de la nation à chaque étape de consommation à long terme.	Sociale Environnementale
Consommation socialement responsable (Caruana et Chatzidakis, 2014, p. 578 basé sur Dahlsrud (2008) et Okoye (2009))	La consommation socialement responsable est une application instrumentale, relationnelle et logique morale par un individu, un groupe, une entreprise et des agents institutionnels afin de chercher l'influence sur les responsabilités associées du consommateur dans un sens large.	Sociale

1.1.2 Pratique de la consommation responsable et l’emballage

La notion de pratique a été introduite en marketing en années 1990 par des travaux (ex. : Bourdieu, 2016; Holt, 1998) selon lesquels le sens de la consommation ne se base pas seulement sur l’achat des objets mais aussi sur celui de pratiques individuelles (Trizzulla *et al.*, 2016). Par conséquent, cette notion de pratique permet d’intégrer à la fois « les comportements marchands » et « les comportements non marchands » (ex. : la consommation responsable en général (Sirieix et Le Borgne, 2017), le gaspillage alimentaire (Dyen *et al.*, 2017)), dans la recherche du consommateur. La pratique est définie comme « *une constellation d’actions organisées présentant certaines “régularités” et précise qu’une pratique constitue une “performance” dans le sens où elle doit être incarnée pour exister* » (Innocent et François-Lecompte, 2020, p. 81; Schatzki, 1996).

Dans le cadre de la CR, la pratique est généralement implantée sous deux formes, positive ou négative, associées aux comportements d’achat du produit ou service écoresponsable et à la résistance (non-achat) concernant le produit/service (Devinney *et al.*, 2006; Lecompte et Valette-Florence, 2006).

La forme positive de la CR – l’achat – renvoie au fait que le consommateur privilégie des produits présentant des caractéristiques pro-environnementales (ex. : produits labellisés, produits-partage) ou sociales (ex. : campagnes collectives d’achat-*Boycott*). Tandis que, la forme négative de la CR se traduit par le refus ou la résistance d’achat chez les consommateurs (François-Lecompte, 2006). Roux (2007) propose un cadre conceptuel de la résistance du consommateur sous l’angle d’un état motivationnel. Cette dernière réfère à « *un état interne qui pousse un individu à réduire la tension ressentie dans une situation de pression ou d’influence où des pratiques, des logiques et des discours marchands sont perçus comme dissonants* » (Roux, 2007, p. 68), qui conduit à diverses manifestations de résistance aux actions/acteurs, au système de

consommation, et au fonctionnement du marché. De plus, une pratique plus courante de la CR consiste à boycotter ce qui réfère à « *la tentative par une ou plusieurs parties d'atteindre certains objectifs en incitant les consommateurs individuels à s'abstenir de faire certains achats sur le marché.* » (Friedman, 1991 cité dans François-Lecompte, 2006, p. 48).

Dans le contexte québécois, selon une étude ayant observé durant dix ans les pratiques de consommation responsable du consommateur québécois, la forme positive renvoie à : (1) le recyclage (recyclage du papier, carton, verre et plastique), (2) le compostage (compostage des résidus de cuisine, des feuilles mortes et des résidus de jardin), (3) la consommation locale (achat de produits locaux ou fabriqués localement et magasinage auprès de commerçants de quartier), (4) la protection des animaux, (5) la protection de l'environnement (achat de produits à faible impact environnemental), (6) la consommation citoyenne (achat auprès d'entreprises soutenant la communauté et des causes), (7) le transport en commun (utilisation des transports en commun comme le bus et le métro), (8) la consommation collaborative, redistribution² et mutualisation³, (9) les pratiques alimentaires durables, (10) l'achat de produits écoresponsables, (11) certaines pratiques liées à la réduction du gaspillage direct (ex. : privilégier les produits en vrac secs ou liquides, privilégier l'emballage comme le contenant, le sac réutilisable) et/ou indirect de l'emballage (ex. : utiliser une liste d'achat pour planifier l'achat afin de réduire le gaspillage alimentaire) (OCR, 2019).

En revanche, la forme négative (la résistance) se traduit principalement par la déconsommation (ex. : réduction volontaire et non volontaire de la consommation afin

² La consommation collaborative de redistribution : utilisation de plateformes Web et d'applications mobiles permettant l'achat/la vente/l'échange/le don de biens de seconde main entre particuliers.

³ La consommation collaborative de mutualisation : utilisation de plateformes Web et d'applications mobiles permettant l'offre/l'accès/l'échange de services entre particuliers.

de réduire le gaspillage alimentaire au niveau de la consommation en raison du surachat) et certaines pratiques liées à l'emballage (ex. : limiter l'achat de produits sur emballés, refuser les sacs lors d'un achat en magasin, etc.).

On constate que plusieurs pratiques de la CR ont une relation étroite avec les fonctions de l'emballage, telles que le recyclage (recyclage du papier, carton, verre et plastique), la réduction du gaspillage alimentaire, les pratiques alimentaires durables, l'achat de produits écoresponsables, et certaines pratiques de zéro déchet (ex. : privilégier les produits en vrac secs ou liquides, utiliser un sac réutilisable, etc.). De ce fait, aborder les études axées sur la relation entre l'optimisation d'emballage et la pratique de la CR apparaît comme étant pertinent et a fait l'objet de peu de recherches jusqu'à présent.

1.2 Conceptualisation de l'emballage éco-conçu

1.2.1 Définition industrielle vs perceptions du consommateur

Le concept de l'emballage éco-conçu est développé en fonction de la notion d'emballage écologique. Il est souvent décrit par d'autres termes comme « l'emballage vert » (green packaging) (Rokka et Uusitalo, 2008), « l'emballage écologique » (packaging eco-friendly) (Prakash et Pathak, 2017) ou « l'emballage durable » (« sustainable packaging ») (Magnier *et al.*, 2016).

Le concept s'est développé avec la notion de l'écoconception et l'approche de l'analyse du cycle de vie (« life-cycle assesment » : LCA) dans un contexte de préoccupation environnementale grandissante (Polito, 2000; Williams et Wikström, 2011). Il est davantage abordé dans la recherche en ingénierie ou dans l'industrie du secteur d'emballage (par ex. Conseil national de l'emballage). Le tableau 1.2 présente une liste non exhaustive de la conceptualisation de l'emballage éco-conçu dans la littérature. Tel qu'illustré au tableau 1.2, le concept d'emballage éco-conçu est essentiellement décrit

par des termes comme : « l'impact environnemental », « l'impact social », « l'analyse du cycle de vie », « recycler », « réutilisable », « réduire ». En somme, l'emballage éco-conçu répond à la responsabilité sociale au niveau environnemental, social et bien-être (fin) à travers la technique LCA (moyen).

Tableau 1.2 Définition de l'emballage éco-conçu

Terminologie	Définition	3 Dimensions de la responsabilité sociale			LCA
		Impact environnemental Eco-efficience (fonctionnalité et durabilité)	Impact social	Bien-être (Consommateur et les parties prenantes)	
Emballage éco-conçu (Magnier et Crié, 2015)	Un design évoquant explicitement ou implicitement le caractère écologique de l'emballage lui-même, et créant des inférences sur le caractère écologique de l'offre, du produit ou de la marque, que ce soit via sa structure (matériaux, réduction ou suppression, réutilisabilité), ses signaux graphiques ou iconographiques ou encore ses signaux informationnels (traduction française par Magnier et Crié, 2015).	Le caractère écologique de l'offre, du produit ou de la marque.	Le caractère écologique de l'offre, du produit ou de la marque.		
Emballage éco-conçu du produit alimentaire (Bertoluci et Trystram, 2013, p.130)	L'écoconception d'emballages passe par la réduction des épaisseurs de matières, par une harmonisation des matériaux de plastique employés, si les compatibilités contenant/contenu l'autorisent, c'est-à-dire si les migrations possibles entre l'emballage et l'aliment restent conformes aux seuils autorisés par la	Harmonisation, compatibilité contenant/contenu	Conformes aux seuils autorisés par la réglementation	Conformes aux seuils autorisés par la réglementation alimentaire	Mentionné dans la définition

		3 Dimensions de la responsabilité sociale			
Terminologie	Définition	Impact environnemental Eco-efficience (fonctionnalité et durabilité)	Impact social	Bien-être (Consommateur et les parties prenantes)	LCA
	réglementation alimentaire européenne.				
Produit emballé éco-conçu du Conseil National de l’Emballage (CNE) « Écoconception du produit emballé: Guide méthodologie » 2019, p.16)	L’écoconception des produits emballés doit intégrer le cycle de vie complet du produit emballé ; elle constitue une approche fonctionnelle qui amène à réfléchir sur le produit lui-même ainsi que sur les fonctionnalités de l’emballage.	Mentionné dans la définition			Mentionné dans la définition
Emballage écologique	Un type d’emballage présente un impact environnemental relativement bas à travers le modèle de l’analyse de cycle de vie (Glavič et Lukman, 2007; Steenis <i>et al.</i> , 2017, p. 287). (Traduction libre)	Mentionné dans la définition			Mentionné dans la définition

Dans la présente thèse, l'emballage éco-conçu est défini à travers deux notions se chevauchant : l'emballage et l'écoconception.

Premièrement, l'emballage est défini comme l'« *Ensemble des matériaux destinés à contenir et à protéger un produit, depuis sa fabrication jusqu'à sa consommation* » (Office québécois de la langue française, 2021). Dans la littérature marketing, l'emballage est défini généralement par les attributs visuels (ex. : matériaux, forme, taille) et verbaux (ex. : marque, texte). Nous pouvons identifier trois niveaux d'emballage selon les fonctions de l'emballage : (1) l'emballage primaire (ou conditionnement) consiste en l'enveloppe matérielle au contact direct du produit ; (2) l'emballage secondaire (ou emballage) réfère à ce qui entoure l'emballage premier. Il vise à regrouper les produits en unité d'achat et transférer les informations aux consommateurs dans le magasin ; et (3) l'emballage tertiaire vise à regrouper les produits en unités de livraison (Kotler *et al.*, 2006).

En tant que composante essentielle d'un produit, l'emballage remplit trois types de fonctions majeures (physiques/fonctionnelles, sociales et commerciales) faisant un lien entre le produit et le consommateur (Binninger, 2017). Au niveau physique, l'emballage remplit les fonctions suivantes : la préservation/protection, le regroupement, la conservation, l'utilisation et l'information (par ex. communication de la date limite de consommation, mode de conservation et d'emploi du produit). Au niveau social, l'emballage peut encourager le recyclage, réduire le gaspillage ainsi que promouvoir les comportements de consommation sanitaire (par ex. consommation du produit biologique). Et au niveau commercial, l'emballage remplit deux fonctions essentielles soit : le positionnement (du produit et de la marque), l'alerte (attirer l'attention des consommateurs).

L'écoconception se réfère à un processus pour atteindre l'objectif d'éco-efficience en intégrant l'impact environnemental et/ou social dans l'ensemble du cycle de vie du produit ou du service (Schiesser, 2012; Wohner *et al.*, 2019). L'écoconception est

considérée comme la clé de l'innovation (Chen, 2009; Puaut, 2008), la stratégie de marketing de l'entreprise permettant d'établir une image forte, de répondre au besoin écoresponsable du consommateur et de faire face aux pressions environnementales (Ottman *et al.*, 2006) et à la future compétitivité à travers la technique de la LCA.

Dans le domaine de l'emballage, l'écoconception consiste en l'intégration de critères environnementaux et/ou sociaux dans la conception de l'emballage à travers les méthodes d'analyse de cycle de vie pour atteindre l'éco-efficience (Schiesser, 2012). En fait, il est nécessaire de répondre à quelques critères principaux dans les étapes de cycle de vie de l'emballage (Zeng *et al.*, 2017).

- Il est important de prendre en considération toutes les parties prenantes de la conceptualisation de l'emballage (design, conditionnement, approvisionnement, logistique, recherche et développement, marketing) dès le début pour bénéficier d'une vision globale ;
- L'optimisation de l'ensemble des systèmes d'emballage : le niveau primaire (inciter l'utilisateur ou consommateur final), secondaire (garnir les présentoirs aux points de vente), tertiaire (faciliter le transport d'un certain nombre d'articles) ;
- L'intégration des attentes du consommateur comme : la commodité d'usage (ex. : taux de restitution, taux d'ouverture/fermeture), la visualisation des informations (ex. : marque, pays de fabrication), le volume et le poids ;
- La valorisation de fin de vie de l'emballage ;
- Traditionnellement, l'emballage éco-conçu constitue un domaine relativement développé dans l'industrie. Selon la littérature en ingénierie, on présuppose que l'emballage éco-conçu comporte des attributs/éléments positifs pour l'environnement (ex. : matériaux recyclables ou biodégradables) et pour les consommateurs (ex. : baisse des déchets, diminution du gaspillage alimentaire)

qui sont les résultats de l'analyse du cycle de vie. Cependant, ces attributs éco-conçus ne sont pas nécessairement visibles ou perçus comme tels par les consommateurs. Il existe un écart entre l'emballage éco-conçu défini selon la LCA et perçu par les consommateurs. Les consommateurs ne peuvent pas percevoir systématiquement tous les attributs écoresponsables de l'emballage en raison de l'absence de connaissances par rapport à la technique innovante de l'emballage (Boesen *et al.*, 2019). De plus, les fonctions d'un emballage sont souvent mal comprises par les citoyens et ces derniers les perçoivent comme « une source de pollution inutile ». Selon un sondage conduit en 2015 pour Éco Entreprises Québec, à peine plus d'un quart (27,6 %) des consommateurs estiment que l'emballage est nécessaire pour protéger et transporter le produit. L'impact environnemental négatif de l'emballage s'avère largement surévalué, car il représente moins de 10% de l'impact environnemental du produit qu'il protège ; mais seulement 12,6% des consommateurs le savent. Par ailleurs, 43,2 % des consommateurs assurent qu'il est nécessaire de minimiser l'emballage (OCR, 2015b).

Le Tableau 1.3 (tableau 4.3 dans l'article 2) compare et établit un contraste entre les attributs dans la littérature professionnelle (selon les résultats de la LCA) et les perceptions du consommateur (selon les résultats de groupes de discussion). On constate notamment que la liste des attributs des emballages éco-conçus perçus par les consommateurs est plus réduite que celles dans la littérature (21 au lieu de 36), qu'elle comporte des caractéristiques plus génériques et qu'elle est complétée par certains attributs abstraits ou non observables. On remarque plus particulièrement

que : (1) certains attributs sont mentionnés par les deux perspectives (matériaux recyclables ou matériaux plus respectueux de l'environnement, poids léger, taille optimisée, ratio contenu/contenant amélioré, couleur verte/bleue/transparent, étiquetage écologique); (2) d'autres ont été « fusionnés » dans la liste des attributs perçus par les consommateurs en raison du manque de connaissance au sujet de certains nouveaux concepts. Du point de vue du consommateur, les matériaux plus respectueux de l'environnement regroupent l'ensemble des matières comme le carton, le papier, le plastique recyclé et le matériau biodégradable. La taille et la structure optimisées combinent le processus d'optimisation du rapport contenu/contenant ou du produit/emballage tel que : l'amélioration du système de fermeture, l'optimisation du poids et/ou du volume des composants/éléments du système d'emballage; (3) certains attributs abstraits, autrement dit qui ne sont pas nécessaires pour décrire les caractéristiques physiques de l'emballage éco-conçu comme le prix élevé du produit éco-emballé par rapport au produit emballé ordinaire ou l'image de marque, apparaissent être importants aux yeux des consommateurs.

Tableau 1.3 Perception des attributs de l'éco-emballage vs éco-emballage dans la littérature

Cycle de vie	Perspective industrielle	Perspective du consommateur
Extraction des matières premières	L'emballage en papier ou en carton est fait de fibre provenant de forêts gérées de manière durable.	Emballage recyclable
	L'emballage arbore une indication claire sur comment en disposer. carton en partie recyclé carton 100 % recyclé carton ou papier fait de fibres vierges provenant de forêts certifiées : FSC, SFI, CSA, PEFC plastique recyclé bambou carton multicouche (par ex. : petite boîte de jus ou carton de lait) styromousse (par ex. barquette pour la viande) pâte moulée ex. : carton d'œufs) plastiques dégradables (par ex. : écodégradables) bois emballage avec un nombre de composants non recyclables réduits	Matériaux plus respectueux de l'environnement
Fabrication	emballage qui diminue le volume par compactage ou vibration	Downsizing
	emballage réduit de la longueur des scellages	Poids et/ou volume des composants/éléments du système emballage optimisé
	Réduire ou éliminer les déchets générés par les systèmes de fermeture et d'inviolabilité après usage	Poids (léger, fins)
	emballage qui réduit ou élimine les déchets générés par les systèmes de fermeture et d'inviolabilité après usage	Poids et/ou volume des composants/éléments du système emballage optimisé
	Poids et/ou volume des composants/éléments du système emballage optimisé	Forme (ronde, courbé, fin)
	Forme (ronde, courbé, fin)	Étiquetage écologique (Logo-FSC, recyclable)
	Le rapport volumique contenu/contenant	Déclaration environnementale

Cycle de vie	Perspective industrielle	Perspective du consommateur
	<p>Le rapport volumique de palettisation optimisé</p> <p>L'emballage porte une mention/label informant qu'il s'agit d'un emballage écologique ou éco-responsable</p> <p>L'emballage a une faible empreinte carbone</p> <p>Information visible et lisible sur l'emballage</p> <p>Clarté d'information nutritionnelle</p> <p>Mode d'emploi clair de la fabrication</p> <p>emballage porte un mode d'emploi clair de l'usage au consommateur</p>	<p>Pays d'origine (produit local)</p> <p>Couleur (vert, bleu, transparent)</p> <p>Clarté d'information nutritionnelle</p> <p>Clarté d'information sur la fabrication</p> <p>Photo (ex. : arbre, feuille)</p> <p>Qualité</p>
Distribution	<p>Les conditionnements des composants de produit des matériaux des emballages et des emballages livrés vides limités</p> <p>Refermeture de l'emballage efficient et optimisé pour améliorer la conservation du produit.</p>	<p>Prix élevé</p> <p>Marque (national, local)</p>
Utilisation	<p>L'emballage qui permet d'augmenter la durée d'utilisation du produit</p> <p>L'emballage qui est fabriqué par un processus de conception qui prend en considération de l'adéquation entre L'emballage défini et le mode de consommation.</p>	<p>Convivialité (clairs instruments de l'emploi d'utilisation)</p>
Fin de vie	<p>Convivialité pour utilisateurs</p> <p>L'emballage primaire en acceptant des recharges de façon à réutiliser</p> <p>Composable</p> <p>Recyclable</p> <p>L'emballage qui réduit ou élimine les déchets générés par les systèmes de fermeture et d'inviolabilité après usage</p>	<p>Contenant réutilisable</p> <p>Emballages réutilisables</p> <p>Recyclable</p>

(Référence : version française du Tableau 1 de l'article 2)

1.2.2 Principaux travaux académiques concentrés sur l’emballage éco-conçu

Travaux consacrés sur l’emballage et les comportements du consommateur : Dans les recherches précédentes en marketing, les impacts des emballages sont abordés selon deux perspectives, holistique et analytique. La première s’intéresse à étudier l’ensemble des caractéristiques physiques du couple ‘produit emballé’. Autrement dit, l’emballage est défini comme une composante d’un produit pour répondre aux attentes des consommateurs (Dano, 1998; Orth et Malkewitz, 2008). En revanche, pour la seconde perspective, l’emballage est étudié comme une composante indépendante du produit et traité comme une combinaison de différents types d’attributs principaux : les attributs graphiques (couleur, photographie, image, logo) et les attributs structurels (les matériaux, la forme, le poids) (Hine, 1995). Magnier et Crié (2015) ont enrichi cette dernière perspective en ajoutant le concept de « durabilité » et définissent un emballage écoresponsable par les attributs visuels durables (en anglais, « sustainable visual attributes », par ex. : matériaux recyclables, biodégradables, caractéristiques refermables) et les attributs verbaux durables (en anglais, « sustainable verbal attributes », par ex. : messages environnementaux, ecolabels).

Les travaux consacrés aux effets de l’emballage sur le consommateur sont en croissance. La plupart des recherches se sont interrogées sur les influences des attributs visuels de l’emballage comme : la couleur (Pantin-Sohier, 2009; Pantin-Sohier et Brée, 2004), la taille (Wansink, 1996; Wansink et Van Ittersum, 2003) et la forme de l’emballage (M. Berkowitz, 1987; Pantin-Sohier, 2009; Raghurir et Greenleaf, 2006; Yang et Raghurir, 2006). Un autre ensemble de travaux s’est intéressé aux impacts de la combinaison de plusieurs attributs. Pantin-Sohier (2009) a étudié les mécanismes selon la combinaison de la couleur et la forme influençant la perception de la personnalité de marque auprès des consommateurs. Parallèlement, la combinaison de la taille et la forme est ressortie comme une influence importante sur la perception du

volume et sur la quantité de consommation (Raghubir et Greenleaf, 2006; Yang et Raghubir, 2006).

Travaux consacrés à l'éco-conception de l'emballage : L'emballage éco-conçu constitue traditionnellement le champ de recherche en industrie qui s'appuie sur la technique LCA. Cette dernière consiste à l'évaluation des impacts socio-environnementaux potentiels de l'ensemble des activités liées à un produit et/ou service, depuis l'extraction des matières premières jusqu'à la fin de vie (Costedoat, 2012). La technique LCA est donc considérée comme un outil pertinent dans le processus d'écoconception de l'emballage.

Concernant les travaux consacrés aux effets de l'emballage éco-conçu sur les comportements du consommateur se limitant aux aspects positifs. Ces travaux tendent à comprendre comment les consommateurs valorisent un produit à travers les caractéristiques écologiques de son emballage dans la décision d'achat. Par exemple, les études de Magnier *et al.*, (2015, 2016) montrent que les caractéristiques écologiques de l'emballage (matériaux recyclables, informations écologiques) ont des effets positifs sur la qualité perçue et la durabilité du produit (Magnier *et al.*, 2016), l'image de marque et l'intention d'achat (Magnier et Schoormans, 2015). Malgré l'attitude positive envers l'emballage éco-conçu, cela ne génère pas nécessairement des achats effectifs de produits éco-emballés. Le taux d'achat est, en effet, relativement faible (Brach *et al.*, 2018; Gleim *et al.*, 2013; Gupta et Ogden, 2009; Papaoikonomou *et al.*, 2011). Ce décalage entre l'attitude et le comportement responsable effectif (en anglais, « attitude-behavior gap ») fait appel à un changement de l'accent de la recherche de l'aspect positif (bénéfices perçus) en explorant l'aspect négatif (risques perçus).

1.3 Emballage éco-conçu et la réduction du gaspillage alimentaire

1.3.1 Conceptualisation du gaspillage alimentaire

Étant donné le nombre important d'études académiques (ex. : Stefan *et al.*, 2013; Aschemann-Witzel *et al.*, 2016, 2018) et professionnelles (ex. : FAO 2011, 2016, 2019 ; WRAP 2015, 2019) qui ont été consacrées au gaspillage alimentaire, il semble qu'il manque un consensus sur la définition de ce concept entre les experts (ex. : chercheurs, professionnels) et les différentes parties prenantes (ex. : consommateurs, détaillants) (voir Tableau 1.4).

Tableau 1.4 Définition du gaspillage alimentaire

Définition	Référence
L'ensemble des aliments perdus ou gaspillés dans la partie des chaînes alimentaires produisant des produits comestibles destinés à la consommation humaine. Les aliments initialement destinés à la consommation humaine, mais qui sont accidentellement exclus de la chaîne alimentaire humaine sont considérés comme des pertes ou gaspillages alimentaires, y compris quand ils font par la suite l'objet d'une réutilisation non alimentaire (aliments pour animaux, bioénergie, etc.)	FAO (2011, p2)
Tous les aliments cultivés, récoltés, transformés, fabriqués ou préparés pour la consommation humaine, mais qui ne sont jamais consommés. Il se produit à toutes les étapes de la chaîne d'approvisionnement alimentaire, la ferme à l'assiette.	Agriculture et Agroalimentaire Canada (2021)
Toute nourriture destinée à la consommation humaine qui est perdue ou jetée tout au long de la chaîne alimentaire, que ce soit au champ, dans le transport, lors de leur transformation, à l'épicerie, dans les restaurants et hôtels ou encore à la maison. Le gaspillage alimentaire touche toutes les catégories d'aliments.	Recyc-Québec, (2021)

Définition	Référence
Toute nourriture destinée à la consommation humaine qui, à une étape de la chaîne alimentaire, est perdue, jetée, dégradée.	Ministère de l'Agriculture de France (2013, p. 1)
[...] toute partie d'aliment consommable ayant été chassé, cultivé, pêché, élevé, produit ou cueilli, de façon intentionnelle ou non, n'aboutit pas à la consommation humaine directe.	Brisebois <i>et al.</i> (2020, p. 1)
Toute nourriture destinée à la consommation humaine qui à un endroit de la chaîne alimentaire est perdue, jetée, dégradée, constitue le gaspillage alimentaire.	La Loi du 11 février 2020 relative à la lutte contre le gaspillage confirme la définition du gaspillage alimentaire initié par Le Pacte national en 2013 ADEME (2016, 2020)
L'action de trier et mettre au rebut délibérément ou consciemment une ressource alimentaire alors qu'elle est parfaitement comestible.	Lundqvist <i>et al.</i> , (2008) cité dans Le Borgne, (2015, p. 11)

Le concept, le gaspillage alimentaire, est pour l'instant davantage développé dans la littérature professionnelle et les « working papers » d'organisations internationales, notamment l'Organisation des Nations Unies pour l'alimentation et l'agriculture (en anglais, « Food and Agriculture Organization of the United Nations » : FAO), Food Use for Social Innovation by Optimizing Waste Prevention Strategies (FUSIONS)⁴,

⁴ Food Use for Social Innovation by Optimising Waste Prevention Strategies (FUSIONS) est un projet pour améliorer l'utilisation des ressources en Europe à travers la réduction du gaspillage alimentaire. Site Internet: <https://www.eu-fusions.org/index.php/about-fusions>

l'Agence de l'Environnement et de la Maîtrise de l'Énergie (ADEME)⁵ en France, Waste & Resources Action Programme (WRAP)⁶ au Royaume-Uni.

La majorité des recherches importantes portant sur le gaspillage alimentaire (ex. : Koivupuro *et al.* 2012; Stefan *et al.*, 2013; Aschemann-Witzel *et al.*, 2016, 2018) ont retenu la définition de FAO (2011, p. 2) selon laquelle la perte alimentaire est définie comme : *« l'ensemble des aliments perdus ou gaspillés dans la partie des chaînes alimentaires produisant des produits comestibles destinés à la consommation humaine. Les aliments initialement destinés à la consommation humaine, mais qui sont accidentellement exclus de la chaîne alimentaire humaine sont considérés comme des pertes ou comme gaspillage alimentaire, y compris quand ils font par la suite l'objet d'une réutilisation non alimentaire (aliments pour animaux, bioénergie, etc.) »*.

Il semble nécessaire de clarifier deux concepts importants liés à cette définition du gaspillage alimentaire plus partagée : la chaîne alimentaire (en anglais, « Food supply chain » : FSC) et la perte alimentaire. La chaîne alimentaire réfère à *« l'ensemble des activités de production, de transport, de distribution et de consommation de la nourriture »* (Traduction libre, FUSIONS, 2014, p. 20). Comme mentionné dans le rapport de la FAO, le gaspillage alimentaire et la perte alimentaire sont deux concepts similaires. Ces termes sont utilisés alternativement dans la littérature. La différence

⁵ L'Agence de l'Environnement et de la Maîtrise de l'Énergie (ADEME) est un établissement public à caractère industriel et commercial (EPIC) français créé en 1991. Ces cinq domaines d'intervention sont : Déchets, sols pollués et friches, énergie et climat, air et bruit, actions transversales (production et consommation durable, villes et territoires durables).

Site Internet : <https://www.ademe.fr/lademe/presentation-lademe>

⁶ Waste & Resources Action Programme (WRAP) est une organisation non lucrative créée au Royaume-Uni depuis 2000. WRAP vise à promouvoir l'utilisation durable des ressources à travers le design du produit, la minimisation du gaspillage, la réutilisation, le recyclage.

Site Internet : <https://wrap.org.uk/about-us>

entre les deux concepts réside dans les étapes de la chaîne alimentaire où la perte aura lieu. Concrètement, la perte alimentaire apparaît en amont de la chaîne alimentaire (la production, la transformation agricole première). À l'inverse, si la perte a lieu en aval de la chaîne alimentaire (la distribution et la consommation), celle-ci est définie comme le gaspillage alimentaire.

Cependant, les études plus récentes ont mis en évidence la distinction entre « perte » et « gaspillage » alimentaire. À partir du point de vue du consommateur, « *le terme “gaspillage” est connoté plus négativement que le terme “perte”, et sous-entend en particulier une certaine responsabilité/faute de celui qui a gaspillé (tandis que celui qui a subi une perte est une victime)* » (Le Borgne, 2015, p. 13). Le terme « gaspillage » pourrait renforcer un sentiment de culpabilité et/ou une impression d'être accusé auprès des consommateurs à cause de leurs comportements (Le Borgne, 2015). De plus, la perte alimentaire est considérée comme un coût financier pour les consommateurs (voir Tableau 1.5).

Tableau 1.5 Distinction entre gaspillage et perte alimentaire

Perspective	Référence	Distinction
Chaîne alimentaire	L'ensemble des aliments perdus ou gaspillés dans la partie des chaînes alimentaires produisant des produits comestibles destinés à la consommation humaine. Les aliments initialement destinés à la consommation humaine, mais qui sont accidentellement exclus de la chaîne alimentaire humaine sont considérés comme des pertes ou comme gaspillage alimentaire, y compris quand ils font par la suite l'objet d'une réutilisation non alimentaire (aliments pour animaux, bioénergie, etc.) (FAO, 2011, p. 2).	L'emploi du mot « perte » pour certains acteurs (ex. : agriculture, industrie agroalimentaire) et du mot « gaspillage » pour d'autres (ex. : consommateurs)
Consommateur	Le terme « gaspillage » est connoté plus négativement que le terme « perte », et sous-entend en particulier une certaine responsabilité/faute de celui qui a gaspillé (tandis que celui qui a subi une perte est une victime). Ceci peut contribuer à renforcer chez une partie des consommateurs un sentiment de culpabilité et/ou l'impression d'une accusation exagérée (Le Borgne, 2015, p. 13).	La dimension éthique <ul style="list-style-type: none"> • La culpabilité • Le raisonnement contre-factuel que cela donne à imaginer
	<ul style="list-style-type: none"> • Les pertes alimentaires représentent les pertes financières relatives au retrait d'aliments ou de parties d'aliments du marché, que ce soit lors de la production, de la transformation, de la distribution en gros, de la distribution au détail, etc. Ces aliments, s'ils sont récupérés, revalorisés (transformés, par ex.), puis consommés ne représentent pas du gaspillage alimentaire. Cependant, ces « pertes » peuvent bel et bien devenir du gaspillage alimentaire si elles n'aboutissent pas à la consommation humaine directe (Brisebois <i>et al.</i> (2020, p. 2) ; • L'ensemble des articles invendus (en raison, par exemple, de défauts d'apparence, des emballages endommagés, des dépassements de la date d'expiration, etc.) et qui peuvent être transférés à des banques alimentaires ou des programmes de redistribution. On peut dire de ces surplus nécessitant d'être gérés avant d'être perdus qu'ils sont de la 	La dimension économique (se traduit par une perte monétaire)

Perspective	Référence	Distinction
Détaillant	<p>nourriture « potentiellement gaspillée » (Audet et Brisebois, 2018, p. 40; Lebersorger, 2014).</p> <hr/> <ul style="list-style-type: none"> • L'expression <i>food loss</i> fait aussi référence aux aliments qui se gâtent et subissent une perte importante de qualité avant d'atteindre le consommateur (Lipinski <i>et al.</i>, 2013). [...] cette vision économique du gaspillage est fortement ancrée dans des dispositifs managériaux qui traduisent concrètement les pertes alimentaires en pertes monétaires (Audet et Brisebois, 2018, p. 40; Lebersorger, 2014); • Les détaillants privilégient le terme « pertes » au terme « gaspillage » (ADEME, 2016; Audet et Brisebois, 2018). 	<p>Les dimensions économiques et managériales :</p> <ul style="list-style-type: none"> • La perte alimentaire associée à la notion de la « perte de qualité » des aliments avant d'atteindre le consommateur ; • La perte alimentaire se traduit par les pertes monétaires, et se lie aux dispositifs managériaux (Audet et Brisebois, 2018).

À partir du point de vue des détaillants en alimentation, la « perte alimentaire » est un terme plus parlant par rapport au « gaspillage ». La notion de la perte alimentaire est associée à la notion de la « perte de qualité » des aliments avant d'atteindre le consommateur. La perte alimentaire se traduit par les pertes monétaires du point de vue économique et est liée étroitement aux dispositifs managériaux (ADEME, 2016; Audet et Brisebois, 2018).

Dans le cadre de la thèse, nous nous focalisons sur les réactions des consommateurs envers le gaspillage alimentaire, plus précisément leurs « intentions de la réduction du gaspillage alimentaire » qui pourraient être définies comme : « *la probabilité subjective d'un consommateur engage de limiter l'action de trier et mettre au rebut consciemment ou non tous les produits alimentaires qui n'ont pas une issue commerciale, mais qui sont encore consommables pour l'homme* » (adapté Lundqvist *et al.*, 2008 cité dans Le Borgne 2015, p.11, et ADEME 2016 cité dans Audet et Brisebois 2018, p.40).

Selon les études consacrées au gaspillage alimentaire à l'échelle mondiale (FAO, 2011, 2019), chaque année, près d'un tiers de la nourriture consommable est perdue ou gaspillée, soit l'équivalent de 1,3 billion de tonnes d'émission Carbone. Le gaspillage alimentaire génère près d'un trillion de dollars de pertes économiques. Au Canada, une étude de Recyc-Québec (2021) montre que 63 % de la nourriture a été jetée, soit l'équivalent de 35,5 millions de tonnes (dont 11,2 du gaspillage alimentaire sont évitables). Plus de 50 milliards de dollars canadiens de pertes liées au gaspillage sont évitables. L'empreinte de Carbone est de 22 millions de tonnes. Parallèlement, dans les autres pays industriels (ex. : Royaume-Uni, France), le gaspillage alimentaire représente un des enjeux les plus importants dans la société. Le Royaume-Uni et la France sont deux pays qui portent attention à la lutte contre le gaspillage alimentaire. Une étude récente réalisée par WRAP (2021) dévoile que, chaque année, près de 43 millions de tonnes de la nourriture sont gaspillées, soit l'équivalent de 25 d'impact de Carbone et de 19 billions de GBP en pertes économiques. En France, le gaspillage

alimentaire de 10 millions (soit 150 kg par habitant) est l'équivalent de 15,3 millions de tonnes de CO₂ représentant 3 % de l'ensemble de l'impact des émissions de l'activité nationale (ADEME, 2016, 2020) (voir Tableau 1.6).

Tableau 1.6 Incidences du gaspillage alimentaire

Enjeux	Échelle mondiale	Canada	Union européenne	Royaume-Uni	France
Quantité de gaspillage alimentaire/an	<ul style="list-style-type: none"> • 1/3 • 1,3 billion de tonnes 	<ul style="list-style-type: none"> • 63 % de la nourriture jetée dans les ménages aurait pu être consommée • 35,5 millions de tonnes (11,2 évitables) 	100 millions de tonnes	43 millions de tonnes	10 millions de tonnes, équivalent de 150 kg/habitant
Perte économique/an	1 trillion USD	Plus de 50 milliards de dollars CAN de pertes alimentaires évitables	595 euros/ménage	19 billions de GBP	<ul style="list-style-type: none"> • 16 milliards d'euros • 159 euros/personne
Impact carbone (CO ₂ /an)	<ul style="list-style-type: none"> • 1,3 billion de tonnes de CO₂ • 8 % de l'ensemble de l'impact des émissions de l'activité nationale 	22 millions de tonnes	227 millions de tonnes	25 millions tonnes	<ul style="list-style-type: none"> • 15,3 millions de tonnes • 3 % de l'ensemble l'impact des émissions de l'activité nationale.
Source	FAO (2019), Statistique du gouvernement canada (2021), Recycle-Québec (2020)	Recycle-Québec (2020)	FUSIONS (2021)	WRAP (2021)	ADEME (2016, 2021)

1.3.2 Principaux travaux académiques concentrés sur les effets de l’emballage éco-conçu sur le gaspillage alimentaire

Trois grands courants de recherche consacrés aux effets de l’emballage sur le gaspillage alimentaire se distinguent ; ceux-ci sont fondés sur les perspectives psychologique cognitive, industrielle et sociologique.

Le premier courant de recherche regroupe les travaux s’appuyant sur la perspective de la psychologie cognitive, qui examine les déterminants psychologiques des comportements liés au gaspillage alimentaire (motivations et/ou freins, y compris ceux qui sont liés à l’emballage). La plupart des études se basent sur la théorie de l’action planifiée (en anglais, « theory of planned behaviour » : TPB) (Ajzen, 1991) qui vise à examiner les motivations (ex. : préoccupation envers le gaspillage ou les déchets, faire la bonne chose, capacité à gérer la nourriture) ou les freins (ex. : identité d’un bon manager, limitation des inconvénients, absence de la priorité) à l’attitude liée au gaspillage alimentaire (Graham-Rowe *et al.*, 2014). Les autres études tendent à identifier les antécédents de l’intention de limiter le gaspillage alimentaire dans le ménage (ex. : norme personnelle, connaissance sur le gaspillage alimentaire, planification et routine de consommation comme l’achat du produit dans des formats de petite taille) dans l’objectif d’expliquer ou de prévoir les comportements associés au gaspillage alimentaire (Visschers *et al.*, 2016).

Le second courant de recherche renvoie à l’ensemble des études en ingénierie et en ingénierie visant à réduire le gaspillage alimentaire à travers l’innovation de l’emballage, en particulier le recours à la LCA. À partir ce point de vue, l’éco-conception d’emballage est considérée comme une solution stratégique pour réduire le gaspillage alimentaire. La littérature identifie que le gaspillage alimentaire pourrait être réduit grâce à l’amélioration des différents attributs d’emballage (notamment grande taille (« oversize »), refermabilité, facilité à vider le contenu) correspondant aux trois

fonctions primordiales influant sur la décision des consommateurs, soit : (1) la protection de qualité (nutrition, frais, sécurité) du produit; (2) la convivialité dans la consommation comme : la facilité à ouvrir, vider et refermer; et (3) la communication, comme le fait de fournir les informations claires et compréhensibles sur la date d'utilisation, l'emploi de conservation du produit.

Le dernier courant adopte une perspective sociologique en s'interrogeant sur les pratiques et le rôle de l'emballage dans la consommation quotidienne. Les études de ce courant sont consacrées à la description du processus par lequel la « nourriture » se transforme en « déchet » (Evans, 2012). La littérature met notamment en évidence le fait que l'emballage (notamment, taille, refermabilité) a une influence sur le déchet généré lors des différentes étapes des pratiques routinières ; par exemple, la taille peut aider les consommateurs à mieux planifier l'achat pour éviter la surachat (Stancu *et al.*, 2016).

Étant donné que ces trois courants de recherche indiquent que l'optimisation de l'emballage (notamment l'écoconception de l'emballage) peut réduire les comportements du gaspillage alimentaire, l'impact de l'emballage éco-conçu sur le gaspillage alimentaire du consommateur est limité, car (1) premièrement, les études basées sur la TPB présupposent que l'intention du comportement va généralement se transférer au comportement effectif. Cependant, ces études n'ont pas réussi à expliquer l'écart entre l'attitude/intention positive envers la réduction du gaspillage alimentaire et les comportements effectifs; (2) deuxièmement, même si les études en ingénierie focalisées sur le sujet sont relativement nombreuses, les facteurs individuels du consommateur (par ex. besoin, motivation, attitude) ne sont généralement pas intégrés dans le design de l'emballage (Wikström *et al.*, 2019); (3) enfin, aucun de ces courants n'aborde une compréhension profonde et complète par rapport au phénomène interdisciplinaire (croisement de la psychologie, de l'industrie et de la sociologie)–les

effets de l'emballage éco-conçu sur les comportements de gaspillage alimentaire des consommateurs.

De ce fait, les articles 3 et 4 de la thèse ont d'abord pour objectif d'établir un modèle conceptuel holistique mettant en évidence les interactions entre les déterminants proximaux (variables psychologiques comme la préoccupation sanitaire, les perceptions), intermédiaires (attributs de l'emballage éco-conçu), distal (ex. : pratiques de consommation, planification) (article 3); et ensuite, de tester le modèle (article 4).

Tableau 1.7 Positionnement théorique des articles 3 et 4

Niveau d'analyse	Courant de recherche (méthodologie)	Objectif	Contribution	Limitation
Proximal	Cognitive psychological: Theory of planned behavior (TPB) (Enquête/expérimentation)	Explorer les motivations et freins au gaspillage alimentaire et les déterminants associés à l'emballage	Comprendre la relation entre l'emballage et les comportements du gaspillage alimentaire du consommateur : explorer les attributs importants de l'emballage (ex. : surtaille, date labeling) et les fonctions influencées par les motivations à limiter le gaspillage alimentaire (ex. : préservation, conservation, communication de la guidance de stockage).	Absence d'étude consacrée à l'emballage éco-conçu
Intermédiaire	Industrie et ingénierie (LCA)	Redesign de l'emballage pour limiter le gaspillage alimentaire	Identifier les améliorations des attributs d'emballage à travers la LCA. L'emballage éco-conçu comme une solution pour limiter le gaspillage alimentaire.	Négliger les perceptions et les besoins du consommateur dans le processus conception du design de l'emballage.
Distal	Sociologie (Ethnographie)	Décrire comme "la nourriture" se transforme en "déchet/ gaspillage "	Identifier les pratiques et les routines permettant de réduire le gaspillage alimentaire dans la vie quotidienne.	Absence d'étude consacrée à l'emballage éco-conçu. Négliger les déterminants psychologiques du gaspillage alimentaire

Synthèse du chapitre I — Revue de littérature

La première section de ce chapitre a permis de comprendre le concept de la CR en mettant en évidence sa définition et ses dimensions. Sur le plan théorique, la consommation responsable peut être définie comme « *l'achat de produits et services qui sont perçus comme ayant un impact positif ou moins d'impacts négatifs sur l'environnement physique et/ou l'utilisation du pouvoir d'achat pour exprimer ses préoccupations sociales* » (François-Lecompte et Roberts, 2006, p. 52). Pour Schlaile *et al.* (2018), la notion de la CR couvre trois dimensions de la responsabilité du consommateur, soit la responsabilité environnementale, sociale, et du bien-être. Sur le plan pratique, à la suite de dix ans d'études de l'OCR portant sur l'évolution de la pratique de consommation responsable au Québec, la consommation responsable se traduit principalement par dix pratiques en contexte québécois, dont plusieurs sont liées étroitement aux fonctions de l'emballage, notamment le recyclage et la réduction du gaspillage alimentaire (OCR, 2019). D'ailleurs, l'écoconception de l'emballage est vue comme l'outil permettant de mettre en place la pratique de consommation puisqu'elle a permis de répondre à la pression environnementale en établissant un juste équilibre entre « la durabilité » et la « fonctionnalité » de l'emballage (Polito, 2000).

La deuxième section de ce chapitre a permis de comprendre le concept de l'emballage éco-conçu à travers les perspectives en ingénierie et du consommateur. La littérature sur la conceptualisation de l'emballage éco-conçu a permis de souligner l'écart existant entre la définition industrielle (selon LCA) et les perceptions du consommateur à l'égard de ce type d'emballage. Les travaux portant sur les impacts de l'emballage éco-conçu sur les consommateurs ont permis de mieux cerner les raisons de cet écart. Celui-ci réside notamment dans le fait que les facteurs internes individuels du consommateur (ex. : perception, besoin, connaissance) ne sont généralement pas intégrés au design de l'emballage (Wikström *et al.*, 2019). Les attributs écoresponsables de l'emballage

perçus par les consommateurs sont davantage limités que ceux définis par l'analyse de cycle de vie (Boesen *et al.*, 2019).

La littérature a montré que l'emballage éco-conçu est surtout appliqué dans le secteur alimentaire, un secteur pionnier qui favorise l'innovation de l'emballage (Rokka et Uusitalo, 2008). De plus, les travaux portant sur les effets de l'emballage éco-conçu sur les pratiques de la consommation responsable ont montré que ses effets, c.-à-d. les effets liés aux services proposés par l'emballage pour le produit et/ou les utilisateurs dans la chaîne logistique, y compris les consommateurs, notamment la réduction du gaspillage du produit et la réduction du risque lié à la santé du consommateur, ont des impacts plus importants par rapport aux effets directs (les effets ayant eu lieu pendant la production des matériaux de l'emballage, le transport et le recyclage), malgré le peu de recherches consacrées aux effets indirects (Lindh, *et al.*, 2016).

De ce fait, aborder les études s'interrogeant sur les effets indirects de l'emballage éco-conçu a permis de répondre à cet appel. En effet, à travers une illustration du cas pratique de la consommation responsable en croissance depuis ces dernières années — la réduction du gaspillage alimentaire, les articles 3 et 4 de la thèse permettent de mieux comprendre les mécanismes des impacts des emballages éco-conçus sur la réduction du gaspillage alimentaire à travers une perspective du consommateur.

CHAPITRE II

MÉTHODOLOGIE

L'objectif principal de cette thèse par articles est de comprendre les impacts de la perception des consommateurs envers l'emballage éco-conçu (bénéfices et risques) sur les comportements responsables, en particulier les comportements liés au gaspillage alimentaire afin d'améliorer le bien-être individuel (conservation de la nourriture et adoption de comportements sanitaires) et collectif (réduction du gaspillage alimentaire).

La présente thèse par articles envisage d'apporter une contribution sur les plans académique et managérial. Elle s'appuie sur une approche mixte en ayant recours aux méthodes de recherche qualitative et quantitative afin de mieux comprendre les perceptions des consommateurs envers l'emballage éco-conçu et les liens avec les comportements de réduction du gaspillage alimentaire.

Ainsi, une méthodologie mixte (Creswell, 2007) combinant la revue de littérature systématique (Arksey et O'Malley, 2005) (article 1), l'approche de chaînage cognitif (« means-end chain » : MEC) (Gutman, 1982; Reynolds et Gutman, 1988; Valette-Florence, 1994) (article 2), l'approche par théorisation inductive top-down (Shepherd et Sutcliffe, 2011) (article 3) ainsi que l'expérimentation (Keppel et Wickens, 2004) (article 4) est adoptée dans cette thèse.

Le premier article procède à une analyse épistémologique sous la forme d'une revue de littérature systématique (Arksey et O'Malley, 2005) des articles abordant les concepts clés de la présente recherche (écoconception, emballage du produit et emballage éco-conçu) par le biais de trois perspectives de recherche (positivisme,

interprétativisme et TCR). L'analyse épistémologique permet de mettre en évidence l'état des lieux sur le savoir précédent ainsi que le processus, les méthodologies de construction par rapport au concept central de la thèse — l'emballage éco-conçu — ainsi que la façon la plus pertinente de maximiser les impacts sociétaux de la recherche.

Le deuxième article s'appuie sur l'approche de MEC (Gutman, 1982; Reynolds et Gutman, 1988; Valette-Florence, 1994) afin d'explorer les perceptions des consommateurs (en particulier, les risque perçus) envers l'emballage éco-conçu et ses impacts sur le processus de décision d'achat.

Le troisième article adopte une approche théorique de type inductif top-down (Shepherd et Sutcliffe, 2011) afin d'établir un cadre théorique par rapport aux effets des perceptions des consommateurs envers l'emballage éco-conçu sur leurs décisions de limiter le gaspillage alimentaire.

Le dernier article s'appuie sur une étude expérimentale en ligne à travers laquelle est testée la relation de causalité entre les perceptions des consommateurs sur l'emballage éco-conçu et leurs décisions liées au gaspillage alimentaire. L'étude expérimentale permet de vérifier des hypothèses de causalité, ce qui se traduit par une comparaison de différents traitements (dans le cadre de cette étude : l'emballage éco-conçu et l'emballage conventionnel) au moyen de leurs effets sur l'intention d'éviter le gaspillage alimentaire.

Le chapitre méthodologique comprend six sections. La première section présente brièvement la méthodologie adoptée dans la thèse. La deuxième section aborde le positionnement épistémologique de la thèse — TCR, en discutant des hypothèses ontologique, épistémologique, axiologique, méthodologique et l'évaluation. La troisième section présente l'approche de la revue de littérature systématique (Arksey et O'Malley, 2005). La quatrième partie aborde l'approche de MEC (Gutman, 1982; Reynolds et Gutman, 1988; Valette-Florence, 1994). La quatrième section explique

l'approche de théorisation inductive top-down (Shepherd et Sutcliffe, 2011). La cinquième section expose les fondements de l'étude d'expérimentation. Enfin, la dernière section discute des qualités de l'étude.

2.1 Positionnement épistémologique des articles de la thèse : « Transformative Consumer Research »

Tout travail de recherche repose sur une certaine vision du monde, utilise une méthodologie et propose des résultats dans l'objectif de prédire, prescrire, comprendre ou expliquer (Thiéart, 2014). L'épistémologie s'interroge sur ce qu'est la science en discutant de la nature, de la méthode et de la valeur de la connaissance. La réflexion épistémologique est une étape primordiale pour effectuer une recherche de qualité puisqu'elle permet de comprendre l'ensemble des présupposés sur lesquels la recherche s'appuie et d'expliquer les implications qui en découlent (Ozcaglar-Toulouse, 2005). Un paradigme de recherche se réfère à un système de croyances fondamentales ou une vision du monde basée sur des suppositions ontologiques, épistémologiques et méthodologiques (Guba et Lincoln, 1994).

La présente thèse par articles se base sur la perspective TCR afin d'amener un changement positif sur la mentalité et les comportements des consommateurs (Mick *et al.*, 2012b).

2.1.1 Panorama de 'Transformative consumer research'

Dans un contexte marqué par la complexité des problèmes sociaux, environnementaux et économiques, un nouveau courant de recherche centré sur la quête du bien-être du consommateur et la société qui s'intitule « Transformative Consumer Research » (TCR) se développe. En se basant sur la perspective pragmatiste, la TCR vise à amener la recherche pratique (en anglais, « *do practical research* ») qui peut être utilisée par les consommateurs, les praticiens et le pouvoir politique pour améliorer le bien-être du consommateur (Ozanne *et al.*, 2011).

TCR est une philosophie regroupant des chercheurs qui explore les moyens alternatifs d'effectuer la recherche visant à améliorer les impacts sociétaux. La majorité des études TCR intègrent les parties prenantes pertinentes au processus de recherche (ex. : identification de problématique, collecte et analyse des données, diffusion et mise en application des résultats) (Davis et Ozanne, 2019).

La TCR s'intéresse aux cinq thèmes de recherche prédominants autour des dimensions du bien-être (pauvreté, développement durable, santé, consommation à risque et matérialisme) (Özçağlar-Toulouse et Burroughs, 2014). Ces thèmes sont étudiés en étant combinés aux typologies du consommateur particulier, notamment le consommateur vulnérable comme les enfants et les adolescents, les personnes âgées, les femmes et les immigrants (Mari, 2011).

La publication d'une recherche en TCR ne se limite pas à la discipline marketing. Comme la problématique étudiée en TCR pourrait avoir des impacts sur différents domaines (ex. : politique publique, économie et sociologie), il est possible de publier l'article dans une revue d'une autre discipline. Les principaux supports académiques du TCR sont: *Journal of Consumer Affairs*, *International Journal of Consumer Studies*, *Journal of Consumer Studies*, *Home Economics*, *Journal of Consumer Policy*, *Journal*

of Public Policy et Marketing, Journal of Macromarketing, Journal of Consumer Education et Journal of Research for Consumers.

Depuis 2006, le mouvement TCR alloue des subventions annuelles pour soutenir la recherche en TCR. Par ailleurs, depuis 2007, la conférence dialogique (fondée sur le nouveau modèle d'échange de la relation académique) organisée par ACR tous les deux ans crée une occasion d'échanges d'insights entre les chercheurs qui s'intéressent à la problématique sociale (Gorge *et al.*, 2015). Au cours de cette conférence, les chercheurs de différents domaines travaillent par petits groupes afin de trouver de nouvelles pistes de recherche et améliorer le modèle (Ozanne *et al.*, 2017). La dernière conférence dialogique de TCR a eu lieu en juin 2019 au *College of Business at Florida State University*. Elle se déroule autour de trois tracks principales : (1) le développement des réseautages des chercheurs qui s'intéressent aux problématiques liées au bien-être individuel et collectif et la maximisation de l'impact sociétal de la recherche; (2) le développement du projet de recherche TCR à long terme; et (3) la mesure de l'impact sociétal.

2.1.2 Positionnements ontologiques, axiologiques et méthodologiques du 'Transformative consumer research'

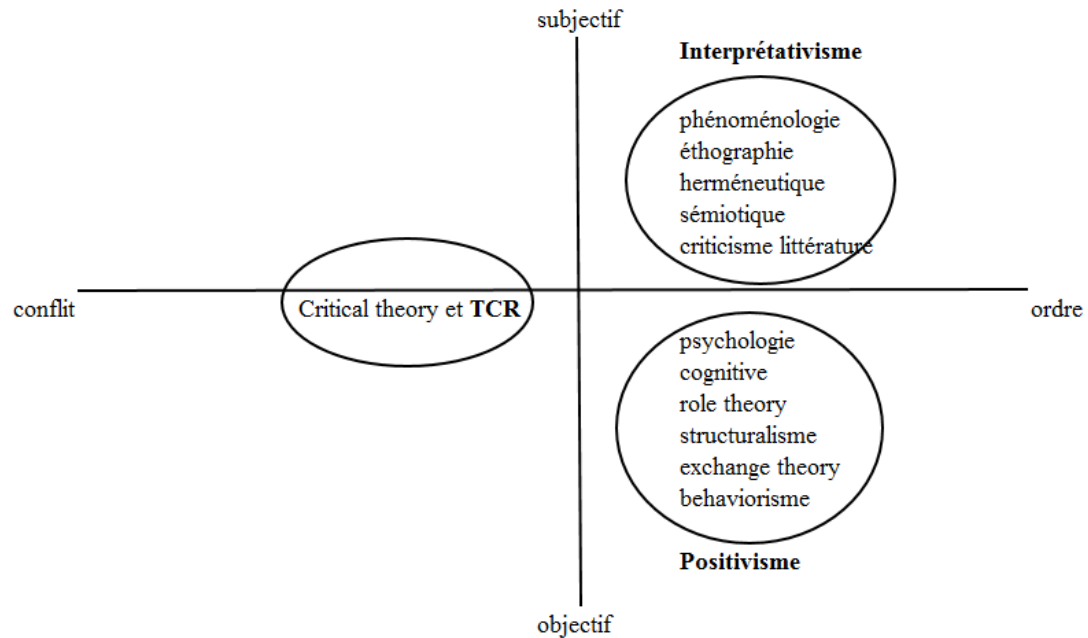
La TCR s'inspire de trois approches traditionnelles : le *Critical Thoery* (CT), le *Participatory Action Research* (PAC) et le *Indigenous Research*.

Positionnement ontologique : L'hypothèse ontologique s'interroge essentiellement sur la nature de la réalité et la nature de l'être humain dans la société (Denzin et Lincoln, 2005). La TCR partage l'hypothèse de l'ontologie relativiste sur la nature de la réalité sociale et de l'être social. (1) La TCR suppose plus précisément que la société est co-créée par les êtres humains, elle est contextuelle, relationnelle et situationnelle (Ozanne et Saatcioglu, 2008; Susman et Evered, 1978). (2) La TCR partage avec la CR l'hypothèse selon laquelle la réalité est historiquement construite. Il met l'accent sur l'interaction constante entre le sujet (sens attribué par les êtres humains) et l'objet (structures sociales). En autres termes, la réalité est vue comme le résultat de l'interaction sociale. Ainsi, (3) la TCR suppose que les consommateurs ont le potentiel d'améliorer la structure sociale contraignante, leur bien-être ainsi que la structure sociale contraignante.

Positionnement axiologique : la différence entre la perspective conventionnelle (Positivisme et Interprétativisme) et la TCR réside dans l'objectif principal de la recherche. En effet, selon la perspective conventionnelle, l'utilisation de connaissances scientifiques est indépendante des connaissances en tant que telles, c'est-à-dire que les connaissances sont considérées comme des informations neutres qui pourraient être appliquées de différentes manières en fonction de l'intérêt du groupe (Sewart, 1978). Par conséquent, les études fondées sur la perspective conventionnelle tendent à préserver le système social existant au lieu de le changer. En revanche, comme le CT, la TCR peut être considéré comme une action politique et morale visant à amener une transformation positive de la société. Ainsi, les résultats de la recherche pourraient être

appliqués aux secteurs académiques, publics et privés (Fuhrman, 1979; Murray et Ozanne, 1991) (voir Figure 2.1).

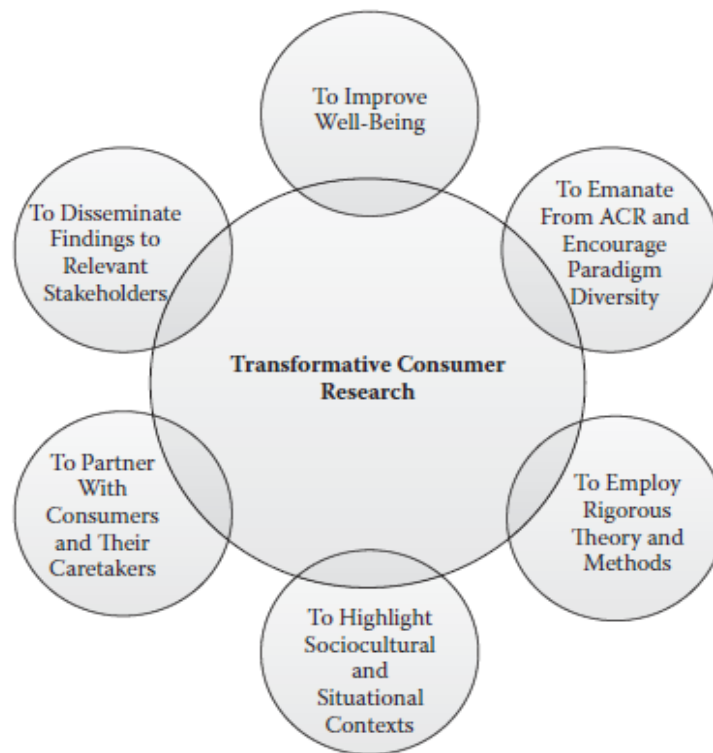
Figure 2.1 **Positionnement TCR**



Méthodologique : Afin de répondre à l'objectif d'améliorer le bien-être des consommateurs et la société, la TCR adopte un positionnement méthodologique mixte.

Évaluation : Étant donné la diversité des approches méthodologiques (qualitative ou quantitative), puisqu'une étude TCR n'est pas nécessairement énoncée en tant que telle, les chercheurs TCR ont pris six engagements principaux afin d'assurer la qualité des études (voir Figure 2.2).

Figure 2.2 Six engagements de TCR



Source : (Mick *et al.*, 2012b, p. 6)

- (1) Développer la conceptualisation du bien-être (*well-being*), c'est-à-dire que la TCR est destiné à étudier profondément sept dimensions ou aspects essentiels du bien-être de McGregor et Goldsmith (1998) : la dimension émotionnelle, sociale, économique, physique, spirituelle, environnementale et politique.
- (2) Encourager la diversité des recherches multidisciplinaires : la TCR ne privilégie aucun paradigme, théorie ou méthode en particulier puisqu'il est toujours nécessaire de prendre en compte leurs conséquences environnementales (« subsequent environment ») telles que : l'objectif, l'auditeur et l'utilité attendus (Mick *et al.*, 2012b). Par ailleurs, la TCR met l'accent sur l'importance de la revue de littérature multidisciplinaire puisque cette dernière permet d'obtenir une vision

globale de la problématique, d'identifier les construits, la théorie la plus pertinente et d'apporter des contributions à divers champs de recherche.

- (3) Mobiliser des méthodes et théories rigoureuses : la TCR propose des démarches méthodologiques afin de construire la théorie opérationnalisable ciblée (*targetable*), orientée vers la solution pour répondre aux attentes et aux préoccupations dans la vraie vie. Pour ce faire, la TCR préconise la recherche active (*activism research*) par les études sur le terrain (*field studies*) et les expérimentations transformatives.
- (4) Mettre l'accent sur les contextes socioculturels et situationnels : la TCR met l'accent sur l'importance du contexte socioculturel des problématiques du bien-être. Les recherches devraient se focaliser sur les problématiques liées à la préoccupation du consommateur et proposer les solutions utiles. Ainsi, il faut prendre en compte les facteurs contextuels (culture, social, familial et environnemental) en faveur de la construction et l'évolution des théories.
- (5) Création de partenariats avec les parties prenantes : la TCR tend à trouver un équilibre entre la théorie et la pratique afin d'aborder des « insights » et de bonnes pratiques pour les parties prenantes. Afin d'assurer la pertinence et la facilité de la mise en place des résultats de recherche, la TCR encourage le design en faveur de l'implantation des résultats comme : les recherches d'activisme, et la stratégie de communication et diffusion efficace. La construction et la mise en œuvre de bonnes pratiques sont aussi vues comme un signe permettant de distinguer une étude basée TCR des autres études.
- (6) Communication des résultats de recherche avec les parties prenantes. : la TCR cherche un « pouvoir de communication » (« *a voice* ») à travers la stratégie de communication multi-audience. Pour ce faire, les recherches devraient d'abord répondre aux attentes de différents auditeurs comme le chercheur, les praticiens, les managers, les pouvoirs publics et notamment les consommateurs. Ensuite, il est nécessaire de faciliter la communication et la compréhension des résultats scientifiques. Autrement dit, les résultats doivent être perçus comme étant utiles et faisables aux yeux du consommateur. Enfin, les résultats pourraient aussi être

rapportés à travers la formation et les médias de masse afin d'éduquer les consommateurs.

2.2 Revue de littérature systématique

La littérature joue un rôle essentiel dans un projet de recherche. Une revue de la littérature propose les fondements de base pour faire avancer les savoirs. Elle est en plus précisément en faveur du développement de la théorie et plaide pour synthétiser les études existantes et découvrir les nouveaux domaines de recherche (Webster et Watson, 2002).

La revue de littérature est considérée comme un outil crucial pour toutes les recherches puisqu'elle permet de cerner les caractéristiques générales des recherches antérieures et de spécifier la question de recherche afin de contribuer aux connaissances dans le futur (Arksey et O'Malley, 2005; Tranfield *et al.*, 2003).

Une revue de littérature de qualité doit répondre aux deux critères suivants : la complexité et la focalisation sur les concepts. La complexité réside dans le fait qu'une revue de littérature de qualité doit arriver à « saturation ». Or, une revue intègre rarement toutes les références car il y a toujours de nouvelles publications. Par conséquent, « la complexité » n'est pas considérée comme un problème (Hart, 2018; Webster et Watson, 2002). Néanmoins, une bonne revue de littérature doit couvrir la « niche » dans la littérature. Les chercheurs choisissent souvent un angle d'analyse (le premier article de cette thèse fondée sur l'angle épistémologique) pour rationaliser l'analyse (recours au logiciel d'analyse des données qualitatives Atlas/Ti). De plus, une bonne revue de littérature est effectuée autour du concept central et des catégories des concepts. Pour y répondre, il est nécessaire d'illustrer le processus de développement et de classification des concepts (Tranfield *et al.*, 2003; Webster et Watson, 2002).

De manière générale, on peut identifier plusieurs types de revue de littérature en fonction de l'approche appliquée et de l'objectif.

En ce qui concerne l'approche appliquée, la revue de littérature peut être de type *traditionnel* (ou *narrative*)⁷ et *systématique* (Jesson, 2011) : la revue de littérature narrative s'appuie sur une approche critique afin d'amener une analyse critique par rapport à la théorie, aux hypothèses de recherche, à la méthodologie et au résultat des études. Cependant, cette approche est souvent critiquée pour plusieurs raisons : (1) son absence de rigueur académique est décriée, car il n'existe pas une méthodologie formelle; (2) les critères d'inclusion et d'exclusion des références sont flous. Autrement dit, la description visant à expliquer « comment » et « pourquoi » obtenir l'échantillon des références n'est pas suffisamment claire ou exhaustive (Webster et Watson, 2002); (3) la revue de littérature se base généralement sur un petit échantillon au lieu de couvrir l'ensemble de littérature sur le sujet; (4) la revue de littérature ne peut pas être reproduite en raison de l'absence de protocole méthodologique ; (5) il est impossible d'examiner la qualité des références sélectionnées, car les critères d'évaluation des références sont absents. Ainsi, les mauvaises interprétations pourraient biaiser les résultats ; enfin (6) il est difficile d'identifier les conflits ou les contradictions dans la littérature (Jesson, 2011). Par conséquent, de plus en plus de chercheurs encouragent le fait d'effectuer la revue de littérature systématique puisqu'elle est considérée comme une méthode de recherche plus rigoureuse, étant donné qu'elle explique notamment l'approche méthodologique de la sélection et l'analyse des références, par rapport à l'approche narrative (Petticrew et Roberts, 2006; Torgerson, 2003), et s'avère plus favorable à la publication (Webster et Watson, 2002).

⁷ Afin d'éviter la confusion terminologique, on utilise le terme « la revue de littérature narrative » pour décrire l'approche alternative de la revue de littérature systématique (sur le plan technique). On utilise aussi le terme « la revue de littérature traditionnelle » pour expliquer un type particulier de revue de littérature qui vise à construire un texte critique sur les théories, les méthodologies et les contextes du sujet (pour ce qui est des objectifs).

Elle se distingue de l'approche narrative par la transparence du processus, qui est bien détaillée, afin de minimiser les biais par la recherche exhaustive des études, l'audit du processus de prise de décision et de conclusion de chercheurs (D. J. Cook, *et al.*, 1997; Tranfield *et al.*, 2003). En outre, la revue de la littérature systématique est particulièrement efficace afin d'interpréter et de relier les recherches précédentes par une perspective innovante afin d'identifier le vide dans la littérature et d'éclairer au sujet des voies de recherche dans le futur (Booth *et al.*, 2016; Jesson *et al.*, 2011).

Pour ce qui est de l'objectif, la revue de littérature peut être de type traditionnel, conceptuel, d'état des lieux, d'expert et de *Scoping review* (Jesson, 2011). La revue de littérature traditionnelle s'appuie sur une approche critique afin d'amener une analyse critique par rapport à la théorie, aux hypothèses de recherche, à la méthodologie et au résultat des études. La revue de littérature conceptuelle, pour sa part, vise à synthétiser les connaissances conceptuelles pour conduire à une meilleure compréhension sur le sujet. L'état des lieux permet de mettre à jour les recherches les plus récentes sur le sujet. La revue de littérature d'experts vise à synthétiser les travaux effectués par les experts reconnus dans le domaine. Enfin, le *Scoping review* est destiné à éclairer l'agenda de recherche dans le futur. Pour ce faire, il est nécessaire mettre en évidence et de critiquer les savoirs existants afin d'identifier les manques dans la littérature. Ce type de revue de littérature permet aussi de définir les questions de recherche, les concepts et les théories pour mettre en lumière les voies de recherche. Il est considéré comme une étape préalable destinée à définir les questions précises pour la revue de littérature systématique subséquente.

Les articles 1 et 3 de la thèse s'appuient sur la méthode Arksey et O'Malley (2005) et Tranfield *et al.* (2003) respectivement pour effectuer une revue de littérature systématique. La revue de littérature du premier article est plus précisément effectuée sous l'angle épistémologique. L'objectif est d'éclairer la conceptualisation du construit central de la thèse — l'emballage éco-conçu. Il se base sur une question de recherche, à savoir :

Comment la connaissance précédente est-elle construite ? Sur quels positionnements ontologique, axiologique, épistémologique et méthodologique se fonde-t-elle ? De ce fait, il s'agit de sélectionner, d'analyser et de synthétiser la recherche dans des domaines reliés comme l'écoconception, l'emballage du produit, l'emballage écologique. Ainsi, il est pertinent de sélectionner l'analyse épistémologique comme un angle d'entrée puisqu'elle permet de comprendre l'ensemble des hypothèses sur lesquelles la recherche s'appuie et d'expliquer les implications qui en découlent (Ozcaglar-Toulouse, 2005). De plus, à travers l'analyse comparative et synthétique sur les principales perspectives de recherche, à savoir le positivisme, l'interprétativisme et la TCR, le premier article vise à éclairer l'agenda de recherche. Concernant l'article 3, il a pour objectif de construire un cadre conceptuel holistique établissant un lien entre l'emballage éco-conçu et le gaspillage alimentaire du consommateur. La revue de littérature systématique se concentre sur la relation (motivations et/ou freins liés à l'emballage) et le gaspillage alimentaire pour ce qui est de la consommation. Dans ce cas-ci, la revue de littérature est considérée comme une étape primordiale de théorisation.

2.3 Chaînage moyens-fins

Le deuxième article vise à explorer les réactions des consommateurs face à l'emballage éco-conçu (notamment les aspects négatifs — risques perçus) et ses effets sur le processus de décision d'achat d'un produit éco-emballé. Pour y répondre, la thèse s'appuie sur l'analyse des chaînages cognitifs (*means-end chain analysis* : MEC). Selon Reynolds et Gutman (1984), tous les comportements du consommateur peuvent avoir des conséquences (positives ou négatives), et ce, par le biais de la consommation d'un produit (ensemble des différents attributs : A's). Les consommateurs tendent à choisir le produit maximisant les conséquences positives (bénéfices) et minimisant les conséquences négatives (risques perçus : C's) afin d'atteindre le style de vie désirable

(valeurs individuelles : V's). L'approche MEC permet d'identifier les déterminants perçus (attributs, conséquences — risques perçus, valeurs individuelles) les plus importants associés à la consommation d'un produit éco-emballé ; mettre en évidence les structures cognitives du consommateur envers l'emballage éco-conçu (relation entre A's, C's et V's) ; et finalement, segmenter les consommateurs en fonction des différentes structures cognitives.

2.4 Theory building

2.4.1 Définition de la théorie

Les deux premiers articles soulignent l'ambiguïté de la conceptualisation de l'emballage éco-conçu et l'absence de base théorique (propositions ou hypothèses) par rapport aux impacts des perceptions des consommateurs envers l'emballage éco-conçu et les comportements de la CR ainsi que ses impacts sur la préoccupation primordiale — la limitation du gaspillage alimentaire. De ce fait, l'article 3 se concentre sur la construction d'un cadre théorique (ou modèle)⁸ holistique (*theory building*) mettant en évidence la relation entre les impacts de l'emballage éco-conçu et la limitation du gaspillage alimentaire du consommateur.

D'après Jaccard et Jacoby (2010), la construction de la théorie (*theory building*) joue un rôle crucial dans le processus scientifique pour expliquer et/ou prédire le phénomène de recherche. La théorie se réfère à « la *description des relations entre les concepts dans un ensemble des propositions (ou hypothèses) et contraintes* » (traduction libre : Bacharach (1989, p. 498)). En d'autres termes, la théorie est un système de construits

⁸ Dans la présente thèse, on ne distingue pas les termes « théorie » et « modèle » (Whette, 2002). On les utilise plutôt alternativement.

(configuration mentale) ou variables (configuration opérationnelle)⁹ et les hypothèses expliquant les relations entre eux. La théorie peut être catégorisée en fonction de différentes dimensions telles que : l'objectif de recherche (décrire, expliquer, prédire et prescrire) (Gregor, 2006); l'approche consistant à construire et tester la théorie (théorie des variables, théorie du processus, théorie hybride), la posture épistémologique (positivisme, interprétativisme, pragmatisme), le niveau d'analyse (simple ou multiple) et le processus de la théorisation (déductive/top-down, inductive/bottom up et abductive).

2.4.2 Approche inductive top-down de la théorisation

En sciences sociales, les connaissances sont construites à travers trois raisonnements: la déduction, l'induction et l'abduction (Thiétart, 2007). La déduction se réfère à une méthode de démonstration qui repose sur la présupposée que les hypothèses sont vraies, alors que la conclusion devrait nécessairement être vraie (Thiétart, 2007; Yu, 2006). Le raisonnement déductif permet de conclure « *à partir de prémisses, d'hypothèse à la vérité d'une proposition (ou à sa non-réfutation) en usant de règle d'inférence* » (Thiétart, 2007, p. 28). Cependant, l'induction consiste à « *une inférence conjecturale qui conclut (1) de la régularité observée de certains faits à leurs constances; (2) de la constatation de certains faits à l'existence d'autres faits non donnés, mais qui ont été liés régulièrement aux premiers dans l'expérience antérieure* » (Morfaux, 1980 cité dans Thiétart, 2007, p. 169). Autrement dit, le raisonnement inductif permet de passer du particulier au général (Thiétart, 2007). Ainsi, l'abduction vise à d'abord construire un cadre conceptuel compréhensif et ensuite le tester.

⁹ Un construit ne peut pas être observé directement. Au contraire, une variable peut être observée directement (Bacharach, 1989).

Au niveau de la théorisation, la majorité des études est effectuée à travers deux approches principales : déductive (*Top-Down deduction*) et inductive (*Bottom-Up induction*). L'approche déductive commence par l'intersection de la littérature afin d'identifier la tension, la contradiction et l'explication par les différentes perspectives d'un phénomène. L'objectif de la recherche est de résoudre le problème de tension, plus précisément l'explication contradictoire dans la littérature précédente. L'approche déductive s'appuie généralement sur le processus *Top-Down*, c'est-à-dire que, à partir du cas général vers celui particulier, les savoirs sont construits à travers le système logique. À l'inverse, l'approche inductive commence par les connaissances et les données brutes. La nouvelle théorie émerge à partir des processus de codage, de la catégorisation des concepts et mis en lien entre eux (Dey, 2003). La comparaison entre la théorie émergente et la littérature correspond à la contribution principale. L'approche inductive s'appuie généralement sur le processus *Bottom-Up*, c'est-à-dire que, à partir des cas particuliers aux cas généraux, les savoirs sont conduits par l'expérience empirique qui se base sur les données.

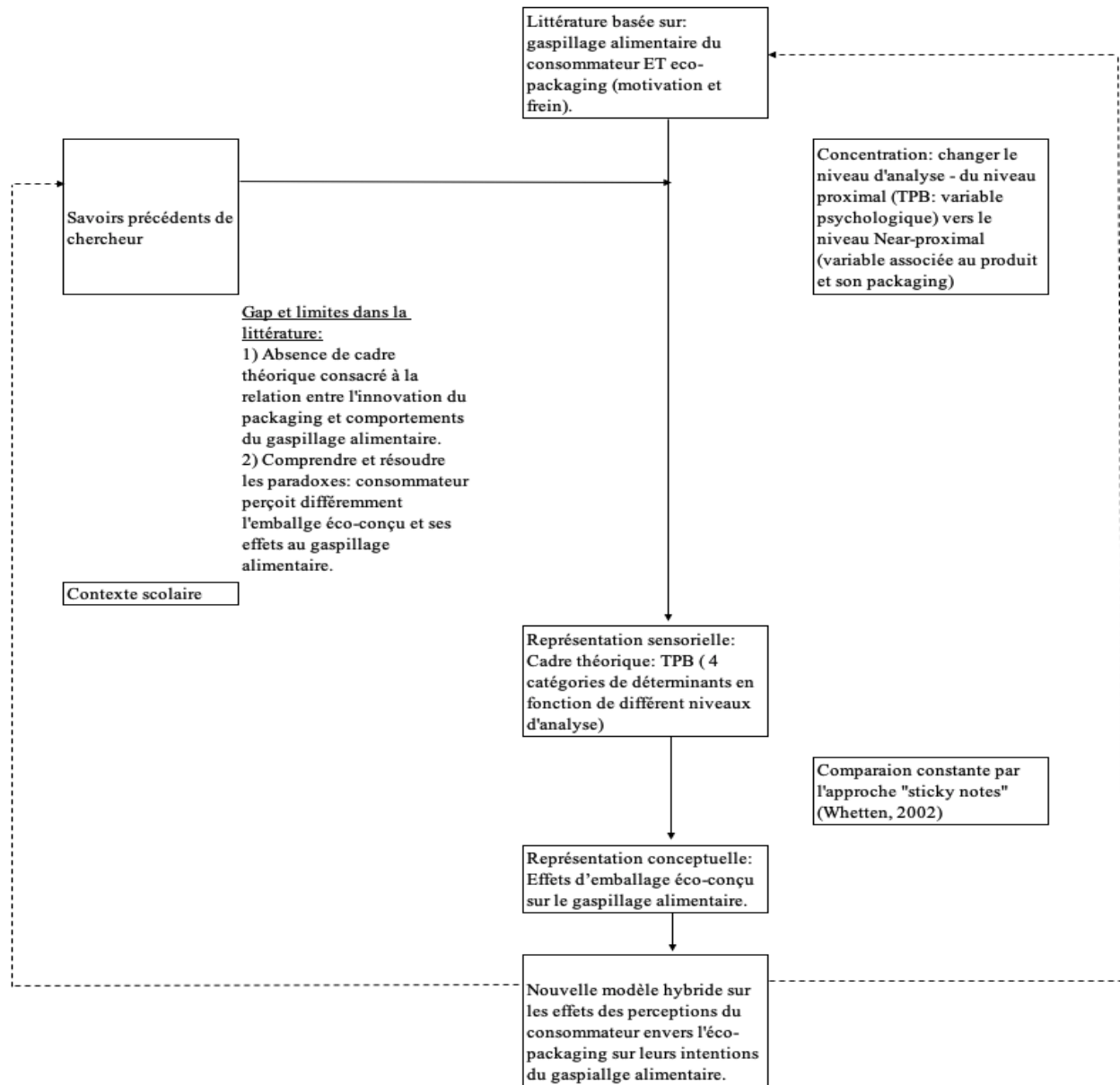
Cependant, ces deux approches traditionnelles comportent certaines limites en ce qui concerne la construction de la théorie. En effet, d'après Weick (1996), la théorie développée par l'approche déductive peut difficilement être testée de manière générale. La théorie s'appuyant sur l'approche inductive est critiquée pour deux raisons principales : (1) les données ne sont pas suffisamment proches du phénomène de recherche. Par conséquent, la nouvelle théorie explique seulement certains aspects au lieu de couvrir l'ensemble du phénomène; (2) ainsi, les résultats de théorisation représentent simplement la description des données comme une liste de variables (Merton, 1967; Sutton et Staw, 1995) ou la description de cas. De ce fait, certains chercheurs recommandent de combiner les approches déductive et inductive dans la recherche comme l'approche abductive (Weick, 1996). Cette dernière est définie comme : « *un processus de recherche testant et ajustant les hypothèses exploratoires qui font le cheminement des concepts* » (traduction libre, Paavola, 2004, p.279 cité dans

Shepherd et Sutcliffe, 2011, p. 362)¹⁰. Autrement dit, le chercheur commence par une base théorique préalable, puis la teste sur le terrain.

L'article 3 de cette thèse adopte une approche alternative qui combine la méthode inductive et l'approche *top-down* afin de construire la nouvelle théorie. Cette approche est « *top-down* » puisque la nouvelle théorie émerge de la littérature. Cette approche est aussi inductive parce que le processus de théorisation commence par les données (littérature). Distinct des approches conventionnelles (déductive, inductive, abductive), le troisième article de la thèse s'appuie sur l'approche « *inductive top-down* » puisqu'elle est pertinente pour la recherche visant à résoudre un problème pratique. Elle est notamment efficace lorsque les recherches précédentes sont vastes, dynamiques, complexes et viennent de différents domaines. La nouvelle théorie est construite à travers une comparaison continue entre la représentation sensorielle et la représentation conceptuelle du phénomène. Concrètement, le processus de théorisation suit les quatre étapes recommandées par Shepherd et Sutcliffe (2011) (voir Figure 2.2).

¹⁰ « *a process of thought and inquiry that proceeds from "an anomaly to the delineation of a kind of explanatory hypothesis which fits into an organized pattern of concepts* » (Paavola, 2004, p.279).

Figure 2.3 Inductive top-down theorizing



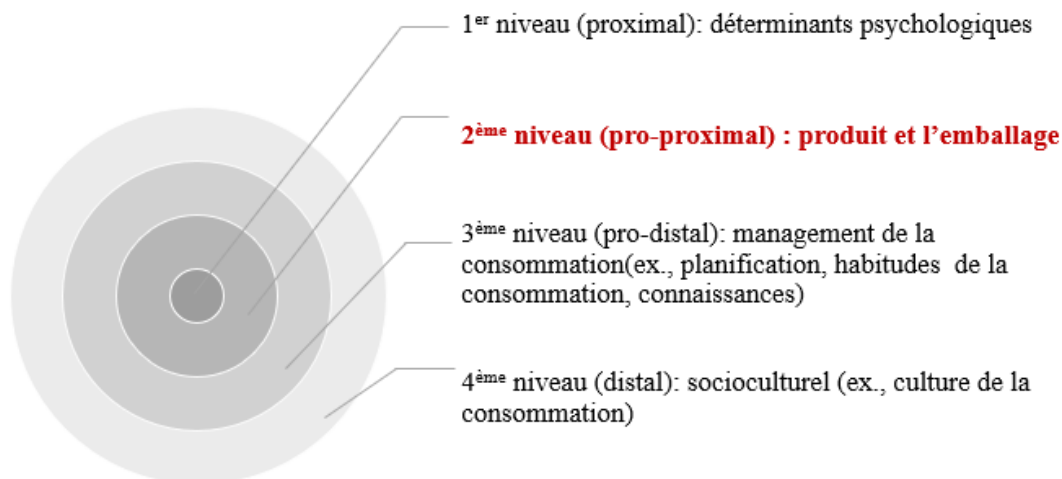
(Source : adapté de la figure 1 Shepherd et Sutcliffe, 2011)

Étape 1 (Revue de la littérature) : L'article 3 s'appuie sur l'approche de la revue de la littérature systématique (Tranfield *et al.*, 2003) afin d'établir un lien entre les différents

sujects, identifier les nouveaux liens entre divers concepts et finalement amener une analyse théorique exhaustive.

Étape 2 (Description de la représentation sensorielle) : La représentation sensorielle est définie comme « *une perception de tensions, contradictions et explications d'un même phénomène de recherche dans la littérature* » (traduction libre, Shepherd et Sutcliffe (2011, p. 367). L'article 3 se concentre sur les déterminants (motivations et/ou freins) générant le gaspillage alimentaire lié à la consommation qui sont classifiés en fonction des différents niveaux d'analyse à partir du déterminant distal vers proximal du consommateur (adapté de la classification de Jaccard et Jacoby, 2010) (Figure 2.4 et le Tableau 5.1 dans l'article 3).

Figure 2.4 Quatre niveaux des déterminants du gaspillage alimentaire de consommation



(1) Le niveau proximal : Au premier niveau, les recherches s'interrogent sur une seule proposition concernant les comportements visant à limiter le gaspillage alimentaire du consommateur qui est influencé par son intention. En d'autres termes, si le consommateur a l'intention de limiter le gaspillage alimentaire, il

va le faire. Ce premier niveau regroupe les déterminants psychologiques basés sur la TPB (Ajzen, 1991) et les autres déterminants psychologiques, notamment la préoccupation environnementale, la préoccupation sanitaire et l'attitude financière.

- (2) Le niveau pro-proximal : TPB (Ajzen, 1991) suppose que l'intention de limiter le gaspillage alimentaire génère directement le comportement. Cependant, la relation entre l'intention et le comportement est complexe parce que le consommateur ne promet pas toujours ce qu'il tend à faire. Il existe d'autres déterminants influençant le comportement du consommateur : dans le cadre de la recherche, il s'agit de déterminants liés aux attributs de l'emballage.
- (3) Le niveau pro-distal : Le troisième niveau d'analyse s'intéresse aux déterminants qui n'influencent pas directement le comportement du consommateur, mais plutôt caractérisent (*shape*) les déterminants des deux niveaux précédents comme les déterminants liés à la gestion de consommation (ex. : planification et routine de consommation, connaissances par rapport au gaspillage alimentaire).
- (4) Le niveau distal : Il s'agit du dernier niveau d'analyse centré sur les déterminants contextuels, tels que la culture de consommation, la culture de la nourriture, etc.

Étape 3 (Établissement de la représentation conceptuelle) : La représentation conceptuelle est définie comme « *les descriptions abstraites par rapport aux relations entre les construits — y compris les explications sur 'comment', 'pourquoi', ainsi que*

les conditions (temporaire et spatiale) — qui amènent une explication plus cohérente sur la représentation sensorielle » (Shepherd et Sutcliffe, 2011, p. 367).

Pour ce faire, on change le niveau d'analyse en focalisant sur le pro-proximal (emballage). Le troisième article adopte plus précisément la technique « *sticky notes* » (Whetten, 2002) afin de construire la représentation conceptuelle (intégrer les nouveaux concepts et interpréter les relations entre ceux-ci).

Étape 4 (Construction de la nouvelle théorie) : Dans le cadre de la thèse, il est proposé un modèle hybride puisqu'il permet de mieux comprendre le phénomène de recherche en combinant les avantages du modèle de variance et ceux du modèle de processus (De Guinea et Webster, 2017). Concrètement, le modèle basé sur les facteurs influençant des comportements du gaspillage alimentaire du consommateur (*variance model*) construire le système des facteurs explique la relation entre les perceptions des consommateurs envers l'emballage éco-conçu et le gaspillage alimentaire. Le modèle basé sur le processus (*process model*), pour sa part, vise à décrire le cheminement ou processus continu des perceptions du consommateur.

2.5 Expérimentation

Le troisième article consacré au développement d'un cadre conceptuel a dévoilé qu'il pourrait exister une relation de cause à effet entre la perception des consommateurs à l'égard de l'emballage éco-conçu et l'intention d'éviter le gaspillage alimentaire à travers la performance perçue des fonctions de l'emballage. De ce fait, le quatrième article de la thèse vise à tester les principaux effets causals dans le cadre conceptuel, soit : (1) les effets directs des attributs de l'emballage éco-conçu sur l'intention d'éviter le gaspillage alimentaire; (2) les effets médiateurs de performances perçues des fonctions d'emballage (physique, social et commercial); et (3) les effets modérateurs de la préoccupation sanitaire. Pour tester les effets de cause à effet, on s'appuie sur

l'approche d'expérimentation puisque cette dernière permet aux chercheurs d'intervenir préalablement à l'observation par la manipulation des variables à travers la comparaison de différents traitements expérimentaux (attributs visuel et verbal de l'emballage éco-conçu et conventionnel) en observant leurs effets sur l'intention de limiter le gaspillage alimentaire (Evrard *et al.*, 2009).

2.5.1 Design expérimental factoriel de 2×2

Afin de tester les hypothèses de recherche, on aborde 2 plans factoriels complets (attribut visuel : refermable vs non refermable) \times 2 (attribut verbal : présence d'information écologique vs absence d'information écologique) qui permettent d'obtenir 4 combinaisons possibles. Le plan factoriel est pertinent puisqu'il permet, d'une part, d'étudier deux aspects principaux (variables indépendantes : refermabilité et information écologique) simultanément et leurs effets d'interaction; et, d'autre part, d'étudier plusieurs variables externes (médiateur : performance perçue des fonctions physiques, sociales et commerciales de l'emballage; médiatrice : préoccupation sanitaire) (Evrard *et al.*, 2009).

La taille d'échantillon pour chaque traitement expérimental est mesurée à l'aide du logiciel G*Power en fonction de (1) le niveau de signification nominale ($\alpha = 0,05$), (2) le pouvoir du test ($\beta = 0,80$), (3) $df = 3$, (4) la taille d'effet = 0,25. Les résultats de test F montrent que, pour reproduire cette étude, il est nécessaire de disposer d'un échantillon de 279 participants afin d'obtenir une puissance du test de 80% pour la variable dépendante (voir Tableau 2.1).

Tableau 2.1 Estimation de la taille d'échantillon

1] -- Sunday, August 20, 2017 -- 16:43:06

F tests - ANOVA: Fixed effects, special, main effects and interactions

Analysis:	A priori: Compute required sample size		
Input:	Effect size	=	0,25
	α err prob	=	0,05
	Power (1- β err prob)	=	0,95
	Numerator df	=	3
	Number of groups	=	4
Output:	Noncentrality parameter λ	=	17,4375000
	Critical F	=	2,6374296
	Denominator df	=	275
	Total sample size	=	279
	Actual power	=	0,9502518

2.5.2 Expérimentation en ligne par Amazon Mechanical Turk

Afin de répondre aux objectifs principaux de la recherche, l'article 4 s'appuie sur l'expérimentation en ligne. Par rapport à l'expérimentation en laboratoire, une expérimentation en ligne permet d'améliorer la validité externe à l'aide des moyens suivants : (1) minimiser les biais causés par l'environnement d'achat inconnu ; (2) limiter la désirabilité sociale par la présence virtuelle des participants ; (3) obtenir de manière efficace l'échantillon représentatif; et (4) contrôler le biais généré par les différents styles de réponses (Alfnes et Rickertsen, 2011; Ertz *et al.*, 2017; Levitt et List, 2007; Milfont, 2009).

Les données sont collectées sur un panel de citoyens canadiens avec la collaboration d'Amazon Mechanical Turk (MTurk). MTurk est le marché d'emploi hétérogène le plus pertinent en ligne pour réaliser l'expérimentation en ligne. Il est particulièrement approprié pour les études concernant les comportements des individus et les processus de prise de décision (Goodman *et al.*, 2013). Ainsi, MTurk permet d'effectuer l'affectation aléatoire (randomization), la manipulation et l'attention check afin

d'assurer la validité interne et externe de l'étude (Buhrmester *et al.*, 2018; Paolacci et Chandler, 2014).

2.5.3 Analyse des résultats

La variable indépendante — les attributs visuels et verbaux de l'emballage (4 modalités : l'emballage conventionnel, l'attribut visuel éco-conçu, l'attribut verbal éco-conçu et l'interaction) — est recodée vers trois variables catégorielles. L'emballage conventionnel est traité comme groupe de contrôle.

Les données sont ensuite analysées par macro PROCESS (Hayes, 2018) en SPSS 26.0 (IBM Corp, 2018) par l'analyse de régression en ayant recours à la technique Bootstrap avec la variable indépendante multi-catégorielles correspondant à 4 traitements expérimentaux. Ce modèle de régression linéaire basé sur la méthode des moindres carrés (*Ordinary least square* : OLS) permet non seulement de tester les effets holistiques (*overall effects*) de l'emballage éco-conçu sur l'intention de limiter le gaspillage alimentaire à travers un test Omnibus (qui ne prend pas en compte le système de codage), mais aussi de comparer les effets entre différents groupes expérimentaux (comparaison entre les effets visuels, verbaux, tous visuels et verbaux éco-conçus) par une série de tests relatifs (direct et/indirect) (équivalent de l'analyse de « contract » de l'analyse de la variance : ANOVA). De plus, PROCESS permet d'estimer les effets médiateurs (modèle 4) et modérateurs (modèle 15) simultanément à travers Bootstrap. Ce dernier renvoie à une répétition de rééchantillonnage avec 5000 réplifications de l'échantillon original. Le Bootstrap est pertinent puisque : (1) c'est une procédure robuste adaptée à la distribution non normale et à l'échantillon de petite taille; (2) elle permet aussi d'obtenir une estimation plus précise des effets de médiation à travers un test fiable et la génération d'intervalle de confiance de l'effet de médiation (c'est-à-dire une sorte de magnitude de la taille d'effet) (Hayes, 2018).

2.6 Critères de la qualité d'étude

2.6.1 Contrôle des biais de la désirabilité sociale

La thématique liée à la CR est soumise à un fort biais de désirabilité sociale (François-Lecompte, 2006). Dans la littérature des études comportementales, la désirabilité sociale a été abordée en général de deux manières. Pour le premier courant de recherche, la désirabilité sociale est considérée comme un biais de mesure. Les biais relatifs de la variance de méthode commune (*common method variance*) sont considérés comme une des sources principales des erreurs de mesure qui a des impacts sur la validité interne et la conclusion de l'étude (Bagozzi *et al.*, 1991; Nunnally et Bernstein, 1978; Podsakoff *et al.*, 2003). En effet, le biais de « *common method variance* » réside dans le fait que la variance est causée principalement par la méthode de mesure au lieu des construits mesurés. Cette variance d'erreurs systématiques (*systematic error variance*) pourrait avoir causé l'explication alternative erronée sur la relation entre les variables indépendantes et les variables dépendantes. À l'inverse, pour le second courant de recherche, le concept de la désirabilité sociale est vu comme un trait de personnalité qui est défini comme : « *le besoin d'acceptation sociale qui peut être atteint à travers les comportements jugés comme étant acceptables et appariés dans un contexte culturel particulier* » (traduction libre) (Crowne et Marlowe, 1964, p. 109).

D'après François-Lecompte (2006), les biais de la désirabilité sociale pourraient se présenter sous deux conditions : la première consiste en la situation où les sujets répondent à des questions sur leurs perceptions et anticipent la signification de la mesure (Frenette, 1999). Cette dernière est généralement soumise à l'influence sociale; par contre, la deuxième consiste en la motivation intrinsèque des individus de se manifester favorablement dans leurs rapports avec autrui.

Dans le cadre des études expérimentales de l'article 4, les biais de la désirabilité sociale ont été contrôlés à travers le design de recherche (contrôle à priori) et la technique statistique d'analyse des données (contrôle a posteriori).

Le design de recherche est considéré comme le moyen crucial pour contrôler les biais de la désirabilité sociale puisqu'il permet d'identifier les liens entre les mesures des variables indépendantes et variables dépendantes. Les variables indépendantes et dépendantes sont plus précisément liées par : (1) le contexte de mesure et le questionnaire ; (2) le langage et la forme de question ; (3) la technique statistique (minimiser les biais de la désirabilité a posteriori). Les deux premiers sont déterminés par le design de recherche. Concrètement, nous nous appuyons sur la triangulation de la source des échelles de mesure et le panel des consommateurs.

- Triangulation de la source des échelles de mesure : les recherches académiques pour les variables indépendantes et externes; ainsi que les enquêtes professionnelles comme les rapports de WRAP (2007, 2009) pour mesurer la variable dépendante — intention d'éviter le gaspillage alimentaire. En fait, l'emprunt ou l'adaptation des échelles de mesure des variables indépendantes et dépendantes de la même source est considéré comme une cause principale des biais de la *Common method variance* en raison de l'état d'esprit (*mind set*) du chercheur (Podsakoff *et al.*, 2003).
- Construction du questionnaire : les concepts ambigus ou non familiers sont définis. Des questions simples ont été formulées.
- Administration du questionnaire en ligne à travers MTurk. Le panel est considéré comme la meilleure façon d'éliminer le biais de désirabilité sociale

(François-Lecompte, 2006; Malhotra *et al.*, 2007). Ainsi, dans l'introduction du questionnaire figuraient des phrases demandant de manière bienveillante aux répondants de s'exprimer en toute liberté : « *Il n'y a pas de bonnes ou de mauvaises réponses. Tous vos points de vue sont intéressants. Vous pouvez vous exprimer en toute sincérité.* »

Pour le contrôle à posteriori, une analyse factorielle confirmatoire (*Confirmatory Factor Analysis : CFA*) a été effectuée afin de vérifier l'unidimensionnalité du construit (J.C. Anderson et Gerbing, 1988).

2.6.2 Validité

La qualité de l'étude expérimentale a été évaluée selon deux critères proposés par Malhotra *et al.* (2011). Selon les auteurs, les deux critères de validité (interne et externe) correspondent aux deux objectifs principaux d'une étude expérimentale. Le premier vise à obtenir des conclusions valides au sujet des effets des variables indépendantes (attributs de l'emballage éco-conçu) sur le groupe d'étude, ce qui correspond à la validité interne. Le second objectif, quant à lui, vise à généraliser les résultats de recherche à une population plus large, c'est-à-dire la validité externe.

Selon Malhotra *et al.* (2011), la validité interne consiste à assurer qu'il existe un effet de cause à effet entre les variables indépendantes et la variable dépendante à travers la manipulation des différentes combinaisons des variables indépendantes. Dans le processus de validité interne, il est nécessaire de contrôler les effets externes causés par les variables externes (dans le cadre de cette étude, cela correspond aux 3 variables médiatrices et 1 variable modératrice). Pour ce faire, on a abordé l'affectation aléatoire des traitements dans le processus d'expérimentation. Pour assurer la généralisation des résultats de recherche, l'échantillon composé de la population canadienne recrutée par MTurk au lieu d'une population d'étudiant a été privilégié.

Synthèse du chapitre II — Méthodologie

L'objectif de ce chapitre, consacré à la méthodologie, est de mettre en évidence : (1) l'orientation méthodologique mixte combinant l'approche qualitative (revue de littérature systématique, MEC, *Top-down inductive theorizing*) et l'approche quantitative (expérimentation); (2) le positionnement épistémologique de la thèse; ainsi que (3) les approches méthodologiques appliquées dans quatre articles de la thèse.

L'utilisation des différentes méthodologies en fonction des étapes de recherche est illustrée par le schéma suivant : la revue de littérature → l'étude exploratoire → la construction de la théorie (*theory building*) → l'étude confirmatoire (*theory testing*).

La première section a présenté le positionnement épistémologique de la thèse – TCR en mettant en évidence l'évolution, les positionnements ontologiques, axiologiques et méthodologiques. TCR regroupe l'ensemble des chercheurs qui visent à amener une amélioration du bien-être individuel (ex. : consommateur) et/ou social, et finalement maximiser les impacts sociétaux de la recherche académique.

Fondées sur la perspective TCR, les sections 2 à 5 ont exposé les approches méthodologiques qui ont été appliquées dans les articles de la thèse.

- (1) Revue de littérature systématique : La revue de littérature systématique est adoptée dans l'article 1 — l'analyse épistémologique (Arksey et O'Malley, 2005) et l'article 3 — Theory building (Tranfield *et al.*, 2003), afin de mettre en évidence la conceptualisation de la notion centrale, l'emballage éco-conçu. Contrairement à l'approche narrative, la revue de littérature systématique s'avère être une approche plus rigoureuse en raison de la présence du processus de transparence, détaillé, et peut être reproduite. De ce fait, la revue de littérature systématique est favorable à la publication par rapport à la revue de littérature traditionnelle (Webster et Watson, 2002).

- (2) Méthode moyens-fins (*means-end chaîne* : MEC) : L'article 2 utilise la MEC (Valette-Florence *et al.*, 2003) qui vise à explorer les réactions du consommateur envers l'emballage éco-conçu, notamment l'aspect négatif — risques perçus. Cette méthode est pertinente pour explorer les attributs du produit/service perçus comme importants afin d'atteindre un but (valeur individuelle). Elle permet aussi de mettre en évidence le lien entre les attributs, les conséquences associées et les valeurs individuelles (A-C-V) qui peut être considéré comme une représentation cognitive des décisions d'achat du consommateur.
- (3) Approche inductive top-down théorisation (Shepherd et Sutcliffe, 2011): l'article 3 adopte une approche inductive top-down pour construire un cadre conceptuel holistique consacré aux effets des perceptions des consommateurs envers l'emballage éco-conçu et un type de pratique de la consommation responsable — la limitation du gaspillage alimentaire. À l'inverse de la théorisation déductive, inductive ou abductive, l'approche top-down inductive concernée est pertinente pour la recherche orientée vers la pratique et caractérisée par une vaste littérature interdisciplinaire.
- (4) Expérimentation en ligne : l'article 4 vise à tester les principales relations cause-à-effet proposées dans le cadre conceptuel à travers 2 expérimentations exploratoires en ligne avec la collaboration de MTurk. Ce dernier est un marché d'emploi hétérogène en ligne pour mettre en place l'expérimentation au sujet des comportements individuels et des processus de prise de décision.

Dans les deux chapitres suivants, les quatre articles de la thèse (chapitres III à VI) sont exposés, puis la conclusion générale est présentée (chapitre VII).

CHAPITRE III

ECO-DESIGN PACKAGING: AN EPISTEMOLOGICAL ANALYSIS AND TRANSFORMATIVE RESEARCH AGENDA

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AVANT-PROPOS À L'ARTICLE 1

Le premier article de la thèse vise à mettre en évidence l'état des lieux des savoirs, les processus et les approches méthodologiques de construction sur le concept de l'emballage éco-conçu à travers trois perspectives de recherche (positivisme, interprétativisme et « Transformative Consumer Research » -TCR-). Ensuite, il propose un agenda de recherche.

Cet article a été publié dans la revue *Journal of Cleaner Production*, une revue consacrée à la production environnementale durable et les applications dans l'objectif d'améliorer la durabilité de la société. La revue est classée Q1 dans la catégorie 'Stratégie et management du développement durable' dans SJR 2020 avec 5-years Impact factor : 7,051 (H Index : 173).

- Zeng, T., Deschênes, J., et Durif, F. (2020). Eco-design packaging: An epistemological analysis and transformative research agenda. *Journal of Cleaner Production*, 276. DOI: 10.1016/j.jclepro.2020.123361.

ABSTRACT

Eco-design packaging is viewed as a packaging innovation strategy for greater eco-efficiency through incorporating environmental and/or social concerns into its life cycle. However, the societal impact of eco-design packaging remains limited due to a lack of summary work focusing on knowledge creation, evaluation, and application. This knowledge construction issue calls for systematic review through an epistemological perspective.

Drawing on the systematic reviews of 261 articles, this research aims to assess the literature that focuses on eco-design, packaging, and eco-design packaging through three perspectives (i.e., positivism, interpretivism, and transformative consumer research (TCR)) to delineate the state of the art of previous research, and then, to propose a transformative research agenda for greater social awareness, research use, and social benefit.

This research provides an in-depth understanding of the role of eco-design packaging for social well-being through the lens of positivism, interpretivism, and TCR. The findings reveal that TCR is deemed as a more suitable way to conduct research in terms of improving the societal impact of eco-design packaging. The authors highlight three avenues for maximizing the social benefits of eco-design packaging by investigating its role in three social challenges: (1) The relationship between new technology and consumers' vulnerability; (2) sustainability; and (3) public health. This research offers several actionable insights for key stakeholders (i.e., consumers, marketing managers, packaging producers, and policy-makers).

Keywords: eco-design packaging; food waste; public health; epistemological analysis; transformative consumer research; systematic literature review

3.1 Introduction

Over the last five decades, packaging has played a crucial role in individual and social well-being, as it links products to consumers through various functions (Boesen *et al.*, 2019). Especially, in the food industry, a number of studies point to packaging as an important influence on sustainability, such as direct packaging waste and indirect packaging-related waste (e.g., food waste) (e.g., Lindh *et al.*, 2016; Wikström *et al.* 2019), and public health (e.g., obesity and diabetes) (e.g., Aerts & Smits, 2019; Thiene *et al.*, 2018). To address these issues, eco-design packaging appears to be a strategic solution to improve its functions by considering the environmental and/or social impact in its design (Zeng & Durif, 2019).

The extant literature regarding eco-design packaging is mostly applied in the context of the food industry because it is considered as one of the fast-growing industries that incorporates new packaging design techniques and innovation (Rokka & Uusitalo, 2008). Two research streams can be identified in the topical literature. The first concerns industrial/engineering studies based on mainly a positivist perspective. From this standpoint, eco-design packaging is viewed as an ensemble of attributes (e.g., recyclable material, resealability) and functions (e.g., preservation, communication). The primary goal is to improve packaging functions to reduce its direct and/or indirect environmental impacts, such as reducing food waste (e.g., Lindh *et al.*, 2016). The second stream refers to consumer behavior studies and adopts generally positivist or interpretivist perspectives to examine the relationship between eco-design packaging and consumers' behaviors. Positivist studies examine the causal effects of eco-design packaging on consumers' sustainable behaviors (e.g., consumption of sustainable products (Gupta & Ogden, 2009; Magnier & Schoormans, 2015)) and health behaviors (e.g., avoiding overconsumption (Aerts & Smits, 2019), calorie intake (Van Ooijen *et al.*, 2017)). Meanwhile, the interpretivist approach seeks a better understanding of

consumers' sensemaking processes associated with eco-design packaging (e.g., Dano, 1996, 1998).

Despite previous research pointing to eco-design packaging as a means of potentially improving individual (e.g., promoting healthy) and/or social (e.g., reducing waste) well-being, its societal impacts, especially on the end user (i.e., consumer) (e.g., consumers' healthy food consumption and consumer-related food waste) remains limited for two reasons. Firstly, studies based on a conventional perspective (i.e., positivist/interpretivist) are designed more for academic interest than for consumers' concerns (Wansink, 2012). Most of these studies aim to create academic knowledge rather than to determine best practice. Therefore, the resultant knowledge cannot be used directly by consumers to improve well-being. For instance, previous research that focuses on the impacts of eco-design packaging reveals that the sustainability innovation of packaging is not consistently perceived as it should be by consumers. The existing gap between consumers' perceptions of eco-design packaging and life cycle assessment results (LCA) (Boesen *et al.*, 2019; Polizzi di Sorrentino *et al.*, 2016; Wikström *et al.*, 2016). Secondly, the body of extant knowledge on eco-design packaging remains fragmentary, because the topic investigated by disciplines (e.g., industry and consumers' behaviors), with extensively varying epistemological considerations, creates knowledge evaluation and implication issues. These issues can be explained by the fact that an epistemological perspective is embedded in whole knowledge claims and affects implicitly the key research aspects, including the research design, data collection, and results interpretation (Anderson, 1986; Ferber, 1977). All of these issues related to how knowledge is created, evaluated, and applied can only be addressed after a systematic analysis of the knowledge construction process (or epistemological analysis). Such work provides a more accurate description regarding how knowledge is generated in the field, and how it should be advanced (Anderson, 1986).

Therefore, drawing on an epistemological perspective, the primary objective of the present article is to develop a systematic review of eco-design packaging from the food consumption industry. Precisely, this article analyzes the literature focusing on the overlapping key concepts (i.e., eco-design, packaging, and eco-design packaging) through positivist, interpretivist, and transformative consumer research lenses (TCR: a research movement for more important social impact).

This research makes three key contributions to the topical literature: First, this research provides an alternative way—TCR—to develop the knowledge regarding the link between eco-design packaging and consumers' behaviors. Second, this research offers an in-depth understanding regarding the concept of “eco-design packaging” and its role in social well-being by assessing the articles focusing on eco-design, packaging, and eco-design packaging. Lastly, this research provides a transformative research agenda to guide future research for greater social awareness, research use, and social benefit.

This paper begins with an overview of three fundamental paradigms, namely, positivism, interpretivism, and TCR, before outlining the systematic literature view approach taken and the key findings. The paper concludes with the transformative research agenda.

3.2 Fundamental paradigms

The term paradigm refers to “a set of basic beliefs (or metaphysics) that deals with ultimate or first principles” (Lincoln & Guba, 1985, p. 107). A paradigm must examine five basic interconnected issues, involving ontology, axiology, epistemology, and methodology, and evaluation (Hudson & Ozanne, 1988).

From an ontological perspective, researchers focus on “the nature of reality” and “the nature of the human being in the world” (Denzin & Lincoln, 2005, p. 183). From an

epistemological perspective, researchers focus on three main questions regarding (1) the nature of the knowledge generated, for instance, whether the knowledge created is nomothetic (i.e., objective and time-free) or idiographic (i.e., subjective and context-related) (Ozanne & Saatcioglu, 2008); (2) a view of causality; and (3) the nature of the “relationship between the knower and knowledge” (Denzin & Lincoln, 2005). Hence, epistemology entails focusing upon the relationship between researchers and the knowledge generated about the phenomenon they investigate. For example, does the knowledge of reality exist independently (i.e., objectivism) or dependently (i.e., subjectivism) of the researcher?

Each paradigm differs in its fundamental goals or axiology. For instance, for positivists, by accepting the assumption of investigating “behavior under universal laws” (Anderson, 1986, p. 160), the principal objective of research is that of explanation and prediction. Researchers try to answer the question of “what will happen in the future if certain conditions hold” (Gregor, 2006, p. 619).

The authors now contrast and compare the three competitive paradigms in marketing by analyzing their ontological, epistemological, axiological, and methodological assumptions and their evaluation (see Table 3.1).

Tableau 3.1 A summary of positivism, interpretivism, and TCR

Item	Positivism	Interpretivism	TCR
<i>Ontological assumptions</i>			
-Nature of reality	<p>Realism:</p> <ul style="list-style-type: none"> Objective and tangible: The "real" reality is independent from the human conscience. Single, ahistorical, and acontextual. Divisible. 	<p>Relativism:</p> <ul style="list-style-type: none"> Socially constructed, depends on the perception of human beings. Multiple realities. 	<p>Sharing the ontological assumptions with critical theory (CT) and participatory action research (PAR):</p> <ul style="list-style-type: none"> Social reality as historically constructed (CT). Micropolitics of power that share a social reality.
-Nature of social beings	<p>Deterministic. Reactive.</p>	<p>Contextual. Proactive.</p>	<p>Contextual. Emphasizes the human potential to improve the social structure constraint (CT).</p>
<i>Axiological assumptions</i>	Explanation and prediction of the common law (explaining and predicting the typical characteristics of human beings).	Understanding and describing in-depth and completely the phenomenon of interest.	Improving well-being while maximizing social justice and the fair allocation of opportunities and resources.
<i>Epistemological assumption</i>			
-Knowledge generated	<p>Nomothetic: Emphasizes the aggregate: How does the phenomenon influence the majority of people?</p> <p>Time-free, value-free, and context-independent. Objectivism.</p>	<p>Idiographic: Focuses on the limits of the target object, but emphasizes the in-depth understanding of targets through the interpretation (sensemaking) process.</p> <p>Time- and context-dependent. Subjectivist.</p>	<p>Knowledge is uncertain, evolving, contextual, and value-laden.</p> <p>Time- and context-dependent. Participativism.</p>

Item	Positivism	Interpretivism	TCR
	Findings are an approximation of the truth. Outlet: Publication in scientific journals.	Value-mediated findings. Outlet: Publication in scientific journals.	Knowledge is created to improve practices of welfare. Publication is not the only outlet of knowledge generated. TCR shares knowledge with the community and is disseminated in multi-formats of communication.
-View of causality	Real causes exist.	Multiple, simultaneous shaping.	Individual, multiple, simultaneous, and various stakeholders shape experiences and issues.
-Research relationship	Dualism and separation subject-object (researcher-research object or target people)	Interaction and cooperation between subject — object.	Cooperative and continuing dialogue between researchers and stakeholders.
-Quality criteria	Verifiability. Confirmability. Refutability.	Ideographic and empathic.	6 qualities and commitments of TCR: <ul style="list-style-type: none"> • to improve well-being • to emanate from ACR and encourage paradigm, diversity • to employ rigorous, theory and methods • to highlight sociocultural and situational contexts • to partner with consumers and their caretakers • to disseminate findings to relevant stakeholders)

3.2.1 Positivism

Positivism is the dominant paradigm in marketing and consumer research (Evrard *et al.*, 2009).

Ontology: Realism. Positivism is conceptualized as having ontological realism. The “real” reality exists independently of humans’ perceptions and consciences (Peter, 1992). Positivists believe that there is some independence between the object (i.e., reality) and the subject who observes it. Positivists assume that the social world is made of necessities, and truth and universal laws exist that can rarely be changed by human action.

Axiology: Explanation and/or prediction. Given this ontological realism, the objective of research is to discover the reality and the universal laws (Hunt, 1990). Hence, research based on a positivist perspective aims to explain the cause of and to predict a phenomenon.

Epistemology: Positivist researchers seek nomothetic knowledge that is objective. In other words, the knowledge created is time-free, value-free, and context-independent. There is a real causality between entities. By accepting the assumption of objective knowledge, researchers are viewed as “outsider” investigators, to avoid creating a direct relationship with consumers during the research process.

Methodology: The positivist prefers experimental studies, surveys, and sophisticated statistical analysis aiming to test (i.e., confirm or reject) the existing theory by hypothetical-deductive logic (e.g., Kerlinger & Lee, 2000; Prager *et al.*, 2011)

Evaluation: From a positivist perspective, three essential criteria are used to evaluate scientific results; these include verifiability, confirmability, and refutability. In other words, the knowledge generated must be tested empirically. Hypotheses need to be

tested empirically in order to determine whether or not they represent reality correctly (Hunt, 1990).

However, the positivist perspective does not take into consideration some important factors in social science, such as (1) social interaction and the influence of researchers, (2) the personal beliefs and values of the researchers, and (3) the researchers' subjective interpretations of data, which are crucial for greater understanding of social phenomena (Peter & Olson, 1983). Hence, interpretivism is called for as an alternative perspective to positivism in marketing and consumer research.

3.2.2 Interpretivism

Ontology: Relativism. The most important distinction between positivism and interpretivism concerns the nature of reality. Interpretivists assume that reality has a relativist ontology, namely, that reality is “apprehendable in the form of multiple, intangible mental constructions, socially and experientially based, local and specific in nature (although elements are often shared among many individuals and even across cultures)” (Lincoln & Guba, 1985, p. 110). This means that reality depends upon the mental constructions of an individual or a group. Reality can be apprehended only through the sense impression and perception of human beings (Peter, 1992).

Epistemology: Subjectivist. Interpretivists assume that there is a link between subjects (i.e., researchers) and research objects (e.g., consumers). Researchers tend to develop more of “a degree of social agreement about the meanings of theories and empirical observation” than “a common law” (Peter & Olson, 1983, p. 120).

Axiology: Understanding. Given a relativist ontology and subjectivist epistemology assumptions, researchers tend to seek an understanding and to fully describe the phenomenon in a particular context through interpretation or the sense-making process.

Methodology: Research is conducted through inductive or abductive processes based on essentially qualitative approaches such as observation and interviews. Hence, research creates knowledge that is context-dependent (e.g., Belk *et al.*, 2013; Patton, 2015).

Evaluation: Ideography and empathy of knowledge are the two criteria needed to assess the quality of research. On the one hand, even if the researcher investigates a singular event, it is important to propose a precise description of the historical and social contexts in which the phenomenon took place. On the other hand, research has to create “a social agreement” about the meaning of the knowledge generated (Thiétart, 2014).

In the 1980s and 1990s, a discussion concerning the epistemology of marketing took place in some top-tier marketing journals (e.g., *Journal of Consumer Research*, *Journal of Marketing* and *Marketing Science*), and scholars called for enriched explanations of the nature of theory, methods, the preeminent goal of marketing, and consumer research. Some scholars such as Anderson (1983), Holbrook (1985), Hunt (1990), and Hudson & Ozanne (1988) called for the development of a specific field to create the kind of knowledge that targets consumers’ own interests (as opposed to managers’ concerns) to improve consumers’ welfare (Mick *et al.*, 2012a).

However, even though marketing is an applied field, for both positivists and interpretivists, the use and application of scientific knowledge to improve the welfare of society is not a primary objective (Derbaix & Brée, 2000), because the conventional paradigms tend to create “neutral information” that can be applied in different ways depending on the objectives of the individuals or groups applying it (Murray & Ozanne, 1991). Moreover, conventional perspectives tend to preserve rather than transform or improve the status quo. Revisiting the key issues relating to the goal of consumer research to improve consumers’ well-being, a few researchers (e.g., D.G. Mick, J. L. Ozanne, R. Hill) have called for a new research initiative drawing on a pragmatic and participative orientation in the fields of marketing and consumer behavior research,

which they have named transformative consumer research (TCR) (e.g., Hill et Dickinson, 2005; Mick, 2006; Ozanne *et al.*, 2011). The scholars within this research program aim to carry out research regarding consumers' interest in solving their problems and improving their well-being.

3.2.3 Transformative consumer research

TCR is a new academic initiative to investigate the role of consumption in society, focusing on five of the main investigated topics: Poverty, sustainability, health, vulnerability, and materialism. TCR is based on pragmatist and participative perspectives, and its goal is to “do practical research that can be used by consumers, activists, policy makers and business to improve consumer well-being” (Ozanne *et al.*, 2011, p. 1). Many TCR studies incorporate diverse key stakeholders within the research process (e.g., problem identification, data collection, application of findings) in order to improve societal benefit (e.g., non-academic knowledge, awareness, research use) (Davis & Ozanne, 2019; Ozanne *et al.*, 2017). Often, a TCR study does not necessarily explicitly focus on TCR in the paper (Davis & Ozanne, 2019). The conceptual boundaries of TCR include six commitments that are shared by researchers to varying degrees (i.e., improving well-being, encouraging paradigm diversity, using rigorous theories and methods, highlighting sociocultural and situational contexts, collaborating with consumers and their caretakers, and disseminating findings to relevant stakeholders) (Mick *et al.*, 2012a, p. 6). One of the most widely shared commitments is the objective to improve individual and/or collective well-being (e.g., consumers' state of health, sustainable consumption and production) (Davis & Ozanne, 2019; Mick *et al.*, 2012a).

Ontology: (1) The nature of reality: TCR is inspired by the ontological assumptions of interpretivists, critical theory (CT), and participatory action research (PAR). First, TCR advocates assume that reality has a relativist ontology. The social world is “cocreated,

context bound, relational and situate” (Ozanne & Saatcioglu, 2008, p. 425). Second, TCR also shares a “historical constructed reality” with CT. From this perspective, reality is socially constructed through constant interaction between subjects (e.g., meanings attributed by humans) and objects (e.g., social structure) (Ozanne & Saatcioglu, 2008). The social structure can be changed and improved by “reflective and change-oriented” methods based on “more inclusive interests.” Finally, TCR takes a Foucauldian perspective, according to which “consumers’ use of natural health mythologies to challenge medical discourses of power” (Ozanne & Saatcioglu, 2008, p. 425). (2) The nature of social beings: Like PAR, TCR posits that consumers can improve their well-being, but they are constrained by the existing social structure. Thus, increasing the power and capacity of consumers to challenge existing injustice in the social structure is one of the most important goals of TCR. To this end, TCR usually focuses on specific target populations, such as vulnerable, at-risk, and disadvantaged consumers (Mari, 2011).

Axiology: TCR examines the problematic backdrop of one or more of the dimensions of well-being, namely, the emotional, social, economic, physical, spiritual, environmental, or political context (McGregor & Goldsmith, 1998; Mick *et al.*, 2012a). The main goal of TCR is to improve consumers’ well-being, whether from an individual or a group perspective. Since it is impossible to maximize individual well-being without considering other people, TCR also aims to promote “social justice and the fair allocation of opportunities and resources” in society (Mick *et al.*, 2012a, p. 7). Therefore, researchers tend to move beyond the creation of knowledge to provide practical wisdom (Mick *et al.*, 2012a).

Epistemology: (1) Knowledge generated. From a conventional perspective (i.e., both positivism and interpretivism), the knowledge created by research as a “final product” is that which is published in a scientific journal. In contrast, TCR posits that knowledge is “uncertain, evolving, contextual and value laden” (Ozanne & Saatcioglu, 2008, p.

425). Thus, publication in a scientific journal is not the end goal of research, and findings can be reviewed and complemented by actors in practice. (2) Causality. Like CR and PAR, TCR posits that consumers' behaviors are influenced by causes and are constrained by social structures. It is critical to take contextual factors (e.g., historical, sociocultural, and political) into account when analyzing processes. Thus, TCR asserts that local or contextual reality is closely connected with macro-structural reality. (3) Research relationships: Like PAR, TCR postulates that consumers are both "participants and patterns" in the research process, because consumers can provide "thorough social accounts" and can improve the applications of findings.

Methodology: TCR promotes the diversity of methodology and collaboration with relevant stakeholders to achieve its transformative goals (Mick *et al.*, 2012b). For instance, participatory action research is one of the most common qualitative approaches for encouraging collaboration between researchers and stakeholders by integrating the latter into the whole research process, from problem identification (e.g., local needs and resources), data collection and assessment, and the application of findings, to knowledge dissemination (e.g., Ozanne & Anderson 2010; Ozanne & Saatcioglu, 2008). In contrast, activism research (AR) translates the qualitative associations of PAR (Ozanne et Saatcioglu, 2008) into a more understandable format for quantitative researchers (Wansink, 2012). AR focuses on actionable, targetable, solution-oriented variables that can create the best potential for transformation (e.g., Lynch Jr *et al.*, 2010; L. R. Young & Nestle, 2002).

Evaluation: TCR proposes six research commitments, including: "Improving well-being, encouraging paradigm diversity, using rigorous theories and methods, highlighting sociocultural and situational contexts, collaborating with consumers and their caretakers, and disseminating findings to relevant stakeholders" (Mick *et al.*, 2012b, p. 6).

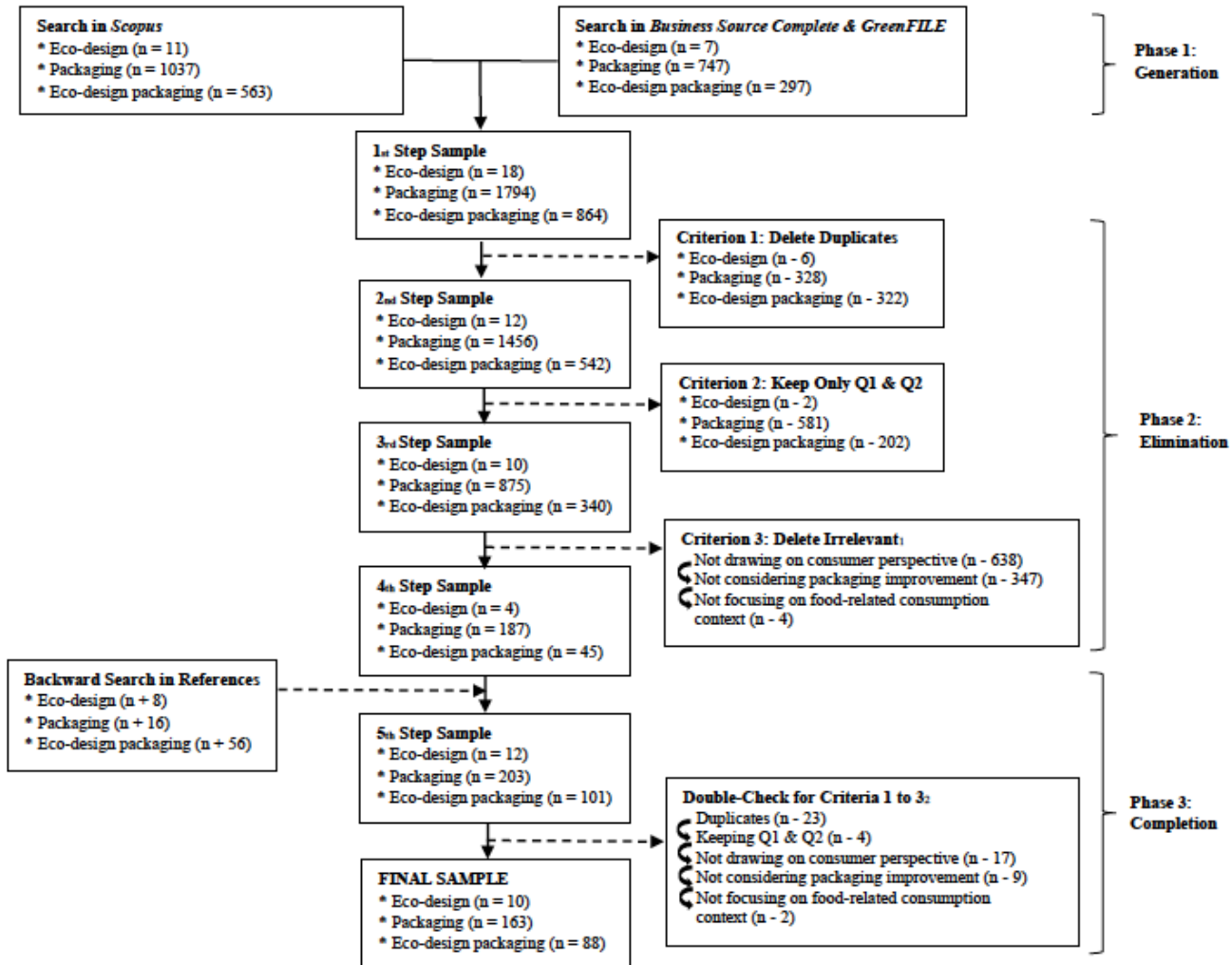
3.3 Research method

This article aims to provide a systematic review and analysis of the existing knowledge of eco-design packaging and directions for further research. Three overlapping concepts related to eco-design packaging (i.e., eco-design, packaging, and eco-designed packaging) in marketing are assessed through the epistemological lenses of positivism, interpretivism, and TCR.

3.3.1 Article selection procedure

A systematic literature search was conducted to identify relevant studies on the topic. The procedure followed the systematic review protocol developed by Arksey & O'Malley (2005). Precisely, the selection process was carried out in three main phases (i.e., sample generation, elimination, and completion) to construct an exhaustive database on the subject (see figure 3.1)

Figure 3.1 Article selection



Notes:

1 Breakdown by category:

	Eco-design	Packaging	Eco-design packaging	Total
Not drawing on consumer perspective:	6	462	170	638
Not focusing on packaging redesign:	0	227	120	347
Not focusing on food-related consumption context:	0	0	4	4

2 Breakdown by category:

	Eco-design	Packaging	Eco-design packaging	Total
Duplicates:	0	22	1	23
Keeping Q1 & Q2	0	3	1	4
Not drawing on consumer perspective:	2	10	5	17
Not focusing on packaging redesign:	0	5	4	9
Not focusing on food-related consumption context:	0	0	2	2

Phase 1: Sample generation. Three complementary databases—Scopus, Business Complete, and GreenFile (the latter two are both part of EBSCO database)—were searched for peer-reviewed articles. The keywords in Table A1 were used to screen the titles, abstracts, and keywords for three themes: Eco-design,¹¹ packaging,¹² and eco-design packaging.¹³ The search included articles published in business, management, and environmental science from all countries up until 13th March 2020. The first step returned 18 articles related to eco-design, 1794 articles related to packaging, and 864 articles related to eco-design packaging, respectively.

Phase 2: Sampling elimination. After removing duplicates (Elimination Criterion 1), the second step resulted in 12 articles related to eco-design, 1456 articles related to packaging, and 542 articles related to eco-design packaging, respectively.

Only the top-tier journals (classified in Q1¹⁴ or Q2 in SJR¹⁵ 2018) were included for the next steps (Elimination Criterion 2). The third step returned 10 papers related to eco-design, 875 papers related to packaging, and 340 papers related to eco-design packaging, respectively.

Then, the content of the selected papers in the third sample (i.e., after the third step) were screened for their relevance with three predefined criteria. The papers were kept if they included the following aspects: (1) A focus on the consumer perspective (i.e., excluding papers that did not focus on consumers' perceptions or behaviors; for instance, papers with a managerial perspective only), since consumers' behavior

¹¹ Focus on the link between eco-design and consumers in the food sector. The search excludes the impact of packaging on consumers to avoid duplicates across the three themes.

¹² Focus on the impacts of food packaging on consumers' behaviors.

¹³ Focus on the impacts of eco-design food packaging on consumers' behaviors. In the present article, the term "eco-design packaging" is used to describe a group of packaging that has a comparatively low environmental impact such as: eco-design packaging, eco-friendly packaging, sustainable packaging.

¹⁴ The journals selected were classified in Q1 or Q2 in SJR 2018. Quartile rankings: Q1 denotes the top 25% of impact factor (IF) distribution; Q2 denotes the middle-high position (between the top 50% and the top 25%).

¹⁵ Based on SCImago Journal Rank indicator 2018 in marketing. SJR is a measure of a journal's impact, influence, or prestige. It expresses the average number of weighted citations received in the selected year by the documents published in the journal in the previous three years.

determinants (e.g., perception, attitude, needs) are important for packaging innovation (Polizzi di Sorrentino *et al.*, 2016; Wikström *et al.*, 2016); (2) a focus on the impacts of packaging improvement/innovation (e.g., sustainable materials, resealability); and (3) a focus on the food industry (i.e., they excluded consumer energy consumption, energy, and waste electrical and electronic equipment (WEEE) consumer behavior; or they excluded eco-design service and events) (Criterion 3). The fourth step returned 4 papers related to eco-design, 187 papers related to packaging, and 45 papers related to eco-design packaging, respectively.

Phase 3: Sample completion. A backward search for additional relevant articles found in the reference lists of the papers already considered was also performed. In addition, papers and research reports stemming from “grey literature” (e.g., research reports from Food and agriculture organization [FAO], French national council of packaging, Waste & resources action programme [WRAP]) that were included in the reference list of these papers were also added. In total, the backward search generated 8 references related to eco-design, 16 references related to packaging, and 56 papers related to eco-design packaging, respectively. Lastly, the fifth step involved checking the fit of the papers to criteria 1 to 3 once more in order to generate the final sample.

At the end of the process, 261 references were selected: 10 on eco-design, 163 on packaging, and 88 on eco-design packaging.

3.3.2 Epistemological assignment

The assignment of the epistemological position (positivism, interpretivism, TCR) of the selected references was conducted through three successive steps (see Table A2).

Step 1. Identifying TCR research based on the two questions related to the axiology. TCR research was identified through two questions: (1) Is maximizing the social

awareness, use, and social benefit of eco-design, packaging, and eco-design packaging part of the explicit goals of the paper? (2) Is the article/report aiming to improve the well-being of consumers or to solve societal issues? If the answer was yes for both questions, then the article was assigned to the TCR studies category. In contrast, if the answer was for any one of these two questions, step 2 was carried out.

Step 2. Identifying positivist research based on axiology and the hypothetico-deductive method. The references were checked for fit using three questions, as follows: (1) Is the article implying causality testing (e.g., experiment)? (2) Is the research based on other quantitative methods (e.g., survey, structural equation modeling, conjoint analysis, regression, LCA)? (3) Do the primary indicators refer to whether the research is based on model and/or hypothesis development and/or testing?¹⁶ If the answer was yes for one of these questions, then the reference was assigned to the positivist research category. If not or if it was not specified, then step 3 was carried out.

Step 3. Identifying interpretivist research based on axiology and the inductive method. In the last step, the remaining references were checked for their fit using three questions: (1) Is the article aiming to understand and describe in-depth and completely the phenomenon of interest? (2) Is the article using traditional qualitative approaches for data collection (e.g., in-depth interview, projective technique, ethnography, semiotic analysis, etc.).

¹⁶ Note: Qualitative research can follow positivism in that the aim of qualitative research can be to test pre-existing conceptual frameworks (or models) Hudson, L. A. et Ozanne, J. L. (1988). Alternative ways of seeking knowledge in consumer research. *Journal of Consumer Research*, 14(4), 508-521. <https://www.jstor.org/stable/2489157> . See, for instance, the paper of Gustavo et al. (2018)

3.3.3 Data analysis

All of the selected references were classified according to their publication information (i.e., authors, country, title, journal), epistemological position, and conclusion. Then, content analysis was carried out based on the five above-mentioned epistemological criteria (i.e., ontology, axiology, epistemology, methodology, and evaluation) and the conclusion.

3.4 Results

Out of the 261 selected studies, 10 articles focused on eco-design, 163 articles focused on packaging (including 6 TCR articles), and 88 focused on eco-design packaging (including 8 TCR articles). All of the studies that focused on eco-design were published after 2000, which indicates the growing interest in eco-conception techniques. Of the 88 studies on eco-design packaging, 80 were conducted between 2010 and 2020, which indicates an increasing interest in topics related to sustainability and packaging innovation in the last 10 years. Only 16 references were identified as TCR-oriented studies. These 16 articles covered three main TCR topics: Consumers' vulnerability, consumers' state of health, and sustainability. The next section examines the selected studies on eco-design, packaging, and eco-design packaging through the three main epistemology perspectives of positivism, interpretivism, and TCR (see Table 3.2).

Tableau 3.2 Epistemological analysis of eco-design, packaging and eco-design packaging

	Eco-design	Packaging	Eco-design packaging		
Topic	<p>Conceptualization of eco-design.</p> <p>Application of eco-design (positivism)</p>	<p>Effects of packaging attributes on the consumption life cycle.</p> <p>Consumption experience (interpretivism).</p>	<p>Motivation/reasons behind consumers' actions (interpretivism).</p>		
Orientation	<p>Dominated by positivism (industrial perspective focuses on legislation and regulation of the production process; economics).</p>	<p>Dominated by positivism (psychology, consumers' behaviors).</p>	Interpretivism	Positivism	
Ontology	<p>Eco-design is characterized by three aspects:</p> <ol style="list-style-type: none"> (1) The environmental and/or social objective in the life cycle; (2) LCA; (3) Normative requirements, such as: International Organization for Standardization (ISO) 14062 and ISO 14006. 	<ul style="list-style-type: none"> • Packaging is seen as a set of attributes (e.g., size, shape, material, color, text, brand, etc.) (i.e., multi-attribute theory). • Classification of packaging attributes: <ul style="list-style-type: none"> - Visual vs. verbal - Graphics vs. structural 	<ul style="list-style-type: none"> • Packaging gives a narrative value of the product: The set of material (i.e., technical) meanings and non-material (i.e., imagined) meanings of the product. • Consumers' perceptions of the packaging 	<ul style="list-style-type: none"> • The essence of eco-designed or green packaging is determined; hence, eco-designed packaging is tangible, fragmentable, divisible, and made of discrete elements. • The green attribute translates as "ecological information" (eco-label, nutrition information, etc.) 	<p>The essence of eco-designed packaging cannot be achieved; it is socially constructed by people through interaction with their environment.</p>

	Eco-design	Packaging	Eco-design packaging
	<ul style="list-style-type: none"> The essence of "eco-design" is determined, reached through LCA procedures. Eco-design is seen as a tangible, divisible process made of discrete criteria, integrating the environmental and social points of view. 		<p>depend on their interpretations.</p>
<p>Axiology</p>	<p>Managerial and industrial perspective → meeting the requirements of the sustainable development of the company at the social and environmental levels (ISO 14000)—in particular, economic.</p>	<p>Managerial perspective (dominant):</p> <ul style="list-style-type: none"> Explain the effects of packaging attributes on consumers' behaviors in the purchasing process (e.g., perception, attitude toward the product, the brand, the quality, etc.) Then predict the typical answer. To identify the typology of consumers according to their 	<p>The main purpose of the study is to better understand how consumers attribute meaning (sensemaking) to packaging.</p> <ul style="list-style-type: none"> The brand management tool, product design. The existing causality between "green attributes" and "consumers' reactions or decisions." <ul style="list-style-type: none"> The practical utility is sought, but is not the first concern. The consumer is someone who experiences feelings and emotions through consumption (not limited to the purchase) of the eco-packaged product.

	Eco-design	Packaging	Eco-design packaging
<p>Epistemology (knowledge generation, causality, relationship between researcher–research object)</p>	<ul style="list-style-type: none"> • Knowledge is used as a "lever"; always seek utilities. • The researcher is like "an engineer," engineering science based on "gap analysis" to solve managerial and/or industrial problems. 	<p>reactions toward packaging.</p> <ul style="list-style-type: none"> • Existence of the cause-and-effect relationship between "packaging" and "people's reactions" (e.g., attitude, emotion, behavior, etc.) • The consumer is seen as an acquirer and caterer of information (cognitive psychology) to make an objective decision. 	<ul style="list-style-type: none"> • Existence of the cause-and-effect relationship between "packaging" and "people's reactions" (e.g., attitude, emotion, behavior, etc.). • The consumer is seen as acquiring and catering information (cognitive psychology) to make an objective decision.

	Eco-design	Packaging	Eco-design packaging
<p>Limitations</p> <p>The majority of the studies devoted to eco-design are limited in industry, based instead on the managerial perspective to meet the normative requirements; few studies consider the needs of the consumers.</p>	<ul style="list-style-type: none"> • Study the consumer (a subjective state) as an object, without considering the social context, history, and culture and consumers' perceptions of packaging. • Most studies use experimentation to verify the effects of various packaging attributes on people's responses. • The sample is limited to students. 	<ul style="list-style-type: none"> • Ambiguity of the conceptualization of "eco-designed packaging." • Acontextual results. • Focus on the profit (i.e., positive side) of green packaging. • The cognitive perspective often overlooks the emotional aspects of the consumer. 	<p>Does not indicate how to put theory into practice to solve real problems.</p>

3.4.1 Positivist perspective

The findings of the systematic review indicate that positivism is the predominant perspective in the studies on eco-design (8/10 references), packaging (143/163 references), and eco-design packaging (75/88 references). The studies focusing on eco-design can be classified into two categories: The first one deals with the conceptualization of eco-design, and the second one focuses on the application of eco-design.

The conceptualization of eco-design is examined from the industrial angle. The fundamental characteristics and the processes of eco-design are identified to propose a conceptual definition of the term. Eco-design can be defined by three essential features: (1) Integrating environmental and social goals into the life cycle of products and their packaging; (2) adopting an LCA approach; and (3) respecting technical commitments to environmental management, such as the International Organization for Standardization (ISO)/TR 1406:2002¹⁷ or ISO 14006:2011.¹⁸ In this regard, the nature of eco-design (i.e., the object) can be determined according to precise norms and regulations independent of the subject. Thus, eco-design is investigated as a tangible, divisible concept made of discrete criteria such as “integrating the environmental point of view” (Zwolinski, 2013), “reducing environmental impacts” (Puaut, 2008), “life cycle” (Aït-El-Hadj, 2013; Pense-Lheritier, 2013; Zwolinski, 2013), and “life-cycle assessment” (Karlsson & Luttrupp, 2006; Polizzi di Sorrentino *et al.*, 2016).

¹⁷ ISO/TR 14062:2002 describes concepts and current practices relating to the integration of environmental aspects into product design and development.

¹⁸ ISO 14006:2011 provides guidelines to assist organizations in establishing, documenting, implementing, maintaining, and continually improving their management of eco-design as part of an environmental management system (EMS).

Studies focusing on the application of eco-design view it as a way to promote product innovation and to improve logistics and operations management, since eco-design creates a new perspective to evaluate products, including their packaging, through LCA (Karlsson & Luttrupp, 2006). Previous behavior studies show that eco-design can improve consumers' perceptions regarding the brand image and product value by taking into account consumers' environmental (e.g., using recycled material, reducing negative impacts during production) and social concerns (e.g., respecting human beings, avoiding greenwashing) (Ottman *et al.*, 2006). Moreover, companies can create a strong brand image and enhanced stakeholder trust through adopting eco-design practices (Puaut, 2008).

In sum, from a positivist perspective, the essence of eco-design can be apprehended through the LCA approach. There is a causal relationship between the implementation of the eco-design process and the reduction of negative environmental and/or societal impacts throughout the product's life cycle. At the axiological level, eco-design is seen as a means to meet industrial and managerial expectations.

Studies dealing with the effects of packaging are also dominated by the positivist perspective. Packaging is mostly examined through an analytical perspective, positing that packaging is an independent component of products. These studies usually evolve using the consumption life cycle: Acquisition → purchasing → consumption and possession → post consumption. Most of the studies reviewed focus on issues upstream of the consumption life cycle, namely, the acquisition process or making purchasing decisions.

From the cognitive psychology perspective, consumers are viewed as acquirers and providers of information for objective decision making. Using the multi-attribute theory (Fishbein, 1976), the concept of packaging is seen as a combination of different attributes such as shape, size, color, and graphs (Smith, 2004) or size, shape, material, color, text, and brand (Kotler, 2003). Thus, there are graphic attributes (e.g., color,

photograph, image, and logo) and structural attributes (e.g., materials, shape, weight) (Underwood, 2003; Underwood *et al.*, 2001). As there is no consensus on the classification of packaging attributes, most studies focus on the impacts of either one attribute or a combination of attributes on the purchase process (e.g., perception, attitude toward the product, the brand, the quality). Their goal is to test the causality between packaging attributes and consumers' cognitive reactions (e.g., attitude toward the product and the brand, consumers' preferences and perceptions toward the product) through experimental studies and statistical analyses (e.g., L. Becker *et al.*, 2011; Agnieszka & Iwanicka, 2015; Deng & Srinivasan, 2013).

Positivists also share the assumption of dualism and the separation of the researcher and the research object (e.g., consumers). However, scant attention is paid to the effects of eco-design packaging (or eco-designed packaging) because of the absence of a consensual definition of eco-design in the marketing literature. Most studies investigating the environmental effects of packaging on consumers' reactions use concepts such as eco-friendly packaging or green packaging.

3.4.2 Interpretivist perspective

From an interpretivist perspective, studies are more likely to focus on consumers' purchases or experiences rather than on the decision-making process (Block *et al.*, 2011). Packaging is seen as an object that gives a narrative value to products. More precisely, it is viewed as a set of material or technical meanings and non-material meanings (i.e., imagined) of products (Dano, 1998). In other words, consumers' perceptions of packaging depend on their interpretations. As a result, the main purpose of investigations is to better understand how consumers make sense of packaging rather than to meet managerial requirements. By accepting relativistic assumptions about the nature of packaging, studies are guided by the inductive approach, which begins with

the data, whether the data emerge from individual or focus group interviews or are constituted by the literature.

Given the research objective of understanding consumers' consumption experiences, studies use a qualitative approach involving interviews, a semiotic approach, conceptual mapping, and a projective approach. Other researchers encourage employing the semiotic approach in the fields of marketing and consumer behavior (Mick *et al.*, 2004). From their perspective, the meaning of the commercial world is fundamental. Consumers are "continually acquiring, using, sharing experiences, and disposing in substantial accordance with the meanings they attribute to products and packaging" (Mick *et al.*, 2004, p. 1). When using the semiotic approach, researchers are able to focus on the meaning attribution and interpretation process rather than the information process (from an economic or a cognitive perspective). In the field of packaging design, researchers aim to understand how consumers attribute meanings to products, brand images, and purchasing decisions through packaging (Dano, 1996, 1998), using the semiotic approach to investigate the effects of packaging on consumers. From this perspective, packaging is viewed as a "discourse" that contains different types of signs: Linguistic signs (e.g., words, sentences) and sign icons (e.g., photographs). Dano (1996) identified three essential values that packaging communicates to consumers: (1) A sensory value, communicating mainly through sensory attributes such as materials, color, and shape; (2) a functional value, describing the function and use of the product; and (3) a social value, usually linked to the target market and position of products through no sensory attributes (e.g., an environmental label). For instance, marketers use environmentally friendly packaging to sell organic food. In this regard, packaging is seen as a tool that consumers experience and assign meaning to (e.g., one way to protect the environment). As a consequence, environmentally friendly packaging is a powerful communication tool to sell green products.

Gelici-Zeko *et al.* (2013) used categorizing and perceptual mapping methods (Schoormans *et al.*, 2010), which are diametrically opposed, to investigate consumers' reactions to food packaging and its effects regarding food acceptability and purchase decisions in supermarkets. By comparing and contrasting the results of categorization and perceptual mapping, the authors identified a prototype of products based on consumers' perceptions of packaging.

Interpretivist researchers assume that the essence of eco-design packaging and eco-friendly packaging cannot be completely discernible, because eco-design packaging is a social construct that depends on consumers' perceptions and sense impressions. The practical utility of packaging is not the first concern of research. Consumers are viewed as experiencing feelings and emotions through the consumption (not limited to the purchase) of the eco-packaged product.

In particular, consumers' perceptions of eco-packaged products is an important topic in the field. In general, the goal is to understand the impacts of eco-design packaging on consumers' perceptions and purchase decisions from their own perspectives. To meet this objective, researchers use qualitative techniques such as in-depth interviews, observation, and the projective technique.

For instance, Magnier and Crié (2015) used a hybrid method that combines eight in-depth interviews followed by 10 Zaltman Metaphor Elicitation Technique (ZMET) interviews (Coulter & Zaltman, 1994) to investigate the impact of eco-design packaging on consumers' perceptions. The findings show that, from a consumer perspective, eco-design packaging is seen as an aggregate of eco-friendly attributes within three categories: Structural cues (e.g., material, recyclability, reusability), graphical cues (e.g., colors, pictures, logos), and informational cues (e.g., claims, carbon footprints).

3.4.3 TCR perspective

Of the references reviewed, only 16 articles used a TCR perspective covering three TCR topics: Vulnerability, state of health, and sustainable development.

3.4.3.1 Topic 1: Consumer vulnerability

Consumers' vulnerability is one of the key topics in the domain of TCR, which is investigated through demographic, environmental, situational, community, and context perspectives (Baker & Mason, 2012). The existing literature that focuses on the link between packaging and vulnerability is mainly addressed by the situational approach. From this standpoint, consumers' vulnerability is viewed as the outcome of various determinants, such as: Personal (e.g., age, gender), economic (e.g., material resources, market activities), and ecological conditions (Baker *et al.*, 2005; Hill & Stamey, 1990; Wisner, 2004). In other words, vulnerability is defined as “*a dynamic multidimensionally state characterized by powerlessness and dependence*” (Baker et Mason, 2012, p. 545) and depends on a particular situation (e.g., consumption experiences).

Most of the studies investigate the impacts of packaging innovation in vulnerable at-risk groups (e.g., older or child consumers). For instance, Ford *et al.* (2016) examined the link between packaging, aging (i.e., biological, psychological, and social), and vulnerability through the packaging journey (e.g., point of sale, transport, household storage, consumer service). The study aimed to reduce the vulnerability and powerlessness of older consumers through packaging innovation and by improving the packaging-related consumption experience. The findings of 11 in-depth interviews and participant observations show the effect of packaging on all three dimensions of aging, especially in terms of psychological and social aging. Moreover, older consumers perceive their own powerlessness during their interactions with particular packaging

attributes (i.e., difficult to open). Likewise, Heiniö *et al.* (2017) highlighted the most valued packaging attributes that influence older consumers' nutritional intakes and independence, including easy readability, easy disposability and recyclability, visibility of the contents, and easy opening. Duizer *et al.* (2009) revealed that recyclability, fair payment of producers, low energy use, and low carbon dioxide emissions during production and shipping have the most important impact on older consumers' food product consumption decisions through a face-to-face survey ($n = 100$) and a focus group ($n = 13$).

3.4.3.2 Topic 2: Consumers' state of health

Mick *et al.* (2012a, p. 9) stated that the main goal of TCR research is to improve people's well-being. In other words, TCR aims to achieve "a state of flourishing," including good health, happiness, and prosperity. Hence, investigations focused on consumers' state of health constitute an important area of TCR. Of the references reviewed, four articles investigated the effects of packaging attributes on consumers' health, focusing in particular on the healthiness of the foods purchased. Based on this food well-being framework (Block *et al.*, 2011; Ozanne *et al.*, 2017), TCR aims to increase people's awareness of health-related problems (e.g., obesity and diabetes), and thus encourages consumers to adopt healthy behaviors (Gorge *et al.*, 2015). TCR also aims to be actively involved with different stakeholders, including consumers, marketing managers, retailers, producers, and public policy-makers (Scammon *et al.*, 2011).

Cook, *et al.* (2013) estimated the impacts of the inclusion of nutrition facts panels (NFPs) on the packaging of ground-meat products. They used the assimilation–contrast theory (Burton *et al.*, 2018) to view packaging as a communication and education tool regarding nutrition-related information. In line with the assimilation–contrast theory, an external element of information (e.g., an NFP) may influence consumers' internal

reference values, which in turn influences their evaluation of products and their purchase intentions. The results of three studies (i.e., a cross-sectional survey, followed by two between-subject experiments) indicate that an NFP is a moderator of the effects of the lean-to-fat ratio (70% lean/30% fat; 85%/15%; 95%/5%) on consumers' product evaluations, which in turn influences their purchase intentions. Consumers' perceptions of an NFP label increase the perceived risk of diabetes, and ultimately reduce the perception of the healthiness of products, thus decreasing purchase intentions.

Chandon (2013) showed how food packaging design may influence consumers' expectations of products and purchasing behaviors through the concept of "health halos," namely, the claims that make consumers believe foods to be more or less healthy (i.e., nutrition) or pleasant (e.g. taste). In general, health halos positively influence consumers' food consumption because consumers perceive fewer health-related risks when they consume food believed to be healthier or tastier (Ramanathan & Williams, 2007). In addition, the effect of health halos on consumers' purchase decisions is moderated by their expectations toward other products in the same category (Chandon, 2013; Kiesel & Villas-Boas, 2013; Kozup *et al.*, 2003). By manipulating three main packaging attributes, namely, cues, shapes, and sizes, researchers aim to identify how these attributes change consumers' quantity and quality expectations (e.g., pleasantness/healthiness) of food, hence ultimately helping to reduce obesity risks.

Likewise, Aerts and Smits (2019) examined the impacts of the depicted suggestions of portion size manipulation on quantity in-take through two mixed experimental studies with child consumers. The findings show that children tend to consume more when presented with packaging containing a larger depicted suggested portion size compared to a regular one. Therefore, this study highlights the importance of packaging innovation, especially regarding portion sizes, on overconsumption and childhood obesity issues.

Bell *et al.* (2016) attempted to assess the impact of packaging commodities (e.g., resealability: Easy to open) on malnourished older consumers in hospital. The authors adapted an ergonomics research method combined with qualitative and quantitative approaches to confirm the conclusions of previous research that the resealability of the packaging can improve older consumers' nutrition.

Van Ooijen *et al.* (2017) established that the shape of packaging can be used as a cue to communicate the healthiness of food. They performed three 2×2 mixed experiments with 1196 consumers. The findings show that: (1) A slim body shape of packaging is seen as a cue for product healthiness (low calories) more so than a wide body shape; (2) consumer's preferences toward slim packaging are related to his/her health-related shopping goal.

3.4.3.3 Topic 3: Sustainability

From a TCR perspective, research on sustainability involves issues of sustainable consumption and production (SC&P), hence dealing with both product consumption and production. SC&P can be defined as “the use of services and related products, which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of further generations” (McDonagh *et al.*, 2012, p. 271). TCR investigations involve both individual and collective levels of consumption: At an individual level, research focuses on consumers' access, opportunities, and choices to help them make better decisions, given the limitations of environmental constraints. In this case, TCR is used as a decision-making tool. At a collective level, research focuses on how to reduce the overall volume of consumption of human beings.

In the last five years, the environmental impact of packaging—in particular, its effects on food waste generation—has become an issue of increasing concern for stakeholders (Hebrok & Heidenstrøm, 2019; Schanes *et al.*, 2018; Wikström *et al.*, 2016). In light of the complex interdisciplinarity nature (i.e., a combination of cognitive psychology, industry, and sociology) and relevance of these phenomena, such studies are usually published in several top-tier international transdisciplinary journals focusing on sustainability and/or food issues, such as the *Journal of Cleaner Production*, *Appetite*, *Food Quality and Preference*, *Food Research International*, *Sustainability*, and *Environment and Behavior*.

A number of studies point to eco-design packaging as a potential tool to influence consumers' sustainable behavior. For instance, De Bondt *et al.* (2017) examined the impacts of packaging resealability on food consumption volume by combining experiments and consumption diaries. The findings show that resealable packaging affects consumers' consumption volume intentions by controlling temporary state factors (e.g., hunger level and mood) and self-regulation. Most participants stated that they intended not to consume the entire contents of a large-sized package (54 oz) if it is in resealable packaging.

Furthermore, Wikström *et al.* (2016) investigated the effects of the shape of packaging (e.g., a lightweight tube and a tray) on consumers' recycling and food waste behaviors. The authors suggested that behavior sciences (e.g., internal factors of consumers, such as motivations, attitudes, needs, and knowledge) should be incorporated into LCA to bring valuable insights into eco-design. Likewise, Williams *et al.* (2018) investigated the impacts of the functions of packaging on consumers' recycling and waste behaviors. These studies have made three contributions for a better understanding regarding packaging functions on consumers' pro-environmental behaviors: Firstly, they identified the main obstacles that cause consumers to dispose of packaging in relation to the functions of said packaging (i.e., the attitude toward cleanliness, the effort

required to clean and sort, and uncertainties about the best environmental alternative); secondly, they revealed that packaging functions affect consumers' recycling decisions through their attitudes toward cleanliness, the effort required to clean and sort the packaging, and the uncertainties regarding the best environmental alternative; and lastly, they highlighted the packaging functions that influence consumers' recycling behaviors (e.g., easy to separate different materials, easy to separate different parts, easy to clean, easy to empty, easy to reseal, easy to compress, and the communication regarding recycling).

Recently, Wikström *et al.* (2019) revealed that packaging optimization can be a strategical solution for reducing food waste and loss, highlighting five research avenues: (1) Examining the impacts of packaging functions on food waste; (2) investigating the overall environmental impacts of product packaging through a trade-off between "functionality" (e.g., product protection and conservation) and "sustainability" (e.g., reducing the environmental footprint); (3) packaging function and environmental footprint evaluation; (4) incorporating food waste issues into packaging design; and (5) exploring business models to reduce food waste by considering relevant stakeholder incentives.

Hebrok and Heidenstrøm (2019) focused on the impact of food-related practices (i.e., acquiring, storing, assessing, valuing, and eating) on food waste. Drawing on 26 fieldworks from 26 households in Norway, the authors attempted to provide more in-depth understanding of the drivers of food waste. The findings highlight that packaging could play a more central role in food waste reduction by improving portion divisions, visibility, and stockability.

Although an increasing amount TCR research focuses on eco-design packaging and consumers' sustainable behaviors (in particular, consumers' food waste behaviors), the limited focus on the social impact of eco-design packaging shows a lack of: (1) A consensual theoretical framework applied to the complex interdisciplinary interplay

between industry, consumers' behaviors, and sociology to understand how it impacts the relationship between eco-design packaging and consumers' sustainable behaviors; and (2) a systematic method for academic knowledge–practice wisdom transformation.

The next section of the paper begins with a discussion of the key factors (i.e., research outputs, awareness, use, and societal benefits) for improving the societal impact of research, and then provides a transformative agenda for future research.

3.5 Conceptualizing a transformative research agenda

3.5.1 Maximization of the societal impact of research

Flyvbjerg (2001) argued that the primary objective of social science is to contribute to rational practice in society rather than theory building. Working within the discipline of social science, marketing and consumer behavior researchers aim to improve the societal impact of their research by reframing both the research process and the knowledge transfer process (Ozanne *et al.*, 2017).

The research impact of a study is measured in terms of four dimensions: The first one is the creation of a knowledge product in the form of a journal article, model, theory, or measurement instrument. The second dimension refers to using the mass media to ensure the societal awareness of research findings through media interviews or press articles. The third dimension corresponds to the use or application of the knowledge produced, involving, for instance, how consumers or managers use research findings as a tool for decision making. The fourth dimension refers to the societal benefits of the knowledge generated. Moreover, the first three dimensions are a necessary but not sufficient condition to achieve societal benefits. Although the latter are traditionally overlooked, they are viewed as one of the most important criteria for the assessment of research impacts.

Studies on eco-design, packaging, and eco-design packaging show that research based on conventional perspectives (i.e., positivism and interpretivism) rarely have a positive societal outcome. The knowledge generated cannot be used directly to change consumers' beliefs and/or behaviors, because, from these perspectives, knowledge about eco-design, packaging, and eco-designed packaging is viewed as neutral information that is independent of its applications by different interest groups (e.g., consumers or companies). As a result, work based on conventional perspectives tends to preserve society's current system, instead of bringing about positive change (Murray & Ozanne, 1991). Moreover, the primary concern of research based on conventional perspectives is to create the knowledge product (e.g., model, theory) destined to be published in a journal article or presented at a conference, rather than to bring societal benefits. This central goal could be the reason for the limited impact of the previous work on this topic.

3.5.2 Transformative research agenda on eco-design packaging

3.5.2.1 Track 1: Motivation and resistance to eco-packaged products

The literature review has shown that previous studies on the effects of sustainable packaging on consumers' behaviors are limited to positive aspects. The purpose of these studies is to comprehend how consumers value a product through the sustainable features of its packaging in the decision-making process (Magnier & Crié, 2015; Thomas, 2014). However, such studies are limited to understanding the gap between consumers' attitudes and behaviors. For instance, little attention is paid to consumers' perceived risks related to eco-design packaging. Since no study has focused upon the links between "eco-design packaging," "perceived risks," and "consumers' behaviors," it seems necessary to explore consumers' perceived risks toward eco-design packaging in the purchasing decision process. By shifting the focus to the "negative" reactions of

consumers (i.e., perceived risks), research can provide a complete understanding of the motivations and resistance associated with eco-design packaging. To meet this objective, it is appropriate to adapt PAR. This approach provides in-depth understanding of consumers, and then co-creates actions by integrating consumers into the research process. More precisely, consumers play a double role in research: On the one hand, they are the “object” or “phenomenon” under investigation, and on the other hand, they are the “partners of researchers” who participate in the whole research process. Therefore, consumers can obtain knowledge about eco-design packaging through participating in the research process, namely, identifying a problem, selecting a methodological approach (in terms of data collection and analysis), proposing and putting solutions in place, and evaluating the social change agenda (Ozanne & Saatcioglu, 2008). More precisely, research involves two steps: (1) Identifying the core problem related to the consumption of eco-packaged products (e.g., motivations and barriers) through focus groups, and (2) collecting and analyzing data through the means–end chain (MEC) approach (Valette-Florence, 1994). The transversal pattern based on MEC (attributes → perceived risk → value) enhances the understanding of the structure of people’s cognitive chain of perceived risk and representative chains of the purchasing decision process of eco-packaged products.

This first track may provide societal benefit from the following aspects:

Academic knowledge: This track makes three key theoretical contributions to the literature, focusing on consumers’ reactions toward eco-design packaging and eco-packaged products, and meets the three criteria for useful theoretical knowledge: “What,” “how,” and “why” (Whetten, 1989). Firstly, this track can explore consumers’ negative reactions (i.e., perceived risk), thus providing a complete understanding of consumers’ reactions toward eco-design packaging and eco-packaged products (e.g., benefits and risks) (i.e., contributions regarding the “what”). Then, this track can also clarify how consumers' perceptions of the attributes of eco-design packaging influence

their decision-making processes associated with eco-packaged products by their cognitive chain (i.e., a linkage of the attributes of eco-design packaging, the consequences of consumers' behaviors associated with eco-design packaging, and individual values) (i.e., contributions regarding the "how"). Lastly, with a shift in focus to consumers' negative reactions (i.e., perceived risks), this track can better explain why consumers do not purchase the eco-packaged product even if they have positive attitudes toward such packaging (i.e., contributions regarding the "why").

Problem-focused knowledge: Besides academic knowledge, this study creates problem-focused knowledge that can be used by consumers, since researchers establish an engaged connection with the end users—i.e., consumers. In other words, consumers' needs are integrated throughout the research processes (e.g., research question, data collection, dissemination of the findings).

Awareness: This track may increase the awareness of marketing managers and policy-makers regarding the perceived risks, concerns and misunderstandings of consumers toward eco-design packaging and the role of packaging in general.

Research use: These findings can be useful for key stakeholders. For consumers, research may eliminate their concerns and misunderstandings toward eco-design packaging and eco-packaged products, and then help them choose the appropriate product through packaging innovation. In other words, such study can translate the conceptual use of "eco-design packaging" into an instrumental use to help consumers' consumption routines (e.g., identify sustainable products, encourage recycling behavior). For marketing managers, the results may improve the visibility of the sustainability of eco-design packaging and products by incorporating attributes that can be perceived by consumers (e.g., eco-friendly materials). Likewise, the results may provide insights into how to improve communication strategy and avoid greenwashing. For packaging producers, the results can explore the internal factors of consumers (e.g., individual values, perceptions, attitudes, motivation, and knowledge) toward the

attributes and functions of eco-design packaging, thus improving packaging development and innovation procedures (e.g., LCA).

Social benefit: This track may result in greater social benefit by a trickle-horizontal approach, such as engaging the end users (i.e., consumers) throughout the research process (see Table 3.3).

Tableau 3.3 Transformative research agenda

Track	Problematization	Research objective (transformation goal)	Societal impact
Motivation and resistance toward eco-packaged products	<ul style="list-style-type: none"> Focus on the benefits, overlooking the perceived risks. Lack of consumer relevance. Overlooking consumers' behavior determinants. 	Explore the perceived benefits and risks of eco-designed packaging (improve consumers' understanding of eco-design packaging).	<p>(1) <u>Research output</u></p> <p>Academic knowledge</p> <ul style="list-style-type: none"> What are perceived risks associated with eco-packaged products' consumption? How do packaging attributes influence consumers' purchasing decisions in regard to eco-packaged products? Why does an attitude–behavior gap exist in regard to eco-packaged products' consumption? <p>Non-academic knowledge product</p> <ul style="list-style-type: none"> Processes: Build an engaged connection with end-users (i.e., consumers) and key stakeholders (i.e., marketing managers, packaging producers, policy-makers) throughout the research process. Outcome: Generate a tool (eco-design packaging) to improve consumers' decision making. Create problem-focused knowledge regarding how to reduce consumers' attitude–behavior gap and how to promote sustainable behavior. <p>(2) <u>Awareness</u></p> <ul style="list-style-type: none"> Increase consumers' awareness regarding the benefit of eco-design packaging. Increase the awareness of packaging producers and marketing managers regarding the perceived risks of eco-design packaging. <p>(3) <u>Research use</u></p>

Track	Problematization	Research objective (transformation goal)	Societal impact
			<ul style="list-style-type: none"> • Consumers: Attain better understanding of eco-design packaging and eco-packaged products and choose the appropriate packaging and product. Translate the conceptual use of “eco-design packaging” into an instrumental use to help consumers’ consumption routines (e.g., identify sustainable products, encourage recycling behavior). • Marketing managers: Consider the perceived risks of eco-design packaging to improve mixed-marketing and avoid greenwashing. • Packaging producers: Consider consumers’ behavior determinants in the packaging design to improve the visibility of the sustainability of the packaging. • Policy-makers: Create new legislation for measuring the degree of the “sustainability” of eco-design packaging according to product categories. <p>(4) <u>Social benefit</u>: Maximize the social benefit by the trickle-horizontal approach (<u>engage</u> the end users—i.e., consumers—throughout the research process).</p>
Effects of packaging optimization on food waste.	<ul style="list-style-type: none"> • Gap between LCA results and consumers’ perceptions of eco-design packaging. • A lack of a theoretical framework. 	Provide a conceptual framework for clarifying the mechanisms linking consumers’ perceptions of eco-design packaging and food waste behaviors (reduce food waste through eco-design packaging).	<p>(1) <u>Research output</u> Academic knowledge</p> <ul style="list-style-type: none"> • What: Lend conceptual clarity by defining the core concepts of consumers’ perceptions of eco-design packaging and consumers’ food waste avoidance intentions. • How: Broaden the consumers’ food waste behavior model from a single- to a multi-level

Track	Problematization	Research objective (transformation goal)	Societal impact
			<p>paradigm by considering food waste as the consequence of interactions between different nested levels of consumption behavior.</p> <ul style="list-style-type: none"> • Why: Identify mediators and moderators that describe the relationships between eco-design packaging and consumers' food waste. <p>Non-academic knowledge product</p> <ul style="list-style-type: none"> • Processes: Build an engaged connection with end-users (i.e., consumers) and key stakeholders throughout the research process. • Outcome: Use the eco-design packaging as a tool to reduce consumers' food waste. <p><u>(2) Awareness</u></p> <ul style="list-style-type: none"> • Increase consumers' environmental awareness by illustrating food waste issues. • Increase consumers' awareness regarding the (personal and social) benefits of eco-design packaging. • Increase packaging producers' awareness regarding the gap between LCA results and consumers' perceptions of eco-design packaging. <p><u>(3) Research use</u></p> <ul style="list-style-type: none"> • Consumers: Provide knowledge related to food waste and the functions of eco-design packaging, as well as how to use eco-design packaging functions (e.g., conservation, communication) to reduce food waste. • Marketing managers and packaging producers: Improve the visibility of the sustainability of eco-design packaging (e.g., reducing food waste) by

Track	Problematization	Research objective (transformation goal)	Societal impact
			<p>considering the attributes/functions that can be perceived from a consumer perspective.</p> <ul style="list-style-type: none"> • Policy-makers: (a) Create a new labeling system (e.g., use by, best before); (b) create indicators for measuring the degree of “food waste avoidance capacity” of eco-design packaging according to food categories; (c) support the eco-design and other innovations of packaging.
<p>The eco-designed packaging on the perception of the healthy character of the product. To enrich oneself with the development of health prevention.</p>	<p>Lack of a standard definition regarding the concept of eco-design packaging from a consumer perspective.</p>	<p>Better understand why eco-designed packaging allows consumers to adopt health behaviors (promote health consumption behaviors through eco-design packaging).</p>	<p><u>(1) Research output</u></p> <p>Academic knowledge</p> <ul style="list-style-type: none"> • What are the eco-design packaging attributes highlight the “healthiness” (e.g., nutrition, freshness, low calories) of the product? • How do eco-design packaging attributes affect consumers’ health behaviors (e.g., consumption of functional food)? • Why: Identify the mediators and moderators of the causal relationships between consumers’ perceptions of eco-design packaging and their intention to engage in health behaviors. <p>Non-academic knowledge product</p> <ul style="list-style-type: none"> • Processes: Engage consumers, packaging designers, and the government throughout the research process. • Outcome: Use eco-design packaging as a tool to encourage healthy consumption decision making and eating behaviors (e.g., downsize packaging, improve nutrition labeling and nutrition claims). <p><u>(2) Awareness</u></p> <ul style="list-style-type: none"> • Increase consumers’ health awareness.

Track	Problematization	Research objective (transformation goal)	Societal impact
			<ul style="list-style-type: none"> • Increase policy-makers' awareness regarding the potential impacts of eco-design packaging on public health interventions and well-being. <p><u>(3) Research use</u></p> <ul style="list-style-type: none"> • Consumers: Provide knowledge regarding indicators to measure the healthiness of food. • Marketing managers and packaging producers: Use packaging (e.g., labeling) as a communication strategy to promote the function of food. • Policy-makers and public healthcare organizations: Use eco-design packaging as a tool to promote more healthy consumption behaviors, thus improving the health status of citizens. Improve the current labeling system by illustrating the dimensions of the concept of "healthiness" (e.g., nutrition, freshness, diet disease).

3.5.2.2 Track 2: Effects of eco-design packaging on food waste behavior

Recently, numerous studies have shown that packaging can affect food waste in various stages of the food supply chain (i.e., production → processing → primary agricultural transformation → retail and consumption stages) (Beretta *et al.*, 2013; Oliveira *et al.*, 2015; Schanes *et al.*, 2018; Vanderroost *et al.*, 2014). In particular, packaging is viewed as one of the most important causes of food waste in the retail and consumption stages, because conventional packaging fails to conserve the freshness and safety of products (Boesen *et al.*, 2019; De Bondt *et al.*, 2017; Hebrok & Heidenstrøm, 2019; WRAP, 2007).

Hence, packaging innovation—in particular, eco-design packaging—is considered as a potential solution to reduce consumers' food waste (Poyatos-Racionero *et al.*, 2018; Schanes *et al.*, 2018), because such packaging is designed with optimization for its environmental and/or societal impact in various stages of its life cycle (i.e., design → procurement → manufacturing → consumption → end-of-life). For instance, previous studies have shown that packaging can extend the lifespan of food by reducing its size (Visschers *et al.*, 2016) and improving its conservation (e.g., easier to reseal and easier to empty) and communication functions (e.g., clear storage guidance) (Bertoluci *et al.*, 2014; Schanes *et al.*, 2018; Vanderroost *et al.*, 2014).

Although research focusing on packaging-related food waste at the consumer level is increasing in the main relevant academic journals (i.e., the top 12 academic journals that publish research on consumers' food waste (Schanes *et al.*, 2018): *British Food, Resources, Conservation and Recycling, Appetite, Food Quality and Preference, Journal of Cleaner Production, Journal of Consumer Behaviour, Journal of Food Products Marketing, Critical Public Health, International Journal of Consumer Studies, PloS one, and The Sociological Review and Waste Managements*), the mechanism linking eco-design packaging and consumers' food waste behaviors is still

underexplored in consumer research because of the lack of a theoretical framework. Therefore, it seems necessary to build a theory concerning the effects of eco-design packaging on consumers' food waste behaviors. From a TCR perspective, research improves consumers' knowledge or perceptions of eco-design packaging and its potential influence on food waste. To address this transformational objective, it is appropriate to adapt AR. (Wansink, 2012) defined activism research as a transformational approach that is designed "intentionally" to create "the final product" (i.e., model or theory) in order to change the behavior of a target population. In contrast with a traditional empirical study, AR focuses on "actionable, solution-oriented variables."

For this track, research could be operationalized through the following steps:

Firstly, visualizing transformation. To this end, it is necessary to answer fundamental questions, including: Who will use the results? The findings will be useful for various stakeholders in the food supply chain FSC (e.g., consumers, marketing managers, packaging producers, and policy-makers); What would be the appropriate communication tools? To meet the transformative objective of the study, it is necessary to have broader communication tools to translate and transfer academic knowledge to audiences, such as short-version papers (for marketing managers and packaging producers), white papers to reduce food waste with eco-design packaging (for policy-makers), and food management guidelines (for consumers). Secondly, developing appropriate research questions and giving actionable answers. The authors should adopt two approaches to developing research questions: A systematic literature review and immersion in some consumer context. Thirdly, collect contextually rich data in the right context. The authors should adopt the method of experimentation in the store laboratory of the retailer partner of the research project. The store laboratory is an exact replica of a store selling products to construct a real purchasing environment (e.g., shelves, Point of sale (POS) information, cash registers) and the natural conditions of

shopping at real stores (e.g., movement through the store, the possibility of physically touching products) (Lombart & Louis, 2016, p. 120). Finally, disseminating the findings to the right actors, namely, people to whom the research is directed at, such as: Consumers, purchasing managers in the family, food and packaging manufacturers, trade associations, and policy-makers.

The second track, focusing on the influence of eco-design packaging on consumers' food waste behaviors, can provide societal benefits from driver aspects such as: Generating academic and non-academic knowledge, increasing environmental awareness, translating conceptual knowledge of instrumental use, and establishing an engaged relationship with key stakeholders during research procedures.

Academic knowledge: Such findings can make three theoretical contributions to the topical literature. First, this track may lend conceptual clarity by defining the core concepts of “consumers’ perceptions of eco-design packaging” and “consumer’s food waste.” These respond to the call for a conceptual definition in literature (i.e., contributions regarding the “what”) (Boesen *et al.*, 2019). Second, this track can broaden the consumers’ food waste behavior model from a single- to a multi-level paradigm by considering food waste as a consequence of interactions between different levels of consumption behavior (e.g., psychological factors, packaging product-related factors, socio-cultural factors). In other words, what are the mediators and moderators of the relationship between eco-design packaging on food waste behavior? How are these factors linked? (i.e., contributions regarding the “how”). Lastly, this track can test the causality between these factors (i.e., contributions regarding the “why”).

Non-academic knowledge: This track may also generate knowledge regarding observable external features of the products (i.e., packaging attributes) and their effect on the unobservable internal features (e.g., packaging functions, product quality, and sustainability).

Awareness: This track can increase consumers' environmental awareness by illustrating the issues of food waste. Moreover, the results may improve consumers' awareness regarding the (personal and social) benefits of eco-design packaging, as well as packaging development in general. Likewise, this track may increase the awareness of marketing managers and packaging producers regarding the gap between packaging decision (based on LCA) and actual packaging perceptions by consumers.

Research use: In terms of research use, this track may help relevant stakeholders in the various stages of the food supply chain, such as consumers, marketing managers, packaging producers, and policy-makers. For consumers, this track can provide relevant knowledge of food waste and packaging functions. For instance, using packaging communication functions (e.g., storage guidance, date labeling) to conserve food quality, which in turn can avoid household food waste in everyday life. For marketing managers and packaging producers, the findings can be used to improve the visibility of the sustainability of eco-design packaging and products by incorporating attributes that make more sense from a consumer perspective (e.g., recyclable, biodegradable materials). This track can also clarify consumers' internal determinants (e.g., individual values, perceptions, attitudes, motivations) that may influence their reaction toward eco-design packaging. Hence, marketing managers and packaging producers can consider these attributes and consumers' internal determinants to improve marketing mix strategy and packaging design processes. For policy-makers, these finding may be insightful to improve current eco-design packaging labeling systems (e.g., introducing a new labeling system to measure the "food waste avoidance capacity" of packaging according to different food categories) and food waste reduction strategies via packaging innovation.

3.5.2.3 Track 3: Effects of eco-design packaging on consumers healthy behavior

As an important topic in TCR, consumers' state of health is more developed in the area of food consumption. In the literature on food consumption, health concerns relate to the happiness and quality of life of the consumers. Guichard and Muratore (2011) highlighted the effects of packaging on the healthiness assessment of food. Consumers tend to assess the healthiness of food through the verbal attributes of packaging, including: (1) The dietetic value (i.e., the objective measurement of food nutrition); (2) the perceived healthiness (i.e., the subjective healthiness perceived by consumers through evaluating food packaging); and (3) semiotic analysis (i.e., evaluation of the healthiness-related messages). However, the effects of the interactions of the healthiness indicators and the visual attributes of eco-design packaging (e.g., easy to reseal feature, new materials for extending food life) on consumers' reactions are still limited, because "eco-design packaging" is a relatively new concept characterized by ambiguity in terms of a definition in the existing marketing literature.

Hence, future research could also investigate whether the attributes of eco-design packaging affect consumers' assessment of food healthiness or helps them to make healthy decisions in the long-term. More precisely, this track attempts to address the following questions: (1) How consumers evaluate food healthiness (i.e., diet disease, source of nutrients) of eco-design packaging compared to conventional packaging? (i.e., is food perceived healthier when in eco-design packaging than when in conventional packaging?). (2) How do interactions of the visual attributes (e.g., easy to reseal feature, new materials) and the verbal attributes (in particular, clear guidance, food label, nutrition information) of eco-design packaging affect consumers' food healthiness evaluation? (3) How do consumers' perceptions of eco-design packaging affect their dietary eating behaviors (e.g., food intake, choice, preference, hedonic response liking) and purchasing behaviors (e.g., purchasing intention, willingness to pay) of healthy food (e.g., fruit and vegetables) through food healthiness assessments?

To address these research questions, it is appropriate to carry out experimental studies, because this method allows researchers to test the causality between eco-design packaging and consumers' health behaviors through manipulating different attributes of packaging (Keppel & Wickens, 2004).

Academic knowledge: This last track, focusing on health prevention, attempts to contribute to the marketing literature through three aspects. First, this track intends to identify the eco-design packaging-related factors that affect consumers' health behaviors (i.e., contributions regarding the “what”). Second, it focuses on how eco-designed packaging could influence consumers' health behaviors through its attributes (e.g., easy to reseal feature, new materials) and functions (e.g., communication and perseveration functions). Third, it looks at how packaging-related factors link to other healthy eating behavior factors (e.g., food intake, choice, preference, hedonic response liking) (i.e., contributions regarding the “how” and “why”).

Awareness: These findings may improve health awareness, public health status, and well-being (e.g., reducing the risks associated with the diabetic or cardiac issues) by influencing consumers to adopt more healthy food consumption behaviors (e.g., controlling calorie intake and overconsumption, and promoting healthy food such as fruit, vegetables, and organic food).

Research use: The findings of this track may provide knowledge regarding the indicators that can be used to measure the healthiness of food, which can guide consumers' purchasing and eating decisions in terms of healthy food. In addition, for marketing managers, the findings can improve their current communication strategy by clarifying the precise healthiness indicators. Likewise, for policy-makers, it may be interesting to using eco-design packaging (e.g., multipack, small-sized pack, nutrition labeling, and nutrition claims) for promoting healthy eating behaviors (e.g., promoting the intake of fruit and vegetables and discouraging the intake of energy, high-sugar and high-fat food), and for obesity prevention in young people who have relevant important

societal impacts (Carrero *et al.*, 2019; DeCosta *et al.*, 2017; Jaime & Lock, 2009). Lastly, such findings may also improve current nutrition education and food-related legislation.

APPENDICE A

Tableau A.1 Keywords used for searching the databases

Theme	Keywords	Search in Scopus	Search in Business Source Complete & GreenFILE	1 st step sample
Eco-design	eco-design AND ¹⁹ consum* AND food ANDNOT pack*	3	2	
	ecodesign AND consum* AND food ANDNOT pack*	8	5	
	Total	11	7	18
Packaging	pack*AND food AND consum* ANDNOT green ANDNOT sustain*ANDNOT eco*	1037	747	1784
Eco-design packaging	eco*AND pack* AND food AND consum*	313	157	
	green AND pack* AND food AND consum*	57	38	
	sustain*AND pack* AND food AND consum*	193	106	
	Total	563	301	864

Note

(1) Search settings in Scopus:

- Date range: Published all year up until 16th March 2020
- Article title, abstract, keywords
- Document type: Article
- Language: English/French
- Subject area: Business, Management, and Accounting; Environmental Science

(2) Search settings in Ebsco:

19

Boolean

operators:

https://service.elsevier.com/app/answers/detail/a_id/11213/supporthub/scopus/#tips.

AND: Both terms must appear, e.g., "cognitive architecture" AND "robots."

ANDNOT: Exclude one term, e.g., "lung" AND NOT "cancer."

Theme	Keywords	Search in Scopus	Search in Business Source Complete & GreenFILE	1 st step sample
<hr/> <ul style="list-style-type: none">- Date range: Up until 14th March 2020- Title (TI)- Abstract (AB)- Author-supplied keywords (KW)- Document type: Article- Language: English/French <hr/>				

Tableau A.2 Epistemological assignment procedure

Procedure	Objective	Index	Question	Decision	Exemplar
Step 1	Identify TCR research ²⁰	Axiology	<p>Q1: Are the primary goals of the article/report to maximize the social awareness, use, and social benefit of eco-design, packaging, and eco-design packaging?</p> <p>Q2: Does the article/report aim to improve the well-being of the consumer or to solve social issues?</p>	<p>If yes for both of these questions, then assign to the TCR category.</p> <p>If no for one of these, then move on to step 2.</p>	<p>De Bondt et al. (2017)</p> <ul style="list-style-type: none"> Examines the effect of the resealability of packaging on food consumption (e.g., extend the shelf life of the food product). Provides actionable insights for consumer welfare and public healthcare, and helps manufacturers to delineate optimal food packaging strategies.
Step 2	Identify positivist research	Axiology	Q1: Does the research include causality testing (e.g., an experiment)?	<p>If yes for one of these questions, then assign to the positivist research category.</p> <p>If no or not specified,</p>	(1) Magnier et al. (2016): Investigates the causal effects of packaging sustainability on the perceived quality of food by consumers; examines the moderating effect of product sustainability through two experiments.

²⁰ TCR can be based on both the inductive or the deductive method.

Procedure	Objective	Index	Question	Decision	Exemplar
			Q2: Is the research based on other quantitative methods (e.g., survey, structural equation modeling, conjoint analysis, regression, LCA)? Q3: Is the research based on modeling and/or hypothesis development? ²¹	then move on to step 3.	(2) Gustavo et al. (2018) (qualitative study based on the positivist perspective): Investigates the motivations, opportunities, and barriers for considering the effective redesign of packaging (e.g. size) by case study (e.g., interviews, observation).
Step 3	Identify interpretative research	Axiology	Q1: Does the article aim to understand and describe in-depth and completely the phenomenon of interest?	If yes for both of these questions, assign to the interpretative	Magnier & Crié (2015): Seeks an understanding of sustainable packaging and its influence on consumers' attitudes and purchasing intentions from a consumer perspective through in-depth

²¹ The qualitative research can be positivist; for instance: Gustavo et al. (2018).

Procedure	Objective	Index	Question	Decision	Exemplar
		Inductive method	Q2: Does the reference use these approaches for data collection (e.g., in-depth interview; the projective technique; ethnographic, semiotic, or content analysis)?	research category.	interviews and the projective technique.

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CHAPITRE IV

ARTICLE 2

THE INFLUENCE OF CONSUMERS' PERCEIVED RISKS TOWARDS ECO- DESIGN PACKAGING UPON THE PURCHASING DECISION PROCESS: AN EXPLORATORY STUDY

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AVANT-PROPOS À L'ARTICLE 2

L'article 2 poursuit la première voie de recherche proposée dans l'article 1 consacré à la vulnérabilité des consommateurs vis-à-vis de l'innovation de l'emballage. Cet article a pour l'objectif d'explorer les réactions négatives des consommateurs (les risques perçus) associé à l'emballage éco-conçu afin d'amener à une compréhension complète sur les perceptions des consommateurs.

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ABSTRACT

Drawing on the means–end chain method, this exploratory study attempts to provide a better understanding of consumers’ perceived risks towards eco-design packaging and its effects on consumers’ purchasing decisions. This study makes diverse contributions in terms of theory, methodology, and policy making. Firstly, this study provides better comprehension for the concept of “eco-design packaging” by combining an industrial perspective (i.e., a life-cycle assessment: LCA) with a consumer perspective (i.e., consumer perceptions). The findings reveal the gap between consumers’ perceptions and the LCA results towards eco-design packaging. Secondly, this study offers an alternative perspective on consumers’ reactions towards eco-design packaging through exploring the “risks” instead of “benefits” examined to inspire package innovation. This study identified five perceived risks (functional, physical, financial, life-standard, and socio-environmental risks). Thirdly, this study illustrates the benefit of using the means–end chain analysis (MEC) framework to explore consumers’ reactions and purchasing behaviors towards sustainable products. Lastly, this study offers several actionable suggestions to managers, packaging designers, and policy makers.

Keywords: eco-design packaging; ecological packaging; sustainable packaging; perceived risks; sustainable consumer behavior; means–end chain; attitude–behavior gap; policy implications

4.1 Introduction

Packaging plays a major role in consumer purchasing decisions, since it links products to consumers through its technical and marketing functions (Rundh, 2009). Since the 1990s, incorporating the notion of sustainability into packaging innovation has been a crucial issue in marketing (Brach *et al.*, 2018). In response to this challenge, eco-design appears to be a strategic solution to optimize packaging (Polito, 2000) because an eco-design packaging is developed with concern for the environmental and/or its social impact in the various stages of its life cycle.

The previous studies focusing on consumers' reactions towards eco-design packaging demonstrate that consumers react mainly positively towards this type of packaging (Magnier & Crié, 2015). The underlying assumption is that eco-design packaging attributes can be perceived positively by consumers. These studies aim to understand how consumers use the sustainability-related characteristics of packaging to give value to a product during purchasing decisions (Magnier & Crié, 2015; Thomas, 2014; Tu *et al.*, 2019). For instance, Magnier and Schoormans (2015); (Orzan *et al.*, 2018) show that eco-design packaging attributes (i.e., recyclable material and sustainable cues) have a positive effect on the perceived quality and sustainability of the product (Magnier *et al.*, 2016), the perceived ethicality of brand, and purchasing intention (Magnier & Schoormans, 2015).

However, despite consumers' positive attitudes, they do not generally purchase the eco-packed product, which is instead characterized by a low purchase rate (Brach *et al.*, 2018; Gleim *et al.*, 2013; Gupta & Ogden, 2009; Papaoikonomou *et al.*, 2011; Pickett-Baker & Ozaki, 2008). This phenomenon of the discrepancy between attitudes and effective purchasing behavior is defined as the attitude-behavior gap (Auger & Devinney, 2007; De Pelsmacker *et al.*, 2005; Jacobs *et al.*, 2018, p. 1156; Lane & Potter, 2007).

A potential explanation for the attitude–behavior gap is that even though eco-design packaging is developed to reduce negative environmental and/or social impacts, it is not consistently perceived positively by consumers. Packaging itself is often poorly understood by consumers who may perceive it as an unnecessary “source of pollution”. A survey conducted for Eco Entreprises Quebec indicates that barely over one fourth of consumers believe that packaging is necessary to protect and transport products. The negative environmental impact of packaging is greatly overestimated, as packaging accounts for under 10% of the environmental impact of the products it protects; only 12.6% of consumers know this, however (GreenUXlab ESG UQAM, 2018; Zeng, 2015).

Hence, it is necessary to shift from the consumers’ positive reactions (i.e., perceived benefit) to their negative reactions (i.e., perceived risk) associated with eco-design packaging to better explain the attitude–behavior gap and, in turn, to gain a complete understanding of consumer behavior towards eco-design packaging.

Perceived risk is defined as “the subjective anticipation by consumers of conceivable losses when assessing alternative choices” (Boivin *et al.*, 2011, p. 193). In consumer responsible behavior literature, perceived risk refers to the barriers to the consumption of a sustainable product (e.g., price, quality, and time) (Brach *et al.*, 2018; Gleim *et al.*, 2013; Gupta & Ogden, 2009; Luchs *et al.*, 2010). Moreover, perceived risk is viewed as a crucial determinant to understand the consumer decision-making process for sustainable products, in particular, the attitude–behavior gap, because it links concrete product attributes (the “means”) to underlying values (the “end” that the consumer expects by purchasing a particular product such as an eco-design packed product) (Boivin *et al.*, 2011).

Therefore, this study aims to explore the negative aspects (i.e., consumers’ perceived risks) associated with eco-design packaging and its effects on consumer purchasing intention. Drawing on means–end chain (MEC) analysis (Reynolds & Gutman, 1988;

Valette-Florence, 1994), this study attempts to answer four questions: (1) How do consumers perceive eco-design packaging (i.e., is there a gap between consumers' perceptions and industrial definition based on life-cycle assessment (LCA))? (2) What are the consumers' perceived risks associated with eco-design packaging in their purchasing decision processes? (3) How can consumer segmentation be carried out in terms of the consumers' perceived risks concerning eco-design packaging? (4) What are the potential eco-packed product consumption patterns based on these perceived risks?

MEC analysis is an efficient approach to determine the consumer purchasing decision process for a specific product. According to Gutman (1984), all consumer behaviors have consequences (positive or negative), which increase by consuming products (including divers attributes). Consumers tend to choose the product that generates the most positive consequences and minimize the negative consequences to achieve their desired lifestyle state (i.e., an individual value). Hence, MEC analysis is appropriate for answering research questions. This approach not only identified the determinants (i.e., the eco-design packaging attributes, consequences, and individual values) that characterize the most important factors for consumers to purchase eco-packed products but have also been able to provide a meaningful association between them (Reynolds & Gutman, 1988). The consumers use this entire attribute-consequence-value structure to assess their individual value (the ends). The achievement of the goal depends on the attributes of the product (e.g., its packaging, brand, and quality), which is considered to be the means. Previous studies show that individual values influence consumer preferences for product attributes. For instance, a consumer with pro-environmental values will give priority to the sustainable attributes of packaging: Recyclable or biodegradable materials (Boesen *et al.*, 2019; Pauer *et al.*, 2019), package downsizing (Wilkins *et al.*, 2016), environmental claims, and labeling (Ertz *et al.*, 2017). Moreover, numerous studies indicate that pro-environmental behavior could be influenced by internal determinants such as individual values, attitudes, emotion, motivation, and

knowledge (Klaiman *et al.*, 2017; Williams *et al.*, 2018). In particular, pro-environmental values (e.g., feelings of being responsible and universalism) and attitudes (e.g., attitudes towards wastage and recycling) have positive impacts on pro-environmental behavior. For instance, Cox *et al.* (2010) and Graham-Rowe *et al.* (2015) reveal that attitudes towards food waste and universalism values influence a consumer's intention to reduce food waste. A consumer with positive attitudes towards recycling and the environment has a greater intention to recycle packaging (Williams *et al.*, 2018) and carries out overall recycling behaviors (Bamberg & Möser, 2007; Ertz *et al.*, 2016; Guagnano *et al.*, 1995; Thøgersen, 2003). Likewise, a consumer with a high level of environmental awareness has more positive perceptions towards eco-packed food (Magnier *et al.*, 2016).

This study makes the following contributions. From a theoretical perspective, (1) this study offers a better understanding of the concept of eco-design packaging by combining an industrial perspective (i.e., LCA) with a consumer perspective. The findings reveal the gap between consumer perception and the LCA results toward eco-design packaging. (2) We provide an alternative perspective on consumers' reactions towards eco-design packaging through exploring the five perceived risks (i.e., functional risks, physical risks, financial risks, life-standard risks, and socio-environmental risks) in their cognitive chaining. Methodologically, this study provides an alternative approach—MEC—to investigate consumers' reactions towards eco-design packaging and other consumers' decision-making processes (Reynolds & Gutman, 1988; Valette-Florence, 1994). From a policy perspective, the finding can be helpful to improve eco-design packaging dissemination and environmental policies including: (1) integrating consumer perspectives into packaging innovation, (2) improving eco-design packaging labeling systems, and (3) integrating eco-design packaging into the economy's circular framework.

The paper begins with a review of the existing literature dealing with three key concepts: Eco-design packaging, perceived risk, and value. Then, the paper describes the conceptual framework, research method, and key findings. Subsequently, the theoretical, methodological, managerial, and political implications are discussed. The paper concludes with the limitations and future research directions.

4.2 Literature Review

4.2.1 Eco-Design Packaging

Given the current growing public awareness and concern for the environment, eco-design is viewed as a feasible option for packaging optimization by integrating environmental impact concerns (Polito, 2000). Pauer *et al.* (2019); Schiesser (2012) argue that eco-design incorporates environmental and/or social concerns into packaging through life-cycle assessment in order to attain eco-efficiency. A number of key criteria need to be met in the life cycle of packaging (Zeng *et al.*, 2017).

- Design: All the stakeholders of the conceptualization of packaging (design, packaging industry, supply, logistics, research and development, and marketing) are taken into consideration from the beginning, to enable a comprehensive vision of the issues involved.
- Procurement: Eco-friendly materials are used (easy to disassemble, recyclable, and degradable).
- Manufacturing: The whole packaging system is optimized: Primary packaging (encouraging the end users/consumers), secondary packaging (filling the

displays at points of sale), and tertiary packaging (facilitating the transport of a number of products).

- Consumption or usage: Consumer expectations are integrated: The convenience of use (rate of a refund, rate of opening/closing), the visualized information (brand name, country of manufacture, etc.), and the volume and the weight.
- End-of-life: The components of packaging should be easy to disassemble, recyclable, and degradable.

4.2.2 Effects of Packaging on Purchasing Decisions

Packaging is commonly examined in terms of two marketing research perspectives. The first view corresponds to a holistic or overall perspective, where packaging's effects cannot be identified separately from the products. The other view is an analytical perspective, where packaging is viewed as a product-independent component. The concept of packaging is thus broadened through the multi-attribute theory that views packaging as a combination of various attributes. Smith (2004) argues that there are four main attributes of packaging: Shape, size, color, and graphics. Other researchers have focused on size, shape, material, color, text, and the brand (Kotler, 2003). There is no consensus on the classification of packaging attributes. Underwood (2003) identifies two categories of attributes: Visual attributes (color, photography, image, and logo) and structural attributes (color, photography, image, and logo).

4.2.3 Perceived Risk

Volle (1995) views perceived risk as the subjective uncertainty people perceive towards the potential losses relating to the attributes that determine product (goods or service) selection in a given purchase or consumption situation. Losses are to be

understood as a result that is inferior to a subjective reference point that is not necessarily zero, nor the status quo, but possibly the level reached through the best alternative or any other individual-specific reference (Kahle *et al.*, 1989; Smith, 2004; Valette-Florence, 1988; Wansink, 1996; Wansink & Van Ittersum, 2003).

Perceived risk is usually defined as a multidimensional concept. Kaplan *et al.* (1974) identify five dimensions of perceived risk: Functional, financial, physical, psychological, and social. An investigation of perceived risk is one of the key research topics in the domain of consumer behavior. The concept is usually seen as carrying a negative value, something that indicates why consumers decide not to select a given product (Pin *et al.*, 2014). It is also used as a tool for market segmentation, product and packaging improvement, pricing, distribution channels, and communication strategies (Havlena & Desarbo, 1991). The attributes of a product, including its packaging, constitute one of the main antecedents of the perceived risk of consumers' purchasing decision-making (Pin *et al.*, 2014).

Furthermore, in the field of responsible consumption research, several studies show that perceived risk, particularly in its functional and financial dimensions, is viewed as a main deterrent to the consumption of ecological products. This could explain the significant gap between declared purchase intention and actual purchasing behavior for socially responsible product consumption (i.e., the Green Gap) (Boivin *et al.*, 2011).

4.2.4 Value in the Purchasing Decision Process

Incentives and deterrents are viewed as the two main factors accounting for consumer selection or inclination, while people's values are the greatest incentives for consumer behavior (De Ferran, 2004; Reynolds & Gutman, 1988). According to Valette-Florence (1988), value involves the interaction of three levels: Their entire set of individual values and personality traits, their set of attitudes and activities, and the products

purchased. People whose lifestyles are similar (i.e., those who share similar behavior patterns for each of the three levels) form a homogeneous group. In other words, people's lifestyles derive from their value systems, attitudes, and consumption patterns (Valette-Florence, 1988). Hence, individual values facilitate our understanding of the incentives and deterrents that govern people's attitudes, preferences, and behaviors towards products (De Ferran, 2004; Kahle *et al.*, 1989). The present study is based on the value system proposed by Kahle *et al.*, 1989), which includes a sense of belonging, the need for excitement, fun and enjoyment, warm relationships with others, self-fulfillment, being well respected, safety, and self-respect; this system has considerable predictive power over consumer behaviors (Valette-Florence, 1988)

4.3 Conceptual Framework: The Means–End Chain Theory

To reveal people's incentives or deterrents and behavioral patterns, Young and Feigin (1975) introduced the means–end chain (or cognitive chaining), further developed by Gutman (1982) and Reynolds and Gutman (1988). According to Young and Feigin (1975), consumers often take into consideration product attributes that represent benefits. The set of associations derived from these benefits and consequences is reflected in increasingly abstract and significant values that form cognitive chaining (Valette-Florence, 1994). Cognitive chaining can arise from the connection between a product's attributes, the consequences consumers derive from those attributes, and potential links with consumers' values (Valette-Florence, 1994).

In order to describe the purchasing decision process for a specific product, cognitive chaining links three successive levels of abstraction: Attributes, consequences, and values (Reynolds & Gutman, 1988; Valette-Florence, 1994). Olson and Reynolds (1983) fine-tuned the structure of cognitive chaining by adding two intermediate levels, for a total of five levels: Concrete attributes, abstract attributes, functional consequences, socio-psychological consequences, and values. Next, Valette-Florence

(1994) advocated a six-level cognitive chain: Concrete attributes, abstract attributes, functional consequences, socio-psychological consequences, instrumental values, and final values. The author argues that this six-level classification can more effectively delineate the boundaries between product knowledge and self-knowledge, hence enabling an increased understanding of people's selection processes. It is worth noting that in some cases, it is easier to use negative reasons to justify choices, since negative associations also reflect people's preferred options (Gengler *et al.*, 1995).

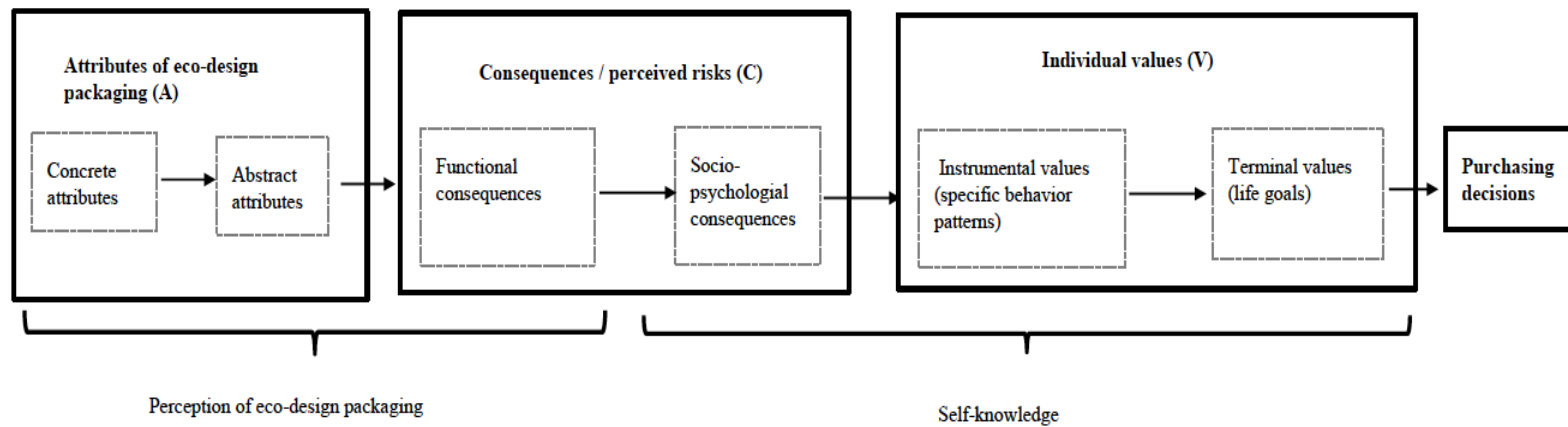
This study is based on the theoretical framework of the means–end chain, with the intent to understand consumers' perceived risks towards eco-design packaging and the role of consumers in the purchasing decision process of eco-packaged products. Figure 4.1 shows this conceptual framework. Three main components from the cognitive chain are related to eco-design packaging: The attributes of the eco-design packaging (A's), the perceived risks or consequences (C's) generated by the attributes, and the individual values related to the consumption of eco-packaged products (V's).

The attributes are classified into two categories: Concrete attributes involving the essential characteristics needed to describe and assess packaging (e.g., recyclable or recycled materials, shape, and color), and abstract attributes representing the subjective assessment characteristics. Consumers' personal interpretations determine their appraisal of abstract attributes, such as price or brand image (Valette-Florence *et al.*, 2003).

Similarly, there are two levels of consequences: Functional consequences, produced by the use of packaging (e.g., product preservation and shelf life) and socio–psychological consequences, which are related to the social functions of eco-design packaging (e.g., an image of environmental protection). In this study, we focus on the negative consequences or risks.

Finally, the individual value systems are divided into two hierarchies (Rokeach, 1973). Terminal values (in other words, life goals (i.e., the ends)); relationship to individual or social goals, such as peace or freedom; instrumental values; or behavioral patterns (i.e., the means) are defined as ways of being or doing (Valette-Florence *et al.*, 2003, p. 3).

Figure 4.1 Conceptual framework.



Source: Adapted from Valette-Florence *et al.* (2003), Figure 2 (p. 34)

4.4 Methodology

4.4.1 Data Collection

In order to meet our research goals, we used an analysis of cognitive chaining, as this approach reveals consumers' cognitive structures (Reynolds & Gutman, 1984). These structures involve the relations between the product attributes (A), the derived consequences for consumers (C), and the consumers' individual values (V). In this study, we focus on perceived risks that, just like values, represent the antecedents of eco-responsible purchasing behaviors (Brieu *et al.*, 2011). An analysis of cognitive chaining also reveals the boundary between knowledge or perception of more concrete attributes and abstract individual values (De Ferran, 2004; Valette-Florence, 1994). This cross-cutting approach (attributes, consequences, and values) brings to light the structure of the individual cognitive chaining of consumers' perceived risks and increases our understanding of the chaining representative of consumers' decision-making processes when purchasing eco-packaged products.

The analysis of consumers' cognitive chaining was conducted through three successive steps (Valette-Florence, 1994) (Please see Table 4.1, Methodology)

Tableau 4.1 Methodology

Step	Research Question	Objective of Each Step	Data Collection	Result
Step 1: Generating the relevant attributes, consequences, and values associated with eco-design packaging in terms of six levels of cognitive chaining: Concrete attributes, abstract attributes, functional consequences, socio-psychological consequences, instrumental values, and terminal values.	To answer research question 1: Explore consumers' perceptions of eco-design packaging. (Is there a gap between consumers' perceptions and industrial definition based on life-cycle assessment: LCA).	Generate an initial list of A-V-C's from existing literature. This initial list was complemented by focus group.	Literature Review	Table 4.2. List of attributes, consequences, and values associated with eco-design packaging. Table 4.3. Industry view versus consumer view of eco-design packaging. Figure 2. Consumers' perceptions of eco-design packaging Table 4.4. Perceived risks associated with eco-design packaging.
	To answer research question 2: Examine the perceived risks associated with eco-design packaging.	Explore the attributes, consequences and individual values of consumers underlie their decision-making process associated with eco-design packaging. Complement the list of A-V-C's.	Focus group (n = 8)	
Step 2: Constructing the individual cognitive chains associated eco-design packaging.	To answer research question 3: Segment consumers based on their perceived risks of eco-design packaging.	Identify the dominant items of Attributes, Consequences, and Values.	Face-to-face individual, laddering interviews with pre-coded cards (n = 19)	Table 4.6. Consumer segments according to perceived risks.

Step	Research Question	Objective of Each Step	Data Collection	Result
Step 3: Constructing an aggregated hierarchical map.	To answer research question 4: Explore the potential eco-packed product consumption patterns based on perceived risks.	Clarify the linkage between Attributes, Consequences, and Values.		Figure 3. Aggregated hierarchical map of risk-oriented consumption patterns.

Step 1. Generating the relevant attributes, consequences, and values associated with eco-design packaging based on six levels of cognitive chaining: Concrete attributes, abstract attributes, functional consequences, socio-psychological consequences, instrumental values, and terminal values. In this first step, data were collected using two techniques: Documents analysis and a focus group. The objective is to (1) explore consumers' perceptions of eco-design packaging attributes (to answer research question 1); (2) to examine the perceived risks associated with eco-design packaging (to answer research question 2).

First, the attributes of different types of eco-packaging were identified and defined through a rigorous analysis of the academic (Berneman *et al.*, 2013; Bertoluci & Trystram, 2013; Magnier & Crié, 2015; Rundh, 2005, 2009) and professional literature (Conseil National de l'emballage, 2019) related to packaging, eco-design, consequences, and individual values (Kahle *et al.*, 1986, 1989). The goal of this stage is to generate an initial list of A-V-Cs from the existing literature.

Then, a focus group of eight consumers or people responsible for their household consumption was formed. The heterogeneity of the demographic characteristics of the people involved was ensured to explore the attributes, consequences, and individual values of consumers underlying the decision-making processes associated with eco-design packaging (Please see Table B.1, Sample of the focus group). This step also attempted to complement the list of A-C-V's created in the last step from a consumer perspective. A focus group is more appropriate than individual interviews because group dynamics and flexibility can yield greater insight into an innovative concept (i.e., eco-design packaging) (Malhotra & Birks, 2007). More precisely, the process was carried out around three topics: (1) general perceptions toward eco-design packaging attributes; (2) the consequences related to the consumption of eco-design packaging (e.g., previous experiences or protentional consequences); and (3) consumers'

evaluation criteria in their purchasing decisions (Please see Appendix C, Guide of the focus group).

Step 2. Constructing the individual cognitive chains associated with eco-design packaging to segment consumers based on their perceived risks of eco-design packaging (to answer research question 3).

The data were collected through 19 face-to-face individual laddering interviews, lasting about 25 min each (Devlin *et al.*, 2003), with pre-coded cards based on a list of A-C-V's and several blank cards. The respondents were selected because they were responsible for their household consumption and thus had experience and ideas regarding eco-design packaging (Please see Table D.1, Sample of individual interviews). An interview with cards was more appropriate than a traditional individual interview since pre-coded cards can improve the efficiency and objectivity of the results (Valette-Florence, 1994). A water bottle that was redesigned according to the LCA was chosen as an exemplar of eco-design packaging. The results of the focus group showed that the eco-design packaging was an improvement (i.e., using the same quantity of 100% recycled rPET plastic contains more water) and was the most visible by consumers.

The interviews were performed as follows. The participants were presented with cards, each related to eco-design packaging attributes. They were first asked to form three groups of attributes with a rank of importance (most important, average, not important). Then, they were asked to select the most important attributes of the first group (i.e., the most important group). The same procedures were repeated at the level of consequence according to the most important attributes identified in the last step, and so on until the values were level. This was done to create a meaningful link between attributes-consequences-values.

Step 3. Constructing an aggregated hierarchical map in order to explore the potential eco-packed product consumption patterns based on perceived risks. This step seeks to explore potential eco-packed product consumption patterns based on perceived risks (to answer research question 4).

4.4.2 Data Analysis

Three approaches were used to analyze the interview data: (1) Content analysis—three coding levels were used to gauge consumers’ perceptions towards the attributes and risks related to eco-design packaging: In vivo coding, based on the concepts emerging from the focus group and the literature; axial coding, based on an analysis of the relationship between the first-level concepts; and an aggregated dimension (Corley & Gioia, 2004; Gioia *et al.*, 1994; Glaser & Strauss, 1985). (2) A non-linear canonical correlation analysis of the hierarchical taxonomy was performed with SPSS Statistics version 23.0 (IBM Corp, 2015) to identify the principal A-C-V orientations. (3) An analysis of the consumers’ hierarchical maps was used to build an aggregated picture of the set of individual chains.

The content analysis of the focus group session and of the literature yielded maps of the attributes, consequences, and values for the individual interviews. Table 4.2 shows 23 attributes, 17 consequences, and 13 values that were identified.

Tableau 4.2 List of attributes, consequences, and values associated with eco-design packaging

Item	Concrete Attributes	Item	Functional Consequences	Item	Instrumental Values
AC1	Recycled materials (recycled cardboard, recycled plastic,	CF1	Value for money	VII	Capable (competent, effective)

	biodegradable plastic, wood, etc.)				
AC2	Recyclable materials	CF2	Protection effectiveness	VI2	Logical (coherent, rational)
AC3	Biodegradable materials	CF3	Communication quality (difficult to understand the information presented on the packaging)	VI3	Intellectual (intelligent, thoughtful)
AC4	Reduced packaging/no overpackaging	CF4	Not easy to consume the product	VI4	Honest (sincere, frank)
AC5	Weight (light, thin)	CF5	Food waste	VI5	Environment-friendly
AC6	Optimized size (to correspond to the product size)	CF6	Hygiene/cleanliness sacrifice	VI6	Responsible (accountable, reliable)
AC7	Optimized volume ratio between content and container	CF7	Health/health safety	VI7	Open-minded
AC8	Shape (round, curved, delicate)	CF8	Lack of time to become used to the new packaging		
AC9	Country of origin (local product)	CF9	Aesthetic sacrifice		
AC10	Eco-labeling (FSC logo, recyclable)				
AC11	Color (green, blue, transparent, white, brown)				
AC12	Eco-responsible statement				
AC13	Photographs (e.g., trees, leaves, meadows)				
AC14	Clear nutritional information				
AC15	Clear manufacturing information				
AC16	Reusable container (e.g., water bottle)				
AC17	Reusable packaging				

AC18	Recycled				
AC19	Recyclable				
Item	Abstract Attributes	Item	Psycho-Sociological Consequences	Item	Terminal Values
AA1	High price	CP1	Trust/credibility towards the product and the brand	VT1	Feeling of accomplishment (sustainable contribution)
AA2	Brand (national, local)	CP2	Pleasure during the consumer experience (hedonism)	VT2	Enjoyment and excitement/pleasure (pleasant unhurried life)
AA3	Packaging quality	CP3	Way of life/quality of life	VT3	Happiness (satisfaction)
AA4	Convenience (clear instructions for use)	CP4	Practicality	VT4	Family security (taking good care of loved ones)
		CP5	Self-concept	VT5	Inner harmony (for personal well-being/security)
		CP6	Respect for the environment	VT6	Sense of belonging
		CP7	Variety		
		CP8	Collective well-being (collective satisfaction)		

4.5 Results

4.5.1 Perceptions of Eco-Design Packaging

From an analytical perspective, packaging is viewed as a combination of various attributes (Pantin-Sohier, 2009; Pantin-Sohier & Bree, 2004). However, the results of the focus group show that there is a considerable difference between the definition of an eco-design packaging found in the literature and consumers' perceptions of it.

From the consumers' point of view, the attributes of an eco-design packaging appear to be a condensed version of those found in the literature. If we compare and contrast the attributes that emerged in the discussion group and those found in the literature (Conseil National de l'emballage, 2019; Zeng, 2015), a number of issues are brought to light (Please see Table 4.3).

Tableau 4.3 Industry view versus consumer view of eco-design packaging

Life-Cycle	Industry View	Consumer View
Raw material acquisition and preprocessing	Recycled cardboard or Fiber	Recycled materials (recycled cardboard, recycled plastic)
	Clear indication of disposing	Recyclable or biodegradable materials
	Partially recycled cardboard	
	100% Recycled cardboard	
	Cardboard or paper with certification FSC, SFI, CSA, PEFC	
	Recycled plastic	
	Bamboo	
	Multi-layer Cardboard	
	Styrofoam (e.g., tray for meat)	
	Molded pulp (e.g., egg carton)	
	Degradable plastics	
	Woods	
	Packaging with a reduced number of non-Recyclable components	

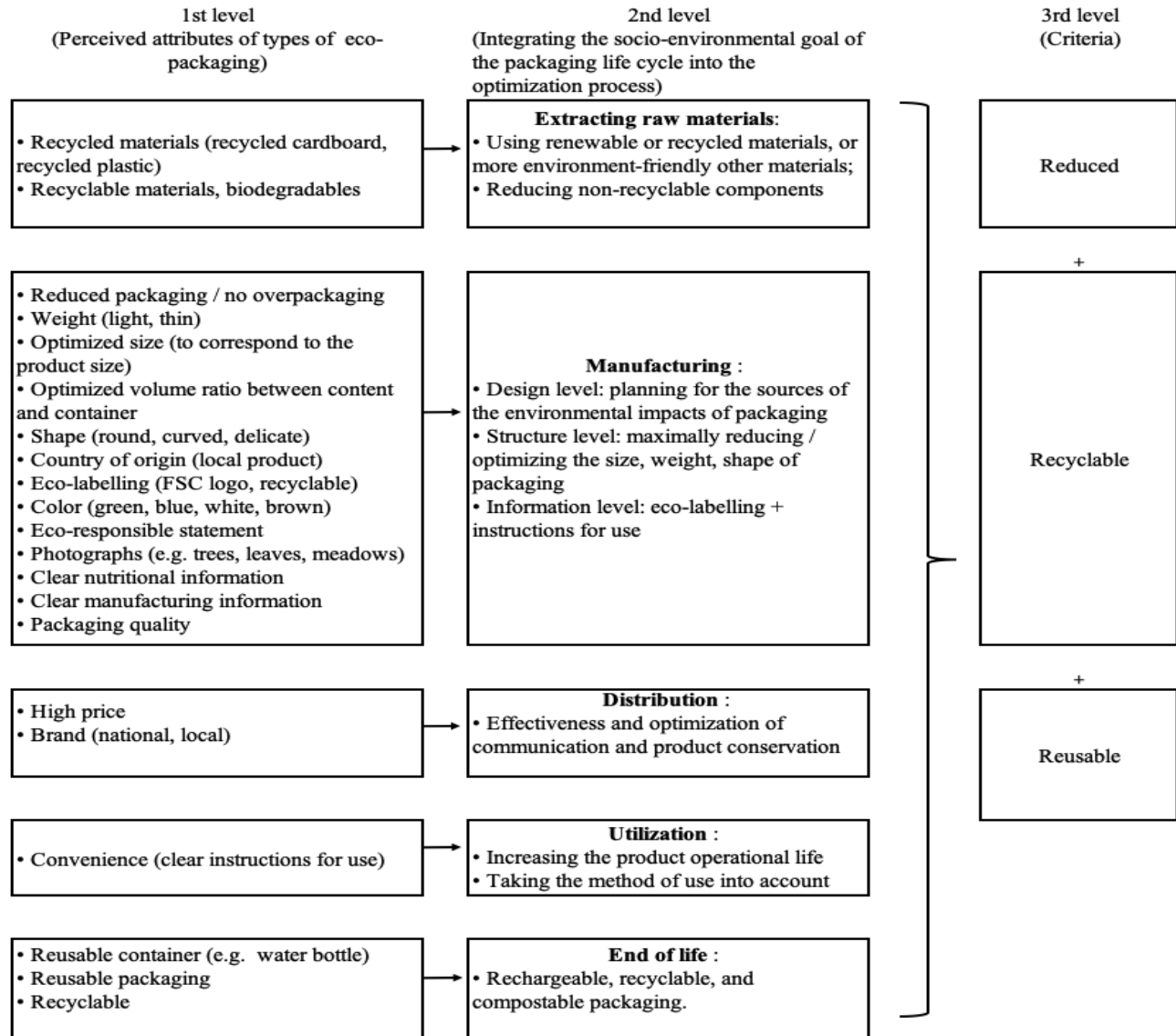
Manufacturing	Packaging that reduces the volume by compaction or vibration	Reduced packaging/no Overpackaging
	Reduced packaging of the length of the seals	Weight (light, thin)
	Reduce or eliminate waste generated by closure and tamper evident systems	Optimized size (correspond to the product size)
	Packaging that reduces or eliminates waste generated by closure and tamper evident systems	Optimized volume ratio between content and container
	Weight optimization of the packaging components/elements	Shape (round, delicate)
	Volume optimization of the packaging components/elements	Country of origin (local product)
	Shape (round, curved, delicate)	Eco-labeling (FSC logo, recyclable)
	Optimized volume ratio content/container	Color (green, blue, transparent, white, brown)
		Eco-responsible statement
	Optimized volume ratio of palletization	Photographs (e.g., trees, leaves, meadows)
	Eco-labeling for fabrication process	Clear nutritional information
	Clear nutritional information	Clear manufacturing information
	Clear manufacturing information	Packaging quality
	Clear user manual	
Distribution	Protecting the product components in transportation	High price
	Efficient reclosing function to protect the product	Brand (national, local)
Utilization	Increasing the product operational life	Convenience (clear instructions for use)
	Integrating the need of the consumer into packaging design process	
	User-friendly	
End of life	Primary packaging by accepting refills for reuse	Reusable container
	Composable	Reusable packaging
	Recyclable	Recyclable
	Reducing or avoiding waste	

1. Some attributes are common to both perspectives:
 - The packaging is made from recyclable materials or materials that are more environmentally friendly.
 - The weight of the packaging ought to be lighter.
 - The size is optimized (i.e., the content/container ratio is improved).
 - The packaging's color is green, blue, or transparent.
 - The packaging shows an eco-label or other environmental label.
2. Other attributes appeared in the consumers' lists because of their lack of knowledge of some new concepts:
 - From the consumers' perspective, environmentally friendly materials comprise materials such as cardboard, paper, recycled plastic, and biodegradable materials.
 - An optimized size and structure are incorporated into the optimization process, the content/container (product/packaging) ratio (such as an improved closing system), and the weight and/or volume optimization of the packaging components/elements.
3. Some abstract attributes (i.e., attributes not necessary to describe the physical characteristics of eco-design packaging), such as the high price of eco-packaged products relative to the price of products in conventional packaging or brand images appearing to be significant to consumers.

Overall, the list of attributes for eco-design packaging, as perceived by consumers is more limited than that found in the literature (Berneman *et al.*, 2013; Bertoluci & Trystram, 2013; Magnier & Crié, 2015; Rundh, 2005, 2009), contains more generic characteristics, and includes some abstract or non-observable attributes.

Figure 4.2 shows the three hierarchical levels of the data related to consumers' perceptions of eco-design packaging. The first level includes those key attributes that emerged from the discussion group and those identified from the literature on eco-design packaging.

Figure 4.2 Consumers' perceptions of eco-design packaging



The second level incorporates the major characteristics of eco-design packaging during its lifecycle. During the extraction of raw materials consumers perceive that eco-design packaging is made with renewable or recycled materials; at the stage of manufacturing, consumers focus on optimization in terms of a reduced structure and via communication (especially eco-labeling); then, at the stages of distribution and use,

consumers expect the packaging to protect and preserve products more effectively. At the end of its life cycle, the packaging is expected to be rechargeable, recyclable, and biodegradable.

The last level comprises three interrelated dimensions of eco-design packaging, the three Rs: Reduction (“Before, I used to buy large packs (...) now, I buy in smaller quantities”), reuse (“I prefer cardboard packaging to plastic one (...) I often buy glass bottles because I know that I can reuse them, for example, the Mason jars, we use those”), and recyclability (“If it’s not recyclable, I always hesitate before buying; we don’t know what to do with our waste, and even if they sort some of it, they also bury a lot”).

4.5.2 Perceived Risks towards Eco-Design Packaging

Table 4.4 shows that eight consequences or functional risks and three psycho-sociological risks were identified in the group discussion and the interviews. Functional risks involve notions such as value for money, the effectiveness of product protection and preservation, waste (especially food waste), potential health risks, and esthetic aspects. The main factors related to psycho-sociological risks involve a certain distrust towards marketing strategies focused on environmental protection and the fear of changing one’s habits.

Tableau 4.4 Perceived risks associated with eco-design packaging

Functional Risks	Verbatim Statements
Value for money	Participant #7: Cost is important to me and the extra cost is constraining, but the bottle of water, I’m going to buy it. But I’m not buying it because it’s recyclable but because it’s the cheapest in my grocery store. Participant #4: Me too, what’s important is the product price, if there’s a two-dollar difference, I’ll buy the cheapest of the two. Participant #3: Price first and packaging last.

Functional Risks	Verbatim Statements
Protection effectiveness	Participant #2: Yes, it's really annoying to throw away, so the next time, I buy smaller quantities or when I understand that a product does not keep well, the next time I go to the store, I'll buy another brand.
Communication (difficult to understand the information presented on the packaging)	Participant #1: It's hard to understand the definition of rPET (...), it's hard to know what standard is used.
Food waste	Participant #8: Sometimes I throw away almost half of what I buy, lots of bread, but also cheese and sometimes meat. It often happens because I plan large quantities or else I buy on special but I don't eat everything.
Sacrifice of hygiene/cleanliness	Participant #7: [Packaging] does not really influence my decision to buy, they should indicate more clearly the efforts they make to make packaging cleaner.
Health/health safety	Participant #1: They say we should not reuse water bottles. Participant #7: I also look for the sell-by-date when I buy. Participant #6: I take packaging that's not harmful to the product (...)
Lack of time to become used to the new packaging	Participant #8: It depends on whether it's an emergency purchase or when I go shopping, if I have time, I then look at the products and the packaging, but if it's an emergency, I go straight to a brand I know. Participant #7: We did it last winter with my flat mates, but we stopped quickly because it's too time-consuming; I prefer buying small quantities even if it means going shopping more often. Participant #4: Even if you plan in advance, in fact you never manage it, you never have the time to do what you've planned. Participant #1: I don't read the labels, I often take the product because I know it. Participant #7: Sometimes I switch products, particularly with the new products, but then there are brands I will never change or else just once so I can compare.
Aesthetic sacrifice	Interviewee: I think that the water bottle is not very pretty, [the shape] is not feminine.
Psycho-Sociological Risks	Verbatim Statements
Trust/credibility towards the product and the brand	Participant #3: I'm suspicious of all this marketing related to environmental products. Participant #7: I'm a little suspicious of all this (eco-packaged products/green products) and then there's the price, but with equal products and equal price, then I can try this product.
Way of life/quality of life	Participant #6: (...) I often buy organic food, but the problem is it doesn't keep so well. I slice my vegetables and I pop them into the freezer.
Respect for the environment	Participant #1: For me, the environmental impact is important.

4.5.3 Major Orientations and Perceived Risks towards Eco-Design Packaging

Before identifying the major orientations of consumers towards eco-design packaging, it is necessary to establish which attributes, consequences, and values are the ones most often mentioned (i.e., frequency of citations) by consumers, to determine the underlying mechanisms of the decision-making process. The frequency of citations represents consumers' sensitivities to the product under investigation (De Ferran, 2004). The study participants are more sensitive to "high price" (n = 13), "recyclable materials" (n = 11), "eco-labeling" (n = 11), "packaging quality" (n = 9), and "shape" (n = 9).

We also observed that consumers express doubts regarding eco-design packaging because of its "value for money" (n = 17), "health safety" (n = 15), "aesthetic sacrifice" (n = 12), "sacrifice of hygiene/cleanliness sacrifice" (n = 15), and "protection effectiveness" (n = 10).

Values no longer mentioned include "inner harmony for personal well-being" (n = 16), "happiness" (n = 14), "enjoyment and excitement" (n = 13), and "family security" (n = 13).

The non-linear canonical correlation analysis was conducted using SPSS Statistics version 23 (IBM Corp, 2015); this analysis identified a perceptual space taking into account the entire set of cognitive chains. The purpose of this stage was to establish a typology of cognitive chains. Table 4.5 shows the three variables of the chain (i.e., the A-C-Vs) and the indices of impairment and adjustment in the perceptual space. (Impairment index: The difference between the maximum adjustment and the actual adjustment. The lower the impairment index, the greater the coherence.)

Tableau 4.5 Impairment index by set of variables and orientations

Impairment Index	Orientations			
	Score	1	2	3
Attributes	0.145	0.030	0.046	0.068
Consequences	0.132	0.022	0.026	0.084
Values	0.179	0.019	0.028	0.132
Mean	0.152	0.024	0.034	0.095
Adequacy index	2.848			
Eigenvalues		0.976	0.966	0.905

We observed that the impairment index for the three variables (A-C-Vs) are generally low, which indicates high chain consistency for each variable (A-C-Vs). The apparent variable-consequences is among the best variable distinguishing the three cognitive chain orientations compared with the attributes and values, because variable-consequences has the lowest impairment index (0.132). The non-linear canonical correlation analysis also identified the most discriminating items for each variable (A-C-Vs) that distinguished one orientation from another (Please see Table E.1).

Ward's method was used to create a hierarchical taxonomy based on three variables (A-C-Vs) in order to segment consumers. The variable-consequences was used to describe each segment since it was the discriminating variable (compared with the two other variables, attributes and values) that distinguished between the three orientations (index = 0.132). This analysis revealed three groups of consumers. Each group evinces its own structure of (A-C-Vs) towards eco-design packaging (Please see Table 4.6).

Tableau 4.6 Consumer segments according to perceived risks

Consumer Segment ²²	Attributes	Consequences ²³	Values
Eco-conscious consumers: Socio-environmental risks	Recycled materials (recycled cardboard, recycled plastic, biodegradable plastic, wood, etc.)	Food waste	Capable (competent, effective)
	Reduced packaging/no overpackaging	Trust/credibility towards the product and the brand	Logical (coherent, rational)
		Practicality	Intellectual (intelligent, thoughtful)
Utilitarian-minded consumers: Functional, financial, and life-standard risks		Respect for the environment	Environment-friendly
	Recyclable materials	Value for money	Open-minded
	Shape (round, curved, delicate)	Protection effectiveness	Enjoyment and excitement/pleasure (pleasant unhurried life)
	Eco-labeling (FSC logo, recyclable)	Health/health safety	Happiness (satisfaction)
	Color (green, blue, transparent, white, brown)	Aesthetic sacrifice	Family security (taking good care of loved ones)
	High price		Inner harmony (for personal well-being/security)
	Packaging quality		

²² The term “orientation” refers to the typology of A-C-V’s structure. For instance, the orientation A3-C3-V3 in the 3rd line of Table 4.6 corresponds to: A (Clear manufacturing information)–C (Hygiene/cleanliness sacrifice, Communication quality)–V (Honest, Responsible). However, the term “consumption segment” describes a group of consumers who share the common characteristics. This study identifies three consumer segments based on their perceived risk associated with eco-design packaging: (1) Eco-conscious consumers, (2) Utilitarian-minded consumers, and (3) Skeptical consumers. Please find the terminology and definition of the core concepts in Table F.1.

²³ The term “consequence” only refers to second a level variable (A-C-V’s). It is measured by 17 items. However, the term “risks” refers to the aggregated concept from the findings. It describes the consumer segments (Table 4.6) and their risk-oriented consumption patterns (Figure 4.3)).

	Clear manufacturing information	Hygiene/cleanliness sacrifice	Honest (sincere, frank)
Skeptical consumers: Physical risks		Communication quality (difficult to understand information presented on the packaging)	Responsible (accountable, reliable)

- Segment 1—Eco-conscious consumers: The first segment includes consumers highly concerned by the socio-environmental risks of eco-design packaging (i.e., food waste, trust towards the product and the brand, practicality, respect for the environment). More precisely, two attributes of eco-design packaging distinguish Segment 1 from another: Recycled materials, reduce packaging/no overpackaging.
- Segment 2—Utilitarian-minded consumers: The second segment views as significant financial and functional risks of eco-design packaging. These consumers take value for money into account; they tend to find a compromise between the key packaging functions, the product price and life standard.
- Segment 3—Skeptical consumers: Segment 3 consumers are skeptics. They stress the communication function of eco-design packaging and link it with the protection function of packaging.

Through an analysis of the frequency of the associations between the concept pairing (attributes, consequences, values), an aggregated hierarchical map was generated to explore the potential eco-packed product consumption patterns based on the perceived risks associated with eco-design packaging.

4.5.4 Impacts of the Perceived Risks towards Eco-design Packaging in the Decision-Making Process

The citation frequency shows that consumers appear to be sensitive towards a number of attributes of eco-design packaging, such as “recyclable materials” (58%), “high price” (68%), “shape” (47%), “recycled materials” (42%), “reduced packaging” (32%), “color” (42%), “eco-labeling” (58%), and “packaging quality” (47%). The risks most frequently perceived are “communication quality” (42%), “respect for the environment” (32%), “value for money” (89%), “hygiene sacrifice” (58%), “health sacrifice” (79%), “aesthetic sacrifice” (63%), “food waste” (26%), “product protection effectiveness” (53%), and “trust” (26%). This analysis of item frequency highlights the different types of perceived risks towards eco-design packaging. “Value for money”, “health sacrifice”, “aesthetic sacrifice”, “hygiene sacrifice”, and “protection effectiveness” are the determining factors in the purchasing decision process for eco-packaged food products, with respective scores of 89%, 79%, 63%, 58%, and 53%. These risks, however, represent only two thirds of the cognitive chain. A representation of cognitive chaining by means of a hierarchical map (Please see Figure 4.3) shows the consumers’ cognitive networks towards eco-packaged products.

Figure 4.3 Aggregated hierarchical map of risk-oriented consumption patterns

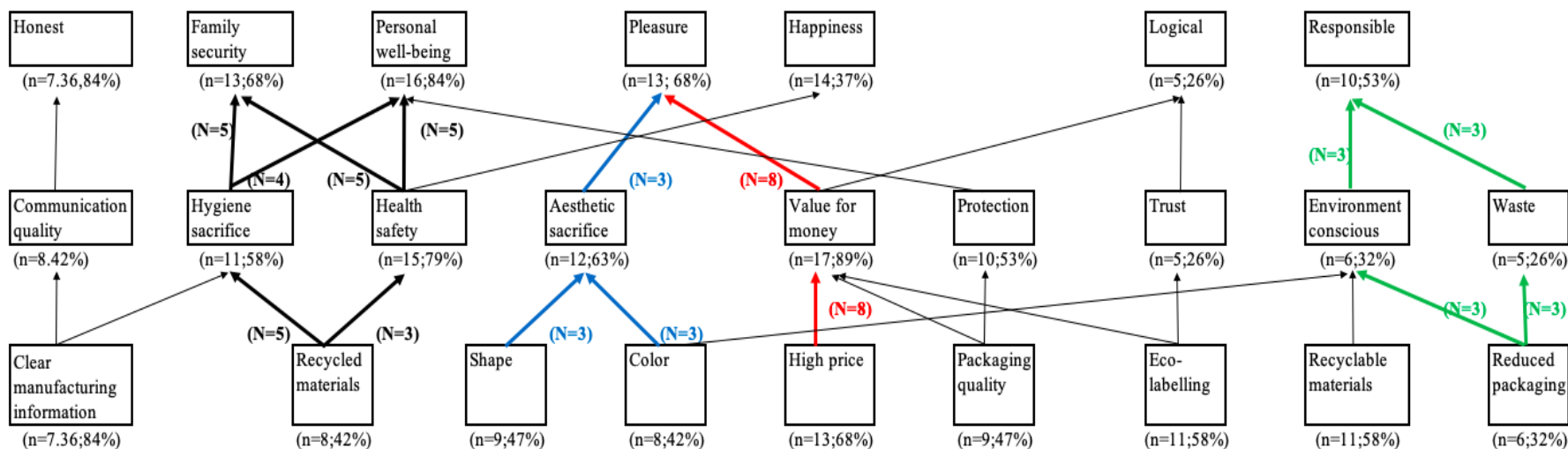


Figure 4.3 shows an aggregated hierarchical map of the consumers' risk-oriented consumption patterns towards eco-packaged products. All the direct associations between concept pairing (attributes, consequences, and values) that are superior to two are shown in this figure to display the chains. The cutoff value should be superior to or equal to 5% of the sample size (Gengler *et al.*, 1995). The major consumption patterns are shown by the higher numbers of citations of direct and indirect relations, shown with bold arrows. Two association types are evident: Direct and indirect. Direct associations involve the relationship between concepts that are adjacent in the means–end chain. Indirect associations, in contrast, correspond to virtual relations along the chain, characterized by concepts mentioned together.

Various attributes of eco-design packaging appear to be the source of consumer perceived risks in the food product purchasing process (e.g., recycled materials, shape, color, high price, and quality) (Please see Figure 4.3). In addition, the aggregated hierarchical map reveals four potential eco-packed product consumption patterns based on perceived risks (Please see Figure 4.3 in bold). The first pattern corresponds to the functional and physical risk-oriented consumption (black chain in bold), generated by the attribute “recycled materials”, which prevents the selection of eco-packaged food products in a search for “personal well-being” ($n = 5$) (Total number of direct and indirect relations showing the dominance of the patterns.) and “family security” ($n = 5$). The second pattern corresponds to the life standard risk-oriented consumption (blue chain in bold) associated with shape and color, which prevents the selection of the eco-packaged food products for “pleasure” ($n = 8$). The third pattern corresponds to the financial risk-oriented consumption (red chain in bold), specifically poor value for money, as reflected in the “high price” ($n = 8$) and “lower quality level”, with respect to ordinary packaging. A fourth pattern relates to the socio-environmental risk-oriented consumption (green chain in bold), such as “food waste” ($n = 3$), usually generated by “overpackaging” ($n = 3$).

4.6 Discussion

4.6.1 Theoretical Contributions

The present exploratory study makes several theoretical contributions to the field of marketing. It focuses on the influence of consumers' perceived risks towards eco-design packaging during the eco-packaged product purchasing decision process. This issue relates to several important marketing concepts.

The first concept is that of eco-design packaging. This study uses an analytical approach to show the main attributes of eco-design packaging. We thus combine an industrial perspective with a consumer perspective to increase the understanding of eco-design packaging. Most previous work has investigated the effects of attributes such as size, color (Pantin-Sohier & Bree, 2004; Rouillet & Droulers, 2004), shape (Pantin-Sohier, 2009), or a combination of two attributes (e.g., size and volume) (Folkes & Matta, 2004; Krider *et al.*, 2001; Wansink, 1996) on consumers' behaviors. In contrast, this study focuses upon consumers' overall perception of eco-design packaging and the influence of the role of the attributes of this packaging on the decision-making process through an analysis of cognitive chains. This concern uncovers the mechanism underlying the attributes of packaging and the relationships between products and packaging. Moreover, this study agrees with the conclusions of the study by Boesen *et al.* (2019) regarding the gap between consumer perceptions and industrial definitions (i.e., the LCA results) toward eco-packaging attributes. More precisely, the attributes that can be perceived by the consumer are more limited than those of the LCA results (please see Table 3). Some attributes are common to both the consumer and the LCA perspective, such as recyclable materials, lighter weight, smaller size, color (e.g., green, blue, or transparent), and sustainable labeling.

In addition, this study contributes to the field of responsible consumption research, in which little attention has been paid to consumers' perceived risks of eco-design packaging. Most studies dealing with the effects of sustainable attributes upon consumers' responses (attitudes and behaviors) have focused on the perceived advantages and values of this type of packaging. For instance, Magnier and Schoormans (2015) showed that consumers believe that sustainable packaging generates two categories of benefits: Individual and public. Individual benefits are associated with people's selfish tendencies, such as seeking security or pleasure. In contrast, public benefits correspond to altruistic benefits. The issue is that positive perceptions of eco-design packaging do not account for the low actual purchasing. Individual decision-making theory (Yates & Stone, 1992) posits that consumers assess both the benefits and the risks a product may bring them. Hence, it is necessary to view the issue from a more comprehensive perspective that includes perceived risks, as advocated by consumer psychology researchers (Einhorn & Hogarth, 1987). Perceived risks are seen as the result of negative consequences and uncertainty. This study has highlighted 11 risks of eco-design packaging, as perceived by the discussion group participants.

Through an examination of cognitive chaining, this study has also shown the underlying cognitive structures of consumers (Gutman, 1982). This approach is used to identify the role of perceived risks in consumers' decision-making processes by linking packaging attributes, the consequences or risks emanating from the consumption process of eco-packaged products, and individual values. The analysis results show that consumers' choices are influenced by five types of perceived risks.

Functional risks are associated with the main functions of eco-design packaging. Previous studies (Banks, 1950; McDaniel & Baker, 1977) have shown that packaging plays a key role in consumers' behaviors, such as assessing and accepting products (McDaniel & Baker, 1977; Schoormans & Robben, 1997). The traditional functions of

packaging can be classified into two categories: Technical functions and marketing functions. The development of packaging, however, has extended its functions. Vila et Ampuero (2007) argue that beyond these two key functions, another category of functions has developed, associated with a set of elements constituting the marketing mix, such as the product, price, distribution, and promotion. Assessing the quality of products is influenced by the attributes of the product as reflected in the packaging. If the packaging is perceived as offering a good quality level (i.e., preservation and product use), consumers believe that the product's quality is equally good. In this exploratory study, eco-design packaging was perceived as being of poor quality because of its attributes: Recycled or recyclable materials and simplified packaging. We observed that consumers tend to link functional risks with other types of risks, such as financial, physical, and eco-responsible risks. Financial risks are connected with poor value for money in consumers' minds. In particular, reduced or simplified packaging appears to disappoint consumers who view this initiative as a strategy to increase the product's price, especially when they pay the same price for a reduced quantity. Finally, the issue of poor packaging performance, in terms of its protection and preservation function, is viewed as one of the major causes of health problems and food waste.

Physical risks: Findings show that consumers are concerned about the key packaging functions of product protection and preservation. The majority of consumers express serious doubts about "recycled materials" and the "manufacturing information" of eco-design packaging, since these attributes are directly linked to the perceived health safety of the products. In terms of the health belief model (Becker, 1974; Rosenstock, 1974), people are motivated to take preventative action if they perceive the threat of a health risk to be serious. In the realm of food consumption, perceived risks involve the perceived risk severity and the vulnerability of the packaged products. Rogers (1983, 1975) explains that people's intentions to adopt a behavior of food product consumption is governed by their motivation to protect themselves from any perceived

health-related risks, which reflects the values of “personal well-being” and “family security” used in this study. Our results appear contradict some other studies of consumer attitudes towards eco-packaging, which concluded that the ecological characteristics of packaging produce health-related long-term value through the protection of the planet (Magnier & Schoormans, 2015).

Financial risks: This study’s findings show that most consumers (89%) perceive the cost of eco-packaged products to be higher than that of ordinary products. Consumers tend to link product price to packaging performance (i.e., product protection and preservation). Previous studies focusing on consumers’ willingness to pay for the eco-responsible attributes of products have been inconclusive. The pioneering work of Kassarian (1971) demonstrated the existence of a positive correlation between less polluting petrol and consumers’ willingness to pay for this type of petrol (Ciuca, 2006). However, Boivin *et al.* (2011) indicate that financial and functional deterrents are the most significant factors explaining why positive attitudes do not lead to actual purchasing behavior.

Life standard risks may be viewed as the negative valence of the life standard value. The latter is defined as the sensations produced mainly by the materials, colors, shapes, and sizes of packaging (Couégnas & Bertin, 2005). Consumers’ perceptions of colors appear to affect the image of the product and the brand (Dooley & Harkins, 1970), their purchasing intention (Dooley & Harkins, 1970), and their attitudes towards the product (Roullet & Droulers, 2004). Our results show that green or transparent packaging influences emotions, induces feelings of nature and calm, and signals more ecological packaging and healthier food products. However, a few consumers said that green packaging is hard to identify in the product category, next to other colors such as blue or red. Similarly, the shape of eco-design packaging (round and curved) arouses aesthetic responses in consumers. These responses constitute an interaction between the packaging’s shape and the person who perceives it. A few female participants stated

that the water bottle is not round enough and carries an unfeminine image. Finally, a combination of the size and extremely elongated shape of the water bottle gives the impression that the bottle contains less water than an ordinary bottle.

Socio-environmental risks: Swaen and Chumpitaz (2008) show that the transaction of signals related to corporate social responsibility enhances consumers' trust in products. In our study, however, consumers expressed a lack of trust (26%) in eco-design packaging because they saw this type of packaging as a marketing strategy to increase sales. Apart from this lack of trust, consumers believed that eco-design packaging, particularly packaging manufactured from recyclable materials, does not reduce loss and food waste. Simplified packaging, particularly no packaging (i.e., selling bulk products), is not viewed as an effective way to protect products and does not provide important information (e.g., the sell-by-date, list of ingredients, instructions for use, and place of origin) explicitly.

4.6.2 Methodological Contributions

This study illustrates how to use MEC analysis to explore consumers' perceived risks of eco-design packaging. MEC was initially introduced by Young and Feigin (1975) into consumer behavior research. MEC is an efficient tool to explain how consumers obtain their desired end states, namely individual values, by consuming a product or service (that is viewed as an ensemble of diver attributes). This technique was then developed by Gutman (1982), Reynolds and Olson (2001) to investigate consumer preference, motivation, and consumer segmentation.

This study provides two insights for using MEC to investigate consumer reactions towards eco-design packaging and sustainable products. First, MEC does not only explore the positive/desirable consequences (e.g., the benefit) of consuming a product but also the negative/undesirable consequences (e.g., the risk). Second, because of its

efficiency and objectivity, an individual interview with the given A-C-V Cards may be a more efficient data collection technique than a traditional interview (Valette-Florence, 1994).

4.6.3 Managerial Implications

From a practical perspective, the marketing manager and packaging designer play an important role in improving packaging design. This study provides the following actionable suggestions:

First, this study reveals that there is a gap between how the package is designed (i.e., based on the LCA indices) and how the package is actually perceived by consumers. This finding can be insightful for both marketing managers and packaging designers. For marketing managers, this study indicates that the eco-design packaging attributes that can be perceived by consumers is more limited than those defined in the LCA. Some attributes make more sense from a consumer perspective, such as recyclable materials, lighter weight, smaller size, color (green, blue, or transparent), and sustainable labeling. Hence, marketing managers should consider these attributes to improve their mix-marketing strategies and better guide consumers toward sustainable purchasing decisions. However, marketing managers should avoid the practice of greenwashing. For packaging designers, eco-design packaging and/or packaging innovation in general could gain more insight from consumer behavior research (Wikström *et al.*, 2016). Packaging designers should take attributes that can be easily perceived by consumers instead of only optimizing packaging from an industry perspective.

Moreover, consumers have several concerns related to the current functions of eco-design packaging (e.g., their efficiency of preservation and communication). Hence, we suggest that packaging designers should include these concerns in their packaging

development procedures. For instance, it is important to improve the preservation and conservation functions to reduce potential hygiene and health risks. Likewise, improving the aesthetic aspects (i.e., reducing life standard risk) of eco-design packaging would help promote such packaging.

4.6.4 Political Implications

For policy makers, these findings show that consumers have various concerns regarding eco-design packaging that prevent them from choosing an eco-design product during their purchasing procedures. These concerns include efficiency (functional risk), price (financial risk), aesthetics (life standard risk), and sustainability (socio-environmental risk). These concerns are due to a lack of relevant knowledge of eco-design (in particular, life-cycle assessment techniques) and packaging functions. Therefore, policy makers should develop new eco-design packaging labeling systems and relevant legislation for each product category. This solution could clarify the indices that are measured to attenuate consumers' perceived risks and, in turn, guide consumers' purchasing decisions. We also suggest that the government encourages eco-design packaging through innovation competitions and financial support. In addition, the eco-design packaging should be perceived as a tool for marketing products as more efficient (e.g., energy efficient, easy to use and/or reuse, and easy to recycle) instead of as a tool for greenwashing. Thus, policy makers should improve current eco-design regulations adapted for each product category in order to control greenwashing.

Lastly, even with their high potential social and environmental impacts, eco-design packaging has not yet fully integrated into the circular economic framework in Canada. Thus, we suggest that the Canadian government, instead of just the packaging industry, take eco-design packaging into account from the outset.

4.7 Limitations and Future Research Directions

This exploratory study developed an MEC analysis of consumers' cognitive structures regarding eco-design packaging. Moreover, the research process was based on (1) data triangulation (i.e., combining two data collection approaches: A focus group and individual interviews with two comparative heterogeneous demographic samples) and (2) method triangulation (i.e., analyzing academic and professional literature, content analysis, and an analysis of cognitive chaining) to obtain more robust results, thereby strengthening the research's validity.

However, due to the exploratory nature of this study, several limitations remain. Firstly, due to the sample ($n = 19$) of individual interviews, this study cannot generalize its findings related to consumers' cognitive chains to all consumers. Moreover, this study revealed four risk-oriented consumption patterns associated with eco-design packaging (i.e., functional and physical risks-oriented consumption patterns, life standard risk-oriented consumption patterns, financial risk-oriented consumption patterns, and socio-environmental risk-oriented consumption patterns).

Through a hierarchical map linking attributes, consequences, and values (Please see Figure 4.3). Note that this representation of static cognitive chaining cannot lead to an inference of causality. Future research may seek to establish a representative of cognitive chaining to build a dynamic causal model of A-C-Vs with a representative sample (around fifty) (Valette-Florence, 1994).

Secondly, this study focused upon the negative reactions of consumers, namely their perceived risk. Future studies focusing upon the positive reactions of consumers (e.g., perceived benefits and perceived quality) through an MEC approach are recommended to gain a complete understanding of the topic.

Another limitation is that this study focused upon food packaging in a Canadian context. A survey of Eco Entreprises Quebec shows that Canadian consumers have a higher awareness of eco-design packaging in food categories (57.1%) than in other product categories, including medication (10.6%) and cleaning products (9.0%) (Éco Entreprises Québec, 2015). The findings for individual cognitive chains may be different across diverse product categories. Thus, a future study may investigate consumers' perceptions towards eco-packaging across different product categories (e.g., cleaning products and cosmetic products). However, we expect similar findings to the food packaging sector.

Lastly, the results of this exploratory study have demonstrated the socio–environmental risks related to packaging. In particular, 26% of consumers interviewed stated that eco-design packaging could cause food waste because of its simplicity, reduction, or poor quality. These results seem to contradict most of the findings of previous consumer studies on the influence of packaging on food waste behaviors, which showed instead that reduced packaging reduces food waste (Svanes *et al.*, 2019; Wikström *et al.*, 2019; Williams & Wikström, 2011; Williams *et al.*, 2018). These inconsistent results may be due to the particular sample and/or an oversight of some effects of key variables (e.g., the effects of time). Hence, it is necessary to perform a confirmatory study of these experimental studies by integrating the effect of time, to investigate the causal relationship between consumers' perceptions towards eco-design packaging and their food waste behaviors.

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APPENDICE B

Tableau B.1 Sample of the focus group

Variables		Frequency	%
Gender	Male	3	38%
	Female	5	63%
Average age	36		
Marital status	Single, never married	2	25%
	In a domestic partnership or civil union	2	25%
	Married	3	38%
	Divorced	0	
	Widowed	1	13%
Origin	Quebec	4	50%
	Other Provinces in Canada	0	
	Other Countries	4	50%
Education	No diploma	0	
	High school graduate	1	13%
	Certificate	2	25%
	Bachelor's degree	2	25%
	Master's degree	2	25%
	Ph.D.	1	13%
Number of Children	No child	5	63%
	1	1	13%
	2	1	13%
	More than 2	1	13%
	Total		8

APPENDICE C

Guide of the Focus Group

Present three different types of eco-design packaging in front of participants:

- A cheese bag made of 100% recycled plastic that is easy to reclose
- A water bottle that improves content/container (product/packaging) ratio (i.e., using the same quantity of 100% recycled rPET plastic contains more water).
- A box of granola bars that use less cardboard.

Tableau C.2 Questions

Topics	Open-End Questions	Complementary Questions
Perceptions regarding eco-design packaging attributes	What are your impressions regarding these packs?	
Consequences relating consumption of eco-design packaging	What do you think about the initiative of eco-design packaging?	
Evaluation criteria in purchasing decision	Can eco-design packaging change your mind when you are shopping?	In your option, what are the most important characteristics for an eco-design packaging (e.g., price, quality, made of recyclable materials)? In your option, which characteristics can be improved?

APPENDICE D

Tableau D.1 Sample of Individual Interviews

	Variable	Frequency	%
Gender	Male	8	42%
	Female	11	58%
Age	18–24	6	32%
	25–34	10	53%
	35–44	1	5%
	45–54	2	11%
Marital status	Single, never married	10	53%
	In a domestic partnership or civil union	4	21%
	Married	5	26%
	Divorced	0	0%
	Widowed	0	0%
Origin	Quebec	8	42%
	Other Provinces in Canada	0	0%
	Other Countries	11	58%
Education	No diploma	0	0%
	High school graduate	2	11%
	Certificate	1	5%
	Bachelor's degree	2	11%
	Master's degree	13	68%
	Ph.D.	1	5%
Total		19	100%

APPENDICE E

Tableau E.1 Multiple adjustment scores of non-linear canonical analysis

A-C-V's		Orientations		
		1	2	3
Attributes	Recycled materials (e.g., recycled cardboard, recycled plastic, biodegradable plastic, wood)	0.047	1.213	0.091
	Recyclable materials	0.099	0.063	0.013
	Reduced packaging/no overpackaging	0.205	0.6	0.293
	Shape (round, curved, delicate)	0.268	0.229	0.029
	Eco-labeling (FSC logo, recyclable)	0.008	0.035	0.272
	Color (green, blue, transparent, white, brown)	0.11	1.169	0.146
	Clear manufacturing information	0.06	0.06	0.231
	High price	0.535	0.014	0.009
	Packaging quality	0.011	0.02	0.743
Consequences	Value for money	0.002	0.087	0.085
	Protection effectiveness	0	0.075	1.385
	Communication quality (difficult to understand the information presented on the packaging)	0.065	0.027	0.051
	Hygiene/cleanliness sacrifice	0.054	1.389	0.767
	Health/health safety	0.636	1.195	0.414
	Pleasure during the consumer experience (hedonism)	0.003	0.84	0
	Practicality	0.361	0.157	0.182
	Respect for the environment	0.736	0.708	0.11
	Food waste	0.026	0.648	0.405
	Aesthetic sacrifice	0.012	0.505	0.117
Values	Trust/credibility towards the product and the brand	0.496	0.438	0.51
	Capable (competent, effective)	0.328	0.069	0.003
	Logical (coherent, rational)	0	0.001	0.286
	Intellectual (intelligent, thoughtful)	0.003	1.018	0.241
	Honest (sincere, frank)	0.019	1.847	0.807
	Responsible (accountable, reliable)	0.033	5.858	0.498
	Enjoyment and excitement/pleasure (pleasant unhurried life)	1.427	0.084	0.003
	Happiness (satisfaction)	0.271	0.28	0.025

A-C-V's	Orientations		
	1	2	3
Family security (taking good care of loved ones)	0.229	1.774	0.112
Inner harmony (for personal well-being/security)	0.181	1.299	0.065

APPENDICE F

Tableau F.1 Terminology and definition of the core concepts

Term	Explanation	Result
<p>nd chain (or cognitive chaining) The term “Means–end chain” is used to describe the theoretical framework and research method. However, the term “cognitive chaining” is used to presented research method and results. Cognitive chaining describes the connection between product attributes (the “means”), the consequences consumers derive from those, and the potential links with consumers’ values (the “end”). More precisely, cognitive chaining links three successive levels of abstraction: Attributes, consequences, and values (A-C-V / s structure). Cognitive chaining can identify the consumer purchasing decision process and behavior patterns associated with a product (i.e., eco-design packaging). Figure 1</p>	<p>The term “consequence” only refers to second a level variable (A-C-V’s). It is measured by 17 items.</p>	Table 1
<p>Consequence</p>	<p>The term “risks” refers to the aggregated concept from the findings. The authors use the term “risks” to describe the consumer segments (Table 4.6) and their risk-oriented consumption patterns (Figure 4.3). Table 4.6 Figure 3</p>	Table 4.6
<p>Orientation</p>	<p>The term “orientation” refers to the typology of A-C-V’s structure. For instance, the orientation A3-C3-V3 in the 3rd line of Table 4.6 corresponds to: A (Clear manufacturing information)–C (Hygiene/cleanliness sacrifice, Communication quality)–V (Honest, Responsible).</p>	Table 4.6
<p>Consumption segment</p>	<p>The term “consumption segment” describes a group of consumers who share the common characteristics. This</p>	Table 4.6

study identifies three consumer segments based on their perceived risk associated with eco-design packaging: (1) Eco-conscious consumers, (2) Utilitarian-minded consumers, and (3) Skeptical consumers.

The term “consumption pattern” describes consumer consumption A-C-V structure based on the perceived risks associated with eco-design packaging. This study revealed four consumption patterns: (1) a functional and physical risks-oriented consumption pattern, (2) a life standard risk-oriented consumption pattern, (3) a financial risk-oriented consumption pattern, and a (4) socio-environmental risk-oriented consumption pattern.

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CHAPITRE V

ARTICLE 3

THE IMPACT OF ECO-DESIGN PACKAGING ON FOOD WASTE AVOIDANCE: A CONCEPTUAL FRAMEWORK

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AVANT-PROPOS À L'ARTICLE 3

Les résultats de l'article 1 et l'article 2 ont identifié les potentiels de l'impact de l'emballage sur le gaspillage alimentaire. L'article 3 a donc pour objectif d'amener une réflexion approfondie sur la relation entre le risque perçu socio-environnemental de l'emballage (le gaspillage alimentaire) et la solution potentielle (l'emballage éco-conçu).

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ABSTRACT

Eco-design packaging is a potential tool to reduce food waste. However, the absence of a theoretical basis regarding the relationships between eco-design packaging and consumer food waste behaviour obscures the social impact of this packaging. This study assesses research linking eco-design packaging and food waste avoidance from a consumer perspective. The authors analyze 22 articles in top-tier journals and conclude that consumer perceptions of eco-design packaging could reduce food waste. Results lead to a conceptual model of the mechanism whereby consumer perceptions of eco-design packaging influence food waste avoidance intentions.

Keywords: consumer perceptions; eco-design packaging; sustainable packaging; food waste.

5.1 Introduction

Food waste ranks as an important sustainability issue for international organizations, NGOs and industrialized nations. One-third of food is wasted or lost per year, which generates economic losses of US\$ 680 billion in industrialized nations and US\$ 310 billion in their developing counterparts (Food and Agriculture Organization [FAO], 2019).

One-third of waste occurring at the consumption owing to poor packaging, instrumental or communication functions (e.g., poorly preserved food, confusing storage guidance information) (Poyatos-Racionero *et al.*, 2018; Wikström *et al.*, 2019). Thus, packaging innovation, specifically eco-design packaging, appears as a strategic solution to curtail consumer food waste. Eco-design packaging exerts a positive environmental impact by taking product lifecycles into account and enhancing packaging functions from inception through to end-of-life (Poyatos-Racionero *et al.*, 2018; Wikström *et al.*, 2019).

Previous studies focusing on the impact of eco-design packaging on food waste restrict to an industrial perspective. They assume that eco-design packaging features more sustainable attributes (e.g., use of biodegradable materials such as NanoPack film to extend product shelf life) to minimize environmental impact (Rhim *et al.*, 2013).

However, the social impact of eco-design packaging remains limited because: firstly, consumers do not consistently perceive all sustainable attributes. Existing gap between consumer perception of packaging sustainability and lifecycle assessment (LCA) results, indicative of insufficient consumer knowledge of eco-design packaging (Boesen *et al.*, 2019). Moreover, some consumers entertain concerns or misunderstandings about eco-design packaging. One-third of Canadian consumers claim packaging to be one of the most important causes of food waste which they view

as a ‘source of pollution’ (Observatoire de la Consommation Responsable [OCR], 2015c); Secondly, there exists no consensual theoretical framework applying to the complex interdisciplinary interplay—psychology, industry and sociology – impacting the relationships between consumer perceptions of eco-design packaging and food waste behaviour.

To address these issues, it must develop a theoretical framework which clarifies the mechanisms linking eco-design packaging and consumer food waste behaviour from a consumer perspective. The authors adopt an inductive top-down theorizing process to build a hybrid model. Appropriate for investigating complex, interdisciplinary phenomena, this approach relies on a systematic analysis of research conducted in a diversity of fields (Shepherd & Sutcliffe, 2011).

The article begins with an outline of the conceptual background. The authors then present the methodology, synthesize the determinants of consumer food waste, propose a hybrid model – key study outcome – and conclude with theoretical contributions and managerial implications.

5.2 Theoretical framework

5.2.1 Consumer perceptions of eco-design packaging

Packaging plays an important role in linking products to consumers through different functions. In the context of growing environmental awareness, eco-design is viewed as a strategic response to the needs of stakeholders by incorporating environmental and/or social considerations into packaging (Gkorezis & Petridou, 2017). Eco-design packaging can be defined from two perspectives: from the engineering perspective, it refers to a type of packaging that has “a comparatively low environmental impact as assessed by lifecycle assessment models” (Glavič & Lukman, 2007; Steenis *et al.*,

2017, p. 287); from the consumer standpoint, eco-design packaging is defined as “packaging design that evokes explicitly or implicitly the eco-friendliness of the packaging” (Magnier *et al.*, 2016, p. 133).

Eco-design packaging impact is examined through an analytical perspective based on multi-attribute theory. Investigations focus on how various discrete, sustainable attributes (e.g., recyclable materials, sustainable cues) impact consumer reactions (e.g., perceptions of product quality and sustainability, purchasing intentions) (Magnier & Crié, 2015).

Previous studies show that recyclable materials (e.g., glass, paper and cardboard) most significantly impact consumer perceptions of sustainability. Van Dam (1996) demonstrates that materials and reusability exert the most important impact on consumer evaluations of packaging sustainability. Moreover, packaging sustainability (recycled cardboard look) positively impacts consumer perceptions of product quality (healthfulness, freshness and safety) (Magnier *et al.*, 2016). Likewise, packaging shape (slim and minimalistic versus oversized) positively influences perceived product healthfulness (low in calories) with a resulting impact on consumer health-related purchasing behaviour (Van Ooijen *et al.*, 2017).

5.2.2 Packaging and consumer food waste

Several studies point to packaging as potentially influencing consumer food waste behaviour. The authors identify three research streams which consider food waste from psychological, industrial and social perspectives. The first stream examines the psychological determinants of consumer food waste behaviour. Most of these studies employ the theory of planned behaviour (TPB) (Ajzen, 1991) as the framework for investigating consumer motivations (e.g., wastage concerns, doing the right thing and food management skills) and barriers (e.g., good provider identity, minimal

inconvenience and lack of priority), and explaining or predicting consumer food waste behaviour (Graham-Rowe *et al.*, 2014). They point to packaging size as the primary cause of food waste since packages all too often contain inappropriate quantities of food.

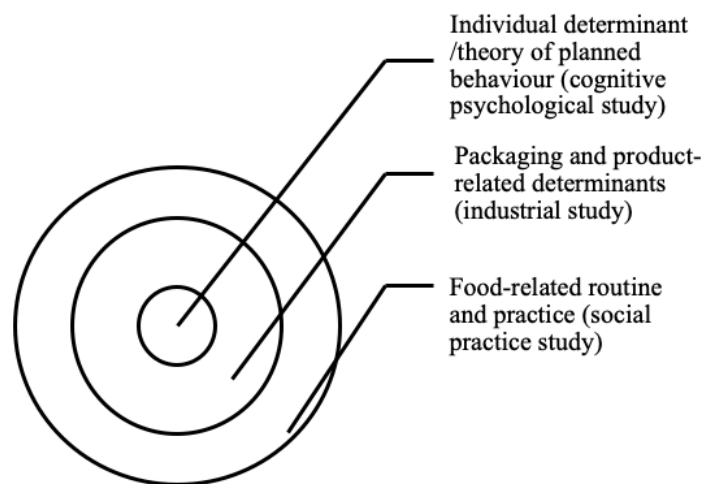
The second stream adopts an industrial perspective from which eco-design packaging is viewed a tool intended to reduce food waste. Wikström *et al.* (2019) and Williams *et al.* (2012) advocate improving packaging attributes to reduce consumer food waste: oversize issues, difficult to empty, protection against physical alteration, convenience. Likewise, Wohner *et al.* (2019) highlight four main packaging functions that influence food waste including protection, convenience (e.g., easy to reclose), communications (e.g., providing information about date labeling, environmental certification and storage guidance), product containment and storage. That said, the impact of eco-design packaging on consumer food waste remains limited as a result of packaging improvements not taking into account consumer needs (Wikström *et al.*, 2019). Besides, Boesen *et al.* (2019) point to the existing gap between consumer perceptions of packaging sustainability and LCA. Results reveal that consumer perceptions of food packaging sustainability relate essentially to materials (e.g., bio-based, glass, plastic, laminated cartons).

The third stream examines consumer food waste behaviour from a social practice perspective, namely food-related practices and routines ranging from food planning to leftover management (planning→ shopping→ storing→ cooking→ eating→ managing leftovers) (Evans, 2011b). The aim is to illustrate how ‘food’ transitions into ‘waste’ in everyday consumer life and then provide more sustainable practices to minimize waste. Packaging plays a crucial role at several stages of food-related practices. For instance, the appropriate packaging size helps consumers with sound planning skills to avoid unplanned products (Stancu *et al.*, 2016). In a shopping context, consumers generally tend to choose larger sized packaging and end up buying more than they need

(Evans, 2011b). Oversized packaging therefore generates food waste through overprovision (Schanes *et al.*, 2018).

The three streams tend to theorize the relationships between packaging and food waste behaviour, and can be represented as a nested hierarchy of consumption behaviours ranging from proximal, to intermediate, to distal (Jaccard & Jacoby, 2010) (see Figure 5.1).

Figure 5.1 Conceptual representation of three research streams focusing on consumer food waste behaviour



The proximal level comprises studies exploring motivations or barriers to consumer food waste behaviour from a cognitive psychological perspective. These studies explore the packaging attributes and functions linking consumer food waste avoidance motivations. The intermediate level comprises industrial studies aim to identify improvements in attributes in packaging lifecycle based on LCA. Eco-design packaging is viewed as a solution for helping reduce food waste. The distal level extends to social practice studies which examine consumer food-related practices and routines, the primary goal being to bring to the fore household practices and routines by means of which ‘food’ transitions into ‘waste’.

Despite all research streams pointing to eco-design packaging as a means of potentially reducing consumer food waste, the impact of eco-design packaging on food waste behaviour remains limited for three reasons: firstly, topical literature reveals a gap between consumer perceptions and industrial definitions (LCA) of eco-design packaging since eco-design packaging does not make allowance for consumer needs (Boesen *et al.*, 2019); secondly, the previous research demonstrate the significant impact of packaging functions on food-related practices. However, most of studies focus on exploring the drivers or barriers to food waste (including packaging-related determinants) instead of proposing solutions (e.g., eco-design packaging) (Wikström *et al.*, 2019); and lastly, studies into the determinants of consumer food waste behaviour confine themselves to a single level of analysis, either proximal (psychological studies) or distal (sociological studies). That said, the impact of packaging on consumer food waste is a complex phenomenon meriting multi-level analyses (Wikström *et al.*, 2019) capable of providing insights into the underlying relationship between packaging and consumer food waste, and how eco-design packaging – as a potential solution – help reduce consumer food waste.

This paper therefore represents a theoretical departure from the norm and marks a shift to multi-level analyses by considering ‘consumer food waste behaviour’ as outcomes of determinant interaction at several different levels rather than a single (proximal/intermediate/distal) level. The packaging, situated midstream, is viewed as an intermediate level determinant with links to other levels. This study aims to provide a multi-level theoretical framework for clarifying the mechanisms by means of which consumer and not industry-based perceptions of eco-design packaging influence food waste decisions. Precisely, this study endeavours to answer two questions: (1) What is the nature of the system of interrelated determinants illustrating the relationships between consumer perceptions of eco-design packaging and consumer food waste avoidance intentions (addressed in variance model)? ; (2) What is the nature of ongoing

consumer perception processes, do consumers perceive eco-design packaging in different ways (addressed in process model)?

5.3 Methodology

Since the impact of consumer perceptions of eco-design packaging and consumer food waste behaviour is a complex, interdisciplinary (psychological, industrial and sociological) phenomenon, the inductive top-down theorizing method is deemed appropriate. This method allows researchers to pinpoint similarities and/or paradoxes across different disciplines, and “is especially appropriate when the body of previous research is vast, dynamic, complex, and/or derives from disparate sources” (Shepherd & Sutcliffe, 2011, p. 374).

5.3.1 Article selection

The selection process is carried out in three steps to construct an exhaustive database. The authors use keywords ‘consumer-related food waste’ and ‘sustainable packaging’ to search article titles, abstracts and keywords but no articles come to light. They expand their investigation to include ‘citations’ and ‘all fields’ appearing in English and French in SCOPUS from 1996-2016. This second search thrust produces two articles from the industrial sector. Subsequent searches using the keywords ‘packaging’ and ‘food waste’ generate 214 articles. Article abstracts are evaluated, and only those focusing on the consumption stages of the food supply chain (FSC) and consumer-related food waste are retained. The authors then turn to searches on the themes of ‘eco-design packaging’ and ‘product packaging’ to round out the database.

Lastly, they conduct manual searches in top-tier journals in different fields (e.g., marketing, environment, design and food). After removing duplicates, the abstract and

contents of the remaining papers are screened for their fit with four predefined criteria: focus on (1) food packaging; (2) packaging optimization; (3) consumption stages of the FSC; and (4) motivations and/or barriers of food waste.

5.3.2 Data analysis

All papers are coded to identify those linking packaging optimization and food waste behaviour which results in a total of 22 articles. The coding process is performed on complete articles by ATLAS/Ti Version 7 software (Scientific Software Development GmbH, 2016). Given the nature of the data (22 articles) and theory-building objective, the authors adopt inductive top-down theorizing as the analytical approach given the latter's appropriateness in understanding and resolving existing paradoxes in topical literature, especially when previous studies are extensive, dynamic, complex and extend across different disciplines. The technique involves commencing with issues (consumer food waste behaviour) and working down to potential solutions (eco-design packaging), paving the way for the emergence of descriptions and coherent answers to research problems, and the formulation of a new theory. Top-down theorizing is based on a consistent comparison of sensory (divers categories of food waste determinants according to the level of analysis from the proximal to the distal) and conceptual representations (focusing the attention on the impact of product-and packaging-related determinants on consumer food waste behavior) of the research topic in the literature (Shepherd & Sutcliffe, 2011).

5.4 Determinants of food waste

Of the twenty-two articles, twenty examine the determinants (motivators/barriers) of food waste. Despite the absence of a theoretical framework for determinants that impact food waste behaviour, these articles identify four categories of determinants

according to different levels of analyse from proximal to distal (Jaccard & Jacoby, 2010) (see Table 5.1).

Tableau 5.1 Determinants of food waste

Level of analysis	Category	Variables
Proximal	Personal psychological determinants (Evans, 2011b; Graham-Rowe <i>et al.</i> , 2015; Thøgersen, 2006)	<ul style="list-style-type: none"> • Attitude to food waste • Subjective norm • Perceived behavioural control • Moral norm, responsibility • Universalisme • Negative emotions avoidance • Obligation to avoid food waste • Self-identity (doing good) • Personal norms • Environmental awareness • Financial attitudes • Health consciousness
	Product- and packaging- related determinants (Aschemann-Witzel <i>et al.</i> , 2016; Boesen <i>et al.</i> , 2019; Van Rompay <i>et al.</i> , 2016; Wikström <i>et al.</i> , 2019)	Packaging: <ul style="list-style-type: none"> • Over-packaged (multipack) • Size (downsized portions, split pack) • Date labeling (use by/best before date) Perceived product quality: <ul style="list-style-type: none"> • Healthiness • Freshness • Nutrition • Taste
Near-distal	Consumption management (Evans, 2014)	<ul style="list-style-type: none"> • Household planning habits • Knowledge of food waste consequences, solution • Storage knowledge • Date labeling knowledge • Shopping habits (frequency, household manager, planning) • Habits of meal preparation, waste
Distal	Socio-cultural determinants (Abdelradi, 2018; Aschemann-Witzel <i>et al.</i> , 2016; Koivupuro <i>et al.</i> , 2012)	Culture of consumption, food, cooking

At the proximal level, the assumption is that consumer food waste reduction behaviour is impacted by intentions in this regard. Determinants impacting food waste reduction intentions include: (1) personal psychological determinants found in the TPB (Ajzen, 1991) and additional psychological variables specially: environmental awareness, Health consciousness and financial attitudes.

At the near-proximal level, attention focuses on why some consumers intend to reduce food waste while others do not. The TPB assumption is that people's intentions impact their behaviour, and that people's intentions directly trigger resulting behaviour. Whenever consumers are intent on avoiding food waste, they will generally act accordingly. However, the relationship between intentions and behaviour is complex, and consumers do not always do what they set out to do. Determinants impacting the relationship between intentions and behaviour include consumer perceptions of products and/or packaging, reworded as (2) product- and packaging-related determinants. This study focuses primarily on this level of analysis.

The near-distal level entails (3) consumption management issues (e.g., knowledge of food waste and packaging) which do not impact consumer food waste behaviour directly but which can "*shape the proximal and near-proximal*" determinants (Jaccard & Jacoby, 2010 p. 61).

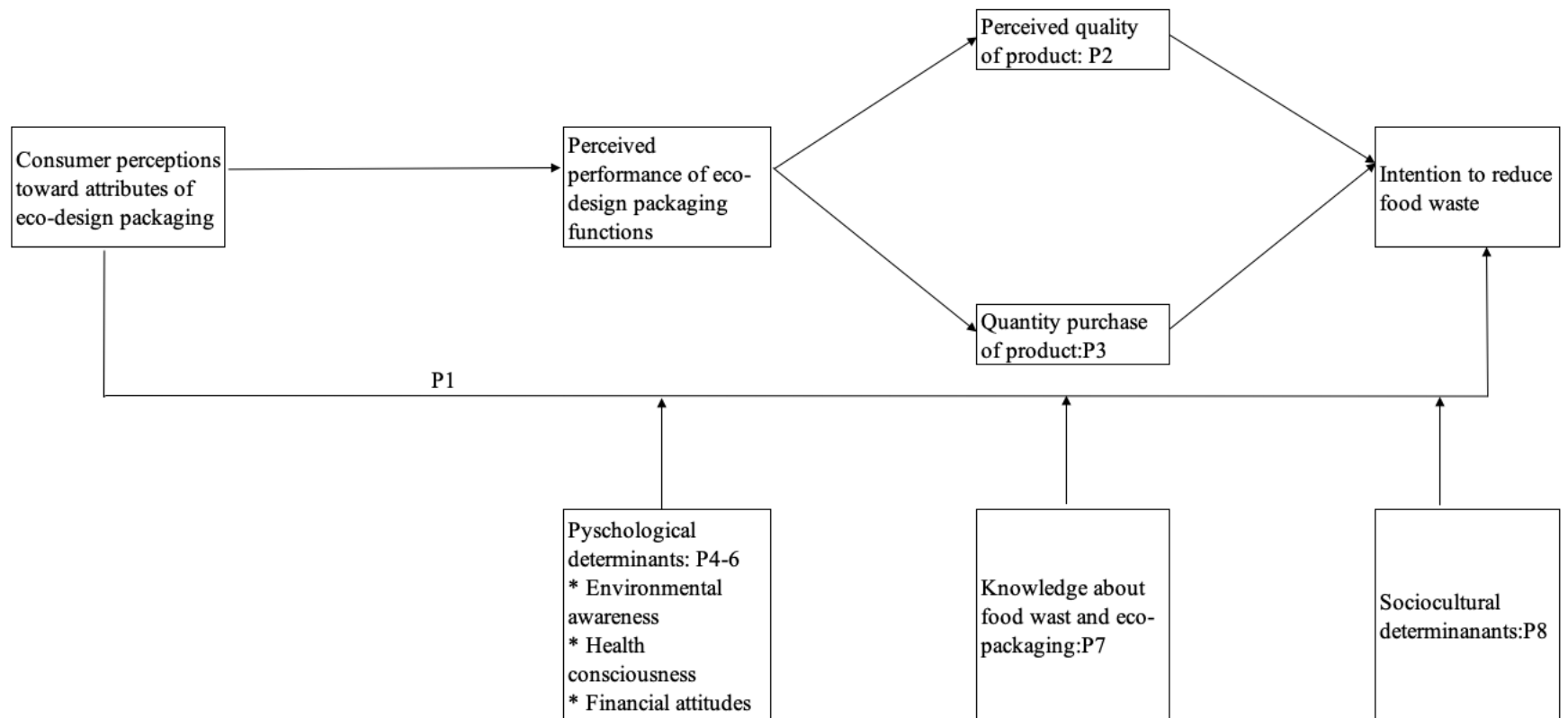
The distal level examines the broader contexts in which food waste behaviour occurs and extends to the likes of (4) sociocultural determinants (e.g., culture of food, consumption).

5.5 Hybrid model of impact of eco-design packaging on food waste avoidance

5.5.1 Variance model

The analysis of the interaction and relationships between the four categories of determinants reveals two categories of determinants: initiating and moderating determinants. Initiating determinants are those which impact consumer food waste avoidance intentions either directly or indirectly. While, moderating determinants do not impact directly/indirectly consumer intentions, but shape relationships between initiating determinants and outcomes (see Figure 5.2).

Figure 5.2 Variance model



5.5.1.1 Initiating determinants

Initiating determinants relate to products and packaging. Consumer perceptions of eco-design packaging influence perceived product quality and quantities purchased through the perceived performance of packaging functions. Next, perceived product quality and product quantities purchased impact consumer food waste decisions. Table 5.2 illustrates the mechanisms linking consumer perceptions of eco-design packaging and consumer food waste avoidance intentions. Consumer food waste reduction intentions are impacted by perceptions of product attributes in terms of quality/quantity. Moreover, consumers infer product attributes based on perceptions of packaging attributes associated with its functions (Becker *et al.*, 2011; Orth & Malkewitz, 2008). As shown in table 2, eco-design packaging (Columns 1, 2, 3) impacts consumer food waste reduction intentions (Column 5) through product perception (Column 4). The authors identify five types of eco-design packaging: easy to close packages, downsized packages, multi-packages, packages with clear guidance and information respecting storage and labeling, and packages with eco-labels.

Tableau 5.2 Impact of perceptions of eco-design packaging on food waste avoidance

Eco-design packaging		Perceived attributes	product	Impact on food waste reduction intentions
Attributes	Types			
Visual	1. Easy to close packaging (e.g., zip lock bags and pouches) (n=44* Occurrences in the 22 relevant articles. 44 means that 'perceived product quality' appeared 44 times in the 22 articles)	Instrumental	Quality	<ul style="list-style-type: none"> Protect food freshness Improve convenience of packaging
	2. Downsized packaging/optimized product-packaging ratio (e.g., single pack for yoghurt) (n=66)		Quantity	Reduce amount purchased for smaller family (purchase necessary quantities)
	3. Multi-packaging (n=13)		Quality, quantity	Consume necessary parts of product
Verbal	4. Packaging with clear guidance/information for storage and labeling. <ul style="list-style-type: none"> Storage guidance and product preservation for freshness and hygiene Date labeling (e.g., use by/best before date) (n=78) 	Communication	Quality	Improve storage practices to prolong product life
	5. Packaging with eco-label (n=35)		Quality	Identify product category (green, organic)

Perceived performance of eco-design packaging functions

The perceived performance of eco-design packaging functions refers to a subjective understanding of eco-design packaging effectiveness compared with conventional packaging. An essential component of any product, product packaging performs instrumental (e.g., preservation, conservation, communication of storage guidance) and commercial (e.g., brand identification) functions linking products and consumers (Magnier & Schoormans, 2015).

In the food sector, packaging plays an important role with respect to product protection, conservation and communications along the FSC (Verghese *et al.*, 2015). It is possible to reduce consumer food waste intentions by notably improving the perceived importance of the instrumental and communications functions of packaging (In the 22 articles reviewed, occurrences number 123 for ‘technical functions’ and 113 for ‘communications functions’.) (Verghese *et al.*, 2015). These findings are confirmed by WRAP (2015) study on consumer attitudes to food waste and packaging. Results point to three leading packaging functions perceived by consumers: the conservation function (‘keep products safe and hygienic’) mentioned by 42% of consumers; the communications function (‘provide important information about the label’) (37%); and the protection function (‘protect product during transport’) (36%). The instrumental function is improved by optimizing packaging appearance or visual attributes: reclosable, split, multipack or downsized. While the communications function is enhanced by optimizing verbal attributes: clarifying date labeling and storage guidelines.

Perceived quality

Perceived quality is linked not only to products themselves, but also to packaging, brand image, personal values, needs and preferences. In a purchasing context, consumers generally choose a high-quality product to obtain ‘good value for their money’ (Magnier *et al.*, 2016; Mugge & Schoormans, 2012). Since perceived quality is intangible, consumers generally infer product quality (intrinsic characteristic) by assessing product packaging (extrinsic characteristic) (Becker *et al.*, 2011). In the sustainable food market, consumers evaluate product quality (healthfulness, freshness, safety) and sustainability through packaging sustainability (De Bondt *et al.*, 2017; Magnier *et al.*, 2016; Van Rompay *et al.*, 2016).

The content analysis substantiate perceived low quality as one of the leading motivators of food waste (50 occurrences of ‘perceived quality’). Stefan *et al.* (2013) argue that consumers consider food waste as food-related behaviour as opposed to environment-related behaviour. They therefore throw out food perceived to be of ‘poor sensory quality’ to avoid health risks. To preserve high food quality over time, retailers should cooperate with packaging producers to develop new functions to avoid storage-related food waste and improve food edibility. Precisely, retailers could optimize the packaging communication function by clarifying storage guidance and date labeling (use by/ best before) to enhance consumer knowledge of storage and the nutrition of food (Aschemann-Witzel *et al.*, 2015).

- Proposition 1: Consumer perceptions of eco-design packaging attributes positively impact consumer food waste avoidance intentions. The more consumers positively perceive eco-design packaging attributes, the more intent they are to avoid food waste.

- Proposition 2: Consumer perceptions of eco-design packaging attributes impact consumer food waste avoidance intentions through perceived performance of packaging functions and product quality. The more its attributes are positively perceived, the greater the perceived performance of packaging functions and product quality, and the greater the intentions to avoid food waste.

Quantity of products purchased

Consumer-related food waste is a complex phenomenon owing to interrelations with other stakeholders (especially retailers and marketers) in the FSC. The content analysis reveals that the quantity of food purchased represents a key determinant of consumer food waste decisions (129 occurrences of product ‘quantity’). Precisely, the packaging size leads to food waste, especially when size exceeds normal purchaser consumption levels (Williams et Wikström, 2011). Besides, pricing strategies (e.g., decrease in unit price for larger units) and price promotions (Estelami & O'Connor, 2018; Tripathi & Pandey, 2019) (e.g., buy one, get one free) encourage consumers to overpurchase, potentially leading to food waste (Aschemann-Witzel *et al.*, 2016; Koivupuro *et al.*, 2012; Williams *et al.*, 2008).

Several types of eco-design packaging can impact product quantities purchased. For instance, multipacks help consumers avoid food waste by enabling them to use only sectioned portions of products, leaving the remainder in the package. Similarly, the provision of different sizes of packaging (e.g., smaller sized packages for smaller families) can help consumers avoid food waste.

- Proposition 3: Consumer perceptions of eco-design packaging attributes impact consumer food waste avoidance intentions through perceived performance of

packaging functions and quantities of products purchased. The more eco-design packaging attributes are positively perceived by consumers, the greater the perceived performance of packaging functions, the lesser the quantities purchased, and the greater the intentions to avoid food waste.

5.5.1.2 Moderating determinants

Moderating determinants number three in total: (1) personal psychological determinants (environmental awareness, health consciousness and financial attitudes); (2) food management determinants; and (3) sociocultural determinants. These determinants do not impact consumer decisions directly but can influence the intensity of initiating determinants and intentions to avoid food waste.

Personal psychological determinants

Environmental awareness includes the likes of consumer attitudes to sustainability (Magnier *et al.*, 2016). Consumers with a high level of environmental awareness (e.g., responsible consumers) react differently to eco-friendly products than consumers with lower levels (Seitz & Razzouk, 2001; van Birgelen *et al.*, 2008). The former generally pay more attention to a company's environmental track record: eco-friendly products, eco-design packaging, corporate social responsibility and responsible communication strategies (e.g., avoidance of green washing). Moreover, consumers with a high level of environmental awareness tend to be more attentive to environmental messages: brand sustainability claims and eco-friendly elements of packaging (Magnier *et al.*, 2016). In sum, responsible consumers believe that environmental awareness can be addressed through individual efforts to foster the purchase of eco-friendly products and reduce waste (Matthes *et al.*, 2014).

Health consciousness refers to “the degree to which a person plays an active role in maintaining his or her health” (Gould, 1988; Naylor *et al.*, 2009, p. 223), which exercises a contradictory impact on food waste behaviour. On the one hand, highly health conscious consumers tend to be more vigilant regarding food quality (e.g. freshness, nutritional value, hygiene) and even throw out food prior to the ‘best before’ date indication (Parizeau *et al.*, 2015; Visschers *et al.*, 2016). These consumers seek to avoid the health risks associated with poor product quality (Evans, 2011b; Graham-Rowe *et al.*, 2014), and build a ‘good provider’ identity through their purchasing behaviour. For instance, in a household context, food purchasers (usually women) frequently overpurchase to meet family member expectations. When products are perceived as fresh, healthful and nutritious, individuals tend to purchase them even if packages are oversized and they know full well that overpurchasing leads to food waste (Evans, 2011a, b; Graham-Rowe *et al.*, 2014). That said, (Magnier & Schoormans, 2015) reports that highly health conscious consumers are more vigilant when it comes to packaging attributes, nutritional information, best before dates and maximum storage time in the refrigerator, as well as packaging materials and size. Therefore, these individuals endeavour to pay attention to packaging communications and preservation functions.

The *financial attitude* is defined as a stable psychological construct characterized by the meanings that the individual attributes to money and which leads to types of behaviour (Urbain, 2000). People’s financial attitude is shaped by and varies according to culture, education and personality. The formation and evolution of financial attitude is therefore viewed as a psychological process by which individuals integrate personal, social and cultural values. Visschers *et al.* (2016) demonstrate that financial attitudes can impact consumer intentions to avoid food waste. On the one hand, consumers exhibiting a high level of financial awareness tend to overpurchase, one of the key factors leading to food waste (Graham-Rowe *et al.*, 2014; Quested *et al.*, 2013), if only because they are more sensitive to pricing strategies (e.g., buy one, get one free). They

are also more concerned about the financial than the environmental consequences of food waste (Magnier *et al.*, 2016; Parizeau *et al.*, 2015; Principato *et al.*, 2015). They view food waste as a waste of money. Thus, some consumers avoid food waste to save money.

- Propositions 4-6: The direct and indirect (through perceived performance of function, product quality/quantity) impacts of consumer perceptions of eco-design packaging attributes and consumer food waste avoidance intentions is greater among consumers exhibiting a high level of environmental awareness / health consciousness/ financial attitudes rather than among consumers displaying lower levels.

Knowledge of food waste and packaging

Knowledge of food waste issues is viewed as a relevant factor in consumer food waste behaviour (Food Use for Social Innovation by Optimising Waste Prevention Strategies [FUSIONS], 2014). Abdelradi (2018) reports that knowledge of food waste positively impacts consumer environmental awareness. Similarly, knowledge of food packaging and the relationship of the latter to food waste is also seen as a relevant factor capable of influencing consumer food waste decisions.

- Proposition 7: The relationship between consumer perceptions of eco-design packaging and consumer food waste avoidance intentions is greater among consumers exhibiting a high level of knowledge of food waste and product packaging rather than among consumers displaying lower levels.

Sociocultural determinants

Even though sociocultural determinants may not impact food waste decisions directly, they are deemed important contextual factors (Aschemann-Witzel *et al.*, 2016). These determinants extend to the culture of food and consumption (e.g., purchase of large quantities owing to low unit prices, materialism). Consumers with a high materialistic outlook (e.g., self-interested individuals and those who attach considerable importance to material possessions) to be less interested in issues of the environment (Abdelradi, 2018).

- Proposition 8: The relationship between consumer perceptions of eco-design packaging and consumer food waste avoidance intentions is moderated by sociocultural determinants.

While the variance model identifies key determinants of the impact of consumer perceptions of eco-design packaging on consumer food waste avoidance intentions, it does not delineate the ongoing processes between these determinants and how they generate outcomes – food waste decisions. To enhance the understanding of consumer perceptions of eco-design packaging and resulting consumer food waste decisions, the authors propose a dual process model.

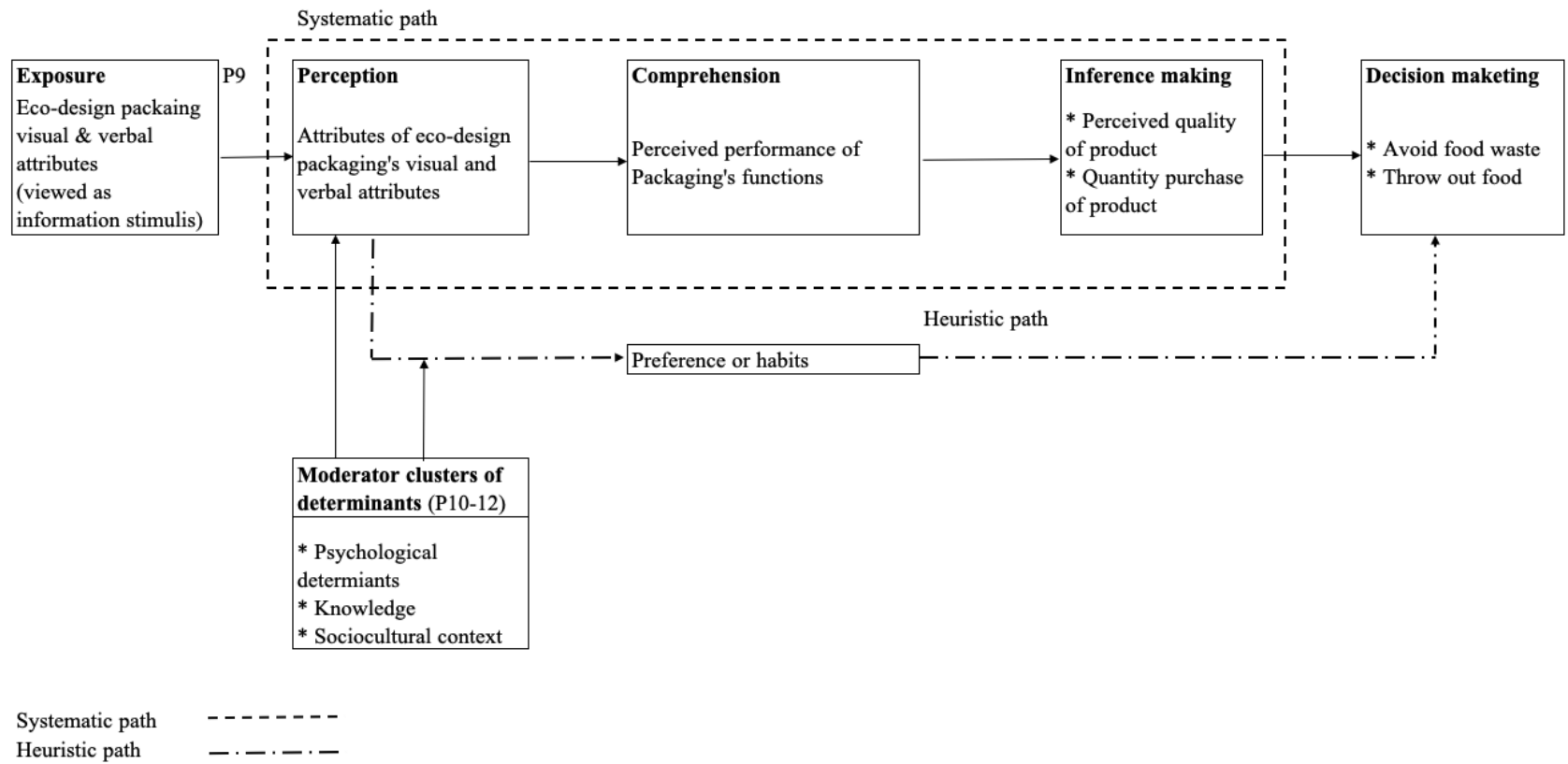
5.5.2 Process model

This section establishes a process model which assesses the ‘how’ and ‘why’ of consumer perceptions as they occur and develop over time to produce outcomes—food waste decisions (intentions to avoid waste or not). The authors also include related variables at each step of the perception process with a view to shedding light on the complementary relationship between the variance and process models.

The impact of consumer perceptions of eco-design packaging on consumer food waste avoidance behaviour can be explained by a dual process based on the systematic assessment of the persuasive information that consumers receive (Balasubramanian & Cole, 2018). This dual process model has been used to explain health and consumer behaviour and to illustrate consumer perceptions of food packaging (Venter *et al.*, 2011). The underlying assumption is that consumer perceptions of eco-design packaging is a persuasion process based on assessment of information related to its attributes.

The process begins with consumer exposure to visual (e.g., sustainable materials or reasealability) and verbal (e.g., environmental claims) stimuli of eco-design packaging in a purchasing or consumption context (see Figure 5.3). At this stage, consumers become aware of the existence of packaging attributes, which they perceive either in whole or in part. The next step involves two different cognitive processes to determine consumer responses to eco-design packaging, one systematic and the other heuristic.

Figure 5.3 Process model



- Proposition 9: Consumers use a systematic or heuristic process to perceive eco-design packaging.

The *systematic path* entails cognitively attributing meaning to and interpreting eco-design packaging. Once the eco-design packaging's attributes have been perceived or received by consumers (phase 1: perception of a perceptual process), the next step in the process involves understanding eco-design packaging functions (phase 2: comprehension). The comprehension phase can be viewed as a process of assigning meaning to packaging attributes and associating them with packaging functions. For instance, a reclosable pack (visual attribute) relates to longer-term conservation function. Optimized packs that provide storage guidance and date labeling (verbal attributes) normally relate to the communications function. The comprehension phase is followed by inference of product quality and quantity. This inference phase is crucial to the overall process given that consumers endeavour to link eco-design packaging (extrinsic characteristic) to the products themselves (intrinsic characteristic). In a purchasing and consumption context, consumers infer product quality (usually intangible) by assessing product packaging (Becker *et al.*, 2011). In the food sector, consumers evaluate freshness, nutrition and safety based on whether packaging provides for the lengthy preservation of contents (Van Rompay *et al.*, 2016). Similarly, consumers estimate product needs and use based on packaging attributes (materials, size) and functions (preservation, storage). Packaging is therefore seen as a signal of good product quality. In the last phase, consumers make decisions relating to food waste (retain or discard) by assessing product quality and quantity simultaneously.

Furthermore, the choice of a systematic or heuristic process varies according to the two types of moderating determinants associated with consumer motivation and consumer ability to process information. The first type includes determinants relating to individual consumers (proximal level) such as personal psychological determinants (environmental awareness, health consciousness and financial attitudes) and

knowledge of eco-design packaging and food waste (near-distal level). The second type relates to sociocultural (distal level) aspects such as the culture of food and consumption.

Heuristic path. In contrast, some consumers view food products as low involvement, high purchase frequency items, often ignoring packaging eco-design efforts. Thus, consumers tend to make decisions based on individual preferences and habits.

- Propositions 10-12: Consumer choice of systematic or heuristic processes depends on levels of psychological determinants, knowledge of eco-design packaging and food waste, and sociocultural context.

5.6 *Discussion and conclusion*

5.6.1 Theoretical contributions

The study makes three theoretical contributions and meets the criteria for useful theory: what, how and why (Whetten, 1989).

Firstly, this paper achieves conceptual clarity ('what'). Eco-design packaging is traditionally defined from an engineering standpoint and refers to a packaging with a low environmental impact following LCA (Stenis *et al.*, 2017). LCA aims to minimize the negative environmental and/or social impact in the packaging lifecycle and achieve a desired level of eco-efficiency (French National Council of Packaging, 2018). However, previous research reveals a gap between how eco-design packaging is defined in terms of LCA and how it is perceived by consumers (Boesen *et al.*, 2019). From a consumer perspective, eco-design packaging is defined as packaging which "*evokes explicitly or implicitly the eco-friendliness of the packaging*" (Magnier *et al.*, 2016, p. 133), an assertion confirmed by this study. Specifically, eco-design

packaging's visual/verbal attributes combine to impact consumer waste decisions albeit to a lesser degree than one would expect based on LCA given that some attributes are not readily perceivable by consumers. The most important visual attributes are: easy to close package (e.g. zip-lock bags and pouches) (n=44), downsized pack containing a lesser quantity (n=66) and multi-package (n=13). Since these two attributes ameliorate the preservation and containment functions, one can better sustain product quality. Two verbal attributes also play an important role in consumer food waste avoidance: multi-packaging (n=13) and clear guidance for storage and date labeling (n=78). These verbal attributes are associated with packaging communication/commercial functions, and are intended to improve food-related practices and routines (Waste&Resources Action Programme, 2015).

Secondly, this paper provides a conceptual presentation of the determinants of consumer food waste behaviour ('how'). Precisely, this study broadens the consumer food waste behaviour model from a single to a multi-level paradigm by considering food waste as a consequence of interactions between four nested levels of consumption behaviour ranging from the more proximal to the more distal: (1) personal psychological determinants based on the TPB (Ajzen, 1991) (Graham-Rowe *et al.*, 2014; Visschers *et al.*, 2016); (2) product packaging-related determinants (perceived product quality and quantity, packaging attributes) (Magnier et Schoormans, 2015; Wikström *et al.*, 2019); (3) consumption management-related determinants (Evans, 2011a, 2014); and, (4) sociocultural determinants (Abdelradi, 2018). The systematic literature review reveals that research based on single-level analyses cannot explain the impact of consumer perceptions of eco-design packaging on consumer food waste decisions. The core concepts are investigated at a different level of analysis and based on a diversity of perspectives: consumer perceptions regarding packaging are examined from a cognitive psychological viewpoint, and eco-design packaging studies from an industrial (LCA) standpoint. In contrast, consumer food waste is investigated from the psychological (e.g., Graham-Roew, 2015) or social practice perspectives (e.g., Schanes

et al., 2018). Accordingly, this study contributes to existing literature by proposing a multi-level conceptual presentation of the determinants of consumer food waste behaviour. Moreover, by shifting attention to the near-proximal level which includes product packaging-related determinants, specifically eco-design packaging, the study proposes a conceptual representation for a broadened understanding of consumer food waste behaviour.

Lastly, this study provides a hybrid model to explain the boundary conditions ('how') and causal relationships ('why') between the constructs ('what'). The variance model emphasizes the 'what' or the changes that initiating variables (consumer perceptions of eco-design packaging attributes) exert on dependent variable (food waste avoidance intentions) While, the process model emphasizes the 'how' and 'why' of a sequence of events (each stage in the consumer perception process: exposure packaging attributes → awareness of attributes → understanding of packaging functions associated with attributes → inference of product quality/quantity via packaging functions → materialization of food waste issues) to produce outcomes – food waste decisions (Ortiz de Guinea & Webster, 2017).

In the variance model, consumer perceptions of eco-design packaging attributes impact consumer food waste avoidance intentions via the perceived performance of its functions, which in turn, impacts perceived product quality and quantities. In the end, all combine to impact consumer food waste decisions. Findings also reveal that the impact of consumer perceptions of eco-design packaging on consumer food waste avoidance intentions are moderated by personal psychological determinants (notably, environmental awareness, health consciousness, and financial attitudes), knowledge of food waste and eco-design packaging, and sociocultural determinants. This variance model can be used as a theoretical framework for directly testing the relationships between perceptions of eco-design packaging and food waste avoidance intentions through experimental studies.

The process model illustrates the ongoing consumer perception processes respecting eco-design packaging and their impact on food waste decision. These perception processes are deemed to form a part of a persuasion process based on the assessment of information relating to eco-design packaging attributes. Moreover, whether consumers elect to adopt a systematic/heuristic process depends on personal psychological determinants, knowledge of food waste and eco-design packaging, and sociocultural determinants. The systematic process is dominated by the cognitive interpretation of the meaning of packaging attributes and understanding of related functions. This two-fold process is followed by inferences made by consumers with respect to product quality (e.g., freshness and health risk) and quantities of products purchased. However, the second path is dominated by affective, non-conscious responses (e.g., preferences and habits) to specific brands or products. This explains why consumers perceive eco-design packaging differently and make differing decisions regarding food wastage.

5.6.2 Managerial and practical implications

This study provides actionable insights for the stakeholders in the FSC.

Firstly, this study points to innovation in packaging as helping consumers reduce food waste and minimize concerns/misunderstandings about packaging. Consumers rely on packaging information (e.g., storage guidance, date labeling) to know how long they can store what they buy. Many also appreciate downsized packages and multipacks to be certain to retain food quality.

Secondly, consumer associations focusing on food consumption and waste (e.g., Food Waste Reduction Alliance, International Food Waste Coalition) are better poised as a result to advise and support consumers regarding food waste, appropriate packaging size, packaging innovations and the role played by eco-design packaging. These same

associations similarly provide knowledge and information about food waste avoidance practices.

Thirdly, packaging producers and marketing managers must make allowance for the FSC and consumer behaviour in an effort to improve the efficacy of the impact of eco-design packaging on food waste. To this end, packaging should be designed to integrate attributes perceivable by consumers such as easy to open and easy to reclose features, and new materials (e.g., atmosphere packaging and oxygen scavengers to extend food life). Besides, since food waste can occur at any stage of the FSC, it is necessary to promote cooperation among packaging designers, retailers, marketing managers and consumers, the object being to enhance the understanding of food waste along the full length of the FSC (Verghese *et al.*, 2015). Continued packaging innovation is important to improve the technical and communications functions in LCA. Specifically, the efficacy of information transfer regarding food waste avoidance knowledge could be enhanced through advanced communications tools such as radio frequency identity tags, time-temperature indicators and food quality (e.g., freshness and nutrition) indicators (Poyatos-Racionero *et al.*, 2018).

Lastly, for policymakers, the findings show that consumers throw out food before the use by date to avoid potential health risks (Parizeau *et al.*, 2015). Hence the importance of ameliorating the current date labeling system (e.g., use by, best before) and educating consumers to make certain that they understand and follow label instructions (Miranda & Kónya, 2007; Verghese *et al.*, 2015). As the study substantiates that consumer environmental awareness can impact food waste behaviour, the authors suggest that government authorities should step up policy efforts and consumer awareness initiatives regarding issues such as the negative impact of food waste and the benefits of packaging innovations (e.g., institution of food waste avoidance guidance in schools and across social networks).

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CHAPITRE VI

ARTICLE 4

CAN ECO-DESIGN PACKAGING REDUCE CONSUMER FOOD WASTE: AN EXPERIMENT STUDY

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AVANT-PROPOS À L'ARTICLE 4

L'article 4 vise à tester le modèle conceptuel proposé dans l'article 3 par les données empiriques. Plus précisément, cet article examine les mécanismes sous-jacents à travers lesquels l'emballage éco-conçu influence l'intention de limiter le gaspillage alimentaire via les fonctions physiques, sociales et commerciales perçues du point de vue du consommateur.

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ABSTRACT

This paper assesses the role of eco-design packaging in consumer food waste and tests the effects of consumers' perceptions of eco-design packaging (redesigned visual and/or verbal attributes) on their intentions to avoid wasting food. The authors posit that eco-design packaging can lead to food waste reduction through its physical, social, and commercial functions. The authors carried out two 2 (visual: resealable vs. nonresealable) \times 2 (verbal: sustainable cues present vs. absent) between-subject experiments of two food products. The results show that eco-design packaging can help reduce consumer food waste: (1) consumers are more sensitive to improvements related to visual rather than verbal attributes of packaging; (2) consumers' food waste decisions seem to be more strongly affected by instrumental functions (e.g., conservation product quality and communication guidance for storage) than social (e.g., pollution related to packaging) and commercial functions (e.g., category identification); and (3) health consciousness has mediated moderating effects on these relationships. This research contributes to the literature by determining underlying mechanisms of the effects of eco-design packaging on consumer food waste. This work can be embedded into the transformative consumer research movement to maximize social awareness, use, and benefits.

Keywords: Eco-design; Packaging innovation; Food waste; Transformative consumer research; Well-being; Experiment

6.1 Introduction

Food waste is one of the most pressing issues today. Approximately one-quarter to one-third of food produced in the world is lost or wasted through the food supply chain, representing approximately 1.3 billion tons of edible food per year (Food and Agriculture Organization [FAO], 2019). In Canada, 40% of food is wasted, generating economic losses of \$31 bn annually (DeLorenzo *et al.*, 2019; Gooch *et al.*, 2014). Food waste can occur at various stages of the food supply chain (production→ processing→ primary agriculture transformation→ retail and consumption). Note that in developed countries (e.g., Canada, the USA, and countries in Europe), approximately 40% of waste occurs at the retail and consumer stages (FAO, 2019).

Previous research focusing on the main determinants of household food waste shows that packaging plays a key role since it links products to consumers through various functions (e.g., preservation, conservation, and communication) (Wikström *et al.*, 2019).

Increasing interest in the relationship between packaging and food waste is not limited to a single discipline. For instance, cognitive psychological works use the theory of planned behavior (TPB) to determine the motivations and/or barriers of consumer food waste behavior (e.g., Graham-Rowe *et al.*, 2014; Aitsidou *et al.*, 2019). Industry studies have focused on measuring the environmental impacts of precise packaging features (e.g., being easy to reseal and reclose and offering information about food safety) on different units of food waste (e.g., waste frequency, mass, and relative distribution) through waste composition analyses, diaries, interviews, and enquiries (e.g., Wikström *et al.* 2019; Williams & Wikström, 2011; and Song *et al.*, 2015). However, social practical works intend to identify food-related practices and routines, including the role of packaging development (e.g., Evans 2014; Miroso *et al.*, 2016; Wahlen & Winkel, 2017; and Schanes *et al.* 2018).

Previous research focusing on the impact of eco-packaging on food waste shows that the current impact is relatively limited for two reasons. First, there is a gap between consumers' perceptions and industrial definitions (life cycle assessment: LCA). The sustainability feature, namely, the on-paper attributes of eco-design packaging, is not consistently properly perceived by consumers (e.g., Boesen *et al.*, 2019; Löfgren & Witell, 2005). In fact, the majority of existing literature focuses on the link between eco-design packaging and consumer food waste behaviors adopting an industrial perspective that has overlooked internal features of consumers (e.g., perceptions, needs, and knowledge) that should be included in an LCA (Wikström *et al.*, 2019). In addition, packaging is not necessarily perceived positively by consumers. One-third of consumers claim that this could be one of the most important causes of food waste (Waste & Resources Action Programme, 2015) or "pollution" per se (Observatoire de la Consommation Responsable [OCR], 2015c). Second, despite recent research pointing to eco-design packaging attributes (e.g., resealability, sustainable cues or labels, and ease of emptying) as means of reducing consumer food waste (e.g., Wikström *et al.*, 2016, 2019), the relative importance of these attributes remains underexplored. Moreover, the causality between eco-design packaging and consumer food waste decisions has not been tested directly (Zeng & Durif, 2020).

Hence, based on consumer perspectives and signaling theory (Spence, 1974), this research assesses the role of eco-design packaging in consumer food waste decisions and argues that eco-design packaging attributes function as signals that influence consumers' intentions to avoid wasting food by affecting the perceived performance of packaging functions. Signaling theory has been used to explain consumer sustainable behaviors. Signaling theory implies that signals such as packaging visual attributes (e.g., sustainable labels) can signal the quality and sustainability of green products (Brach *et al.*, 2018; Hidalgo-Baz *et al.*, 2017; Magnier *et al.*, 2016), which in turn affect sustainable consumer behaviors, including purchase intentions and the willingness to pay for organic products (Magnier & Schoormans, 2015), perceived risks of green

products (Brach *et al.*, 2018), and purchasing intentions of Corporate social responsibility-associated products (Bennett & Chakravarti, 2009).

More specifically, this research tests the overall and relative effects of eco-design packaging (redesigned visual and/or verbal attributes) in terms of customers' intentions to avoid wasting food. Drawing on two online experiments, the paper addresses two questions: (1) How do consumers perceive eco-design packaging's visual and verbal attributes? (2) How and why do consumers' perceptions of eco-packaging affect their food waste decisions?

This work is embedded in a transformative consumer research movement to maximize social awareness, use, and benefits for relevant stakeholders. The paper contributes to the literature by determining the underlying mechanisms of the effects of eco-design packaging on consumer food waste and by contributing to a better understanding of the relative importance of different types of eco-design packaging (i.e., visual and verbal attributes eco-designed or completely eco-designed packaging) for consumer food waste decisions. Moreover, this paper provides actionable insights into the use of eco-design packaging to reduce consumer food waste and improve individual and collective well-being for relevant stakeholders.

This paper is organized as follows. First, we begin with the theoretical framework and hypotheses used by clarifying the relationships between eco-design packaging and consumer food waste. Second, we present the research methodology employed and our online experiments. Third, the procedures and findings of the two experiments are presented. Fourth, theoretical and practical contributions are discussed. We conclude with the study's limitations and avenues for future research.

6.2 Theoretical framework and hypothesis

The green market is characterized by asymmetric information and credence quality evaluation. First, eco-design packaging producers know more about their products than consumers do. For instance, eco-design packaging is constructed according to LCA by integrating environmental and/or social concerns into each stage of its life cycle from design to end-of-life. Consumers are unlikely to have the knowledge to discriminate between LCA indices (the sustainable attributes of packaging are defined by LCA indices) (Boesen *et al.*, 2019). Second, the claimed sustainability (i.e., superior environmental and/or social performance) of these products is viewed as a credence attribute that is difficult to evaluate before or after consumption (Brach *et al.*, 2018; Gleim *et al.*, 2013). This challenge regarding the assessment of credence attributes also exists for eco-design packaging. For instance, the previous literature shows that eco-design packaging functions (e.g., easy to close, containing the right amount, and physical–chemical protection) serve as potential means to reduce food waste (Wikström *et al.*, 2019). However, this food waste-reducing performance is difficult for consumers to evaluate. On one hand, the packaging development process rarely integrates the needs and attitudes of consumers; on the other hand, there is a knowledge gap and skepticism among consumers regarding eco-design packaging (Magnier & Schoormans, 2015), limiting the positive impacts of eco-design packaging on food waste reduction (Zeng & Durif, 2019).

The eco-design of packaging occurs by incorporating environmental and/or social concerns into the packaging life cycle (Zeng & Durif, 2019). Packaging is viewed as a combination of sustainable visual (e.g., recyclable or biodegradable materials) and verbal attributes (e.g., sustainable cues and ecolabeling). From a signaling theory perspective, eco-design packaging attributes are considered signals involving information on superior performance that can generate sustainable individual (e.g.,

promoting healthy eating) (Aagerup *et al.*, 2019; Bech-Larsen, 1996; Binninger, 2017; Magnier *et al.*, 2016) or social benefits (e.g., promoting recycling) (Bamberg & Möser, 2007; Magnier & Crié, 2015; Thøgersen, 2003). Eco-design packaging attributes affect consumers' sustainable behaviors through physical (e.g., preservation, storage, conservation, and protection of a product), social (e.g., encouraging recycling and reducing waste), and commercial functions (e.g., communicating a product's category and brand) (Binninger, 2017; Rundh, 2005, 2009). Consumers respond differently to these three packaging functions. In general, packaging's material and technological attributes (associated with instrumental functions such as protection and conservation) have greater effects on a consumer's evaluation of food quality, credibility, and purchasing intentions than nonmaterial symbolic attributes (associated with social functions such as reducing pollution and encouraging recycling or commercial functions such as identification, positioning, and distinction) whereas nonmaterial symbolic attributes have more important impacts on attractiveness (Binninger, 2017).

6.2.1 Packaging attributes, physical function, and food waste

Numerous studies reveal that the visual attributes of eco-design packaging (in particular, their size, material, and resealability) affect consumer food waste behaviors through physical functions (e.g., preservation, storage, conservation, and protection) (e.g., Steenis *et al.*, 2018; Wikström *et al.*, 2016, 2019). For instance, cognitive psychological studies focusing on the motivations and/or barriers of consumer food waste behavior claim that oversized packaging is an important cause of household food waste (e.g., Aschemann-Witzel *et al.*, 2011; Graham-Rowe *et al.*, 2015). Some industrial studies focusing on the impacts of packaging innovation on food waste indicate that packaging of an optimized size containing the right amount of product according to the needs of consumers serve as a potential means to avoid waste. In addition, the ability to easily reclose packaging is perceived as an important feature

that significantly affects consumers' consumption volume intentions and self-regulation by controlling their hunger levels and moods (De Bondt *et al.*, 2017). Likewise, several social practice studies focusing on the link between food-related practices and food waste reveal that an appropriate packaging size helps consumers establish plans and routines, thus preventing unplanned consumption (Stancu *et al.*, 2016).

In addition, the verbal attributes of packaging (e.g., claims and descriptions) are more precise than their visual attributes and are closely associated with consumers' cognitive processes (Magnier & Schoormans, 2015; Obermiller & Spangenberg, 1998). Wikström *et al.* (2019) indicate that improving the verbal attributes associated with the physical functions of packaging (e.g., the clarity of messages regarding food waste such as best-before dates and of food storage information such as optimal storage temperatures and how long products can be stored in a refrigerator) can reduce household food waste due to a product being past its best-before date and of poor quality. Likewise, Wohner *et al.* (2019) focused on the drivers and issues of packaging-related food losses and waste across the food supply chain and found to similar results. Their results show that some key verbal attributes (i.e., correct storage or freezing guidance and easy opening and disposal of packaging) can improve protective functions (e.g., preserve "undesired physical, chemical, and biological changes") and prolong the shelf life of a product.

H1: The effect of consumers' perceptions of eco-design packaging attributes (visual, verbal, and interactive) on their intentions to avoid wasting food is mediated by the perceived performance of the packaging's physical functions. The more eco-design packaging is perceived positively, the stronger the perceived performance of its physical function, which in turn increases intentions to avoid wasting food.

6.2.2 Packaging attributes, social function, and food waste

In addition to being functional, eco-design packaging attributes are often used to evaluate the “sustainability” of a product and its packaging (Steenis *et al.*, 2018). Several studies reveal that eco-friendly materials (e.g., material reduction, recyclable materials, and biodegradable materials) have the most significant impact on the perceived sustainability of products and the pro-environmental behaviors of consumers. For instance, Van Dam (1996), van Dam and van Trijp (1994) showed that recyclable materials (e.g., glass, paper, and cartons) have a positive impact on consumers’ sustainable behavior. Likewise, Magnier *et al.* (2016) showed that recycled cardboard packaging positively affects the perceived quality of organic food. Similarly, a study by Rokka and Uusitalo (2008) showed that eco-friendly materials (recycled cardboard packaging labels) and packaging resealability impact consumer purchasing decisions (contributing 34% to overall utility) more than other attributes (i.e., brand, price, and convenience, which contribute only 17% to overall utility).

Verbal attributes (e.g., environmental cues, third-party certification labels, and self-declared eco-friendliness) are also viewed as indices for social functions by encouraging recycling, reducing waste, or promoting healthy food (Auger *et al.*, 2008). A large number of studies have examined how consumers use the verbal attributes of packaging to evaluate the social benefits, sustainability, and healthfulness of a product. For instance, environmental labels (e.g., third-party certification labels) and self-declared environmental cues help consumers distinguish sustainable products from conventional ones (Bleda & Valente, 2009), increasing products’ credibility (Brach *et al.*, 2018) and perceived quality and consumers’ willingness to pay for sustainable products (e.g., Ertz *et al.*, 2017; Ubilava *et al.*, 2010; Limnios *et al.*, 2016). In addition, according to Bennett and Chakravarti (2009), consumers prefer highly visible social signaling (i.e., sustainable verbal attributes) that establishes socially desirable traits (e.g., contributing to “the greater good” and charitable behavior). Likewise, Binnering

(2017) notes that the highly visible verbal attributes of packaging (i.e., labels, logos, or cues) act as a functional signal to evaluate the intrinsic credence quality of a product (i.e., attractiveness, credibility, healthfulness, and freshness). Grandi *et al.* (2019) and Hidalgo-Baz *et al.* (2017) indicate that environmental and health-related information provided on packaging has positive effects on consumers' perceptions of the sustainability and healthfulness of food, which in turn affects their food purchasing decisions.

In addition, verbal attributes provide additional messages regarding the use, conservation, and end-of-life management of a product. For instance, in a food product category, guidance on storing and date labeling is associated with consumer food waste decisions. Wikström *et al.* (2019) revealed that approximately one-third of household food is wasted due to spoilage (i.e., it undergoes negative physical or chemical changes). A study of Norwegian consumers showed that approximately 27% of food waste occurs due to incorrect storage (Stensgard *et al.*, 2016). Thus, improving storage information may reduce food waste. Likewise, date labeling (e.g., the best-before date) results in wastage in different food categories such as cheese, milk, yogurt, meat, and fish. According to a survey conducted in the UK and Norway on packaging-related food waste, waste can be reduced by improving date labeling systems. For example, a survey conducted in the UK focusing on the link between packaging and household food waste indicated that approximately 20–31% of meat and fish, 10–15% of bread, and 9% of yogurt is wasted for reasons associated with date labeling systems (Wikström *et al.*, 2019).

H2: The effect of consumers' perceptions of eco-design packaging attributes (visual, verbal, and interactive) on their intentions to avoid wasting food is mediated by the perceived performance of packaging's social function. The more positively eco-design packaging is perceived, the stronger its perceived social function, which in turn increases intentions to avoid wasting food.

6.2.3 Packaging attributes, commercial function, and food waste

In addition to physical and social functions, visual attributes play an important role in distinguishing eco-design packaging and products from conventional ones. Packaging is viewed as a “silent salesman” and plays an important role in communication strategies. Packaging communicates key commercial information regarding a product’s categories and brand to consumers. For instance, Boesen *et al.* (2019) revealed that although the eco-design packaging attributes perceived by consumers are more limited than expected (through life cycle assessment), recyclable materials (e.g., biobased, glass, plastic, and laminated cartons) and resealability are the two most important indicators used to distinguish eco-design packaging and products from conventional ones, thus encouraging pro-environmental behaviors (e.g., green product purchasing and recycling). Likewise, eco-design packaging serves as an indicator for identifying healthier food (e.g., organic food) from conventional food through eco-labels or sustainable cues (Magnier *et al.*, 2016). Consumers who prioritize healthier food are less likely to waste it (Parizeau *et al.*, 2015; von Massow *et al.*, 2019).

H3: The effect of consumers’ perceptions of eco-design packaging attributes (visual, verbal, and interactive) on their intentions to avoid wasting food is mediated by the perceived performance of packaging’s commercial function. The more positively eco-design packaging is perceived, the stronger the perceived performance of its commercial function, which in turn increases intentions to avoid wasting food.

6.2.4 Health consciousness, packaging functions, and food waste

Health consciousness is a personal psychological determinant defined as “the degree to which a person plays an active role in maintaining his or her health” (Gould, 1998, cited by Naylor *et al.*, 2009, p. 223). Gould (1988) claims that highly health-conscious

consumers are more sensitive to health-related information because they tend to expand their health-related knowledge by assessing this information (e.g., the naturalness, nutrition, and freshness of a product). Moreover, highly health-conscious consumers pay more attention to conflicting or complementary health and environmental information provided on food packaging (Naylor *et al.*, 2009). In addition, the previous literature reveals that health consciousness has a paradoxical effect on consumer food waste decisions.

Some research indicates that health consciousness corresponds to a desire to avoid wasting food (e.g., Quested *et al.*, 2013; Visschers *et al.*, 2016). However, other researchers claim that highly health-conscious consumers are more sensitive to food quality and particularly to the freshness of perishable food (e.g., meat, fruit, and vegetables). These consumers are more likely to throw away expired food or leftovers even when the food has not passed its best-before date (Evans, 2011b; Parizeau *et al.*, 2015). The inconsistent effects of health consciousness on consumers' sustainable behaviors are explained by the trade-off between sustainability and functionality. According to Glazer and Konrad (1996), consumers' sustainable behaviors can be viewed as charitable behaviors jointly driven by a product's social and self-signaling potential. Consumers prefer products that send highly visible social signals associated with their benevolence (thus reducing food waste), and engaging in private self-signaling may be associated with a given product (promoting healthy consumption behavior). In other words, consumers' sustainable behaviors depend on their perceptions of social signaling (represented by "sustainability") and self-signaling (represented by "functionality"). In the present research, self-signals indicate potential health savings or promote healthy consumption. More precisely, in addition to sending social signals to others, an individual can also "self-signal to the individual in question" (Bennett & Chakravarti, 2008, p. 1010). An individual will then be willing to engage in a particular behavior associated with a desirable trait even in the absence of social benefits (Quattrone & Tversky, 1984). Furthermore, Luchs *et al.* (2010) revealed that

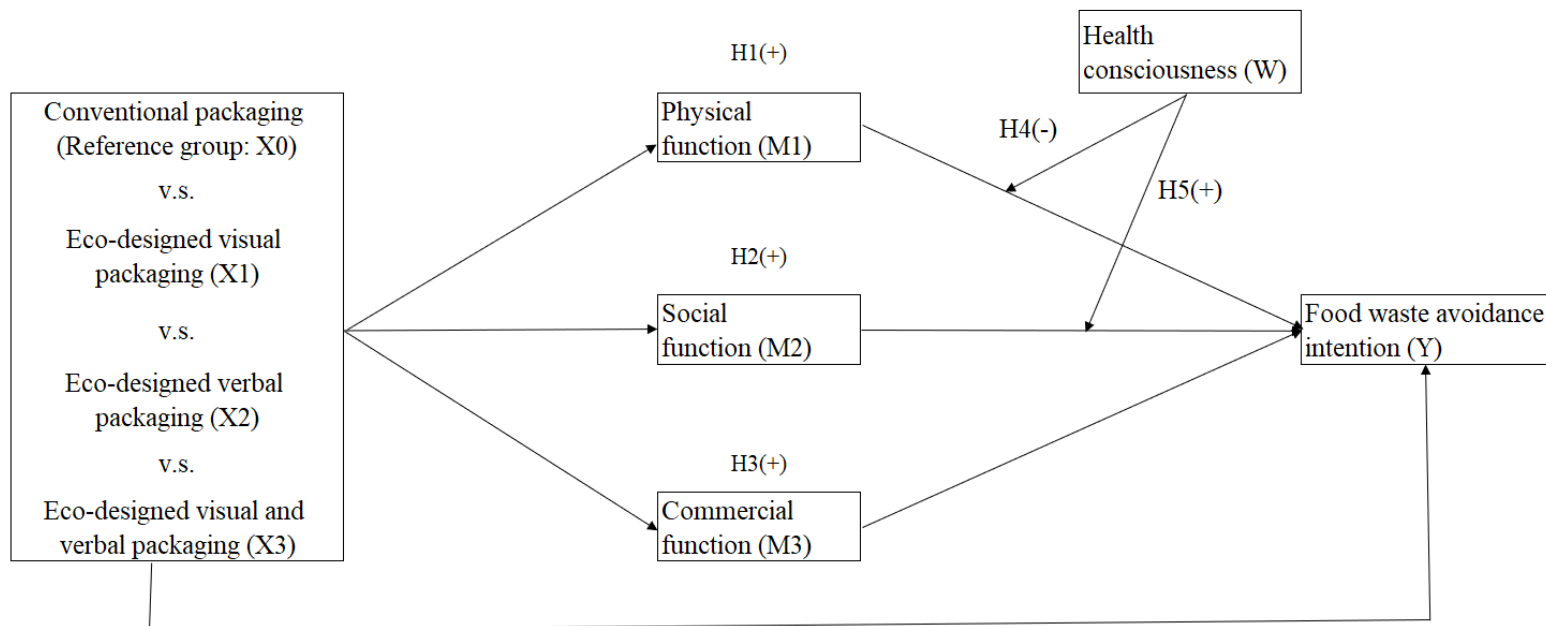
consumer perceptions of sustainability and functionality are often in conflict. Consumers must compromise between sustainability (e.g., the social functions of packaging such as encouraging recycling and reducing food waste) and physical or instrumental functions (e.g., the conservation and production of a product's quality). Social functions are usually related to social benefits or the "greater good" such as reducing waste whereas physical or instrumental functions are more associated with personal benefits such as maintaining one's health and reducing health risks.

Visual attributes have greater self-signaling potential because the associated self-benefit is more concrete and associated with more psychological proximal goals (e.g., remaining healthy), which are assessed from the observable visual features of a product (e.g., material, size, and form) (Bennett & Chakravarti, 2008). For instance, recycled cardboard packaging positively affects consumers' perceptions of food's healthfulness, freshness, and safety (Magnier *et al.*, 2016; Zeng & Durif, 2020). Likewise, packaging shape (e.g., slim vs. oversized) has a positive effect on calorie intake (Van Ooijen *et al.*, 2017). Verbal attributes have greater social-signaling potential because social benefit ("the greater good") is associated with higher-order, more general goals (e.g., encouraging recycling and organic food purchasing) (Bennett & Chakravarti, 2008). These benefits are more difficult to identify and evaluate from the visual features of packaging (e.g., including resealability in packaging design in improving the capacity for preservation). Social benefits are communicated through explicit claims (e.g., labeling and claims) (Magnier & Cri e, 2015). For instance, eco-labels have a positive influence on consumers' green purchasing intentions by enhancing the credibility and reducing the risks of a product (Brach *et al.*, 2018). Likewise, eco-labels and sustainable cues can encourage consumers' pro-environmental behaviors such as recycling (e.g., Williams *et al.*, 2016, 2018) and the adoption of sustainable innovation (e.g., Noppers *et al.*, 2014; Atkinson & Rosenthal, 2014).

Thus, in this research, the authors assume that self-signaling is derived more from visual attributes and associated physical functions while social signaling is derived more from the verbal attributes of packaging and associated social functions. In this way, consumers infer potential self-benefits (remaining healthy) or social benefits (avoiding wasting food). Benefits for the self are characterized as more concrete, “more psychologically proximal, and associated with lower level goal attainment” (Bennett & Chakravarti, 2009, p. 50) (e.g., maintaining a healthy state). Social benefits for the greater good are based on more general goals (e.g., avoiding wasting food to protect the environment) (Bennett & Chakravarti, 2009) (see Figure 6.1).

H4/H5: The indirect effect of packaging attributes on a consumer’s intentions to avoid wasting food (Y) through the perceived performance of instrumental (M1)/social (M2) functions depends on the consumer’s health consciousness (W). The effect of the perceived performance of the instrumental (M1)/social (M2) function on a consumer’s intentions to avoid wasting food (Y) is lesser/greater when consumers exhibit a high level of health consciousness (HHC) (vs. a low level of health consciousness or LHC).

Figure 6.1 Conceptual framework



6.3 Methodology

To test the causal relationships between consumers' perceptions of eco-design packaging and their intentions to avoid wasting food, we performed two between-subject online experiments of visual attributes (resealable vs. nonresealable) \times 2 verbal attributes (sustainable cues present vs. sustainable cues absent) (see Table 6.1). In a between-subject experiment, each participant is tested in only one treatment condition. Compared to the within-subjects design, which can have carryover effect issues, the between-subject design avoids carryover effects without counterbalancing (Birnbaum, 1999).

Tableau 6.1 Experiment design

Visual attributes (Resealability)	Verbal attributes (Sustainable cues)	
	Absent	Present
Non-resealable	Condition 1 76 subjects	Condition 3 76 subjects
	Condition 2 76 subjects	Condition 4 76 subjects

The experiments were conducted in collaboration with Amazon's Mechanical Turk (MTurk). MTurk is currently the leading online labor market for experiments and especially appropriate for behavior decision-making studies due to its low cost, speed of data collection, and heterogeneity of participants (Goodman *et al.*, 2013). In addition, MTurk allows researchers to perform randomization, manipulation, and intention checking to guarantee internal and external validity (Buhrmester *et al.*, 2018; Paolacci & Chandler, 2014). Respondents were randomly recruited by MTurk, which sent an e-mail inviting respondents to participate in an online survey about "packaging innovation" in July 2019. Once they clicked on the hyperlink to the survey, potential

respondents were required to read the description of the study and answer two filter questions regarding their age and place of residence to ensure a sample of the Canadian population of over 18 years of age. Then, the participants were invited to read and accept (or refuse) participation in the online survey.

In study 1, the visual attributes of an eco-design milk box were manipulated by the resealability of the packaging. The verbal attribute was manipulated by the presence or absence of environmental cues. Study 2 replicated a study for a cheese bag. The visual attribute was manipulated by the presence or absence of a zipper. The milk and cheese categories were chosen because they represent the majority of items commonly wasted in the consumption stage (Waste and Resources Action Programme, 2019).

A total of 304 participants were recruited and randomly assigned to one of the four treatment conditions for each food product category (milk and cheese; 1 participant was removed from the initial sample for the cheese product due to an incomplete response given in study 2. In total, 64.5% of the respondents were men, and 38.8% were 25–34 years of age (see Tableau G1). In addition, randomization is the most reliable approach for creating homogeneous groups without involving potential biases. Moreover, randomization ensures a near equivalence of “nuisance characteristics” of subjects across treatments (Keppel & Wickens, 2004).

6.4 Study 1

The purpose of study 1 was to test for differences in consumer intentions to avoid wasting food (Y) and the perceived performance of packaging’s physical (M1), social (M2), and commercial (M3) functions across four types of packaging corresponding to four experimental conditions (i.e., X0: conventional packaging — reference group, X1: eco-designed visual packaging, X2: eco-designed verbal packaging, and X3: eco-

designed visual and verbal packaging) and the multiple mediation effects of the perceived performance of the packaging's physical, social, and commercial functions.

6.4.1 Stimuli and procedure

First, the respondents were asked to indicate their perceptions of the eco-design packaging's attributes on a 7-point Likert scale (from 1 = "totally disagree" to 7 = "totally agree"). The purpose of this step was to develop an overall understanding of consumers' perceptions of eco-design packaging attributes. Second, four experimental conditions were randomly assigned to four homogenous groups. Under each treatment condition, respondents were presented with a drawing representing a carton of milk using "milk" as a fictitious brand name along with the presence or absence of sustainable cues. Sustainable cue priming was assigned to an existing label to control confounding effects. Sustainable cue priming was presented as follows: "The procedure has been validated by a recognized independent organization." Testing with a fictitious brand is preferable to testing with a real brand, as this limits the effects of consumers' prior attitudes and preferences toward a given brand (Ertz *et al.*, 2018). The authors also emphasized that the presented brand name is different from the most popular brands on the market. At the beginning of all fictitious scenarios, respondents were told that the newly launched brand "milk" has recently developed a new, more environmentally friendly procedure for its packaging. Third, each participant was asked to look at a picture of the milk packaging and answer questions about the performance of the packaging's functions, the product's quality, and responsible consumption (including intentions to reduce food waste). Finally, the respondents were asked to complete a demographic section.

6.4.2 Measurement

Consumers' intentions to avoid wasting food were measured by four items adapted from The Waste and Resources Action Programme (2009); Visschers *et al.* (2016) ($\alpha = 0.819$). Seventeen items adapted from Binninger (2017) were used to measure the perceived performance of physical ($\alpha = 0.877$), social ($\alpha = 0.809$), and commercial ($\alpha = 0.732$) functions (see Table G2).

6.4.3 Analysis and results

Ordinary least squares (OLS) regression was performed using PROCESS Macro (model 4) (Hayes, 2018) in SPSS 26.0 (IBM Corp, 2018) with the bootstrap resampling method. This regression-based analysis method provides not only an overall indication of whether consumers' perceptions of eco-design packaging attributes (Xs) directly affect their intentions to avoid wasting food (Y) by an omnibus test but can also provide precise conclusions by focusing on a specific comparison between different types of eco-design packaging (different groups of X corresponding to eco-design visual and verbal attributes and their interactions) through further relative total effect tests (providing the same results as part of a one-way Analysis of variance — ANOVA) as well as relative direct and indirect effects tests. Moreover, a bootstrap confidence interval was generated for each regression, mediation, and moderation analysis, which together provide a more accurate indicator of effect size than the normal theory approach (Hayes, 2018).

Moreover, to test the hypothesis of the relative effect of each group (i.e., the relative importance of visual and verbal effects and their interactions notated as X1, X2, and X3 relative to conventional packaging notated as X0), multiple antecedent variables for eco-design packaging (containing the four initial groups including the control group, which represents conventional packaging) were coded into three groups using one of a

variety of different group coding systems in PROCESS (Hayes, 2018). Thus, the coefficients of X1, X2, and X3 directly capture the relative importance of visual and verbal effects and their interactions.

The Omnibus test of relative direct effect reveals a significant impact at a level of 10% for the four experimental conditions on intentions to avoid wasting food (R^2 -Chng = 0.0229, $F(3, 297) = 2.3992$, $p = 0.0681 < 0.1^*$) (*: p -value < 0.1; **: p -value < 0.05). Thus, the participants' perceptions of eco-design packaging (overall) significantly affected their intentions to avoid wasting food without focusing on specific comparisons between different types of packaging (X0: conventional packaging, X1: eco-designed visual packaging, X2: eco-designed verbal packaging, and X3: eco-designed visual and verbal packaging).

Furthermore, the overall effects of eco-design packaging attributes (Xs) on the perceived performance of the physical function (M1) were statistically significant at a level of 5% ($R^2 = 0.1552$, $F(3, 300) = 18.3657$, $p = 0.000^{**}$). More precisely, the visual eco-design attribute (X1) has a significant and positive relative effect on the perceived performance of the physical function at a level of 5% ($b = 0.8385$, $se = 0.1430$, $t = 5.8627$, $p = 0.000^{**}$). Likewise, consumers indicated a stronger perceived effect of the physical function on interactions between visual and verbal elements (X3) than for conventional packaging ($b = 0.8175$, $se = 0.1430$, $t = 5.7165$, $p = 0.000^{**}$). However, no significant effects of sustainable cues (verbal attributes) on perceived physical functions were found ($b = 0.1757$, $se = 0.1430$, $t = 1.2288$, $p = 0.2201$ NS).

A test of the relative indirect effects of eco-design packaging attributes (Xs) on food waste avoidance intentions (Y) through physical (M1), social (M2), and commercial functions (M3) was then carried out. The findings of this test show that the indirect effects of eco-design packaging (Xs) are mainly accomplished through the perceived performance of physical (M1) functions. The authors used PROCESS with 5000 bootstrap samples and 95% bootstrap confidence intervals to test the relative indirect

effects of eco-design appearance (X1: $b = 0.1636$, $se = 0.00741$, 95% bootstrap CI = [0.0254;0.3157]) and interactions (X3: $b = 0.1595$, $se = 0.0075$, 95% bootstrap CI = [0.0241;0.3197]) through the perceived performance of the physical function (M1). Since both bootstrap CIs were above zero, the relative indirect effect of eco-design appearance (X1) and interaction (X3) through the perceived performance of the physical function (M1) seems to be positive. However, relative indirect effects through social and commercial functions were not significant at 5%. As a result, since at least one of the relative indirect effects was different from zero, the authors conclude that the effect of eco-design packaging attributes on consumer intentions to avoid wasting food is mediated by the instrumental packaging function (Hayes, 2018). Thus, H1 is supported.

6.4.4 Discussion of study 1

The results show that respondents' intentions to avoid wasting food varied across the three types of eco-design packaging (visual, verbal, and combined eco-design elements) versus conventional packaging through the perceived performance of its functions. Specifically, visual eco-design alone as well as the interaction of visual and verbal attributes had significantly positive indirect effects on consumers' intentions to avoid wasting food through the perceived performance of functions. However, visual eco-design attributes (X2) do not have a significant indirect effect through physical functions (M1).

6.5 Study 2

Study 2 was performed to (1) replicate the findings of study 1 for the other product (cheese) and to (2) examine the moderation effect of consumer health consciousness. To these ends, the authors replicated the procedure used in study 1 and adapted it to the

other product (cheese). A supplemental section on individual psychological variables (including health consciousness) was then added to the questionnaire.

6.5.1 Measurement

The factor analysis of the perceived performance of the packaging's function generated identical results to those of Study 1. As a result, physical ($\alpha = 0.855$), social ($\alpha = 0.867$), and commercial functions ($\alpha = 0.822$) were used in the mediation and moderation effect analysis. Food waste avoidance intentions were measured from the same items as those used in Study 1 ($\alpha = 0.820$). Health consciousness was measured with three items adapted from Quedsted *et al.* (2013) ($\alpha = 0.878$).

6.5.2 Analysis and results

The findings of the Omnibus test through OLS show that the overall direct effect of eco-design packaging attributes (Xs) on consumers' intentions to avoid wasting food (Y) was statistically significant at the 5% level (R^2 -Chng = 0.0322, $F(3, 296) = 3.3861$, $p = 0.0185 < 0.05^{**}$).

Moreover, the overall effects of eco-design packaging attributes (Xs) on the perceived performance of physical ($R^2 = 0.0675$, $F(3, 209) = 7.2105$, $p = 0.0001^{**}$) and social functions ($R^2 = 0.0354$, $F(3, 209) = 3.6572$, $p = 0.0129^{**}$) were statistically significant at a level of 5%. However, we found no significant effect on the perceived performance of commercial functions ($R^2 = 0.0978$, $F(3, 209) = 0.9627$, $p = 0.4107$). More precisely, eco-design appearance ($b = 0.5222$, $se = 0.1504$, $t = 3.428$, $p = 0.0006^{**}$) and interactions ($b = 0.6421$, $se = 0.1504$, $t = 4.2698$, $p = 0.0000^{**}$) indicated significant and positive relative effects on the perceived performance of packaging's physical

functions at a level of 5%. However, the relative effect of sustainable cues was not significant at a level of 5% ($b = 0.2641$, $se = 0.1504$, $t = 1.7564$, $p = 0.08$).

A set of tests on the relative indirect effects of eco-design packaging attributes (Xs) on consumer intentions to avoid wasting food (Y) through perceived performance functions (Ms) was performed with PROCESS using 5000 bootstrap sampling. The findings show that the indirect effects of eco-design packaging (Xs) are mainly achieved through the perceived performance of physical (M1) rather than other functions. More precisely, eco-design packaging appearance (X1) ($b = 0.1108$, $se = 0.0540$, 95% bootstrap CI = [0.0245; 0.2311]) and interactions (X3) ($b = 0.1363$, $se = 0.0583$, 95% bootstrap CI = [0.0351; 0.2618]) had significantly positive relative indirect effects on consumers' intentions to avoid wasting food (Y) through the perceived performance of physical attributes (M1). However, relative indirect social and commercial functions were not significant at 5%. Given that at least one of the relative indirect effects is different, the effect of eco-design packaging attributes on food waste avoidance intentions is mediated by the perceived performance of packaging functions (Hayes, 2018).

To test the moderation effects of health consciousness, the authors used model 15 in PROCESS. The findings show that the path between physical functions (M1), social functions (M2), and intentions to avoid wasting food (Y) ($M1 \rightarrow Y / M2 \rightarrow Y$) for indirect effects ($X's \rightarrow M's \rightarrow Y$) is contingent on health consciousness (R^2 -chng = 0.0259, $F(11,291) = 10.4429$, $p = 0.0014^{**}$ for path $M1 \rightarrow Y$; R^2 -chng = 0.0137, $F(11,291) = 5.5347$, $p = 0.0193^{**}$ for path $M2 \rightarrow Y$).

A further analysis focusing on the mediated moderation relative effects (named the relative condition effect) of health consciousness was carried out to investigate how consumers' perceptions of three types of eco-design packaging (X1: eco-design appearance, X2: sustainable cues, and X3: interactions) affected their intentions to avoid wasting food (Y) through physical (M1) and social functions (M2), contingent

on consumers' levels of health consciousness. The analysis of relative conditional effects shows that health consciousness had moderated mediation effects on the impacts of packaging attributes on intentions to avoid wasting food (Y) through physical and social functions (via path M1/M2→ Y). Specifically, (1) the relative conditional indirect effects of sustainable cues (X2) on consumers' intentions to avoid wasting food (Y) through the perceived performance of physical functions (a moderated mediation effect on path M1→ Y) are weaker for consumers with HHC than for those with LHC ($b = -0.1113$, $se = 0.0835$, 95% Bootstrap IC = $[-0.3049, -0.0223]$); (2) the relative conditional indirect effects of sustainable cues (X2) on consumer intentions to avoid wasting food (Y) through the perceived performance of social functions (with a moderated mediation effect on path M2→ Y) are stronger for consumers with HHC than for those with low health consciousness (LHC) ($b = 0.1070$, $se = 0.0673$, 95% Bootstrap IC = $[0.0031, 0.2591]$); (3) the relative conditional indirect effects of interactions (X3) on a consumer's intentions to avoid wasting food (Y) through the perceived performance of the physical function (a moderated mediation effect on path M1→ Y) are weaker for consumers with HHC than for those with LHC ($b = -0.2705$, $se = 0.1094$, 95% Bootstrap IC = $[-0.5164; -0.0984]$); (4) the relative conditional indirect effects of interactions (X3) on consumers' intentions to avoid wasting food (Y) through the perceived performance of social functions (moderated mediation effects on path M2→ Y) are stronger for consumers with HHC than for those with LHC ($b = 0.1237$, $se = 0.00693$, 95% Bootstrap IC = $[0.011; 0.2741]$). However, (5) health consciousness only has a negative relative conditional effect on the indirect relationship between eco-design appearance (X1) and a consumer's intentions to avoid wasting food (Y) through physical functions (M1) ($b = -0.2200$, $se = 0.0939$, 95% Bootstrap IC = $[-0.4224; -0.0603]$). A nonsignificant effect is found for the conditional relative indirect effects of social functions. Thus, H4 and H5 are partially supported.

6.5.3 Discussion of study 2

The findings of study 2 confirm that consumers' intentions to avoid wasting food are different for eco-design packaging than for conventional packaging based on the perceived performance of packaging's physical and/or social functions rather than based on its commercial functions. These results are in line with the conclusions of study 1 on the relative indirect effect of the perceived performance of physical functions (M1). Moreover, these results confirm that eco-design visual (X1) and interaction (X3) attributes have positive indirect effects on consumers' intentions to avoid wasting food (Y). Verbal eco-design attributes (X2) do not have a significant indirect effect through physical functions (M1).

A further analysis focusing on the moderation effects of health consciousness shows that health consciousness has a negative mediating moderation effect through the perceived performance of physical functions (M1). Otherwise, health consciousness has a positive mediating moderation effect through the perceived performance of social functions (M2).

The opposite valence of mediated moderation effects of health consciousness can be explained by (1) consumers' opposing perceptions of "sustainability" and "functionality" and (2) a trade-off between "self-signals" and "social-signals" characterizing consumers' pro-environmental behavior.

From the first perspective, consumers' perceptions of sustainability (e.g., encouraging recycling and reducing waste) and functionality (e.g., conservation and protection of food quality) are often in conflict (Luchs & Mick, 2018; Luchs *et al.*, 2010). In addition, according to definitions of packaging functions (Binniger, 2017), physical or instrumental functions representing the "functionality" of packaging seem to be more strongly related to personal benefits such as maintaining one's health and reducing health risks. However, social functions characterizing the "sustainability" of packaging

are more likely to be related to the “greater good” such as reducing food waste. The opposite valence for the moderation effects of health consciousness is in line with the conclusions of previous studies. Specifically, the results indicate that the mediated moderation effects of health consciousness are stronger for physical functions than for social functions ($|b_{(\text{physical} \times \text{health})}| > |b_{(\text{social} \times \text{health})}|$: $0.2705 > 0.1237$) when both visual and verbal attributes are eco-designed (X3).

From the second perspective, consumer food waste reduction behavior is jointly driven by the self- or social-signaling potential of eco-design packaging. In other words, consumer food waste decisions depend on the potential self (referring to a “more concrete, psychologically proximal goal” such as maintaining one’s health or promoting the consumption of healthier foods) or social (referring to more general goals for the greater good such as reducing food waste) benefits generated by the physical (preservation quality of products) and social functions of packaging (incorporating food waste into packaging innovation). These results also confirm a trade-off between “self-signals” (a physical function) and “social signals” (a social function) based on the level of consumer health consciousness. When making food waste decisions, consumers with high levels of health consciousness still more swayed their own needs than by those of society. In other words, consumers value greater benefits for the *self* (associated with the fulfillment of physical functions such as health) than for society (associated with the performance of social functions such as reducing food waste).

6.6 Discussion

This study investigates the effects of eco-design packaging attributes and relevant functions on food waste from a consumer behavior and signaling theory perspective (Spence, 1974). It contributes to research on packaging innovation and consumer food waste behavior, which are currently underexplored in the literature.

Drawing on two experimental studies conducted on two categories of food products, this study provides insights into means of reducing consumer food waste by improving the sustainability of packaging. The relationship between packaging development and food waste behavior is generally investigated from cognitive psychological and industrial perspectives (Zeng & Durif, 2020). Studies adopting the cognitive psychosocial perspective attempt to explore how important packaging attributes (e.g., size, preservation, and date labeling) or functions can be linked to consumer food waste avoidance motivations (e.g., Graham-Rowe *et al.*, 2014; Waste & Resources Action Programme, 2015). Numerous studies show that the visible attributes of packaging (in particular, reducing packaging size) can prevent overconsumption and food waste (Koivupuro *et al.*, 2012; Williams & Wikström, 2011). Studies adopting an industry perspective focus on the precise improvement of attributes at each step of the packaging life cycle via LCA. Eco-design packaging is viewed as a means to reduce food waste (Williams & Wikström, 2011). However, although this industrial perspective provides a precise measure of sustainability performance associated with attributes via LCA, packaging performance is not necessarily perceived by consumers. Recent studies reveal a gap between industrial definitions and consumer perceptions of the sustainability performance of packaging (Boesen *et al.*, 2019). Thus, it is important to integrate the needs and attitudes of consumers into packaging development (Wahlen & Winkel, 2017; Wikström *et al.*, 2019).

Our two experimental studies are therefore based on two assumptions: (1) the sustainable market is characterized by asymmetric information in that consumers do not necessarily have prior knowledge about eco-design packaging and food waste and (2) packaging attributes are signals (observable features) that can influence consumers' perceptions of the performance of a packaging function (an unobservable feature), which in turn influences their food waste decisions.

From a theoretical perspective, this paper contributes to the literature focused on the link between eco-design packaging and consumer food waste by determining underlying mechanisms. The findings indicate that visual eco-design attributes of packaging as well as its verbal attributes derive greater performance from the physical function relative to conventional packaging. However, verbal attributes (sustainable cues) have no significant indirect effect through physical functions. These findings are in line with the literature on the trade-off between the self-benefits and sustainability (e.g., avoiding wasting food) of consumer sustainable behaviors (Benett & Chakravarit, 2009). In fact, consumer food waste avoidance behaviors can be viewed as a type of sustainable behavior that jointly affects the potential self-benefits (e.g., remaining healthy) and social benefits (e.g., avoiding wasting food) of packaging (in this research, the authors assume that self-benefits are derived more from packaging visual attributes and their associated instrumental functions). In addition, previous research has shown that consumers give greater priority to eco-design packaging for its social benefits rather than for its self-benefits (e.g., Binninger, 2017; Panzone *et al.*, 2016). However, this is not always the case. In fact, this research shows that consumers give greater priority to eco-design packaging for its self-benefits rather than for its social benefits (nonsignificant effects of visual attributes were found in two studies) when deciding whether to throw away food. These findings offer insights for better understanding the motivations underlying consumers' decisions to choose different types of packaging (visual, verbal, or completely eco-designed) when making decisions regarding food waste.

Furthermore, a nonsignificant indirect effect of eco-design packaging was found through social and commercial functions, indicating that consumers' food waste decisions seem to be more strongly influenced by how they perceive the physical function (e.g., preserving food) of packaging than its other functions (e.g., whether packaging is categorized as green packaging or not). These findings also confirm

claims made in the literature that the physical functionality of food packaging takes priority over sustainability and commercial functions (Panzone *et al.*, 2016).

In study 2, the authors investigated the individual-level traits that predispose consumers to the varying prosocial (vs. proself) signaling potential of eco-design packaging. The authors hypothesized the behaviors of consumers with HHL to be motivated more by physical functions than by social functions. The results of our moderation analysis of health consciousness indicate negatively and positively mediated moderation effects on the relative indirect effects of eco-design packaging on consumers' intentions to avoid wasting food through physical (M1) and social functions (M2), respectively. These results are in line with the literature on the trade-off between "functionality" (the associated self-benefit) and "sustainability" (the associated social benefit) experienced during sustainable decision-making (Luchs & Mick, 2018; Luchs *et al.*, 2010).

These results can help stakeholders involves in various stages of the food supply chain (consumers, packaging producers, retailers, and policy makers). First, this research indicates that eco-design packaging can help consumers reduce food waste by improving the visual and verbal attributes of packaging by linking their physical and social functions. In particular, improving packaging's physical function through resealability (e.g., for preservation and storage) could help reduce food waste.

Second, for marketing managers, this research shows that consumers are more strongly influenced by the improvement of visual attributes and by a combination of visual and verbal attributes. Only the verbal eco-design attribute (e.g., sustainable cues) did not seem to be sufficient for consumers to evaluate a product's physical function. Moreover, previous studies have shown that consumers give greater priority to eco-design packaging for social benefits (i.e., the "greater good") than for self-benefits. These findings suggest the value of a more social-benefit-oriented communication strategy (e.g., emphasizing the ease of recycling) (Panzone *et al.*, 2016). However, the present study shows that what drives consumers to choose eco-design packaging for its "social

benefits” (i.e., a consumer’s desire to be perceived as a good person) can be heavily attenuated by a hidden “self-benefit” (e.g., health consciousness and additional cost). Moreover, consumers seem to give greater priority to “self-benefits” in relation to high cost-related behaviors such as health-related behaviors (e.g., deciding whether to throw away expired food). That consumers prefer self-benefits and express social benefits more explicitly is implicit (consumers shift their pro-social behavior). Hence, future communication strategies should highlight that eco-design packaging offers greater efficacy in preserving food (thus providing greater self-benefits) rather than only making sustainability arguments (social benefits).

Third, packaging producers can benefit from consumer behavior research (Williams *et al.*, 2012). Specifically, redesigning several key visual attributes (e.g., resealability and vacuum packaging) can improve consumers’ perceptions of the physical performance of eco-design packaging (e.g., maintaining freshness and extending food shelf life) and functionality, which reduces food waste (e.g., cheese). Likewise, the visibility and clarity of packaging’s social function (i.e., sustainability) can be improved through the current date labeling system (e.g., “best before” but not “bad after”), by creating new sustainable labels (e.g., food waste prevention labels) (Wikström *et al.*, 2019), and by providing more actionable information on how to preserve food (e.g., the temperature at which to freeze food). Moreover, this research reveals negatively and positively mediated moderation effects of health consciousness on the indirect effects of instrumental and social functions, respectively. Hence, consumers’ health consciousness should be considered in food packaging innovation to find a better balance between instrumental and social functions to satisfy consumers with different levels of health consciousness.

Finally, for policy makers, the findings show that eco-design packaging can be used as strategic means to reduce consumers’ food waste. However, consumers have limited relevant knowledge about eco-design packaging, packaging functions, and the positive

effects of packaging on food waste reduction. Thus, the authors suggest that the government develop a labeling system to measure the capacity for packaging to reduce food waste across different food categories. In addition, eco-design packaging should be implemented correctly to reduce food waste rather than as a tool for greenwashing. Hence, the authors suggest that the government improves current regulations on the promotion of eco-design packaging and eco-packed products for each food category to control greenwashing.

6.7 Limitations and research avenues

Some limitations of the present research highlight avenues for future work. First, this research focused on two key attributes of eco-design packaging: resealability and sustainable cues. Further research can be expected on other important attributes that may influence consumer food waste decisions. Recent industrial studies examining packaging innovations and food waste highlight that household food waste generation can be prevented by improving visual (e.g., contains the right amount, is easy to empty, and is easy to dose) and verbal attributes (e.g., information about ingredients and food safety, nutrition, environmental certification, and storage guidance and date labelling) (Wikström *et al.*, 2019).

Second, this research examined the role of eco-design packaging in consumer food waste decisions without considering interactions between packaging and products. Recently, some evidence has shown that consumer food waste decisions may be influenced jointly by packaging and product features (e.g., perceived quality and quantity purchased) (Zeng & Durif, 2020). Further studies on the effects of interactions of eco-design packaging and products are recommended to gain a stronger understanding of the topic. Moreover, the developed model can be refined by including important sociocultural factors (e.g., culture of consumption) (Abdelradi, 2018;

Aschemann-Witzel *et al.*, 2016; Koivupuro *et al.*, 2012) and factors regarding consumption management (e.g., household planning and shopping habits (Evans, 2014).

Third, although this research reveals the diversity of consumer perceptions of eco-design packaging and its functions, it did not identify the profile of consumers based on their perceptions of eco-design packaging. Thus, research that segments consumers based on their reactions to associated eco-design packaging and their food waste-related decisions could be expected. Since a number of studies on consumers' sustainable behaviors have shown that their behaviors could vary in terms of gender, age, and education (e.g., Akehurst *et al.*, 2012; Laroche *et al.*, 2001), it would be interesting to integrate sociodemographic variables to describe consumer segments through cluster analysis approaches (e.g., K-means or hierarchical cluster analysis).

As another limitation, this research focused on the Canadian context and on only two food categories (milk and cheese). The findings may be different for other food categories with diverse life cycles. Thus, further research can test the developed model across different countries and food categories such as bread, fruit, and vegetables.

Finally, the current research was limited to consumer intentions regarding food waste. However, numerous studies point out an intention–behavior gap (Park & Lin, 2018). Moreover, although online experiments can partially control for bias due to social desirability, this problem could be solved by using more objective questionnaires and effective measures of food waste behavior such as interviews, enquiries, diaries, or waste composition analysis (WCA) (Wikström *et al.*, 2019).

APPENDICE G

Tableau G.1 Sample.

Variable		Frequency	%
Gender	Male	196	64.5%
	Female	108	35.5%
Age	18-24	67	22%
	25-34	118	38.8%
	35-44	63	20.7%
	45-54	29	9.5%
	> 55	7	2%
Marital status	Single, never married	118	38.8%
	In a domestic partnership or civil union	30	9.9%
	Married	114	37.5%
	Divorced	9	3%
	Single but cohabiting with a significant other	25	8.2%
Origin	Quebec	34	11.2%
	Alberta	34	11.2%
	British Columbia	55	18.1%
	Manitoba	14	4.6%
	New Brunswick	4	1.3%
	Nova Scotia	10	3.3%
	Ontario	145	47.7%
	Prince Edward Island	1	0.3%
Number of Children	Saskatchewan	5	1.6%
	No child	161	53%
	1	57	18.8%
	2	46	15.1%
	3	26	8.6%
	More than 3	14	5%

Variable	Frequency	%
No diploma or less than a high school degree	5	1.6%
High school graduate	54	17.8%
Education Certificate	49	16.1%
Bachelor's degree	141	46.4%
Master's degree	42	13.8%
Ph.D.	13	4%
Total	304	100%

Tableau G.2 Measurement.

Constructs	Items	Study 1	Study 2
Perceived performance of packaging's functions	After looking at the image above, how much do you agree with the following statements: [...]	Factor loading	Factor loading
Physical		$\alpha = 0.877$	$\alpha = 0.855$
	This pack can promote hygiene and food safety.	0.701	0.709
	1. This pack is innovative.	<0.40	0.695
	2. This pack is easier to empty.	<0.40	0.618
	3. This pack is easier to open.	0.753	<0.40
	4. With this pack it is easier to consume the correct amount.	<0.40	0.609
	5. This pack is easier to reclose.	0.838	0.661
	6. This pack ensures higher food quality when unopened.	0.488	0.567
	7. This pack ensures higher food quality when opened.	0.932	<0.40
	8. This pack can protect products under various conditions (e.g., transport).	0.632	0.48
	9. This pack is convenient, easy and efficient to use and can change my lifestyle.	0.558	0.644
Social		$\alpha = 0.809$	$\alpha = 0.867$
	This pack can reduce pollution (e.g., food waste, pollution related to the packaging itself, etc.).	0.697	0.709
	1. This pack is easy to recycle.	0.815	0.733
	2. This pack encourages recycling.	0.752	0.699
Commercial		$\alpha = 0.732$	$\alpha = 0.822$
	This pack enables and promotes food category identification (e.g., organic).	0.545	0.446
	1. This pack displays and describes the food it contains and additional messages (e.g., guidance on food storage and date labeling).	0.564	0.604
	2. This pack contains less food.	0.529	<0.40

Constructs	Items	Study 1	Study 2
	3. This pack includes better information on when the food can be consumed safely.	0.724	0.664
Health consciousness			$\alpha = 0.878$
	I do not think that eating leftovers is damaging to my health.		0.562
	1. I think that consuming leftovers is harmless.		0.804
	2. I think that one can safely eat food products whose use-by dates were a few days ago.		0.489
	3. Health is very important to me.		0.812
	4. Health means a lot to me.		0.97
		$\alpha = 0.819$	$\alpha = 0.820$
Food waste prevention attention	I try to waste no food at all.	0.748	0.501
	1. I always try to eat all food in purchase.	0.750	0.450
	2. I try to produce very little food waste.	0.726	0.69
	3. I aim to use all leftovers.	0.693	0.79

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CHAPITRE VII

CHAPITRE DE CONCLUSION

L'objectif principal de cette thèse était d'approfondir les connaissances sur les réactions (positives et négatives) des consommateurs envers l'emballage éco-conçu et ses impacts sur une pratique de consommation responsable — la réduction du gaspillage alimentaire. La revue de littérature systématique sur plusieurs postulats (positiviste, interprétativiste, TCR) et divers disciplines (notamment, ingénierie, psychologie, sociologie) a mis en évidence que la conceptualisation de l'emballage éco-conçu et ses impacts sur les pratiques de la CR dans la société sont limités pour les raisons suivantes : (1) l'absence d'une définition consensuelle; (2) une connaissance partielle du phénomène, car circonscrite dans le domaine de l'ingénierie. Ces études s'appuient principalement sur la perspective positiviste et ne prennent pas en compte le point de vue des consommateurs (ex. : perception, besoin, connaissance) (Wikström *et al.*, 2019); (3) l'absence de cadre théorique holistique consacré aux effets de l'emballage éco-conçu sur les pratiques de la CR (notamment sur les pratiques de la réduction du gaspillage alimentaire). En répondant à l'appel existant, les connaissances sur les réactions des consommateurs envers les emballages éco-conçus et ses impacts sur le gaspillage alimentaire développées durant la présente thèse constituent une contribution dans un domaine peu exploré, l'utilisation des emballages éco-conçus, afin d'améliorer des pratiques de la CR, notamment la réduction du gaspillage alimentaire. Les connaissances conçues durant la thèse permettent aux organismes environnementaux et de la CR, fabricants d'emballage, marketeurs et détaillants,

politiques publiques d'implémenter les emballages éco-conçus en processus de prise de décision de façon réussie tout en évitant les réactions négatives des consommateurs. Pour atteindre son objectif principal, la présente thèse répond à quatre questions essentielles que l'objectif principal suscite :

- Quels sont les sujets et les problématiques les plus discutés liés au concept de l'emballage éco-conçu ?
- Quelles sont les perceptions du consommateur envers les emballages éco-conçus?
- Quels sont les mécanismes sous-jacents par lesquels les perceptions des consommateurs envers les emballages éco-conçus influencent leurs intentions de réduire le gaspillage alimentaire ?
- Quelle est la relation de cause à effet entre les perceptions des consommateurs envers les emballages éco-conçus et leurs intentions de réduire le gaspillage alimentaire ?

Afin de répondre à ces quatre questions, la thèse est répartie en quatre études. Les résultats de la première étude sont reportés dans le premier article qui répond à la première question de recherche. À travers une revue de littérature systématique effectuée sur 261 articles publiés dans des revues scientifiques prestigieuses (classées en Q1 ou Q2 selon le classement SJR 2018 comme *Journal of Cleaner Production*, *Journal of Consumer Research*, *Psychology and Marketing*) sous un angle épistémologique, le premier article a mis en évidence trois voies de recherche, soit : (1) la vulnérabilité des consommateurs face aux innovations liées à l'emballage (risques perçus associés aux emballages éco-conçus); (2) l'emballage et le gaspillage alimentaire du consommateur; et (3) l'emballage et la consommation des alimentaires

durables. Les résultats de la deuxième étude sont rapportés dans le deuxième article qui explore les risques perçus des consommateurs envers les emballages éco-conçus et leur influence sur leurs décisions d'achat des produits éco-emballés. En plus, en répondant à deuxième question de recherche, cette étude construit des chaînages cognitifs afin de générer une typologie des orientations de la consommation des consommateurs associée aux emballages éco-conçus. Les résultats de la troisième étude sont rapportés dans le troisième article qui établit un nouveau modèle théorique concernant les impacts des emballages éco-conçus sur la réduction du gaspillage alimentaire des consommateurs. Ce modèle propose un cadre théorique holistique sur la relation entre les emballages éco-conçus et le gaspillage alimentaire du consommateur (quatre catégories de déterminants et deux processus continus du gaspillage alimentaire). Les résultats du quatrième article confirment des hypothèses de recherche dans le modèle théorique, notamment ceux liés aux effets des attributs (visuels, verbaux et les interactions) et des fonctions (instrumentale, sociale, commerciale) des emballages éco-conçus dans l'intention d'éviter le gaspillage alimentaire. Le modèle est aussi un outil pour améliorer des pratiques de la réduction du gaspillage alimentaire en étape de consommation.

L'enchaînement de ces quatre articles reflète le cheminement du projet de recherche de la thèse qui commence par la mise en évidence des voies de la recherche axée sur l'emballage éco-conçu émergent dans la littérature (article 1), qui s'intéresse ensuite à l'exploration des réactions des consommateurs (positives et négatives) envers ce type d'emballage (article 2), avant de conclure par l'établissement (article 3) et la confirmation (article 4) d'un nouveau modèle théorique d'une pratique plus importante dans la société contemporaine de la consommation responsable des consommateurs – la réduction du gaspillage alimentaire.

En somme, la contribution de la présente thèse consiste en quatre articles publiés à des revues scientifiques prestigieuses (*Journal of Cleaner Production*, *Technological*

Forecasting and Social Change, Journal of Promotion Management, Sustainability), deux communications à des conférences internationales et un prix de la meilleure publication. Voici les références :

Articles publiés dans la revue scientifique avec comité de lecture

- Zeng, T., Deschêches, J., et Durif, F. (2020). Eco-design packaging: an epistemological analysis and transformative research agenda. *Journal of Cleaner Production*, 276 (Q1). DOI : 10.1016/j.jclepro.2020.123361.
- Zeng, T., et Durif, F. (2019). The Influence of Consumers' Perceived Risks towards Eco-Design Packaging upon the Purchasing Decision Process: An Exploratory Study. *Sustainability*, 2019,11(21),6131 (Q2). DOI : 10.3390/su11216131. **(Prix 2019 de la meilleure publication au Doctorat dans le cadre du programme 'À nous la recherche' – ESG UQAM)**
- Zeng, T., et Durif, F. (2020). The impact of consumer perceptions of eco-packaging on food waste avoidance: A conceptual framework. *Journal of Promotion Management*, 26(5) (Q2). DOI: 10.1080/10496491.2020.1729320.
- Zeng, T., Durif, F., et Robinot, E. (2020). Can eco-design packaging reduce consumer food waste? An experimental study. *Technological Forecasting and Social Change*, 162, 120342 (Q1). DOI: 10.1016/j.techfore.2020.120342.

Communications dans la conférence scientifique internationale

- Zeng, T (2020, juin), The signalling explanations for the effects of Eco-design packaging on food waste behaviours, *Academy of Innovation, Entrepreneurship, and Knowledge Conference 2020 (ACIEK)*, ESIC, Madrid, Espagne, 23-25 juin.
- Zeng, T., et Durif, F. (2019, juin), A hybrid model of the effects of consumer perceptions of eco-packaging on food waste avoidance, *Innovation, Entrepreneurship, Knowledge Academy Conference 2019 (INEKA)*, Université de Verona, Italie, 11-12 juin.

Le chapitre de conclusion est consacré à la discussion au sujet des contributions principales de la thèse (théorique et managériale), des limites et des voies de recherche. Dans un premier temps, le chapitre expose les principales contributions théoriques de la thèse en ce qui concerne la CR, la recherche sur l’emballage éco-conçu en ingénierie et la TCR. Dans un deuxième temps, le chapitre présente les implications managériales pour les parties prenantes (organismes environnementaux ou de la CR, fabricants d’emballage, marketeurs détaillants, et politiques publiques). Il s’agit d’illustrer comment transférer les principaux résultats académiques de la présente thèse en pratiques afin de participer à l’amélioration de l’éducation et de la sensibilisation à l’acceptabilité des emballages éco-conçus dans une optique de réduction du gaspillage alimentaire. Le chapitre se conclut par une discussion des limites et voies de recherches futures.

7.1 Contribution théorique

D’abord, sur le plan théorique, la thèse apporte les contributions dans trois champs de recherche : la CR, la recherche sur l’emballage éco-conçu en ingénierie et la TCR sur l’innovation de l’emballage (voir Tableau 7.1).

Tableau 7.1 Contributions théoriques aux trois champs de recherche

Champs de recherche	Littérature	Research Gap	Contribution de la thèse
Consommation responsable	<ul style="list-style-type: none"> • Mettre en évidence la tendance développée des pratiques de la CR liée à l'utilisation de l'emballage éco-conçu et la réduction du gaspillage alimentaire; • Explorer les réactions diversifiées (notamment positives) des consommateurs envers des emballages éco-conçus. 	<ul style="list-style-type: none"> • Absence d'étude consacrée à l'emballage éco-conçu et ses relations avec la pratique de la réduction du gaspillage alimentaire; • Les connaissances sur les comportements du gaspillage alimentaire sont fragmentées (inspirées principalement par les recherches en psychologie et sociologie). 	<ul style="list-style-type: none"> • Établir une conceptualisation de la notion de l'emballage éco-conçu par la perspective du consommateur; • Étudier la pratique de la réduction du gaspillage alimentaire (facteurs influencent, outils d'amélioration les pratiques – les emballages éco-conçus) (articles 3 et 4); • Explorer les réactions (notamment négatives) des consommateurs envers les emballages éco-conçus (article 2); • Examiner les motivations et freins du gaspillage alimentaire sur le plan de consommation et les facteurs influents associés à l'emballage (article 3).

Champs de recherche	Littérature	Research Gap	Contribution de la thèse
Recherche sur l'emballage éco-conçu en ingénierie	<ul style="list-style-type: none"> • Identifier les améliorations des attributs d'emballage à travers la LCA; • L'emballage éco-conçu comme solution pour limiter le gaspillage alimentaire; • Les études concentrées aux effets directs de l'emballage éco-conçu (les effets ayant eu lieu pendant la production des matériaux de l'emballage, du transport et du recyclage) sont nombreuses. 	<ul style="list-style-type: none"> • Négliger les facteurs internes individuels du consommateur (les perceptions et les besoins) dans le développement et l'innovation de l'emballage; • Les effets indirects de l'emballage éco-conçu (sur le gaspillage alimentaire) de l'emballage sont sous-explorés. 	<ul style="list-style-type: none"> • Proposer une perspective alternative (TCR) pour étudier l'emballage éco-conçu et ses impacts sur le gaspillage alimentaire (article 1); • Synthétiser les savoirs sur l'emballage écoconçu) (article 1); • Mettre en évidence l'écart entre la définition (LCA) et les perceptions des consommateurs envers l'emballage éco-conçu (article 2); • Développer et tester un modèle théorique sur les impacts des emballages éco-conçus sur le gaspillage alimentaire par la perspective du consommateur pour compléter les recherches en ingénierie basées sur LCA (articles 3 et 4).
TCR	Offrir une nouvelle perspective en recherche des consommateurs afin d'amener un changement positif et d'améliorer les impacts sociétaux de la recherche académique.	Le sujet lié aux impacts des emballages éco-conçus à la réduction du gaspillage alimentaire) est sous-exploré	<ul style="list-style-type: none"> • Identifier trois voies de recherche transformatives au sujet (article 1); • Contribution à la thématique de la vulnérabilité du consommateur par l'exploration des réactions négatives du consommateur face à l'innovation (article 2);

Champs de recherche	Littérature	Research Gap	Contribution de la thèse
			<ul style="list-style-type: none">• Contribution à 2 volets de la thématique du développement durable : mode de vie et responsabilité de consommation (articles 3 et 4);• Contribution à la thématique de la santé publique par l'amélioration des fonctions de l'emballage éco-conçu et des consciences sanitaires du citoyen (articles 3 et 4).

7.1.1. Contributions à la consommation responsable – pratique de la réduction du gaspillage alimentaire

L'emballage joue un rôle important dans plusieurs pratiques de la CR puisqu'il établit le lien entre le produit et le consommateur à l'aide de différentes fonctions (physique, social et commercial) (Binninger, 2017). Après dix ans d'études de OCR axées sur les pratiques de la CR au Québec, celles-ci montrent que le refus, la réduction, le recyclage et le compostage s'appuyant sur différents types d'emballage éco-conçus sont les mesures principales pour réduire les impacts négatifs sur l'environnement, ce qui implique d'adopter des pratiques telles que : la réutilisation de contenant (65 % des consommateurs québécois), l'achat de produits éco-emballés (57,4 %), l'achat de produits avec peu d'emballage ou vrac (29,5 %), ou l'adoption des pratiques de la réduction du gaspillage (plus de 50 %). Ainsi, les impacts indirects de l'emballage éco-conçus (liés aux services proposés pour l'emballage, le produit et/ou les consommateurs, notamment la réduction du gaspillage alimentaire) ont des impacts sociétaux plus importants que ses impacts directs (les effets ayant eu lieu pendant la production des matériaux, du transport et du recyclage de l'emballage) (Lindh, *et al.*, 2016).

Cependant, les résultats d'une revue de littérature systématique menée sur 22 articles consacrés à la relation entre l'emballage écoresponsable et le gaspillage alimentaire et, publiés dans les revues prestigieuses (classées Q1 ou Q2 en SJR 2018) ont montré qu'en l'absence d'étude consacrée spécifiquement aux impacts de l'emballage éco-conçu sur le gaspillage alimentaire par la perspective du consommateur (article 3). Les connaissances sur cette relation sont fragmentées, inspirées principalement par les recherches des autres disciplines (notamment psychologie, ingénierie et sociologie).

Afin de répondre à l'appel, la présente thèse contribue aux champs de recherche de la CR à l'aide des quatre manières suivantes :

Premièrement, la thèse propose une conceptualisation de la notion de l'emballage éco-conçu à travers la perspective épistémologique (article 1) et la perspective analytique (chaînage cognitif) (article 2). La revue de littérature systématique (261 articles) sur plusieurs postulats (positiviste, interprétativiste, TCR) et divers disciplines (ex, ingénierie, marketing, sociologie) montre plus précisément que l'absence d'une définition consensuelle dans la littérature : à partir de la perspective, l'emballage éco-conçu est vu comme l'ensemble des attributs écologiques servant à combler différentes fonctions (ex. : protection de l'environnement) par la perspective positiviste (ex. : Bertoluci *et al.*, 2014; Boesen *et al.*, 2019). Au contraire des positivistes, les interprétativistes considèrent que l'emballage confère une valeur narrative au produit : significations matérielles (techniques) et significations non matérielles (imaginé) du produit (Dano, 1996, 1998). À l'inverse, du point de vue TCR, l'emballage éco-conçu est considéré comme un outil afin d'amener un changement positif dans la société notamment le sujet lié à la vulnérabilité des consommateurs face aux innovations (ex. : Baker et Mason, 2012; Ford *et al.*, 2016), ses impacts sur le gaspillage alimentaire (ex. : Wikström *et al.*, 2016, 2019) et la consommation des aliments durables (ex. : Carrero *et al.*, 2019; Guichard et Muratore, 2011).

Le deuxième article basé sur la perspective du consommateur permet de mettre en évidence le fait que les attributs de l'emballage éco-conçu perçus par les consommateurs sont plus limités que ceux définis par la LCA (21 vs 36) (voir Tableau 1.3). Certains attributs sont mentionnés par les deux perspectives, notamment les matériaux écoresponsables (recyclables et/ou biodégradables), le poids léger, la taille et le ratio contenu/contenant optimisé, la couleur (vert, bleu ou transparent), l'étiquette écologique ou environnementale. Ces résultats sont alignés sur les études en ingénierie consacrées à l'existence d'écarts entre les perceptions des consommateurs et la définition en ingénierie (LCA) sur l'emballage éco-conçu (Boesen *et al.*, 2019). Ainsi, les attributs de l'emballage éco-conçu perçus par les consommateurs sont agrégés sur

trois dimensions (3 R) : la réduction, la réutilisation et la recyclabilité (Figure 4.3), par l'approche de Corley et Gioia (2004).

Deuxièmement, la thèse explore les réactions des consommateurs (notamment l'aspect négatif) et amène une vision globale sur les réactions des consommateurs associées aux types d'emballage éco-conçu en s'intéressant particulièrement à la réaction négative des consommateurs — risque perçu. Les résultats de l'analyse des moyens-fins (*mean-end-chain*) identifient cinq risques associés à la consommation d'un produit éco-emballé, soit : les risques fonctionnels, physiques, financiers, liés au style de vie et socio-environnementaux (notamment le gaspillage alimentaire).

Troisièmement, la thèse contribue à la CR en identifiant quatre catégories de déterminants (motivations et/ou freins) des comportements liés au gaspillage alimentaire, soit : (1) les déterminants psychologiques des individus basés principalement sur les déterminants de la théorie du comportement planifié (Ajzen, 1991) (ex. : attitude, normes subjectives, perception de la capacité de contrôle) ; (2) les déterminants relatifs au produit et son emballage (qualité perçue et quantité d'achats du produit, attributs d'emballage) ; (3) les déterminants associés au management de consommation (ex. : fréquence d'achat, planification d'achat, connaissance sur la réduction du gaspillage alimentaire) ; (4) les déterminants socioculturels (article 3) (voir Tableau 5.1).

Par la suite, l'article 3 établit un cadre théorique holistique (modèle hybride) pour mettre en évidence le mécanisme sous-jacent des effets de la perception des consommateurs à l'égard de l'emballage éco-conçu sur leur intention liée au gaspillage alimentaire. De manière plus précise, le modèle de variance a identifié la relation entre quatre catégories de déterminants du gaspillage alimentaire (les effets modérateurs de la performance perçue des fonctions d'emballage et la qualité perçue du produit (Aschemann-Witzel *et al.*, 2016) et la quantité d'achats, ainsi que les effets

modérateurs des déterminants psychologiques : la préoccupation environnementale (Matthes *et al.*, 2014), sanitaire, et l'attitude financière ; les déterminants sociodémographiques comme les connaissances et la culture) (Koivupuro *et al.*, 2012) (Figure 5.2). Le modèle processus décrit le processus continu des effets de l'emballage éco-conçu sur l'intention de limiter le gaspillage alimentaire. En fait, les impacts des perceptions des consommateurs envers l'emballage éco-conçu sur l'intention de limiter le gaspillage peuvent être expliqués par deux chemins de persuasion distincte. Le chemin 1 s'appuie sur les analyses cognitives : percevoir → compréhension (sur les fonctions de l'emballage) → inférence (qualité/quantité du produit) → prise de décision. En revanche, le chemin 2 se caractérise plutôt par un processus affectif par lequel les attributs de l'emballage éco-conçu sont généralement ignorés par les consommateurs (Figure 5.3).

Enfin, l'article 4 confirme les effets de la perception des consommateurs à l'égard de l'emballage éco-conçu à travers la performance perçue envers les fonctions physiques et sociales. Les consommateurs semblent davantage sensibles à l'écoconception des attributs visuels associés que ceux verbaux puisque les attributs visuels de l'emballage (ex. : matériaux écoresponsables, refermabilité) sont généralement liés aux fonctions instrumentales (ex. : protection et conservation du produit), ce qui exerce une influence sur l'intention de s'adonner au gaspillage alimentaire. En outre, l'étude dévoile les effets modérateurs paradoxaux de la conscience sanitaire sur le lien entre la performance perçue des fonctions physiques et sociales : (1) les effets des perceptions des consommateurs envers l'emballage éco-conçu (attribut visuel éco-conçu et combinaison d'attributs visuels et verbaux éco-conçus) sur l'intention de limiter le gaspillage alimentaire à travers la performance perçue de la fonction physique sont plus forts pour les consommateurs avec un haut niveau de conscience sanitaire (vs bas niveau de la conscience sanitaire) ; (2) à l'inverse, les effets indirects sur la performance perçue de la fonction sociale sont moins forts pour les consommateurs

avec un haut niveau de conscience sanitaire (vs bas niveau de la préoccupation sanitaire). Ces effets paradoxaux confirment l'arbitrage (*trade-off*) entre la fonctionnalité (liée au bénéfice individuel comme la santé) et la durabilité (liée au bénéfice social comme la protection de l'environnement) (Glazer et Konrad, 1996).

7.1.2. Contribution au champ d'études concentré sur l'emballage éco-conçu en ingénierie

Les impacts sociaux des recherches en ingénierie consacrées aux effets de l'emballage éco-conçu sur le gaspillage alimentaire sont limités étant donné que celles-ci négligent le point de vue des consommateurs (ex. : perception, besoin, connaissance) (Wikström *et al.*, 2019). En fait, la majorité des recherches en ingénierie se basent sur une perspective positiviste à travers laquelle l'emballage éco-conçu est vu comme l'ensemble des attributs définis selon LCA au lieu de besoins des consommateurs. Or les effets de l'emballage éco-conçu sur le gaspillage alimentaire dépendent des perceptions de l'utilisateur (Wikström *et al.*, 2019) et les participations de différentes parties prenantes (ex. : organisations environnementales et de la CR, marketeurs et détaillants, fabricants de l'emballage et la politique publique).

La thèse contribue aux champs d'études sur l'emballage éco-conçu et à l'innovation de l'emballage en proposant une perspective alternative de recherche — TCR. La TCR consiste en une nouvelle initiative de recherche visant à amener une transformation (en esprit et en comportements) positive et améliorer le bien-être individuel/collectif dans la société. La TCR s'intéresse aux problématiques qui se trouvent au cœur de la préoccupation sociétale telles que la pauvreté, le développement durable, la santé, la consommation à risque (Özçağlar-Toulouse et Burroughs, 2014).

Le premier article de la thèse consiste en une réflexion profonde sur la façon de construire les savoirs qui pourraient générer une transformation positive de la société à travers une analyse épistémologique en examinant les cinq questions fondamentales — l'ontologie, l'axiologie, l'épistémologique, la méthodologie et l'évaluation — sur trois perspectives de recherche adoptées sur le sujet (positivisme, interprétativisme, et TCR). Les résultats de la revue de littérature sous angle épistémologique sur 261 articles (concernant l'écoconception, l'emballage et l'emballage écoconçu) montrent que les recherches basées sur la perspective positiviste (comme la plupart de recherche en ingénierie) visent à construire les connaissances neutres qui sont souvent indépendantes de leurs applications. De plus, ces travaux tendent à conserver le système actuel de la société au lieu d'amener un changement (Murray et Ozanne, 1991). Alors que la TCR permet d'améliorer les impacts sociétaux (c.-à-d. la création de savoirs académique/pratique, l'amélioration de la conscience, l'application et le bénéfice sociétal) du sujet de recherche et intègre les parties prenantes pertinentes (dans le cadre de la thèse, ce sont les organisations environnementales et de la CR, les marketeurs et détaillants, les fabricants de l'emballage, les politiques publiques) au processus de recherche (ex. : identification de problématique, collecte et analyse des données, diffusion et mise en application des résultats) (Davis et Ozanne, 2019).

7.1.3. Contribution à la TCR

De plus, la thèse contribue à la TCR à travers l'introduction l'emballage éco-conçu comme outil d'amélioration du bien-être du consommateur et les parties prenantes. En effet, l'emballage éco-conçu pourrait générer un changement positif sur les trois thématiques de recherche prédominantes dans la TCR (vulnérabilité, développement durable, santé).

Premièrement, à travers l'article 2, la thèse explore la vulnérabilité des consommateurs face à l'innovation. Cet article aborde le bénéfice social sur plusieurs aspects : (1) créer des savoirs académiques et (2) générer des connaissances pour résoudre un problème (réduire la vulnérabilité du consommateur face à l'emballage écoconçu), (3) attirer les attentions des parties prenantes pour l'amélioration des perceptions de l'emballage écoconçu auprès des consommateurs, (4) améliorer l'utilisation de la recherche académique.

- Création des savoirs académiques : le deuxième article de la thèse a mis en évidence des réactions négatives des consommateurs envers les attributs de l'emballage éco-conçu et comment ces derniers peuvent influencer leurs décisions d'achat par l'approche MEC. Les résultats ont permis de compléter les connaissances par rapport aux motivations du consommateur concernant l'achat du produit éco-emballé (ce qui se concentre sur le bénéfice).
- Génération des connaissances guidées par une problématique en pratique (*Problem-focused knowledge*) : cet article a identifié les attributs perçus plus importants aux yeux de consommateur (ex. : recyclabilité, taille réduite, étiquetage écologique, réutilisabilité) (voir Tableau 1.3) pour améliorer la visibilité de l'emballage écoconçu.
- Ainsi, les résultats pourraient aussi améliorer les connaissances des consommateurs envers les fonctions de l'emballage éco-conçu et l'emballage en général dans la protection environnementale. Les résultats pourraient être utilisés pour éduquer les consommateurs : l'emballage éco-conçu est « un outil » potentiel pour réduire l'impact environnemental (ex. : le gaspillage alimentaire) plutôt qu'« une source » de pollution.
- Enfin, les consommateurs jouent un rôle important à plusieurs étapes importantes de cette recherche (ex. : définir les attributs de l'emballage écoconçu, identifier les conséquences et les valeurs associées aux attributs). La

collaboration avec les consommateurs — l'utilisateur final de l'emballage — dans le processus de recherche a permis d'améliorer l'utilisation des résultats de la recherche académique au sujet.

Deuxièmement, la thèse explore une des thématiques fondamentales de la TCR — développement durable en interrogeant la relation entre l'emballage éco-conçu et le gaspillage alimentaire sur le plan de la consommation. Dans l'ouvrage centré sur la TCR, Mick *et al.* (2012b) ont mis en évidence trois volets sur la thématique du développement durable : (1) le mode de vie, (2) la durabilité et la responsabilité de consommation, et (3) l'idéologie de consommation. Le premier consiste plus précisément à amener un vrai changement en ce qui concerne le mode de vie et la valeur de consommation avec le développement sur les plans économique, social et politique. Le second volet renvoie à la recherche de la durabilité et la responsabilité basée sur le concept de « consommateur citoyen ». Le troisième volet est destiné à étudier les fondements théoriques autour des concepts tels que les besoins, le matérialisme ainsi que l'idéologie de consommation contemporaine (Mittelstaedt *et al.*, 2014).

Certains travaux en TCR ont étudié les effets des messages ou de l'étiquetage dans l'emballage sur les comportements du consommateur (ex. attitude et intention d'achat) (ex. : Svederberg, 2002 ; Tangari et Smith 2012). Or, les impacts de l'emballage éco-conçu sur le gaspillage alimentaire sont peu explorés dans la thématique du développement durable de la TCR en raison de l'absence de la définition consensuelle sur la notion de l'emballage éco-conçu et l'absence d'un cadre théorique axé sur cette relation.

Les troisième et quatrième articles de la thèse contribuent notamment sur 2 volets (le mode de vie et la responsabilité de consommation) du développement durable de la TCR : d'abord, l'article 3 a établi un modèle sur les impacts de l'emballage

éco-conçu sur le gaspillage alimentaire du consommateur. Ce modèle a dévoilé qu'il est possible de changer la mode de consommation des produits alimentaires (plus précisément, la gestion des surplus et le gaspillage) par l'amélioration des fonctions de l'emballage éco-conçu (instrumental, social).

Enfin, comme la thèse se concentre sur le secteur alimentaire puisque ce dernier est considéré comme l'un des secteurs pionniers de l'emballage innovant (Rokka et Uusitalo, 2008), ses résultats pourraient avoir une influence sur la santé publique. L'article 2 a identifié les risques perçus physiques et fonctionnels du consommateur envers l'emballage éco-conçu généré par l'attribut « matériaux recyclés », qui est lié aux préoccupations hygiènes et sanitaires. Les articles 3 et 4 ont montré que l'emballage éco-conçu peut influencer la décision du gaspillage alimentaire du consommateur à travers l'amélioration notamment de ses fonctions : instrumentale (ex. : conservation, préservation), sociale (ex. : recyclable, réutilisable). De plus, l'article 4 a confirmé que la conscience sanitaire du consommateur a des effets modérateurs sur la relation causale entre l'emballage éco-conçu et la décision du gaspillage alimentaire du consommateur. Le Tableau 7.2 synthétise les contributions théoriques de la thèse par article.

Tableau 7.2 Contributions théoriques de la thèse par article

Article	Question de recherche	Contribution	Résultats
Article 1	Quels sont les sujets et les problématiques les plus discutés liés au concept de l’emballage éco-conçu ?	Proposer une nouvelle perspective de faire la recherche et les voies de recherche afin de maximiser les impacts sociétaux de l’emballage éco-conçu : TCR	<ul style="list-style-type: none"> • Tableau 3.1. A summary of positivism, interpretivism, and TCR • Tableau 3.2. Epistemological analysis of eco-design, packaging, and eco-design packaging
		Proposer un agenda de recherche	<ul style="list-style-type: none"> • Tableau 3.3. Transformative research agenda
Article 2	Quelles sont les perceptions du consommateur envers les emballages éco-conçus?	Mettre en évidence la conceptualisation de l’emballage éco-conçu (LCA vs Consommateur)	<ul style="list-style-type: none"> • Tableau 4.2. List of attributes, consequences, and values associated with eco-design packaging. • Tableau 4.3. Industry view versus consumer view of eco-design packaging
		Explorer les perceptions des consommateurs envers l'emballage éco-conçu (bénéfices et risques)	<ul style="list-style-type: none"> • Tableau 4.3. Aggregated hierarchical map of risk-oriented consumption patterns.
Article 3	Quels sont mécanismes sous-jacents par lesquels les perceptions des consommateurs envers les emballages éco-conçus influencent leurs intentions de réduire le gaspillage alimentaire ?	Établir un cadre théorique (modèle hybride)	<ul style="list-style-type: none"> • Tableau 5.1. Determinants of food waste • Figure 5.2. Variance model • Figure 5.3. Processus model
Article 4	Quelle est la relation de cause à effet entre les perceptions des consommateurs envers les emballages éco-conçus et leurs intentions de réduire le gaspillage alimentaire ?	Confirmer les effets des perceptions des consommateurs envers l’emballage éco-conçu à travers la performance perçue envers les fonctions physiques et sociales	<ul style="list-style-type: none"> • Figure 6.1. Conceptual framework

7.2 Implications managériales

Outre les contributions théoriques, cette thèse fournit des implications managériales et/ou pratiques pour diverses parties prenantes : organisations environnementales ou de la CR, fabricants de l'emballage, marketeurs et détaillants, politiques publiques (voir Tableau 7.2)

Tableau 7.3 Implications managériales

Partie prenante	Mission	Recommandation
Organismes environnementaux ou de la consommation responsable		
International Food Waste Coalition (http://internationalfoodwastecoalition.org)	Association à but non lucratif, constellation d'organisations alimentaires unissant leurs forces pour réduire le gaspillage alimentaire tout au long de la chaîne de valeur des services alimentaires dans le monde.	Ajouter le rôle de l'emballage éco-conçu comme outil permettant de mieux conserver les aliments dans l'onglet du site « Do good: Save Food »
International Consumer Research & Testing (IFWC) (http://internationalfoodwastecoalition.org)	Leader mondiale de l'organisation visant à fournir des informations de haute qualité et indépendantes aux consommateurs du monde entier.	Voir les recommandations pour <i>Protégez-vous</i>
WRAP (https://wrap.org.uk/category/sector/waste-management)	WRAP travaille avec les gouvernements, les entreprises et les communautés pour fournir des solutions pratiques pour améliorer l'efficacité des ressources.	<ul style="list-style-type: none"> • Vulgariser les emballages éco-conçus; • Transférer les bonnes pratiques de la réduction du gaspillage alimentaire en utilisant les emballages éco-conçus.

Partie prenante	Mission	Recommandation
Protégez-vous (https://www.protegez-vous.ca)	Protégez-Vous est un organisme sans but lucratif qui œuvre au moyen d'un site web, d'applications, de guides pratiques, d'un magazine et d'initiatives.	<ul style="list-style-type: none"> • Transformer les informations sur les bénéfices d'utilisation des emballages éco-conçus dans la pratique de réduction du gaspillage alimentaire; • Montrer aux consommateurs comment choisir des types d'emballages éco-conçus pertinents pour améliorer les fonctions avec les illustrations précises; • Intégrer un outil de « comparateur » des différents types d'emballage en fonction de différentes fonctions recherchées.
Ethiquette (https://lespagesvertes.ca/entre-prise/ethiquette-ca/)	Un des principaux organismes environnementaux du Québec centrés sur l'investissement responsable.	Intégrer l'investissement des emballages éco-conçus dans l'onglet « actions écoresponsables ». Ce dernier permet de faire de l'éducation publique sur une nouvelle forme d'investissement responsable concernant des emballages éco-conçus.
Équiterre (https://www.equiterre.org)	<ul style="list-style-type: none"> • Un des principaux organismes environnementaux du Québec; • Mission: proposer des solutions concrètes pour accélérer la transition vers une société où les citoyens, les organisations et les gouvernements font des choix écologiques qui sont également sains et équitables. 	<ul style="list-style-type: none"> • Proposer les solutions de l'emballage éco-conçu diversifié destiné aux citoyens et aux organismes. <ul style="list-style-type: none"> ○ Pour les citoyens: par ex. : bonnes pratiques d'éviter le gaspillage alimentaire en utilisant les fonctions de l'emballage (conservation, préservation, communication) ○ Pour les organismes : par ex. : améliorer la visibilité de meilleure performance des fonctions de conservation de l'emballage • Créer un onglet sur le site Internet afin de regrouper les documents gouvernementaux sur l'utilisation de l'emballage éco-conçu pour réduire le gaspillage alimentaire. Le but est de s'adonner à l'éducation publique et accélérer la transition vers une société où les parties prenantes (citoyens, organisations environnementales ou de la CR, fabricants d'emballage, marketeurs et détaillants, politiques publiques) privilégient les emballages éco-conçus. • Diffuser les bonnes pratiques sur les réseaux sociaux

Partie prenante	Mission	Recommandation
<p>Éco entreprise du Québec (ÉEQ) (https://www.eeq.ca/a-propos-de-eeq/)</p>	<ul style="list-style-type: none"> • ÉEQ est un organisme à but non lucratif privé représentant les entreprises qui mettent sur le marché québécois des contenants, des emballages et des imprimés dans leur responsabilité de financer les coûts des services municipaux de collecte sélective efficace et performante. • Optimiser la chaîne de valeur de la collecte sélective et mettre en place des approches innovantes, dans une perspective de développement durable et d'économie circulaire. 	<ul style="list-style-type: none"> • La sensibilisation auprès des consommateurs : fournir des astuces pour reconnaître et privilégier des emballages éco-conçus, particulièrement dans le secteur alimentaire. • L'accompagnement auprès des entreprises dans le secteur d'emballage : Intégrer des questions rapport à la prise en compte des facteurs internes des consommateurs dans le « Test d'autodiagnostic » au portail OptimEco.ca.
<p>Recyc-Québec (https://www.recyc-quebec.gouv.qc.ca/a-propos/qui-sommes-nous/mission-vision-mandat-valeurs)</p>	<ul style="list-style-type: none"> • Mission : Amener le Québec à réduire, réutiliser, recycler et valoriser les matières résiduelles dans une perspective d'économie circulaire et de lutte contre 	<p>Valoriser non seulement les effets directs de l'emballage éco-conçu (ex. : réduction, réemploi, recyclage), mais aussi ses effets indirects (qui sont liés aux services proposés pour l'emballage et/ou les utilisateurs comme : le gaspillage alimentaire).</p>

Partie prenante	Mission	Recommandation
	<p>les changements climatiques.</p> <ul style="list-style-type: none"> • Vision : devenir un partenaire déterminant d'un Québec sans gaspillage 	
Fabricants de l'emballage		
LAKLÉ (https://lakle.com/index.php/fr/)	Fabricant de l'emballage mettant l'accent sur le design, la R&D de l'emballage	Améliorer l'aspect esthétique pour mieux promouvoir l'emballage écoconçu.
RODA (https://www.rodapack.com/fr/a-propos)	Fabricant d'emballage qui vise à répondre aux besoins de la marque en proposant une vaste offre d'emballages innovateurs et performants.	<ul style="list-style-type: none"> • Intégrer les facteurs internes du consommateur (perception, motivation, expérience) • Tenir compte du concept de l'écoconception dans l'innovation de l'emballage afin de montrer l'emballage éco-conçu autant efficace et écologique
Carrousel (emballage alimentaire) (https://www.carrousel.ca/fr/produits-ecoresponsables.html)	Fabricant de l'emballage écologique mettant en priorité le bien-être des personnes.	<ul style="list-style-type: none"> • Tenir compte du bien-être et de la santé publique dans le design de l'emballage • Ajouter une sous-section intitulée « l'emballage éco-conçu » dans l'onglet « produit écoresponsable » puisque le couple produit-emballage est souvent évalué ensemble par les consommateurs (il existe une interaction entre le produit et son emballage) » • Ajouter sous-section intitulée « Guide des bonnes pratiques associées à l'emballage »
Marketeurs et détaillants		

Partie prenante	Mission	Recommandation
<p>Conseil québécois du commerce de détail (CQCD)</p> <p>(https://cqcd.org/nous-joindre/)</p>	<p>Leader du secteur du commerce de détail au Québec ayant pour mission de représenter, promouvoir et valoriser ce secteur et de développer des moyens pour favoriser l'avancement de ses membres.</p>	<ul style="list-style-type: none"> • Onglet « Événements »: lancer des événements sur la promotion des emballages éco-conçus. • Créer « Le guide des normes de stratégie de communication pour les emballages éco-conçus »
Politique publique		
<p>Ministère de l'Environnement et du Changement climatique du gouvernement fédéral canadien</p> <p>(https://www.canada.ca/fr/environnement-changement-climatique.html)</p>	<p>S'engager à protéger l'environnement, à conserver le patrimoine naturel du pays et à fournir des renseignements météorologiques pour tenir les Canadiens informés et en sécurité.</p>	<ul style="list-style-type: none"> • Sensibiliser les citoyens aux impacts du gaspillage alimentaire dans l'étape de consommation sur l'environnement et le rôle positif de l'emballage éco-conçu dans la gestion des déchets alimentaires; • Intégrer l'emballage éco-conçu dans le cadre de l'économie circulaire canadienne afin d'obtenir une vision globale sur le rôle de l'emballage éco-conçu dans le design du produit, la consommation, la gestion des déchets (<i>waste management</i>), l'innovation, etc.
<p>Ministère de l'Agriculture, des Pêcheries et de l'Alimentation (MAPAQ)</p> <p>(https://www.mapaq.gouv.qc.ca/fr/Pages/Accueil.aspx)</p>	<p>MAPAQ exerce une surveillance de toute la chaîne alimentaire aux fins de la protection de la santé publique de même que de l'amélioration de la santé et du bien-être des animaux.</p>	<ul style="list-style-type: none"> • Intégrer les bonnes pratiques de réduction du gaspillage alimentaire par l'emballage éco-conçu dans l'onglet « Consommation des aliments » • Regrouper les règlements associés à l'écoconception des emballages alimentaires (ex. : ISO 14006, ISO14064) dans l'onglet « Loi et règlement » • Proposer les bonnes pratiques des emballages éco-conçus pour mieux conserver les aliments et protéger la santé publique.

Partie prenante	Mission	Recommandation
Bureau d'audiences publiques sur l'environnement (BAPE) (https://www.bape.gouv.qc.ca/fr/)	BAPE informe et consulte les citoyens, enquête, puis avise le ministre responsable de l'Environnement sur les dossiers qu'il lui confie, afin d'éclairer la prise de décision gouvernementale.	<ul style="list-style-type: none"> • Informer : organiser les séances publiques et divers modes de diffusion par rapport à l'utilisation des emballages éco-conçus afin de réduire le gaspillage alimentaire. • Consulter : tenir des séances publiques afin de cerner les enjeux et les préoccupations des citoyens envers la relation entre l'emballage et le gaspillage alimentaire. • Aviser : proposer des rapports sur « l'emballage éco-conçu comme un outil de réduction du gaspillage alimentaire » afin d'éclairer la prise de décision gouvernementale du ministre responsable de l'Environnement.

Note: ce tableau illustre certaines des principales parties prenantes internationales et québécoises associées à l'emballage écoconçu. Il ne s'agit pas d'une liste exhaustive.

7.2.1 Implications et recommandations pour les organisations environnementales et de consommation responsable

Deux recommandations pour les organisations environnementales internationales (ex. : *International Food Waste Coalition* : *IFWC*, *International consumer research & testing* : *ICRT*, *WRAP*) et nationales (ex. : *Équiterre*) ainsi que les organisations liées à la promotion des pratiques de la CR (ex. : *Protégez-vous*, *Ethiquette*)

- (1) Vulgariser les emballages éco-conçus : les résultats de la thèse montrent les connaissances limitées des consommateurs envers l'emballage éco-conçu et ses impacts potentiels sur la réduction du gaspillage alimentaire du consommateur. De ce fait, il est nécessaire de vulgariser la notion d'emballage éco-conçu en ayant recours à plusieurs outils de communication: par exemple établir un index avec les illustrations sur les termes techniques (ex. : analyse de cycle de vie), créer un forum de discussion, créer des capsules de vidéo par rapport au processus de l'écoconception de l'emballage et les différents types de l'emballage écoconçu.
- (2) Transférer les bonnes pratiques de la réduction du gaspillage alimentaire en utilisant les emballages éco-conçus : il semble important de transférer les connaissances sur la manière de choisir un type d'emballage éco-conçu spécifique (emballage avec la taille réduite, emballage refermable) et le rôle de l'emballage éco-conçu dans les pratiques de consommation responsable en général (ex. : recyclage, consommation d'aliments produits de manière durable).
Plus précisément :

Pour *Protégez-vous* : on suggère d'intégrer « les bonnes pratiques des emballages éco-conçus pour réduire le gaspillage alimentaire du ménage » dans la sous-catégorie de l'onglet « Tests et articles » — Santé alimentaire. Le but est de : (1) transformer les informations sur les bénéfices d'utilisation des emballages éco-conçus dans la pratique

de réduction du gaspillage alimentaire; et (2) montrer aux consommateurs comment choisir des types d'emballages éco-conçus pertinents (ex. : un emballage refermable) pour améliorer les fonctions (ex. : conservation, protection des aliments) avec les illustrations précises (ex. : photos de différents types des emballages, capsules vidéo). De plus, on suggère d'intégrer un outil de « comparateur » des différents types d'emballage en fonction des différentes fonctions recherchées (ex. : conservation, convivialité, communication) dans l'onglet — Outils et services. Ce « comparateur des types d'emballages éco-conçus » peut être utilisé comme outil de décision afin de choisir les différents types d'emballages éco-conçus en fonction des besoins.

Pour *Éthiquette* : afin de répondre aux missions de « *faire éduquer publique, de faciliter la consommation écoresponsable, et outiller la population pour une transition écologique* » à travers l'investissement responsable (source : <https://lespagesvertes.ca/entreprise/ethiquette-ca/>), on suggère à *Éthiquette* d'intégrer l'investissement des emballages éco-conçus dans l'onglet « actions écoresponsables ». Ce dernier permet de s'adonner à l'éducation publique en adoptant une nouvelle forme d'investissement responsable concernant des emballages éco-conçus, incluant par exemple, des fonds qui soutiennent l'écoconception des emballages pour réduire le gaspillage alimentaire.

Pour *Équiterre* : En tant qu'un des principaux organismes environnementaux du Québec, *Équiterre* pourrait proposer les solutions de l'emballage éco-conçu face aux problématiques de gaspillage alimentaire diversifié destinées aux citoyens (intégré dans l'onglet « solutions citoyens ») et aux organismes (intégré dans l'onglet « solutions organisation ») (ex. : améliorer la visibilité de meilleure performance des fonctions de conservation de l'emballage).

Pour *Éco entreprise du Québec (ÉEQ)* :

- La sensibilisation auprès des consommateurs : ÉEQ pourrait jouer un rôle de sensibilisation auprès des consommateurs afin qu'ils adoptent les bons gestes pour réduire le gaspillage alimentaire à travers les emballages éco-conçus. Les résultats de la thèse montrent que le secteur alimentaire est l'un des secteurs pionniers de l'emballage éco-conçu et de l'emballage innovant. De ce fait, ÉEQ pourrait fournir des astuces (ex. : choisir meilleure fonction de préservation des aliments, choisir l'emballage avec une guidance de conservation des aliments claire pour des raisons de santé) pour reconnaître et privilégier des emballages éco-conçus, particulièrement dans le secteur alimentaire.
- L'accompagnement auprès des entreprises dans le secteur d'emballage : Pour concevoir des emballages éco-conçus mieux perçus auprès des citoyens, on suggère à ÉEQ d'intégrer des questions liées à la prise en compte des facteurs internes des consommateurs (ex. : « *Nous avons pris en compte des besoins, des perceptions des consommateurs envers l'emballage* » dans le « Test d'autodiagnostic » au portail OptimEco.ca. Ce dernier permet de compléter les indices techniques basés sur les indices de l'analyse de cycle de vie.

Pour Recycle-Québec : Il est important de mettre l'accent non seulement sur les effets directs de l'emballage éco-conçus (ex. : réduction, réemploi, recyclage), mais aussi sur ses effets indirects (liés aux services proposés pour l'emballage et/ou les utilisateurs comme le gaspillage alimentaire).

7.2.2 Implications et recommandations pour les fabricants de l'emballage

Pour les fabricants d'emballages (ex. : LAKLÉ, RODA, Carrousel), les résultats de la thèse montrent l'impact potentiel de l'emballage éco-conçu sur la limitation du gaspillage sur le plan de la consommation.

D'ailleurs, En 18 août 2021, la ville de Montréal annonce « *la fin du plastique à usage unique sur son territoire à partir du 1^{er} mars 2023 et les sacs de plastique dès le 1^{er} septembre 2022* » (Girard-Bossé, 2021). Il est donc intéressant de poursuivre l'investissement dans l'écoconception ou autres innovations de l'emballage. Cependant, il s'avère important d'intégrer les déterminants internes du consommateur (ex. : perception, besoin, connaissance) dans le processus de conceptualisation et d'innovation de l'emballage éco-conçu (Wikström, F. *et al.*, 2019). En effet, les résultats de la thèse confirment l'existence d'un écart entre les perceptions des consommateurs à l'égard de l'emballage éco-conçu et la définition industrielle. Il est donc nécessaire d'améliorer la visibilité des caractéristiques écoresponsables de ce type d'emballage, notamment les attributs visuels (ex. : refermabilité, matériaux écoresponsables, taille réduite, ratio emballage/produit optimisé) pour prolonger la durée de consommation et les attributs verbaux (ex. : identification par la fréquence radio, indicateurs de date-température, indicateurs de la qualité du produit en ce qui concerne la fraîcheur et la nutrition) (Poyatos-Racionero *et al.*, 2018).

7.2.3 Implications et recommandations pour marketeur et détaillants

En tant que leader et porte-parole du secteur du commerce de détail au Québec, le Conseil québécois du commerce de détail (CQCD) pourrait valoriser la solution innovatrice-écoconception de l'emballage afin d'améliorer l'écosystème du commerce de détail au Québec. Or, il est aussi important d'aviser les détaillants que l'emballage éco-conçu n'est pas nécessairement perçu positivement par les consommateurs. De ce fait, on suggère au CQCD de créer « Le guide des normes de stratégie de communication pour les emballages éco-conçus » qui établira un équilibre entre la fonctionnalité et la durabilité dans l'onglet « Blogue ».

7.2.4 Implications et recommandations pour les politiques publiques

7.2.4.1 Éviter le scepticisme

L'étude sur les réactions des consommateurs envers les emballages éco-conçus montre que les perceptions des consommateurs à l'égard ce type d'emballage oscillent entre préoccupation et scepticisme. Ces derniers sont caractérisés par cinq risques associés à la consommation d'un produit éco-emballé, soit : les risques fonctionnels, physiques, financiers, liés au style de vie et socio-environnementaux (notamment gaspillage alimentaire). Ces résultats démontrent l'absence de connaissances par rapport à l'écoconception, la technique de l'analyse du cycle de vie, ainsi que le rôle dans les pratiques de consommation responsable. De ce fait, il est nécessaire de :

- Développer et raffiner le système de labélisation pour aider les consommateurs à identifier le type d'emballage en fonction des différentes catégories de produits.
- De plus, dans les campagnes de promotion de l'utilisation des emballages éco-conçus ou des emballages écologiques en tant qu'outil des pratiques de consommation responsable, il faut éviter d'exagérer les fonctions sociales (ex. : recyclage, réduction du gaspillage alimentaire) en négligeant les fonctions instrumentales de l'emballage (ex. : conservation, protection). Ces campagnes de promotion des emballages éco-conçus doivent particulièrement établir un équilibre entre la fonctionnalité et la durabilité de ce type d'emballage.

7.2.4.2 Soutenir l'écoconception et l'innovation de l'emballage

Le deuxième article montre que la majorité des consommateurs québécois (89 %) perçoivent que le prix du produit éco-emballé est plus élevé que celui du produit

conventionnel. Les consommateurs tendent à établir une relation entre le prix et la performance instrumentale de l'emballage. Dans le cas général, il existe une corrélation positive entre le prix et la performance du produit (Kassarjian, 1971). Or, les résultats démontrent que le prix élevé et la performance des emballages éco-conçus ne sont pas nécessairement corrélés de manière positive. De ce fait, on suggère au gouvernement (ex. : *Ministère de l'Économie et de l'Innovation du Québec*) de soutenir des projets d'éco-conception ou autre innovation de l'emballage afin de réduire le coût de ce type de l'emballage et d'augmenter sa compétitivité.

7.2.4.3 Intégrer l'emballage éco-conçu dans le cadre de l'économie circulaire

Les résultats de la thèse montrent que l'emballage éco-conçu pourrait avoir des impacts importants sur la société et l'environnement. C'est la raison pour laquelle l'innovation d'emballage est intégrée dans plusieurs politiques et législations nationales et internationales telles que : *Projet de Loi C-429 de la Chambre des communes du Canada*, *EU Packaging and Packaging Waste Directive*, *National Packaging and Waste Legislation*. L'amélioration de la performance environnementale de l'emballage est notamment intégrée à l'objectif primordial dans *EU Packaging and Packaging Waste Directive* — la législation principale concentrée sur l'emballage et le gaspillage dans l'Union européenne. Ainsi, l'écoconception de l'emballage et du produit est intégrée dans le plan d'action de l'économie au sein de l'Union européenne puisqu'elle est considérée comme un des composants essentiels du modèle de l'économie circulaire (Talens Peiró *et al.*, 2020). De ce fait, on recommande au Ministère de l'Environnement et du Changement climatique du gouvernement fédéral canadien de l'intégrer dans le cadre de l'économie circulaire canadienne afin d'obtenir une vision globale sur le rôle de l'emballage éco-conçu dans le design du produit, la consommation, la gestion du gaspillage (*waste management*), l'innovation, etc. (European Commission, 2020; Milios, 2016).

7.3 Limites et pistes de recherches futures

Bien que la thèse apporte une meilleure compréhension au sujet des réactions des consommateurs envers l’emballage écoconçu et des impacts sur une des pratiques liées à la CR — la limitation du gaspillage alimentaire et les applications pratiques pour amener un changement positif de la société, elle comporte quelques limites sur le plan de la conceptualisation et de la pratique, qui ne sont pas complètement explorées. Une discussion plus précise est effectuée dans la section suivante sur les limites de la thèse et les pistes de recherches futures.

- (1) Examiner les autres pratiques de la CR: bien que la thèse amène une compréhension approfondie sur les réactions positives et négatives des consommateurs envers le type d’emballage écoconçu en combinant la posture épistémologique de recherche (positivisme, interprétativisme, et TCR) et les perspectives multidisciplinaires (ingénierie, marketing, psychologique, sociologie), et explore notamment ses impacts sur un type de pratique de la consommation responsable – la limitation du gaspillage alimentaire, ses effets sur les autres pratiques de la CR ne sont pas explorés dans leur entièreté, par exemple la consommation des aliments produits de manière durable (associée aux thématiques de la santé du TCR).
- (2) Mettre l’accent sur l’autre forme de la CR — le non-achat ou la résistance des consommateurs : L’article 2 explore les réactions négatives des consommateurs envers l’emballage écoconçu. Ces résultats confirment que l’initiative d’écoconception de l’emballage n’est pas nécessairement visible du point de vue du consommateur (Boesen *et al.*, 2019). Ces réactions négatives pourraient aussi expliquer la croissance de la forme négative de la CR – le non-achat et la résistance, notamment : l’achat de produits en vrac, le refus de disposer d’un emballage non recyclable, le refus de prendre des sacs lors d’un achat en

magasin) (OCR, 2019). Les futures études pourraient effectuer une réflexion approfondie sur la résistance des consommateurs, par exemple, les comportements de boycottage des consommateurs envers les produits suremballés ou avec un emballage non recyclable.

- (3) Explorer les effets des interactions entre les risques et bénéfices perçus dans l'article 2 : Il serait pertinent d'examiner les effets des interactions entre les risques et bénéfices perçus envers les emballages écoconçus par le MEC afin d'obtenir une compréhension approfondie des réactions des consommateurs, c'est-à-dire comment les consommateurs pourraient balancer les risques et bénéfices perçus associés aux emballages écoconçus dans leur prise de décision. Ainsi, les résultats obtenus dans l'article 2 se basent sur le produit alimentaire dans le contexte canadien. Pour obtenir le MEC généralisable, il convient d'effectuer des études à travers différentes catégories du produit (ex. : médicaments, produits d'hygiène) et autres contextes.
- (4) Tester d'autres hypothèses du modèle hybride et répliquer les études en effectuant des expérimentations sur d'autres catégories de produit : L'article 3 de la thèse propose un modèle hybride parallèle permettant d'éclairer les mécanismes sous-jacents aux effets des perceptions du consommateur envers leur intention de limiter le gaspillage alimentaire. Le modèle de la variance vise à mettre en évidence la nature du système des déterminants interreliés qui représente les relations entre les perceptions des consommateurs envers l'emballage écoconçu sur leurs intentions de limiter le gaspillage alimentaire. Finalement, le modèle de processus décrit la nature du processus continu des consommateurs. Autrement dit, les consommateurs perçoivent-ils de manière différente (cognitive ou affective) l'emballage écoconçu ? L'article 4 de la thèse teste empiriquement les hypothèses primordiales du modèle de la variance comme les médiateurs de la performance perçue des fonctions de l'emballage

et le modérateur de la conscience sanitaire. Les futures études pourraient continuer à tester d'autres hypothèses du modèle de variance, notamment l'effet de la préoccupation environnementale.

(5) Étudier le processus continu du gaspillage alimentaire du consommateur passe par l'étude qualitative. En fait, l'étude qualitative présente trois avantages pour examiner les comportements du gaspillage alimentaire : en premier lieu, elle permet de se concentrer sur des événements ordinaires (ex. : percevoir l'emballage éco-conçu → comprendre les fonctions de l'emballage → inférer la qualité/quantité du produit → jeter/garder la nourriture) afin de pouvoir vraiment saisir ce qui se passe dans la vraie vie (Miles *et al.*, 2014); en deuxième lieu, les études qualitatives permettent de décrypter « la complexité » du phénomène du gaspillage alimentaire grâce à « la richesse » et « le caractère englobant » des données qualitatives. Enfin, les données qualitatives sont souvent collectées sur une longue période et caractérisées par une « forte puissance explicative » des processus de l'impact de l'emballage éco-conçu sur le gaspillage alimentaire (Miles *et al.*, 2014). De ce fait, il est possible de dépasser les formules du « quoi » et du « combien » (répondues plutôt dans le modèle de variance par les études quantitatives) pour examiner « comment » et « pourquoi » les perceptions du consommateur envers l'emballage éco-conçu influencent leur décision du gaspillage alimentaire. De ce fait, les futurs travaux pourraient tester le modèle de processus à travers les méthodes qualitatives comme les entrevues en profondeur, l'observation, le journal ou l'analyse des composantes des déchets (*waste composition analysis*) pour examiner le processus continu des effets de l'emballage écoconçu sur les comportements effectifs du gaspillage alimentaire.

(6) Reproduire les études expérimentales dans l'article 4 : L'article 4 s'intéresse à deux études expérimentales exploratoires afin de vérifier les liens de cause à

effet dans les perceptions des consommateurs envers l'emballage écoconçu sur leurs intentions de la réduction du gaspillage alimentaire. Cependant, certaines limites des études expérimentales devraient être soulignées, ce qui pourrait mener à de nouvelles pistes de recherche futures.

D'abord, même qu'il n'existe pas de différence significative entre les résultats basés sur l'échantillon de MTurk et ceux basés sur l'échantillon traditionnel MTurk, la recherche comporte certaines limites. En fait, les participants MTurk accordent généralement moins d'attention aux stimuli, qui pourraient réduire le pouvoir du test statistique. Ils tendent à chercher les réponses en ligne au lieu de donner leurs propres réponses (ex. : certains répondants cherchent les impacts potentiels de l'emballage écoresponsable sur l'actualité au lieu de donner leurs propres perceptions). Ces derniers pourraient réduire la validité externe de la recherche (Goodman *et al.*, 2013). En ce sens, il conviendrait d'effectuer les études en les reproduisant, dans un premier temps dans un contexte physique comme : un magasin laboratoire in situ; ensuite, dans un deuxième temps, sur d'autres catégories de produits (ex. : légumes, fruits, pain). En outre, les études étant basées sur le contexte canadien, les résultats pourraient varier selon les différents contextes sociaux et culturels. Il serait donc pertinent d'avoir recours à des études internationales afin d'obtenir des résultats généralisables à l'échelle internationale.

Une autre limite renvoie au problème de la fiabilité des données déclaratives collectées afin de mesurer les perceptions des consommateurs de la réduction du gaspillage alimentaire. Il est donc nécessaire d'examiner les impacts des perceptions des consommateurs envers les emballages écoconçus sur les comportements effectifs de la réduction du gaspillage.

Par ailleurs, la littérature en ingénierie a montré que le gaspillage alimentaire des consommateurs pourrait être réduit à travers l'amélioration des autres

attributs visuels (ex. : l'emballage contient la bonne quantité selon le besoin du consommateur, il est facile à vider ou à doser) et verbaux (ex. : informations sur la sécurité du produit alimentaire, nutrition, date d'utilisation/d'expiration, écolabel) de l'emballage (Wikström *et al.*, 2019; Wohner *et al.*, 2019).

- (7) Enfin, les futures études pourraient continuer à tester d'autres hypothèses du modèle de variance dans l'article 3, notamment les effets de la préoccupation environnementale. En fait, plusieurs études ont montré que les consommateurs avec un haut niveau de préoccupation environnementale (ex. : consommateurs responsables) réagissent différemment en lisant les informations écoresponsables que ceux avec un niveau de préoccupation plus bas (van Birgelen *et al.*, 2008). Les consommateurs avec un haut niveau de préoccupation environnementale sont plus sensibles envers les innovations écoresponsables (ex. : écoconception de l'emballage) afin de réduire les empreintes environnementales (ex. : recyclage, réduction du gaspillage alimentaire), et cette sensibilité se manifeste dans leurs comportements (ex. : achat d'un produit éco-emballé) (Matthes *et al.*, 2014). De même, il conviendrait d'intégrer d'autres déterminants des comportements du gaspillage alimentaire liés à l'emballage et/ou produit tels que : la qualité perçue du produit et la quantité d'achats du produit.

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