

Consumer support for sustainable food packaging: a novel approach for research-to-commercialization

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1. Introduction

With little over seven years until the 2030 targeted timeframe for implementing the seventeen Sustainable Development Goals ("SDGs"), the urgency to develop real solutions to the SDGs is growing. Thus the need to combine these academic and commercial efforts to focus more on research-to-commercialization projects is required.

As a serial entrepreneur and sustainability researcher, I have undertaken a research project toward my master's in sustainability management at the University of Waterloo ("UW") that I plan to implement after graduation. This path has resulted in a novel approach to the research using a custom developed mobile application ("app") for data collection in this research project. The research version of the mobile app also serves as a prototype for future commercialization to provide evidence of consumer support for a shift by the food industry towards more sustainably packaged food in Canadian supermarkets, thus addressing SDG12 Responsible Consumption and Production.

First, I will provide my own research-to-commercialization project as case study by 1) providing an overview of my research into consumer support for sustainable food packaging, and 2) outlining my plans to commercialize this research by using consumer support for sustainable food packaging to shift Canada's food industry. Then, I will discuss three research-to-commercialization themes by: 1) examining my reasons for adopting a novel methodological approach for this research-to-commercialization project, 2) discussing the role academic research and commercial projects play in addressing real-life sustainability issues, and 3) the challenges of conducting novel research in a traditional academic environment with recommendations creating a stronger environment for research-to-commercialization projects.

2. Research: Establishing the Gap Between Consumer Intention and Behaviour

Background: Canada generates 3.3 million metric tonnes of plastic waste generated in Canada each year (Young 2019) of which sixteen percent is single-use plastic (SUP) food packaging (Schweitzer et al. 2018). Unfortunately, despite our good intentions to recycle plastic, approximately nine percent of plastic waste in Canada is recycled (Young 2019), with the remainder ending up in landfills or polluting land and waterways. The CoVID-19 pandemic has further increased our use of plastic food packaging due to health concerns (Kitz et al. 2020; Scaraboto, Joubert, and Gonzalez-Arcos 2020), and

plastic waste is projected to increase by thirty percent over the next decade (Elmslie and Wallis 2020).

There is significant support for reducing and even eliminating plastic waste in Canada. Nearly three-quarters (73.4%) of Canadian consumers support banning single-use plastic food packaging in favour of more sustainable food packaging options, according to a consumer survey by Dalhousie University (Walker et al. 2021). Twenty percent of Canadians are green consumers (White, Hardisty, and Habib 2019) who actively seek out and purchase sustainable products and services, including food products. However, there are barriers to consumers purchasing food products without plastic packaging in Canadian supermarkets, including the lack of availability of plastic-free food products and the higher price point that often accompanies sustainable packaging.

Theoretical Framework: Research into consumer behaviour shows a gap between consumer intention and their purchasing decisions relating to sustainable food products (Ketelsen, Janssen, and Hamm 2020; Scott and Vigar-Ellis 2014; Walker et al. 2021). Labelled the “attitude- behavior gap” by Ajzen (1991), the Theory of Planned Behavior (“TPB”) explains the connection between consumer intention and actual behaviour. Many consumer studies into sustainable food packaging have also used the TPB as their theoretical basis (Arvola et al. 2008; Chao 2012; Hansen, Jensen, and Solgaard 2004; Nguyen et al. 2020; Testa, Iovino, and Iraldo 2020; Yadav and Pathak 2016).

Research Question and Objectives: My research focuses on determining the factors at the point-of-purchase leading to the gap between Canadian consumers' intention to purchase food products with plastic-free packaging and their purchasing decisions when food shopping. This quantitative research will: 1) quantify the gap between Canadian consumers' intention to purchase food products without single-use plastic packaging (“intention”) and their actual purchasing decisions (“behaviour”), and 2) identify the factors that influence Canadian consumers' purchasing decisions at the point-of-purchase (POP) leading to the gap between intention and behaviour when purchasing food products without plastic packaging.

Methodology: A novel approach to data collection has been adopted for this research project using a custom-developed Android mobile app to collect data from 100 consumers in Ontario, Canada, to capture their purchasing decisions as they are making them in a real-life environment, in other words, while shopping for food in supermarkets. Data collection was completed in September 2022 with 106 of 225 participants completing the study – a completion rate of 47.1%.

Participants were asked to provide information on their purchasing decisions for up to fifteen food products of their choice (excluding fruits, vegetables, and alcohol) and answer questions on their attitudes to single-use plastic packaging for food products. Demographic information was also collected for data analysis purposes. A third-party participant recruitment company was engaged in recruiting eligible participants to the study, thus ensuring a representative sample, and maintaining distance between the researcher and participants and administering the appreciation to participants after the data collection was completed. The workflow of the data collection process using the mobile app is documented in Figure 1.

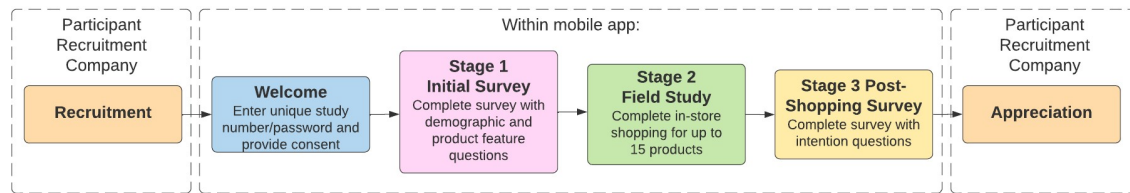


Figure 1: Mobile App Workflow Through the Data Collection Process

Findings: Initial results show: 1) there is a discernable grouping between green consumers (22%) and other consumers (78%), and 2) that price tops the primary factors for decision-making when buying food, likely due to recent food inflation. The second finding has significant implications for the transition to sustainable packaging which often comes with a higher price tag. Further analysis will be conducted to 1) compare the gap between consumers' intention to purchase sustainably packaged food products and their actual behaviour between green consumers and other consumers, and 2) examine the decision-making factors between the two groups.

Limitations and Future Research: The primary limitation of the research is the relatively small sample size of 106 participants completing the study, constrained mainly by the time and budget allocated to this research project. However, due to the adoption of a mobile app for data collection, the potential for replicability of this research study is high. The research could be repeated with a larger sample size across all Canadian provinces and territories. The research could also be targeted toward a narrower population group, such as green consumers or Zoomers (or Gen Z). Further research could be conducted for different consumer goods product types, like cleaning products, toiletries, and cosmetics. Additionally, the same methodology could be replicated at a different point in time for comparative purposes, for example, to account for seasonality or food price fluctuations.

3. Commercialization: Using Consumer Support for Sustainable Food Packaging to Shift Canada's Food Industry

My personal and professional journey has led me to ideate on solutions to the lack of food in plastic-free packaging. Understanding the gap between consumers' intention and behaviour led to my master's research in this area at UW and the vision for implementing this research as a business. As a serial entrepreneur, having previously run a web systems development company in Toronto and a food production company in Taipei, I am uniquely positioned to intersect my current role in academic research with a background in entrepreneurship and experience in policy development. This led me to embark on this research project that I plan to implement through my third venture [NoSUP Canada](#). Founded in October 2021, NoSUP Canada plans to gather real data from food shoppers seeking and often failing to buy plastic-free food products in supermarkets to support a shift in the Canadian food industry.

The mobile app developed during the academic research project serves as the prototype for later publicly available versions of the app. The research results will be used as the proof of concept for the business idea. Although NoSUP Canada has been registered as

a for-profit corporation, its mission is environmental protection through eliminating plastic packaging waste over financial gain.

4. Adopting a novel methodological approach for research-to-commercialization

I have frequently been asked why I developed a custom mobile app for data collection when other established methods, such as an online Qualtrics survey, could also be used. There are three primary reasons for this novel approach: 1) A knowledge gap has been established through a review of prior academic research in the lack of consumer research conducted in a real-life environment (Fernqvist, Olsson, and Spendrup 2015; Seo et al. 2016), such as shopping in the supermarket. 2) Consumer behaviour tends to capture consumers' intention rather than their actual behaviours, leading to a limited understanding of any differences between intention and actual behaviour. 3) Most consumers are familiar with using a mobile app to conduct day-to-day activities, including creating online shopping lists and tracking eating habits.

A mobile app was chosen as the data collection tool to increase consumer confidence and comfort in the data collection tool leading to better data. In considering the advantages of using mobile apps for self-administered data collection over other survey methods, including paper-based ones, Marcano Belisario et al. (2014) suggest increased speed, scalability and lower cost of implementation, as well as the reduction of recall bias as advantages of an app-based approach. However, they determined no discernible benefit in data accuracy or response rates compared with other survey methods.

The decision to adopt a novel approach to data collection for this research project sought to address the methodological gaps in current research by 1) utilizing an interactive tool to gather information on purchasing decisions at the time they were made, rather than the static survey approach, and 2) conducting the research in the real-life environment of the supermarket, instead of a simulated research environment such as consumer panels. With a 47.1% completion rate for my research study, this methodological approach has been justified.

5. Exploring the role of academic research and commercial projects in addressing real-life sustainability issues

Academia plays a significant role in providing the research on which sustainable development issues can be identified and examined; however, governments and businesses often provide the practical implementation of solutions to these issues. In examining the roles of academia and business in addressing sustainability, Breitbarth and Herold (2018) highlight the success of academic research in identifying and qualifying sustainability-related issues; however, this knowledge generation often fails to translate into real solutions to the issues. A stronger link between theoretical research and real-life practice could result in more progress in meeting the SDGs in a timely manner.

The emergence of university programs connecting business and sustainability (Lewington 2022), such as my own [sustainability management master's program](#) at UW. In a review of the efforts toward promoting work on the SDGs in the tertiary academic context, Sevilla, Ramaswamy, and Zachs (2020) extensively examined the activities of a

limited subset of eleven Canadian universities. While there is significant support for research in sustainable development topics, the support for ventures with a sustainability focus was relegated to community engagement rather than integrated into the research process.

6. Examining the challenges of conducting novel research in a traditional academic environment

This research project has been designed to go beyond academia to commercial application. Wakkary, Beesley, and Ladly (2007) highlight the connection between technology-based research methodologies and commercialization. The former provides an opportunity to develop and test a prototype for the latter. However, the current university structures result in barriers to research-to-commercialization in practice. As a founder-researcher, I have experienced both opportunities and challenges as a result of conducting novel academic research in four main areas: (1) academic expectations; (2) funding and business support; (3) ethics; and (4) legal considerations.

Academic expectations: Taking a novel research approach took considerable time and effort to persuade the research committee that it was a feasible and desirable. It was also essential to create boundaries between the research and commercialization aspects of the project, including the app development process and through setting clear academic expectations for the success of the research project as distinct from the plans for later application.

Funding and business support: I received financial support for the research project through the [Mitacs Accelerate Entrepreneurship program](#). This is designed for research-to-commercialization projects where researcher-entrepreneurs are given project funding with matched funding¹ coming from my own early-stage venture, NoSUP Canada. UW's solid entrepreneurial ecosystem has resulted in several opportunities to support the business side of this research project. The research secured the support of UW's campus incubator, [Velocity](#), which was required to qualify under the above funding program, and I am currently working on validating the business concept through UW's social impact incubator, [GreenHouse](#). Additionally, I have had the opportunity to participate in several university-level and regional pitch competitions, including Problem Pitch, Jack Rosen and Three-Minute Thesis competitions resulting in securing initial commercial R&D funding to support the commercialization plans.

Ethics: There was more ethical complexity for considerations of participant privacy, data security and project risk for this research project given that the data would be collected through a mobile app hosted on a third-party server. Furthermore, given that ethics approval was required early in the research process to qualify for funding, an extensive amendment was required after the mobile app development was complete to review the final form of the data collection tool.

Legal considerations: UW's stance on intellectual property (IP) rights related to a student's research played a large part in my decision to accept an offer to do my

¹ Matched funding is usually offered with a 50:50 split; however, under a special offer at the time of application, Mitacs provided 75% of the funding for the first term (of three) of this research project.

master's research there. UW's [Policy 73](#) protects the creator's academic generated IP; in other words, students personally retain any IP rights to their research. Navigating this IP stance in practicality was more challenging requiring workarounds to the standard university practices in order to protect my IP rights resulting in significant delays in starting the app development.

To create an environment for solid research and its translation into commercial application, the barriers to successful research-to-commercialization projects need to be addressed within academia to create a conducive environment for turning research into action. Recommended steps towards this include: 1) changing the mindset of academia to allow for dual-purpose research, 2) providing more financial and business support for research-to-commercialization projects, and 3) reducing the bureaucratic burden of such research projects, including funding, ethics, and legal considerations.

Conclusion

A stronger bridge between academic research and commercial implementation will result in more timely and actionable solutions to the SDGs over the next seven years.

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