MASTERS RESEARCH PROJECT

TRANSFORMING THE FUTURE: STRATEGIC AI ADOPTION FOR SMALL FOOD & BEVERAGE BUSINESSES

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ABSTRACT

Small businesses witness their evolution and resilience in 2025 through technology, which serves as a catalyst for both innovation and sustainable growth, as well as adaptability. Artificial Intelligence (AI) emerges as a standout transformative tool because of its capacity to revolutionize business operations while enhancing customer engagement and productivity levels. Canadian small businesses in the Food & Beverage sector have not widely adopted AI, even though its potential looks promising.

Research shows that 30.1% of businesses see AI as a means to improve efficiency according to McKinsey's 2025 (Economic Potential of Generative AI | McKinsey, 2025), report but a mere 7.5% of Canadian companies actually implement AI in their production processes according to the 2024 S. C. Government of Canada report (S. C. Government of Canada, 2024) only 7.5% of Canadian companies use AI for production processes. Information and cultural industries exhibit the highest AI adoption rate at 20.9% while professional services stand at 13.7% and finance at 10.9%, but accommodation and food service industries show only a 0.9% adoption rate because small businesses within this sector face implementation difficulties (S. C. Government of Canada, 2024). The 2024 survey and 2025 study by Edelman Mexico and Microsoft collected responses from Canadian small business leaders who have between one to 250 employees regarding their leading challenges and opportunities connected to AI adoption. The 2025 Edelman Mexico and Microsoft survey found that 78% of Canadian small business leaders with 1–250 employees are considering AI implementation while 65% are promoting AI tool adoption among their staff. Even as interest in AI grows among businesses, only 2% plan to expand their AI investment next year due to ethical concerns and cybersecurity risks along with difficulties in upskilling and unclear AI implementation processes. Yet, the potential gains are clear. Businesses testing AI solutions have reported increases in productivity and customer satisfaction as well as better work quality and employee engagement, achieving an average productivity improvement of 31% (New Study Reveals Canada's SMBs Are Turning AI Curiosity into AI Action – Microsoft News Center Canada, 2024).

To bridge this adoption gap, this Major Research Project (MRP) explores the systemic challenges small businesses face in the Food & Beverage industry. It offers an iterative, design-led roadmap for responsible and scalable AI adoption. Guided by the Double Diamond Framework, a structured design-thinking methodology that alternates between divergent exploration (expanding research and exploration) and convergent decision-making (narrowing down findings and solutions). This approach ensures a holistic and iterative process, allowing for the identification of real-world barriers and the development of scalable AI adoption ideas. By analyzing emerging AI industry-specific constraints and policy frameworks, this research offers practical, evidence-based insights to accelerate AI adoption in the chosen niche sector. To ground the research in lived experience, fieldwork was conducted using the Technology Acceptance Model (TAM) across nine small businesses, revealing significant barriers to AI adoption, including unclear value propositions, digital skill gaps, and cultural resistance to change. These findings highlight the urgent need to address foundational challenges before AI implementation efforts can succeed at scale.

The outcome of this research is an AI adoption playbook known as "**Biz Guide**" which was developed using AI tools to function as a hands-on, strategic toolkit that supports small businesses throughout their AI transformation journey. The practical resource integrates case studies, sector-specific frameworks, curated tools, ethical checklists to support data-driven decisions and uphold human-centred values including artisanal quality and sustainability. Small business owners and industry stakeholders together with policymakers and technology providers will find this study full of vital insights. This study delivers actionable strategies which assist small businesses to bridge digital gaps and integrate AI inclusively for Canadian business success in an evolving digital marketplace.

ACKNOWLEDGEMENTS

This research pays tribute to global researchers and institutions and industries for their vital participation in representing diverse voices during AI governance design. The sustained dedication to inclusive methods and ethical principles in AI development drives transformative progress in this field.

I want to express my profound appreciation to primary advisor and supervisor Suzanne Stein for her irreplaceable knowledge and patience while she consistently supported the Major Research Project (MRP) vision. Her guidance and support was vital in developing this work and I am extremely grateful. I value her generous time commitments during our discussions which have greatly contributed to my work.

My educational experience at OCAD University improved significantly because of the fundamental support and encouragement from my professors. I value the guidance which enabled me to develop strategic thinking skills and learn proper practices for efficient and ethical AI work. Your reliable support and collaborative efforts sustained my drive across the entire project duration.

My research has produced meaningful results because of the interest and interaction alongside the support I received from my partner and friends. My family deserves my gratitude because they cultivated my curiosity which led me to constantly ask why things work the way they do? and what if scenarios? while understanding how things happen? I am endlessly grateful for all the support.

Finally, to the readers of this MRP, I want to express gratitude for the time you dedicated to reviewing this research and interacting with its findings. Your deep interest coupled with your thoughtful insights and reflections helps bring significance to this work and I truly value your time and attention.

DEDICATION

This report pays special tribute to my father whose consistent guidance and wisdom shaped both my personal growth and professional development. My father instilled in me the core principles of curiosity, perseverance and integrity during my early years which now serve as the foundation of my identity. He functions as both my father and my mentor while providing inspiration and serving as my role model through his demonstration of wisdom and resilient forward-thinking vision. His firm belief in the power of knowledge together with his dedication to innovation and ethical responsibility has guided me through every challenge. He encouraged me to overcome boundaries and embrace new technologies with an open perspective. His dedication to advancement and excellence taught me to focus on future possibilities while envisioning a world transformed by substantial progress. His teachings about courageous dreaming and disciplined learning in conjunction with visionary technological creation became the foundation for this work. His guidance has propelled my continuous quest for innovation and impact throughout my meaningful career journey and I remain eternally grateful. This research reached success through my husband and daughter's continuous support and motivation.

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GLOSSARY OF ACRONYMS

This report features a summary of the industry-specific acronyms that have been highlighted for reference.

SME – Small and Medium Enterprise

SMB – Small Medium Businesses

F&B – Food and Beverage

AI – Artificial Intelligence

TAM – Technology Acceptance Model

PU - Perceived Usefulness

PEOU - Perceived Ease of Use

BI – Behavioral Intention

STEEP+V+L – Social, technological, Economic, environmental, Political, Value + culture & Legal

DEFT – Drivers, Enablers, Frictions, Turners

SCORE – Strengths, Weaknesses, Opportunities, Risks, Rewards & Effectiveness

CLA – Casual Layered Analysis

UX – User Experience

CX – Customer Experience

ALAAS – AI as a Service

GDPR – General Data Protection Regulation

CCPA – Canadian Center for Policy Alternatives

PCI DSS – Payment Card Industry Data Security Standard

PIPEDA – Personal Information Protection and Electronic Documents Act

AID – Artificial Intelligence Disclosure

DISCOVER - THE PROBLEM SPACE

The Discovery phase starts by framing the project brief followed by a thorough examination of the small business in food and beverage sector across the AI landscape; to pinpoint the central problem statement. Once the problem statement and key research questions were established, the next step involved, designing the research methodology, which included selecting right tools and methods for the research, to tackle the defined problem area. The research employs a mixed-method approach that integrates primary research with secondary research to gain to obtain detailed insights discussed further in the chapters, define, deliver and develop.

Introduction

Toronto's food and beverage industry powers the Canadian economy through small and medium-sized businesses that create economic growth and innovation while engaging communities. Toronto stands as one of Canada's most vibrant food centers which accommodates numerous independent restaurants, cafes, food manufacturers and suppliers. The city's multicultural identity is showcased through the diverse culinary offerings provided by these SMBS which serve to bolster the local economy. The food industry now widely acknowledges Artificial Intelligence (AI) as a critical instrument to boost operational efficiency while optimizing supply chains and enhancing decision-making processes along with providing customized customer experiences. Toronto's food and beverage SMBs have not yet widely adopted AI technologies despite their known advantages. The widespread adoption of AI solutions faces obstacles from high implementation costs together with technical skill shortages as well as challenges in scaling and integration. Small businesses in the city face difficulties in learning how to utilize AI for practical operational enhancements.

This Major Research Project (MRP) investigates how small food and beverage businesses in Toronto are implementing AI technology and identifies both the obstacles and driving factors that impact their successful implementation. The research adopts an iterative methodology which emphasizes ongoing learning and refinement processes instead of suggesting a universal solution to fit Toronto's ever-changing market landscape. The described approach proves fundamental, for SMBs which need to maintain flexibility and responsiveness to market changes and technological progress. Through strategic foresight tools like trend and driver mapping alongside horizon scanning and intervention strategy development the research constructs a strong AI adoption framework that responds to specific contexts. The tools serve to pinpoint crucial elements determining AI adoption through technological progressions and policy adjustments along with growing consumer demands. The strategy maintains its adaptability to Toronto's evolving food and beverage sector through proactive identification of potential challenges and opportunities. The intervention approach identifies vital sectors requiring specific actions to achieve maximum effect which enables businesses to minimize risks while exploiting AI capabilities. The Research uses foresight methodologies alongside qualitative and quantitative research techniques to obtain a deeper understanding of AI adoption within Toronto's food and beverage SMBS. Through literature review the study examines AI implementations case studies which encompass successful and failed implementations to form a foundational base and collects diverse stakeholder interview insights to identify patterns and trends through data analysis. The methodology creates a dynamic AI adoption framework that meets Toronto's food and beverage small businesses' specific requirements. The framework enables SMBs to move from experimental AI use to long-lasting integration through its focus on practical insights and iterative development. The method strengthens competitive positioning and business endurance while enabling Toronto's food and beverage companies to sustain adaptability and innovation as they navigate an AI-heavy marketplace.

The research contribution includes an AI Adoption Playbook and implementation templates developed through Artificial Intelligence (AI) tools which serve as a foundation for small businesses in the food and beverage sector to efficiently grow with AI. Appendix C&D of this document includes the foundational Playbook "BizGuide". The research reveals that the "BizGuide playbook" features attributions of AI tools used through an AID (Artificial Intelligence Disclosure) statement (*Weaver,* 2024). The appended section at the end of this paper plays a critical role in advocating responsible AI usage while promoting transparency and educating readers about research application purposes.

AI Evolution: A Journey from Theory to Transformation

AI evolution has progressed through three main phases which includes the pre-AI era before widespread adoption followed by the AI era and extending to future forecasts which shows how AI can benefit small businesses.

PRE-AI ERA (1940s–2000s)

The AI concept existed primarily within academic research and creative exploration before businesses adopted it as a critical entrepreneurial topic. Commercial results from the initial theoretical and experimental stage of AI development remained minimal. Small businesses remained unaffected by the pre-AI era which acted as a critical developmental stage for technologies that achieved widespread acceptance in subsequent years. Neural networks development went hand-in-hand with language processing and automation advancements which remained dormant before undergoing transformation.

1950: Can machines think? This profound question became the basis of Alan Turing's inquiry to the world. He launched a generational quest with his development of the Turing Test *(Stanford Encyclopedia of Philosophy, 2003)*.

1956: The term “Artificial Intelligence” received official recognition and established as a distinct field (*Artificial Intelligence (AI) coined at Dartmouth*).

1966: Joseph Weizenbaum created ELIZA which became one of the initial chatbots to simulate conversation through pattern matching and substitution techniques. These experiments together with rule-based reasoning mark important milestones in the AI’s History *(The History of AI, n.d.)*.

1974: The "AI Winter" began in 1974 when AI research faced decreased funding and interest because expectations were not met and researchers encountered limitations (*The History of AI*, n.d.).

1997: IBM’s Deep Blue demonstrated AI's capabilities in strategic games by defeating world chess champion Garry Kasparov (“Deep Blue versus Garry Kasparov,” 2025).

1999: AI found its way into consumer technologies during 1999 through systems like Amazon's recommendation algorithm (*The History of Amazon’s Recommendation Algorithm*, 2019).

2006 as marked the beginning of GeofIn Frey and Yann LeCun's breakthrough work which placed deep learning at the forefront of AI development and sparked continuous growth and innovation (*The History of AI*, n.d.).

AI ERA (2010s–2020s)

The 2010s marked the transition of AI from academic publications to everyday applications. With the rise of cloud computing, APIS and mobile devices, even solo entrepreneurs could tap into AI-powered tools.

2011: Apple introduced Siri to serve users as an AI virtual assistant in 2011 proving advancements in natural language processing (Apple's “Siri,” 2011).

2016: No-code platforms became available during the same period when Salesforce Einstein introduced AI capabilities to CRMs enabling businesses to predict sales trends and understand customers better (*Salesforce AI — Powerful AI Solutions*, n.d.).

2020: COVID-19 accelerated digital adoption. During COVID-19 small businesses migrated online and began using AI technologies for chatbots and customer service operations (*Will COVID-19 Bring About the Mass Adoption of AI in the Private Sector? - Spiceworks*, n.d.).

2023: Small business AI adoption grew from 25% to 48% as ChatGPT, Canva’s and Jasper led improvements in customer service automation together with data analytics and marketing communications.

2024: Generative AI tools like ChatGPT enabled businesses to automate content creation and customer service inquiries while generating marketing materials which led to reduced operational costs and improved productivity (*The Impact of Technology on U.S. Small Business | U.S. Chamber of Commerce*, n.d.).

2024: Small businesses now implement AI tools in various capacities at a rate of 98% *(The Impact of Technology on U.S. Small Business | U.S. Chamber of Commerce, 2024)*.

2025: The study predicts 75% of SMEs will begin testing AI applications and 83% of these growing businesses will adopt AI technology (*New Research reveals SMBs with AI Adoption, Salesforce AI, 2024*).

2027: Industry experts forecast personalized AI agents will enable businesses to gain insights into their brand identity and objectives which will become standard practice *(Daniel Kokotajlo, Scott Alexander, Thomas Larsen, Eli Lifland, Romeo Dean,* AI 2027, 2025).

2030: Canada targets 100% AI-enabled, digitally fluent small businesses by 2030 *(Pan-Canadian AI Strategy, CIFAR, 2023)*; advancing a world-class AI ecosystem that delivers inclusive, sustainable impact *(Automation Nation? AI Adoption for Canadian businesses, The Dais, 2023)*.

AI Era: The New Era of Intelligence and Industry Transformation

Artificial Intelligence (AI) changes industry landscapes around the globe and the food industry is not exempt from its impact. The incorporation of AI technologies like machine learning and robotics with autonomous systems transforms business operations through increased productivity and better decision-making while enabling personalized customer experiences *(Hooker & Kim, 2022)*. AI functions beyond support to drive new standards in supply chain management and operational efficiency while transforming consumer engagement within industries.

"We are transitioning from the digital age — the dotcoms and ecommerce — to the AI era. A lot of routine jobs will be done by AI, like it or not. AI is here and this is the new era." - Bruce Huang. (Iparsons, 2024)

FIGURE 1: TOP AI STATISTICS (LPARSONS, 2024) WITH IMAGES & ILLUSTRATIONS OF HUMAN AI INTEGRATION ACROSS DEVICES

AI means different things to different people. Users who encounter AI through platforms like ChatGPT and other generative systems frequently develop the misconception that AI functions exclusively through generative means. They would be mistaken. Each day AI operates silently to manage playlist curation as well as social feed personalization while translating languages and automating conversations. Artificial Intelligence powers voice assistants which respond to our inquiries, smart devices which adapt to our daily routines, and chatbots which solve problems before we even dial. Artificial Intelligence makes our interactions with technology smoother by providing Netflix recommendations and Google Translate services without our awareness. Once we identify AI's presence in daily life, we understand it better and appreciate its technological capabilities alongside the convenience and limitless potential it offers us.

Artificial Intelligence stands as a fundamental force for innovation in today's evolving scientific and technology environment by revolutionizing how humans interact with technology and solve problems while also reshaping our conception of intelligence *(Giuggioli & Pellegrini, 2022)*. The rapid implementation of AI across various fields creates massive opportunities but introduces ethical questions and operational challenges that demand strategic evaluation. The education, healthcare, and finance sectors have adopted AI technologies for data modeling tasks and predictive analytics plus automation purposes *(Iparsons, 2024)*.

The food and beverage sector is transforming through AI application which extends from ingredient procurement to creating customized consumer interactions. AI enables businesses to forecast demand while minimizing waste and optimizing prices for new recipes to maintain sustainable profitability. Operations are being revolutionized by self-driving delivery robots while AI-powered chatbots enhance customer engagement and intelligent inventory systems create stronger resilience. AI goes beyond streamlining processes by creating new opportunities that enable businesses to adapt to market changes through innovation and growth.

AI in the Food & Beverage Industry: A Competitive Imperative for Small Businesses

The adoption of Artificial Intelligence (AI) is crucial for small and medium-sized businesses (SMBs) in the Canadian food and beverage industry because AI is transforming entire industries. The food and beverage industry generates over $140 billion annually and serves as a major pillar of Canada’s economy by employing more than 1.7 million people in food production, retail, and hospitality sectors *(S. C. Government of Canada, 2024)*. The combination of increasing food prices and supply chain problems along with changing consumer tastes and workforce shortages requires AI solutions to boost operational efficiency, environmental sustainability and market competitiveness.

The food processing and production sector provides employment opportunities for half of Canada's diverse workforce while contributing significantly to the local economy (*Toronto Food & Beverage Manufacturing Sector Roadmap 2020-2030, Economic Development & Culture, City of Toronto.pdf*). AI creates meaningful effects on Canadian society by providing numerous opportunities while also introducing various challenges. The Government of Canada collaborates with international specialists to promote smart regulatory practices while establishing research communities and nurturing homegrown talent alongside supporting diverse business ecosystems to develop AI responsibly. The recent Budget 2024 announcement includes a $2.4 billion investment aimed at maintaining Canada's leadership position in artificial intelligence *(Artificial Intelligence Ecosystem, 2025)*.

The food and beverage sector in Canada consisting of local bakeries, home-based food businesses, independent restaurants and specialty food retailer’s fuels entrepreneurship and generates jobs. The food and beverage manufacturing sector provides a wide range of job opportunities that span basic entry positions to highly skilled roles thereby serving as an integral medium for job resource for many new immigrants in the city. The food and beverage manufacturing industry has seen many experienced individuals start their own businesses of various sizes which has driven entrepreneurial growth and sector expansion. The movement of food and beverage production into cities places small enterprises in urban centers such as Toronto under increased pressure to compete with larger organizations that leverage advanced technology. The food industry operates across multiple segments which include Quick Service Restaurants (QSRs) and retail food production alongside home-based artisans all striving to meet consumer demands while maintaining sustainability and ensuring economic survival.

Artificial Intelligence levels the competitive playing field for businesses of all sizes. By providing predictive analytics and optimized resource allocation alongside enhanced customer personalization, AI enables small businesses to automate their operations while staying flexible to market changes. A significant number of small businesses remain unable to access the necessary resources which would allow them to adopt these technological developments. The success and growth of small food businesses in a fast-paced market environment rely on strategic AI adoption which is supported by municipal policies and digital infrastructure. This study aims to close the AI divide by providing small food businesses with necessary tools and strategies which enable them to implement AI solutions for sustained resilience and competitive growth in a fast-paced industry with no time for delay.

Purpose of the Research

According to Canadian Government definitions small businesses are privately held organizations that operate with limited employees and generate more modest revenues when compared to big corporations. The typical range for worker numbers in Canadian businesses extends from one to ninety-nine employees. The combination of Labour Force Survey data and ISED calculations shows that private sector businesses drove net employment changes from 2020 to 2021 where small businesses accounted for 69% of the total employment change and medium-sized businesses contributed 17.4% while large businesses accounted for 13.7% according to Statistics Canada (S. C. Government of Canada, 2023). Small businesses function as crucial sectors within local economies and serve as source of breeding ground in the food industry. This Major Research Project (MRP) study investigates small businesses that function within the food and beverage sector with a focus on –

- Home-based production businesses
- Local bakeries and specialty food shops
- Independent food entrepreneurs and small-scale food manufacturer

Positionality & Motivation

My role as a human-centred designer and strategist fits within a constructivist and pragmatic paradigm because human experience alongside industry interactions and technological changes create knowledge. My planning and future analysis method accepts multiple potential outcomes because businesses need continuous adaptation during transformation processes. Trend & Driver Analysis and Horizon scanning enable me to maintain an iterative and multidisciplinary research process through active participation. The method integrates qualitative insights (e.g. The method combines stakeholder interviews and engagement with quantitative analysis to examine emerging trends and drivers systematically while evaluating potential impacts and identifying strategic opportunities. With immense experience in User experience (UX), customer experience (CX) and business strategy as a practitioner-researcher I interpret data using my industry knowledge and maintain an open mind to ensure unbiased contextual understanding. I take an active role in generating insights through the integration of emerging trends, stakeholder perspectives and strategic opportunities to create meaningful conclusions. Through my dedicated approach to ethical and inclusive research I make sure that AI adoption strategies focus on making systems accessible and transparent while delivering fair benefits to SMBS. To ensure research integrity, I cross-checked insights from different data sources and perspectives using multiple methodologies and reflect critically on how my interpretations affect research outcomes.

My exploration of AI research began with my profound interest in its potential to revolutionize industries and transform both decision-making processes and human experiences. My strong foundation in design and innovation naturally led me to examine the connections between AI applications and business strategy along with customer experience and operational efficiency. Through my role as a Senior User Experience Designer at a major Canadian bank I gained direct experience with digital banking solutions tailored for small businesses and commercial enterprises. This role ignited my curiosity about the potential of artificial intelligence to empower small local businesses by providing technological solutions that optimize operations and customer engagement to promote sustainable business growth. This research will provide small businesses with necessary AI know-how and strategic guidance for proper AI implementation and adoption. This research work aims to provide Canadian food and beverage small businesses with required tools and guides which will help them navigate AI transformations successfully while maintaining competitiveness and sustainability within the dynamic digital economy.

Research Approaches

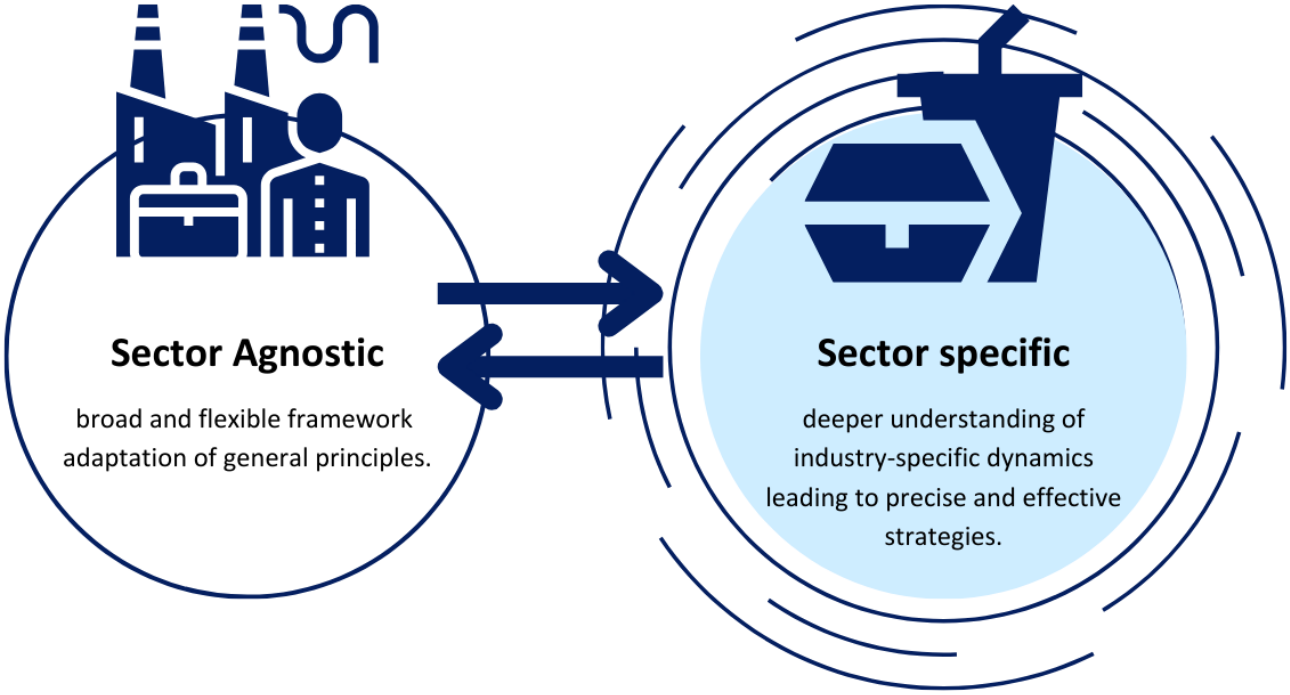


FIGURE 2: HIGHLIGHTING RESEARCH APPROACHES – SECTOR AGNOSTIC OR SECTOR SPECIFIC (PREFERRED DIRECTION)

Research initially branched into two separate directions with one path being broad and the other focused. The sector-agnostic approach delivered a flexible system usable across various industries, yet the sector-specific approach offered detailed insights designed for specific industry segments. The research journey refined its focus on the food and beverage industry which is primed for AI-based advancements. Small businesses struggle with AI implementation because they have constrained financial resources along with limited assets and technical difficulties. Recognizing these obstacles proved imperative for developing strategies that bridge the gap so AI can transform F&B while simultaneously impacting other similar industries.

Research Question & Objectives

The integration and acceptance of new technologies, particularly AI systems, has become vital in today's fast-changing digital environment. This study seeks to explore the effective adoption of AI-driven automation and hyper-personalization in small and medium-sized businesses (SMBs) within the food and beverage sector. As technological advancements continue to reshape customer expectations and business models, we predict the ability of SMBs to strategically adopt AI by 2035; this will determine their long-term competitiveness, operational efficiency, and customer engagement. This study aims to explore how SMBs can effectively implement AI to enhance customer experiences while ensuring sustainable and ethical AI adoption. To analyze AI integration challenges, opportunities, and best practices, this research employs the Technology Acceptance Model (TAM) *(D. Davis, Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology 1989 JSTOR)* as a guiding framework. The study seeks to understand how SMBs in the food and beverage industry can overcome barriers to AI adoption and leverage automation and hyper-personalization to remain competitive in an AI-driven marketplace.

The primary research question guiding this study asks:

"How might small businesses in the Food & Beverage sector adopt AI to automate operations and enhance hyper-personalized customer experiences for sustainable competitive advantage by 2035?"

This focused timeline of 2035 it aligns with the projected maturity of AI-driven automation and personalization technologies. This ensures that small businesses can adopt AI in structured phases (2025, 2030, 2035) rather than through reactive, fragmented efforts.

The study examines how AI-based automation and highly personalized services can improve customer connection and business functions while delivering customized experiences which ensure automation supports rather than substitutes human skill in small food industry businesses. This study aims to determine the ways through which small and medium-sized businesses in the Food & Beverage sector can implement AI solutions to establish sustainable competitive advantages by 2035. Field research combined with a literature review revealed that AI adoption levels differ among food industry sub-sectors which include restaurants as well as food processing facilities alongside bakeries and beverage manufacturers. The bakery sector stands out for its distinctive combination of modern technological advances with traditional handcrafted skills. In Toronto 34.5% of food-related businesses operate in bakery and tortilla production *(Toronto, 2017).* This analysis emphasizes the economic importance of AI-driven automation and hyper-personalization within this industry space. Bakeries serve as an ideal example for AI-driven business transformation because they operate between mass production and customization. This study expands its analytical scope from bakeries to encompass small businesses throughout the Food & Beverage industry. Through analysis of various case studies, the research seeks to determine which AI adoption strategies work best for

overcoming sector-specific challenges while capitalizing on unique opportunities. The research sharpens its focus because these sector-specific dynamics require targeted investigation.

Identifying Challenges and Overcoming Barriers –

How might we identify the specific challenges small medium businesses in food and beverage sector face with AI adoption and help them overcome these barriers?

Integration AI Adoption & Implementation –

How might SMBs strategically integrate AI-driven automation to enhance operational efficiency while maintaining human-centered business practices?

Ensuring Authenticity & Trust –

How might AI-powered hyper-personalization redefine customer experiences in the food and beverage sector without compromising authenticity and trust?

Government and Industry Support –

How might government policies and industry partnerships support SMBs in AI adoption while ensuring ethical and secure AI use?

Recognizing these industry-specific dynamics, the research was refined to focus on how AI can enhance customer-centric innovation in small businesses while ensuring ethical and human-centered business practices. This refinement captures the duality of AI's role—enhancing operational efficiency through automation while preserving personalized customer experiences. By exploring these questions, the study aims to propose a structured roadmap for AI adoption, balancing technological advancement, business sustainability, and customer-centric innovation by 2035 *(Artificial Intelligence Tools: Notion AI editor, Microsoft Co-pilot & Grammarly; Writing – Review & Editing: The revision and editing of the manuscript).*

Research Methodology

"…creativity is the habit of continually doing things in new ways to make a positive difference to our life" (Nessler, 2018).

The journey to implement AI within the food and beverage industry presents many complexities. This study blends creative problem-solving and structured analysis in its multi-method research approach to chart a clear path forward. For this research, **"The Double Diamond Framework"** stands at the core of the methodology by offering a dynamic process to explore issues, define problems, develop solutions and implement them (*The Double Diamond - Design Council*, n.d). The iterative framework helps in conducting deep investigations of challenges while developing practical solutions. The research findings are further, connected to practical applications using the **"Technology Acceptance Model (TAM)"** which examines business readiness and perception of AI implementation. The research achieves a smooth progression through its methods which allows it to transition from data collection and trend analysis toward developing AI adoption strategies and implementation plans. The flexible and insightful approach helps pinpoint industry challenges while delivering solutions that enable successful AI-driven transformation in the food and beverage industry.

Double Diamond Framework:

The Double Diamond Framework stands as the central methodological approach for this research to evaluate AI adoption across small and medium-sized businesses in the food and beverage industry. The Double Diamond Framework acts as a structured yet adaptable system for guiding design thinking research and innovation studies through AI adoption challenges. It consists of two core phases: The framework consists of Discover & Define (Problem-Space) which explores challenges followed by Develop & Deliver (Solution-Space) which refines and tests solutions. The structured design process relies on alternating divergent and convergent thinking throughout each stage to deliver a human-centered and iterative problem-solving approach for the industry.

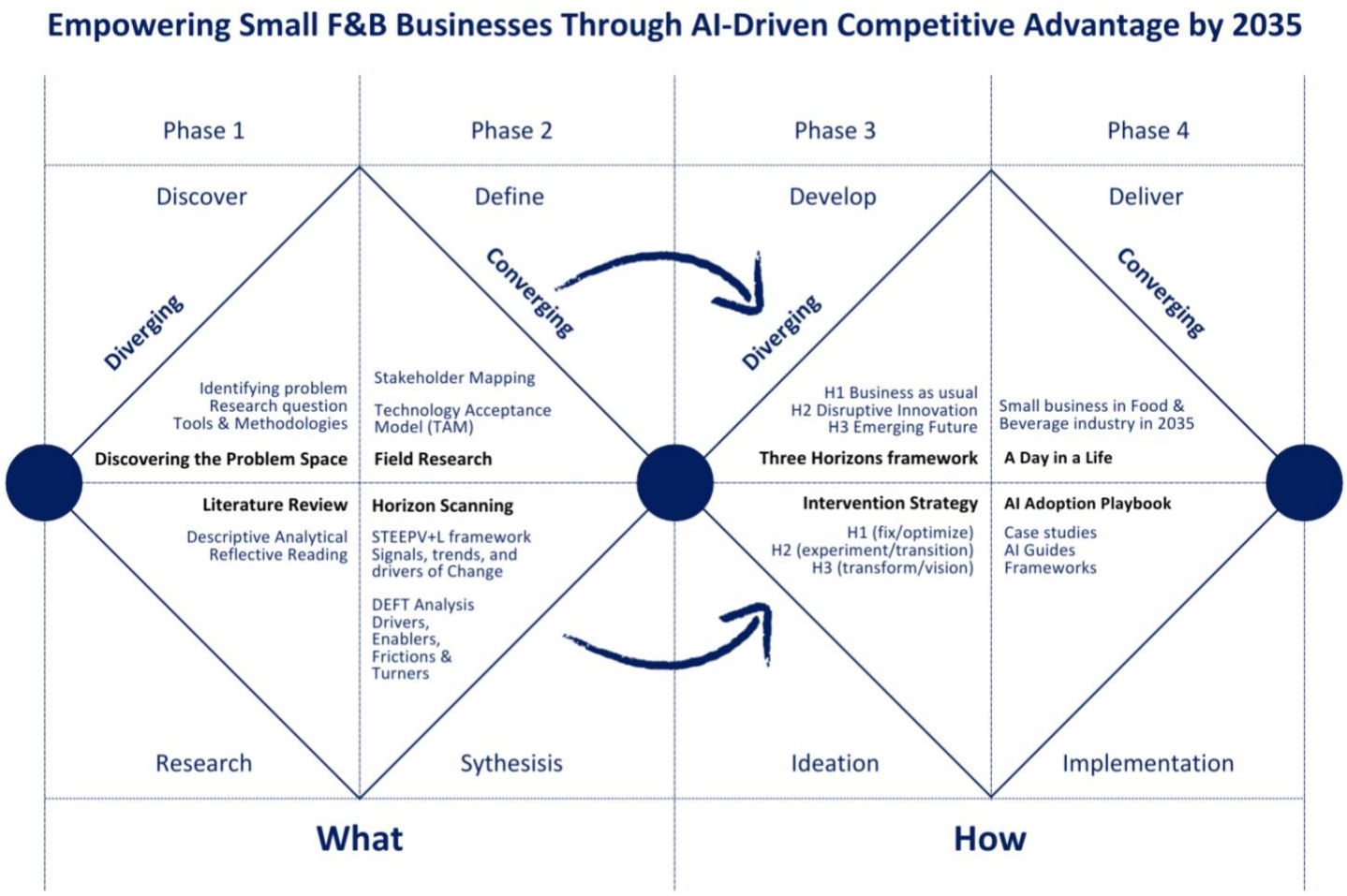


FIGURE 3: RESEARCH PATH FINDING DIAGRAM OF METHODOLOGIES MAPPED ACROSS DOUBLE DIAMOND FRAMEWORK – DISCOVER, DEFINE, DEVELOP AND DELIVER

The first diamond, **Discover & Define (Problem-Space – Divergent to Convergent)** investigates obstacles that SMBs face when adopting AI solutions within the food and beverage industry. These phases seek to establish a thorough understanding of both external and internal factors that affect AI integration while also clarifying and directing research toward a precise problem statement and strategic path.

The second diamond, **Develop & Deliver (Solution-Space – Divergent to Convergent)** moves through phases from understanding problems to creating solutions and executing them. This phase employs scenario mapping, wind tunneling, stress testing, strategic foresight along with rapid prototyping methods to develop and improve AI adoption strategies.

Discover – Exploring the AI Adoption Landscape (Divergent Thinking)

The research phase investigates how AI will affect small food businesses while analyzing the surrounding ecosystem which includes market preparedness regulatory obstacles operational limitations and cultural viewpoints. The goal is to perform a considerable assessment of AI deployment among SMBs while pinpointing obstacles and discovering new possibilities through Horizon Scanning methodologies. Key research Methods in the Discover Phase: Literature Review & Horizon Scanning. Analytical Tools: STEEPV+L Framework, DEFT Analysis. **Key research Methods in the Discover Phase: Literature Review & Horizon Scanning. Analytical Tools: STEEP+V+L Framework, DEFT Analysis.**

Literature Review

The literature review followed a structured iterative method that combined descriptive, analytical, and reflective components to thoroughly understand the effects of AI on small and medium-sized businesses (SMBs) within the food and beverage sector. The research utilized the University of Reading's guidelines for prioritizing insights, knowledge base and case studies to develop synthesizes which then combined with field research data formed actionable strategies and roadmap support small businesses *(Libguides: Academic writing: Descriptive, analytical and reflective writing 2024)*.

The descriptive phase involved collecting and sorting information from various sources such as gray literature and industry reports to build a foundational understanding of AI development and its effects on SMBs. For this research I utilized, the tools "Zotero" to organize all the sources and create citations efficiently.

During the analytical phase I conducted a thorough evaluation of existing literature to discover patterns and trends as well as identify research gaps. I utilized "Notion" to organize findings based on their relevance and problem/purpose while employing theoretical frameworks and addressing challenges and integrated "Zotero" through the "Notero" plugin for easy data transfer. The study uncovered 12 trends in AI adoption along with personalization and automation frameworks and best practices as well as systemic influences.

In the reflective phase, I utilized Miro to create visual maps that showed how different themes, trends, and research gaps interconnected. The reflection placed research findings within the distinctive challenges and opportunities specific to SMBs to ensure theoretical and practical dimensions were both addressed.

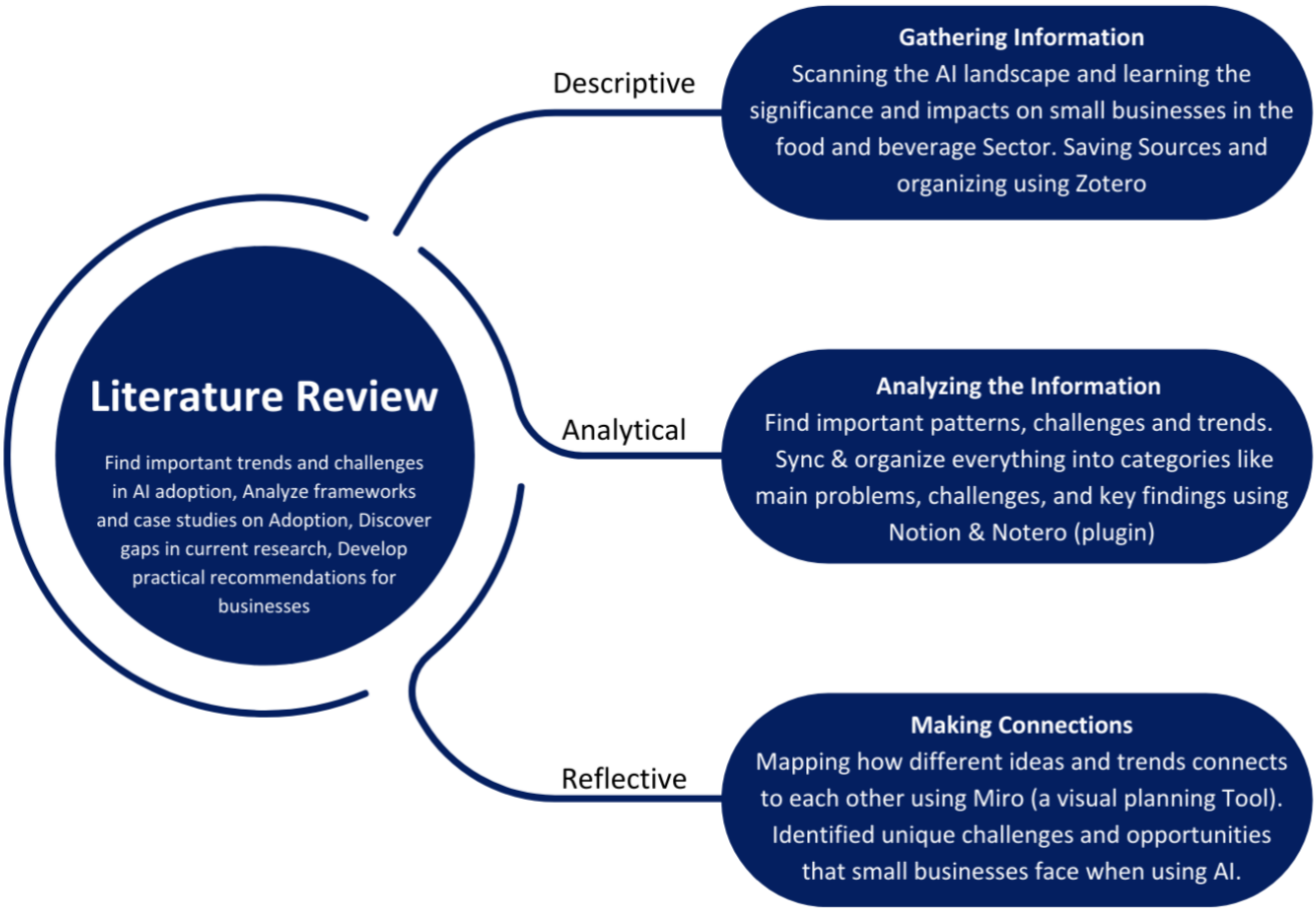


FIGURE 4: ILLUSTRATION OF LITERATURE REVIEW PROCESS CONDUCTED USING THE "UNIVERSITY OF READING'S GUIDELINES.

The structured approach established a strong foundation for my MRP through the examination of existing knowledge and frameworks related to AI and Small Medium Businesses in the Food Industry by identifying major trends and challenges and uncovering research opportunities and gaps. The research illustrates its robustness and practical relevance to readers while connecting academic discussions with real-world applications in the food and beverage industry.

Define – Narrowing Key AI Adoption Challenges (Convergent Thinking)

The Define stage shifts from exploration to synthesis, distilling research insights into specific barriers and opportunities for SMB AI adoption. **Key Research Method in Define Phase – Surveys & Semi structured Interviews. Analytical Tools: TAM, SCORE & Stakeholder Analysis.**

Field Research: AI Readiness Assessment

For the field research study with living participants, as part of the research process, first step followed was to apply Research Ethics Board for approval. Once receiving the approval, the study involved conducting surveys and semi-structured interviews across 9 small businesses operating within the food and beverage sector across Canada. Participants were strategically picked from a list of 15 based on operational criteria and interest in the study. These were diverse group of small business owners spread across varied geographic locations; with nine based in Toronto

and one operating from Vancouver. The interviewees represented a range of professional backgrounds, including food production, catering, baking services, and beverage production. Due to confidentiality the participant details are treated as anonymous and synthesized to research findings in the section “Barriers to Ai Adoption”. The field research data collected was analyzed using Technology Acceptance Model (TAM), framework in combination with supporting tools such as SCORE & stakeholder analysis. To understand the systemic influences and worldviews this research also explored Casual Layered Analysis for further deeper understanding of structures; analysis shared in Appendix A: Casual Layered Analysis (CLA).

Technology Acceptance Model (TAM) Framework

The Technology Acceptance Model (TAM), first proposed by Fred D.Davis (Davis, 1989) provides a framework for understanding how users come to accept, analyzing their intentions and perceptions for utilizing new technology. **The TAM framework involves: Perceived Usefulness (PU) & Perceived Ease of Use (PEOU) which shapes Attitude Toward Using (ATU) leading to; Behavioral Intention (BI); influence by External Variables (e.g., demographics, system features); resulting in Actual Usage (AU).**

To assess AI adoption behavior among SMBs, this research integrates the Technology Acceptance Model (TAM) as a theoretical foundation in combination with field research analysis. In the context of AI adoption in SMBs, this model helps evaluate whether small business owners and employees perceive AI tools as intuitive, accessible, and beneficial in enhancing operational efficiency and customer engagement. The study applies TAM in both surveys and interviews to understand behavioral attitudes toward AI adoption and identify the digital divide between large corporations and small businesses in leveraging AI-driven innovations. It focuses on key areas such as AI readiness, technological advancements, adoption behaviors, challenges, and the practical realities of business operations.

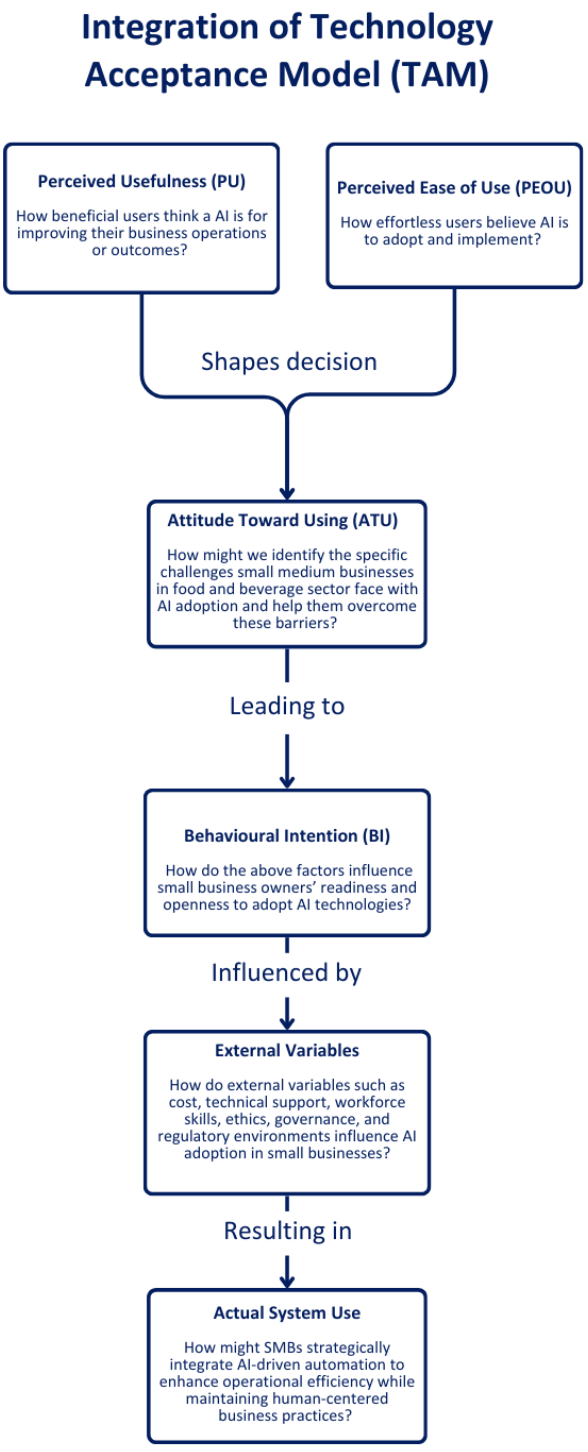


FIGURE 5: ILLUSTRATION OF PROCESS FLOW (IMAGE ON THE RIGHT) FOR INTEGRATION OF TECHNOLOGY ACCEPTANCE MODEL (TAM) INTEGRATION FOR FIELD RESEARCH ANALYSIS.

Horizon Scanning

The research utilizes Horizon Scanning techniques to explore trends in AI adoption and pinpoint significant obstacles and forces affecting Small and medium sized businesses (SMBs). The research approach allowed for systematic examination of various future uncertainties and disruptive elements and weak signals that will affect AI implementation in the food and beverage sector.

STEEP+V+L Framework as a foundation with DEFT Analysis

The STEEP+V+L framework enabled a systematic evaluation of AI adoption's complexity by offering a broad view of interconnected factors that affect AI integration in SMBs. By using foresight methodologies to identify potential shifts and disruptions by mapping Signals, Trends and Drivers in each category of STEEP+V+L to understand long-term implications, the framework provided immense analytical capabilities across various dimensions.

- **Social:** The study included societal perceptions about AI along with ethical dilemmas and employment effects linked to skill enhancement.
- **Technological:** The technological section evaluated progress in AI technologies along with their functionalities and application limits for SMBs.
- **Environmental:** The analysis explored how AI technology helps organizations use resources more efficiently while reducing their environmental footprint.
- **Economic:** The study investigated main economic factors including cost savings benefits, productivity improvements, and competitive market demands that drive organizations to adopt AI.
- **Political:** Examination of government policies and legislative frameworks revealed how they influence the development of AI technology and its adoption among industries.
- **Values/Cultural/Ethics:** The examination included ethical issues related to fairness and transparency alongside accountability and cultural views of AI technology.
- **Legal:** Examined legal aspects related to data privacy concerns while determining intellectual property rights and regulatory compliance requirements.

Signals are early indicators suggesting potential for future AI changes or possibilities including subtle regulatory changes, new business approaches, and developing technology advancements. **Trends are Observable patterns** that shaped AI adoption included automation growth, hyper-personalization trends and AI-powered decision-making in SMBs. **Drivers are the Core forces** that push AI adoption forward include industry-specific requirements combined with competitive pressures together with shifting consumer expectations. To deepen this analysis further, I employed DEFT analysis *(Voros, 2003)*, a structured approach that helped identify interdependencies and anticipate future strategies, ensuring that AI strategies were aligned with broader systemic changes. The DEFT framework (Drivers, Enablers, Friction, Turners) is offered here as a basis for determining the range and type of force underpinning a trend *(Adam Gordon, 2010)*.

- **Drivers:** The study revealed the main driving forces behind AI adoption such as technological advances, new regulations, and economic factors that support growth.
- **Enablers**: The study recognized foundational elements that support AI adoption through government incentives together with digital infrastructure and talent development programs.

- **Friction:** A review of adoption barriers for AI highlighted issues such as change resistance alongside regulatory limitations and ethical challenges.
- **Turners:** The analysis measured possible opposing forces that could alter the trajectory of AI adoption. Forces emerge when there is intent to challenge a trend through actions that delay its progress, halt its movement or redirect it towards a different path.

By mapping these elements across the STEEP+V+L framework and leveraging DEFT analysis, I was able to: Identify interdependencies between technological, economic, and societal factors shaping AI adoption. Anticipate potential disruptions and regulatory shifts, ensuring AI strategies were resilient and future ready. Move beyond a purely technological perspective, embedding ethical, social, and environmental considerations into AI adoption strategies. This foresight-driven approach enabled the development of a more nuanced, strategic roadmap for AI adoption in SMBs, ensuring sustainable growth, regulatory compliance, and ethical AI integration within the evolving business landscape.

Develop – Defining AI Adoption Strategies (Divergent Thinking)

The Develop phase is where possibilities take shape, guiding small businesses in the F&B sector toward a structured AI adoption journey. This stage is not just about integrating AI, it's about crafting a strategic roadmap that balances immediate operational enhancements, market disruptions, and long-term transformation. Using Strategic foresight-framework, we develop scalable, human-centered AI adoption strategies that align with business realities while preparing for future shifts. **Key Foresight Driven Methodologies – Discovering & mapping adoption strategies using Three horizon model across time**

Three Horizons Model

The Three Horizons Framework was developed by Bill Sharpe, a futures practitioner and researcher affiliated with the International Futures Forum (IFF). To envision AI's evolving role in food & beverage SMBs, I applied the Three Horizons Model alongside the Technology Acceptance Model (TAM), SCORE analysis, and stakeholder mapping. This framework helped structure a phased transition from incremental adoption to a fully AI-integrated ecosystem.

- **Horizon 1 – Business as Usual or Incremental AI Adoption (2025–2028):** Gradual AI adoption focused on operational efficiency amid financial and regulatory constraints.
- **Horizon 2 – Transition Phase or AI Driven Market Shifts (2028–2032):** Emergence of AI-native market shifts, evolving consumer behavior, and adaptive business models.
- **Horizon 3 – Visionary Phase or AI-Integrated Future (2032–2035):** Fully autonomous ecosystems, underpinned by AI ethics, governance, and workforce transformation.

Designing the Intervention Strategy: The Intervention Model in this research offers a structured framework for identifying and sequencing strategic actions needed to support AI adoption in small food and beverage (F&B) businesses. It emphasizes not just what must change, but also who should be involved, when interventions are most impactful, and where within the system they should be applied to ensure equitable, ethical, and sustainable transformation. Using STEEP+V+L factors, I evaluated Intervention strategies across these horizons; back casting from a desired AI future to identify actionable steps today for small food and beverage businesses. This structured roadmap accelerates AI adoption while allowing SMBs to adapt in manageable phases. It balances short-term feasibility with long-term reinvention, ensuring AI integration is strategic, ethical, and future-ready. Intervention

strategy mapping tool helped layer interventions across time - H1 (fix/optimize), H2 (experiment/transition), and H3 (transform/vision) to shape long-term, sustainable outcomes (Bill Sharpe, Three Horizons, n.d. Patterning of Hope, 2020). It enabled me to assess current realities (H1), identify transitional shifts (H2), and define aspirational yet achievable futures (H3). By aligning interventions to each horizon, the AI adoption playbook becomes both visionary and actionable—supporting realistic, future-ready decisions that evolve with each business's journey.

Deliver – Implementing AI Adoption Strategies (Convergent Thinking)

The Deliver phase focuses on developing and validating practical AI adoption models which concludes with the creation of AI Adoption playbook cocreated using AI tools, guiding small businesses through their AI journey. The process turns research data into practical resources specifically designed for small business implementation.

AI Adoption Playbook – "BizGuide"

The AI Adoption Playbook serves as a future-oriented practical guide that enables small food and beverage businesses to deploy AI technology with clear understanding and surety. It consists of two core components:

- The resource functions as a **strategic Guidebook** which serves as a planning tool by providing industry-specific insights together with case studies of both successes and failures and established best practices. The resource guides organizations through self-assessment processes and facilitates long-term growth planning for intelligent scalability.
- The **Implementation Toolkit** within the BizGuide chapters, offers a set of practical hands-on tools which include step-by-step deployment instructions with a selection of AI solutions and ethical checklists alongside approaches that integrate automated processes and human creativity. The framework allows organizations to adopt AI systems in an informed way while maintaining sustainability and responsibility.

Research Scope & Limitations

The research presents a practical and ethical guide for AI implementation in small food and beverage enterprises that develops scalable and user-friendly strategies which remain relevant through future industry changes. The structured methodologies help SMBs maintain their unique value propositions in changing environments by creating actionable AI strategies which combine intuitive adoption toolkits with data driven ethical implementations. The speed of AI makes it impossible to achieve complete data saturation which means that the identified themes and patterns will change over time and thus requiring analysis to extend beyond the current study's boundaries.

Efficient attempts have been made to document diverse perspectives, but some subthemes and alternative viewpoints stay unexamined because achieving total saturation across all technological and industry-specific variations remains impossible. The vast AI literature and case study collection makes it difficult to provide complete coverage. The research builds a substantial foundation by examining new trends and adoption obstacles along with data driven ethical implementations to create forward-thinking discussions about AI applications in small and medium-sized businesses. The findings stimulate further investigation while maintaining an adaptive and inclusive dialogue about AI adoption that evolves with technological advancements.

DEFINE – NARROWING KEY AI ADOPTION CHALLENGES

The Define phase is about narrowing the Key AI adoption challenges across small businesses in Food and beverage sector focussing on phased across two parts –

First stage is understanding the barriers & challenges of AI adoption based on field research and analyzing them across Technology acceptance model.

Second stage is analyzing the signals, trends & drivers of change impacting the AI adoption across the social, technological, economic, environmental, political, value and legal factors.

Barriers to overcome AI Adoption

The Technology Acceptance Model (TAM) is a useful framework for analyzing user research findings, especially when exploring technology adoption. This research applies TAM to examine field research data about AI adoption and perceptions among small and medium businesses in the food and beverage sector. This report section investigates how perceived usefulness (PU), perceived ease of use (PEOU), behavioral intention (BI), and external factors affect the adoption of AI technology. The field research was done across **nine small businesses** identified major obstacles to AI adoption which must be resolved before full implementation can proceed. The small business owners who participated in my interviews showed both concerns and hopeful expectations about AI since they understood its revolutionary impact on their business operations. The research findings unveiled major potential areas for AI adoption which promise enhanced operational efficiency along with innovative growth possibilities for businesses.

Perceived Usefulness (PU) – How beneficial users think an AI is for improving their business operations or outcomes?

Positive Indicators:

- **Efficiency Gains:** Small Business owners see AI's value in automating customer management, streamlining inventory tracking and improving marketing strategies for better customer service. They embrace automation and value AI tools for inventory management and 3D printing for cake toppers, recognizing the potential for operational ease & hence improve efficiency. Some sees AI tools aiding in social media scheduling, predictive analytics & CRM automation, market trend analysis, and sales forecasting.
- **Improved marketing:** Some Small business in bakery & catering find AI-generated social media content (e.g., captions, posts) valuable for time savings and engaging customers across multiple platforms.
- **Enhanced Personalization:** AI is seen to provide tailored services, like creating customized customer interactions or generating personalized design recommendations for some within bakery businesses.

"AI is definitely a very good platform... we can't just think, like, you know, AI is going to take away somebody's job or something. No, it's going to ease their job." – Research Participant from beverage Industry.

"We've only been using it [ChatGPT] for maybe two months or one month. Really, it's a newer thing that we're trying out to see if it's good. It cuts down us having to sit here and think of something to put. You know, saves a lot of time, for sure."– Research Participant from bakery Industry.

"Sometimes it's a little bit harder to use for someone that is not proficient in these kinds of things. Some people are just not good with technology." – Research Participant from beverage Industry.

"It is possible that I use AI, if AI can combine with 3d printing. Will use AI generated 3D Cake Toppers & Accessories to personalise cakes and enhance my operations" – Research Participant from bakery Industry.

Barriers:

- **Limited Value Perception:** Limited Value Perception: Businesses in the bakery and food catering sector that operate on a small scale are hesitant to invest in AI because they see their business as a hobby and question how AI can fit with their low scaling priorities. These businesses worry that AI-generated content will make their brands less distinctive while also showing a preference for direct customer contact instead of automated systems.
- **Return on Investment (ROI):** The return on investment (ROI) and cost-effectiveness of AI remain unclear as major concerns. AI developments keep changing fast requiring ongoing financial input which can put stress on available resources.

Recommendations:

- **Develop Case Study Repositories:** Create repositories of case studies by gathering and distributing examples that showcase practical use cases and advantages of AI implementation for small and medium enterprises. Case studies may need documentation of both successes and failures to provide sector-specific examples that build user confidence and facilitate informed decision making.
- **Promote Accessible and Low-Risk AI Solutions:** Industry leaders and technology providers should be urged to develop affordable and low-risk AI adoption models that enable broader access. Intuitive no-code and low-code platforms serve as the foundation of these models to allow non-technical individuals to experiment with AI solutions while learning to scale them without requiring advanced technical skills.
- **Design Modular, Plug-and-Play AI Portfolios -** Support the creation of adaptable AI solution collections which include plug-and-play tools specifically designed to satisfy different business requirements. The portfolios enable users to streamline the process of choosing and implementing features that match their business operations needs and industry workflows.

"Maybe if AI could take in orders for us... see what flavor they want... that'll be pretty interesting to see how that would go."– Research Participant from bakery Industry.

"I would be happy to hear from experts and get expert recommendations on AI tools. Maybe someone that knows what they're doing would be good, because none of us really use AI very much." – Research Participant from bakery Industry.

"We want to something we on the current scale of what the technology is moving towards... we don't want to be on the old books." – Research Participant from beverage Industry.

"We need to embrace AI and not be worried about it all the time. You must embrace it and use it the best way possible for your own need, hopefully ethically. But These decisions are taking too long to be made." – Research Participant from Food production & catering Industry.

Perceived Ease of Use (PEOU): How effortless users believe AI is to adopt and implement?

Positive Indicators:

- **User-Friendly Technology:** Some businesses have started to implement tools such as ChatGPT, Canva, and CakeCost for tasks showing their willingness to adopt simple and easy-to-use technology. Business owners demonstrate a willingness to adopt AI technology incrementally.
- **Interest in Training:** Several small businesses demonstrate their readiness to join workshops and pilot programs for AI knowledge acquisition.

Barriers:

- **Complexity and Lack of Technical Expertise**: Many small business owners are hesitant about AI due to limited technical knowledge/ expertise concerned about maintaining multiple platforms. Some small business leaders also express their concerns about AI because they believe their workforce lacks training to manage AI tools effectively combined with fears regarding job displacement and additional training expenses. Manual processes (e.g., physical notebooks, WhatsApp orders) are preferred due to ease and familiarity. Small Businesses also feel overwhelmed by the variety of AI tools and demand clearer defined guidance on adoption.
- **Affordability:** Small business owners highlight the necessity for AI tools to have easy and intuitive interfaces while pointing out the absence of cost-effective AI solutions. Training gaps and affordable resources remain unavailable for small businesses to participate in their own learning and education. Several businesses demonstrate willingness to embrace low-priced options ($10-$30/month) which implies their adoption of AI solutions may be hindered by financial constraints.
- **Time Constraints:** Small and medium-sized businesses (SMBs) feel that their time constraints prevent them from exploring and learning about new AI technologies. Businesses require AI solutions that users can implement with minimal training and which provide instant usability. SMBs would implement AI solutions through tools specifically designed for the food and beverage industry. They desire software solutions which

"Personal touches is still the best, because at the end of the day, it is a customer, and they are buying from you because you are different. People just want to be heard, and the AI won't listen to you like that. I feel like humans, human touch is still very special." – Research Participant from bakery Industry.

"People use AI just to get the extraordinary photographs of cakes, and they want me to replicate that, and it's hard for me to tell them, this is AI generated." – Research Participant from bakery Industry.

"I'm not sure. I guess if I have my stuff online, it's always subject to be hacked. If the technology has glitches or problems, then you will lose everything." – Research Participant from bakery Industry

"Because I'm not a technical guy, the first thing is how to use it [AI], so I have to get trained myself." – Research Participant from Home Based Food production and catering Industry.

deliver time savings without necessitating prolonged training periods.

- **Information Overload:** SMBs have trouble selecting useful AI tools because of the overwhelming number of available options and lack of knowledge about their operational uses. They lack confidence about which solutions have undergone thorough testing and proven effectiveness.
- **Technology Integration & Technical Complexity**: SMB's struggle with understanding AI capabilities while also experiencing hesitation when it comes to integrating multiple technological platforms. Simple and intuitive AI tools would encourage SMBs to adopt and prefer AI solutions.
- **Ethical challenges and Privacy issues:** AI adoption presents ethical challenges for small business customers because they might feel uneasy if AI collects too much personal information about them. Small businesses experience anxiety about illegal usage of technology due to the absence of ethical frameworks and possess limited knowledge regarding its regulations. Concerns about compliance with AI regulation exist throughout the industry. Small businesses express worries about holding data ownership along with proper handling of data security and privacy. Small businesses perceive increased risks from misinformation which requires clarification alongside best practice implementation for effective adoption.

Recommendations:

- Small businesses require AI systems which present clear business advantages through simple usability. These enterprises lack understanding about how these tools aid their operations and the potential advantages they offer.
- Technology specialists and industry experts should develop AI training toolkits with workshops to help small business owners improve their digital literacy and understanding of AI technologies. Develop user-friendly, industry-specific AI solutions.

Attitude of Using AI & Behavioral Intention (BI) - How do the above factors influence small business owners' readiness and openness to adopt AI technologies?

Positive Indicators:

- **Proactive and Open Attitudes:** Businesses show great enthusiasm for AI tools that fit their operational requirements while remaining cautiously optimistic about AI implementation for better operational efficiency and customer service improvements.
- **Cautious or Selective Intentions:** Small businesses believe AI-powered corporate competitors put them at a disadvantage and find AI unaffordable and overly complicated for their food service operations. Although small businesses show openness towards AI, they proceed with careful steps by adopting AI technology slowly and focusing on easy-to-use solutions. While they considered AI integration, they exhibited reservations because they believed AI technology might not suit their hobby-oriented business model that relies heavily on personal service. Businesses express enthusiasm for AI use in backend operations yet show reluctance towards adopting AI for customer interactions.
- **Balancing Automation with Personalization:** Small businesses demonstrate a strategic mindset when choosing which business processes to automate and which to keep under human control. As customer expectations shift, as SMB owners turn to AI systems to improve operational efficiencies and personalize experiences while working to understand methods for sustaining meaningful customer relations. The contrast of "The AI Barista vs. Through the juxtaposition of "The AI Barista" with "The Neighborhood Baker" businesses create meaningful discussions about merging community warmth with smart efficiency.

- **Preserving Artisanal Identity with Hybrid AI:** Many SMBs are actively pursuing hybrid AI systems capable of automating routine tasks while safeguarding their brand's craftsmanship and creative expression. Instead of completely rejecting AI systems business owners search for options that allow them to keep manual control in crucial areas including customer service and culinary creation. The metaphor of “The Robot Chef vs. "The Artisan" illustrates the expanding trend towards AI augmentation which focuses on collaboration between human abilities and machine intelligence.

External Variables (Contextual Influences)

Small businesses thriving across local community, faced divergent paths as they evaluated how to incorporate AI technology into their operations. Each carried a unique background and history of evolution, but all were influenced by their environments, external variables play an important driver influencing their adoption journey.

- **Preserving Personal Touch:** Many small businesses stress the importance of preserving personal touch and one-one customer interactions and hence show that AI should assist human connections with routine backend automations rather than replacing them.
- **Nature and Size of Business:** Limited scope of businesses, infrastructure scalability, hobby-based structures and operational volume of deliveries prevent small and seasonal businesses from seeing the benefits of AI implementation and hence .
- **Adaptable AI Solutions:** Businesses catering to niche market preferences such as menu options catering to preferred choices example: vegan and eggless cakes or seasonal flavors, highlight their need for customization and flexibility in AI tools.
- **Changing Regulations and Fear of Data Breach:** Many small business owners express their concerns about not having clearly defined regulations for usage of AI and changing regulations on potential legal liabilities, data privacy risks, and the possibility of unknowingly violating AI-related laws. These uncertainties contribute to hesitation delaying their AI journey and integration; hence missing out on opportunities to enhance productivity, streamline operations, and drive long-term growth.

Unveiling AI’s Impact: Trend Exploration

AI is reshaping the food and beverage industry, with projections soaring from $3 billion to $30 billion by 2028 (*How AI Is Impacting the Food and Beverage Industry*, 2023). **But what drives this rapid adoption, and how can small businesses in the Food & Beverage sector adopt AI? To uncover answer to the first question Let’s start with understanding, what shapes the Perceived Usefulness (PU) with AI and How AI enhances business performance?** I delved into global insights, real-world applications, and case studies; not just to highlight successes, but to learn from failures. Examining these real-world scenarios provided a practical lens to assess AI’s benefits, risks, and challenges, ensuring a foresight-driven approach to adoption. Using STEEP+V+L framework (Social, Technological, Environmental, Economic, Political, Values/Ethical, and Legal) as influencing factors mapped **12 pivotal Trends driving AI adoption in the food and beverage industry. Each trend was examined through: Signals & Signposts – Early indicators of emerging shifts; Current Implications – Immediate effects of AI integration; (DEFT) Drivers, Enablers, Frictions & Turners – The forces accelerating, enabling, or hindering adoption; Extrapolations – Future predictions on AI’s long-term impact.** By synthesizing these elements, I developed an in-depth narrative of AI’s evolving role in the F&B sector, highlighting the opportunities, challenges, and strategic considerations businesses must navigate to implement AI effectively and responsibly.

Trend and Driver Mapping: Analysis of 12 Trends driving AI adoption

FIGURE 6: DEMONSTRATION OF 12 PIVOTAL TRENDS MAPPED ACROSS STEEP+V+L FRAMEWORK (SOCIAL, TECHNOLOGICAL, ENVIRONMENTAL, ECONOMIC, POLITICAL, VALUES/ETHICAL, AND LEGAL)

Social Trend: AI-Driven Personalization

Trend Overview: Today's consumers want individualized experiences where their dietary preferences and culinary tastes are predicted by artificial intelligence. Personalization via AI chatbots and intelligent ordering platforms revolutionizes the food service sector and helps small businesses stay competitive in the market driven by demand. AI-powered analysis of user behavior patterns, previous purchases, and current market trends enables companies to develop customized menus, apply dynamic pricing, and provide precise food recommendations. Chatbot-powered self-service kiosks and ordering platforms increase customer satisfaction by making decisions more quickly and with less friction. Businesses that use AI-driven personalization in their operations will succeed, and those that don't risk falling behind.

Signals: Just Eat Takeaway, the largest food delivery service in Europe, Just Eat Takeaway, uses artificial intelligence in the food and beverage industry to give restaurants highly customized menu recommendations along with dynamic pricing and demand forecasting tools. The average order value increased by 14% for the company, and delivery efficiency increased by 13%. The future of dining; AI-Powered Solutions for Tailored Food and Drink Experiences *(Blogger, The future of dining: AI-Driven Solutions for personalized food and beverage experiences 2023).* Tastewise AI helps restaurants personalize their menus by providing data-backed insights (*TasteGPT*, 2023). Due to AI misinterpreting customer requests, McDonald's experienced issues with its AI-powered drive-thru system, processing roughly 15% of orders incorrectly *(Abbie@lalacommunications.com, Observability in marketing 2024).*

Implications: With personalized experiences, artificial intelligence allows companies to connect with customers on a deeper level than was previously possible. Its potential remains unbounded despite barriers like privacy concerns, high implementation costs for SMBs, and inconsistent adoption rates. In addition to NLP-driven chatbots and predictive analytics tools, businesses can use AI-powered recommendation engines to develop dynamic pricing and customized menus while guaranteeing smooth customer interactions. The payoff? Using AI technology boosts sales performance, improves customer satisfaction, and reduces waste while increasing profits through intelligent inventory management.

Drivers (D)	Enablers (E)	Frictions (F)	Turners (T)
Consumer demand for hyper-Personalization.	AI-powered recommendation engines and chatbots	Data privacy concerns and AI transparency issues. Skepticism about AI in food services.	potential resistance from AI over-reliance which may stifle human creativity.

TABLE 01: DEFT ANALYSIS FOR AI DRIVEN PERSONALIZATION

Extrapolations: By 2040, the food industry will experience a revolution through the integration of artificial intelligence, which will combine biometric tracking systems and real-time health information to provide predictive meal suggestions during everyday life. Imagine an artificial food assistant that anticipates your desires and metabolic responses, creating meal plans tailored to your nutrient needs before you even decide on a meal. Today's cutting-edge restaurant AI tools will become the norm as restaurants adopt these technologies to improve customer engagement and build trust through transparent data processes. Companies that embrace this transformation will become industry leaders by providing a personalised experience that sets new standards of loyalty and industry benchmark. Virtue of tomorrow's dining experience will be implemented by sophisticated intuitive systems.

Social Trend: Influencer Marketing & Digital Engagement

Overview: Small business marketing strategies now heavily involve social media influencers, and Canadian food and beverage companies are at the forefront of this. Small businesses are re-investing their marketing budgets in influencer collaborations, because consumers are more likely to trust an influencer's recommendation than traditional advertising. For identifying relevant influencers, monitoring engagement and calculating return on investment, companies combine AI-based analytics with influencer marketing platforms.

Signals: As stated by Alex Shvarts, CEO of FundKite, consumers prefer authentic advertising that incorporates trustworthy influencer backing. Personalized marketing strategies and social media influencers are effective ways to engage with customers and promote products these days. Traditional print advertising's waning efficacy has led to a rise in influencer-focused digital marketing tactics (*How to Measure Success When Working With Influencers*, 2024). The influencer marketing sector is anticipated to increase from $9.7 billion in 2020 to $22.2 billion by 2025, per Statista's Global Influencer Market Value 2020-2025 (*Global Influencer Market Value 2020-2025*).

Implications: With Instagram Stories outselling traditional billboards in terms of sales, Canadian food and beverage companies must rethink their approaches to customer engagement. With authenticity now key to success, influencers are trusted voices that generate referrals. If companies wish to remain relevant, they must implement AI-based influencer marketing strategies that leverage data to find partnerships that generate a high return on investment. Increasing regulatory standards and increasing public scepticism about fake endorsements are changing the marketing landscape constantly. Artificial intelligence tools to improve targeting will combine digital and offline interaction, making virtual influencers more visible. Adjusting to this new trend, while complying with regulations and anticipating changes in the sector, is a challenge for businesses.

Drivers (D)	Enablers (E)	Frictions (F)	Turners (T)
AI driven Influencer analytics improving Rate of Investment (ROI) and audience targeting.	Rise of AI-generated influencers platforms & automated content generation	Growing concerns over AI-generated influencers and deepfake content authenticity.	Regulatory scrutiny on undisclosed sponsorships and AI-driven influencer marketing, AI-powered advertising and social media manipulation.

TABLE 02: DEFT ANALYSIS FOR INFLUENCER MARKETING & DIGITAL ENGAGEMENT

Extrapolations: To increase their local brand awareness, small food and drink companies will in the coming years start to work more closely with micro-influencers with 1 000 to 100 000 followers. By using automated influencer selection and optimizing campaigns based on real-time consumer behaviour analysis, AI-based influencer marketing platforms should dominate the market within five years. The use of virtual influencers and AI-generated brand ambassadors is on the rise due to increased trust in AI solutions, which puts at risk the reliance on human influencers and the maintenance of a stable level of engagement.

Social Trend: Workforce Displacement Concerns

Overview: AI is changing work life in drastic ways—mostly by redefining our roles and automating the sort of repetitive work that we used to do in the way that people in our parents' generation used to get by on the 9-to-5 schedule. If you don't think that's happening, then try explaining to your kids why, unlike them, you had to log into an online portal at 3 a.m. to schedule your next in-person meeting. Solutions like automated scheduling (hardly the smartest use of AI, but an AI use nonetheless) and human-replacing HR chatbots are helping SMBs bridge the work deficit that our labor shortage has created. And these demands aren't going away; the Bureau of Labor Statistics projects that between now and 2030, the 2020s will see the addition of almost 8 million new AI-relevant jobs.

Signals: In sectors like logistics and food service, the application of AI should increase. Job losses from AI and other forms of automation could be concentrated in these sectors *(S. C. Government of Canada, 2024)*. Labor-intensive, low-wage jobs, especially in service sectors, seem most vulnerable to being automated. Of course, generating AI requires lots of low-wage jobs for people who are not yet qualified to use it *(Khalid, 2023).* The installation and maintenance of AI systems create lots of decent jobs that should ease the worries of anyone concerned about the impact of AI on the labor market. But there's a catch, as this paragraph from the 2024 update of "AI in the Food Industry" *(AI in the Food Industry 2025 | Throughput AI, 2024).*

Implications: The integration of artificial intelligence into the workforce certainly has its benefits. Increased productivity and faster completion times for tasks that would otherwise be done by humans are great advantages. But as we move forward with this technology, we must stop and ask some very important questions. Is AI going to take over our jobs? Maybe. Is it going to make us work harder and under more surveillance than ever before? Probably. And what about these ethical AI specialists we keep hearing about? Shouldn't they be monitoring AI's effects on us, the actual people who work for a living and can't afford to be replaced by a robot?

Drivers (D)	Enablers (E)	Frictions (F)	Turners (T)
Aging workforce: Cost-cutting Demands; Labor shortages, AI in workforce augmentation	AI-powered scheduling and workforce optimization reducing operational costs. Need for reskilling initiatives to transition workers into AI assisted roles.	Resistance from labor unions and job displacement fears.	Job losses leading to workforce instability

TABLE 03: DEFT ANALYSIS FOR WORKFORCE DISPLACEMENT CONCERNS

Extrapolations: AI is changing workplaces as it automates repetitive tasks and begins to redefine job roles. Solutions that are powered by AI and assisting small and medium-sized businesses (SMBs) in making up for labor shortages and efficiency gaps include robotic assistants, HR chatbots, and automated scheduling. These productivity tools are driving down staffing costs even as they deal with human inefficiencies that can’t be overcome without automation. If the past is any guide, the deployment of these tools is bound to create concerns about skill shortages and job displacement.

Technological Trend: AI Powered Nutritional Profiling & Food Innovation

Overview: Artificial intelligence is transforming the food innovation landscape through revolutionary changes. The reasons are not hard to find. Efficiency. Personalization. Science. Here is a simple overview of what AI does or, more accurately, what it can do for food innovation: Artificial intelligence is driving a revolution in food innovation. The reasons are not hard to find. Efficiency. Personalization. Science. The recipe development process led by AI in food innovation boosts the nutrients in ingredients while ensuring complete dish assembly from sourcing to serving to match any health, lifestyle or taste need.

Signals: IBM Watson utilizes Food Data Central API Python applications to perform AI-driven analysis of ingredient data for nutritional profiling and dietary recommendations *(New Study Reveals Canada's SMBs Are Turning AI Curiosity into AI Action – Microsoft News Center Canada, 2024).* The organization Habit leads this innovation with dietary recommendations tailored to each person's biometric and genetic information *(DigitalDefynd, 2024).* Coca-Cola's AI-powered vending machines customizes drink mixes based on user preferences. Starbucks & McDonald's offers Personalized AI recommendation systems based on their previous orders and preferences, enhancing customer satisfaction and loyalty and hence driving upselling *(Blogger, The future of dining: AI-Driven Solutions for personalized food and beverage experiences 2023)*. The Chipotle restaurant chain utilizes an AI-driven assistant called Guac Bot for customer inquiries about their menu and ingredients which results in 23% lower call center expenses and 19% higher customer satisfaction scores (*AI in Food and Beverage – Smart Secret Ingredient*, 2024). Mondelez International uses artificial intelligence to create delicious products by taking into account factors like ingredient costs and environmental impact while producing 70 market-ready products at an accelerated speed *(*Court, 2024).

Implications: IBM Watson Health and machine learning examples of AI solutions that are addressing these huge concerns and that are really helping to fill this massive void. To do what, you ask? Well, to provide the truly customized, individualized nutritional guidance that seems to be critically necessary today. These AI solutions work with us, or rather they work for us, in doing the following: they assess our situations (at least from an AI point of view) and they generate meal plans and dietary advice that fit us like a glove; hence the term personalized nutrition.

Drivers (D)	Enablers (E)	Frictions (F)	Turners (T)
Rising demand for personalized nutrition plans and AI-driven meal recommendations.	AI-driven biometric data analysis, smart meal planning tools.	Trust issues with AI designed meals, health advice and recommendation.	AI regulations delaying food innovations, biotech-based approvals and trust issues regarding heath claims.

TABLE 04: DEFT ANALYSIS FOR AI POWERED NUTRITIONAL PROFILING & FOOD INNOVATION

Extrapolations: By 2040, it's possible intelligent health ecosystems will evolve from today's AI-driven meal trackers. These will be "smart" systems that go beyond basic dietary recommendations to real-time, integrated health advice. The foundations of such an architecture are already in place, with wearable fitness technology that ties into mobile health applications. From there, a universe of potential opens. For instance, your meal composition and the associated nutrient value could be determined by an AI-powered kitchen (to the degree that some components of "smart" kitchens might count as wearables).

Technological Trend: Automation in Food Service & Delivery

Overview: Automation in food production is making it more efficient and reducing the need for human workers. Food delivery drones, robot chefs, and automated drink dispensers are becoming ever more common. Quick-service restaurants (QSRs), cloud kitchens, and commercial kitchens are working with AI-powered robotic chefs and automated food processing units to achieve labor efficiency, speed, and accuracy. The automation of meal assembly processes alongside quality assurance tasks and repetitive food preparation work enables robots to perform necessary functions for both processing units and human workers.

Signals: Spyce, located in Boston, is utilizing robotics in a fully automated kitchen, with robots preparing food and using artificial intelligence algorithms to ensure that each dish is prepared exactly as intended, which drastically reduces wait times and increases customer satisfaction (DigitalDefynd, 2024). An artificial intelligence-driven pizza robot at Domino's (DigitalDefynd, 2024). A dining experience holographically will be hosted by an artificial intelligence, in which AI chefs will interact with customers, explain the composition of the meal, and recommend some pairings (some of which are already available as an experiential dining experience in Toronto; see, Example: Le Petit Chef (Le Petit Chef, 2020).

Implications Quick-service restaurants and cloud kitchens will benefit from the speed, accuracy, and consistency that AI-powered robotics bring to the fast-paced food service industry. AI-powered quality control, robotic drink dispensers, and automated prep are raising the bar and increasing productivity while lowering expenses. But progress also brings difficulties; some diners still yearn for the human touch, and labor resistance is sparked by job displacement. Automation and moral workforce transitions must be balanced by small businesses, which should also fund training initiatives to assist displaced employees.

Drivers (D)	Enablers (E)	Frictions (F)	Turners (T)
Rising demand for automation, efficiency and reduced labor cost.	AI-integrated POS (Point-of-Sale) systems, AI-powered delivery logistics, and robotic food preparation.	High implementation costs, especially for SMBs. Consumer preference for human-prepared meals in fine dining experiences.	AI improves operational speed but challenges traditional culinary employment. Consumer resistance to full automation in dining

TABLE 05: DEFT ANALYSIS FOR AUTOMATION IN FOOD SERVICE & DELIVERY

Extrapolations: Envision entering a completely self-sufficient dining establishment where robotic chefs expertly prepare your food, AI-powered kitchens tailor meals to your preferences, and holographic hosts lead your meal. By 2035, AI-driven personalization will be used in fine dining, fast food restaurants, and even home kitchens to create meals according to dietary requirements and biometric information. This change won't be welcomed by everyone, though. There will be a backlash; "handcrafted dining" will become a luxury, with human chefs providing a high-end, artisanal experience. Smart and automated food is the way of the future, but balance is key to success. The human touch must be enhanced by AI, not replaced, according to businesses.

Environmental Trend: AI for sustainability & Food Wastage Reduction

Overview: To achieve a low-carbon society, artificial intelligence (AI) is applied in many ways to assist in the worldwide push toward sustainability. Food service businesses are reaping the benefits of this application: AI is helping them waste less food and reduce their carbon emissions, especially during the delivery process. What's more, AI is also helping to improve food supply chains. An efficient food supply chain is vital if we are to realize a low-carbon society. Things like government initiatives and international sustainability objectives (e.g., the 2030 Agenda for Sustainable Development) have made AI a key tool for monitoring environmental performance and transforming business models.

Signals: AI-powered products like Winnow and Orbisk optimize supply chains, minimize restaurant food waste, and maximize the energy consumption of logistics. AI solutions help us use energy more wisely and reduce our carbon footprints *(AI in the Food Industry 2025 | Throughput AI, 2024).* Food deliveries are getting better and carbon emissions are going down thanks to AI-powered logistics *(Scale AI | Canada's AI Cluster, Promoting Artificial Intelligence, 2024).* Government funding for AI-powered sustainability initiatives. increased use of AI to monitor environmental impacts from industries *(Scale AI | Government of Canada, 2024).* Sustainable Goals for Agenda 2030, using AI to monitor and adapt to the environmental impacts of food production *(G. A. Canada, 2017).*

Implications AI-driven waste reduction is now standard in the industry. It cuts costs and allows firms to meet their sustainability targets. If you think this is an exaggeration, consider this: Half of the food produced worldwide ends up as waste. That is a $1 trillion problem. The Federal Government's think tank, the National Artificial Intelligence Initiative Office, reports that the use of AI in preventing food waste will pay off big, both economically and environmentally.

Drivers (D)	Enablers (E)	Frictions (F)	Turners (T)
Regulatory Push for Sustainability	AI-powered waste tracking and smart food inventory management.	Adoption barriers for small businesses due to cost, long term investments and infrastructure limitations.	Failure to adopt AI leading to sustainability fines

TABLE 06: DEFT ANALYSIS FOR AI FOR SUSTAINABILITY & FOOD WASTAGE REDUCTION

Extrapolations: Small businesses will have easier access to eco-friendly AI solutions thanks to the implementation of AI sustainability grants by governments. AI-powered carbon footprint tracking will be required for food production, and real-time sustainability dashboards will make the process transparent for both consumers and regulators. AI-powered food waste monitoring will be widely used by 2030, helping businesses cut costs and excess inventory.

Economical Trend: AI in Supply chain Optimization & Inventory Management

Overview: AI plays a transformational role in optimizing supply chains by impinging broadly on the improvement of logistics. Its impact is felt in three areas, all of which have to do with making supply chains more visible, better understood, and more efficient: 1. Traceability 2. Demand prediction 3. Automated inventory tracking and management. Humans have always been at the center of these three indispensable functions of supply chain management. Now, artificial intelligence is taking over, improving efficiency, and exerting more and more control.

Signals: To ensure food safety and lower the risk of contamination, businesses like IBM's Food Trust use blockchain and artificial intelligence to track the supply chain (Vidhani, *2025*). Blue Yonder and other AI-enabled inventory management systems reduce food waste by using predictive analytics *(BSEtec, 2024)*. TE-FOOD is an example of a platform that combines blockchain and AI to ensure food safety and traceability through end-to-end supply chain transparency *(Blogger, The future of dining: AI-Driven Solutions for personalized food and beverage experiences 2023).*

AI solutions used by Wasteless help to dynamically adjust food prices, improving inventory turnover and reducing waste *(Blogger, The future of dining: AI-Driven Solutions for personalized food and beverage experiences 2023).* Taco Bell: The fast-food chain aimed to improve customer satisfaction, order accuracy, and efficiency by deploying its AI-driven drive-thru system at hundreds of locations. Because of the AI system, employees can now concentrate more on direct customer interaction and the quality of the food *(Blogger, The future of dining: AI-Driven Solutions for personalized food and beverage experiences 2023).*

Nestlé has implemented demand forecasting driven by artificial intelligence and is using it throughout its supply chain to cut waste and optimize inventory. The results are impressive. Nestlé now boasts a 95 percent accuracy in predicting demand, which it does through the analysis of sales data, weather patterns, and a host of other factors. The food giant reports a 20 percent decrease in inventory and a 10 percent increase in on-shelf availability as a result of its forecasting *(Blogger, The future of dining: AI-Driven Solutions for personalized food and beverage experiences 2023).*

AI-powered platforms such as ThroughPut AI use historical data to predict demand and minimize spoilage. Tyson Foods uses artificial intelligence (AI) in computer vision to automate quality checks on its production lines. (*AI in the Food Industry 2025 | Throughput AI*, 2024). Millions of dollars in annual cost savings are achieved by assisting the company in identifying defects 50% faster and requiring less manual labor *(Blogger, The future of dining: AI-Driven Solutions for personalized food and beverage experiences 2023)*.

Implications: Forecasting demand, controlling inventories, and ensuring food safety—all these functions of the supply chain are being transformed by artificial intelligence and the ever-deepening penetration of our systems into the Internet of Things. And what small business wouldn't want to do better in all those areas? They are fundamental to running an efficient operation and to making money. Expensive wastage, often uncalculated, is built into our food supply system. By not using AI or not being able to use it, small businesses will find the system too forgiving of errors for them to stay competitive.

Drivers (D)	Enablers (E)	Frictions (F)	Turners (T)
Demand for real-time logistics tracking & predictive demand forecasting. Increasing regulatory and consumer expectations for food traceability.	AI-powered blockchain systems ensuring food safety and transparency. Smart inventory tracking, automated warehouse management, and demand prediction tools.	Cybersecurity threats in AI-driven supply chains. High costs and reluctance among SMBs to implement AI solutions.	AI failures disrupting food supply chains and data security concerns.

TABLE 07: DEFT ANALYSIS FOR AI IN SUPPLY CHAIN OPTIMIZATION & INVENTORY MANAGEMENT

Extrapolations: Supply chains powered by AI will be completely self-sufficient by 2035, with self-optimizing logistics networks that can anticipate and react instantly to changes in demand, weather, and delays in transit. But widespread adoption may be slowed by cybersecurity threats in AI-powered supply chains, SMB resistance to implementing new technology, and consumer mistrust of algorithmic food control. Real-time logistics tracking and the drive for sustainable supply chains will spur additional AI developments, improving the resilience, speed, and intelligence of food distribution.

Economical Trend: Financial Barriers for Small Business Adoption

Overview: Small business operations can undergo a complete transformation due to the revolutionary potential of AI. With this new technology comes an opportunity—the opportunity to leverage predictive analytics and automated inventory management in a way that could dramatically alter the otherwise routine business of operating a small enterprise. Yet, on the threshold of this revolutionary change, many small businesses appear stuck—they can't seem to come up with the capital necessary to pay for this new opportunity. They certainly can't afford the gaudy price tags associated with AI that large firms can easily cover. And large firms, in contrast to small ones, find it much easier to secure the all-important funding needed to bring about change under the umbrella of anything AI.

Signals: The high cost of AI implementation keeps SMBs from adopting it. These companies must weigh the immediate expense of the investment against its promised long-term benefits *(McKinsey, 2024).* AIaaS (AI as a Service) and cloud-based AI tools help reduce costs, making it more feasible for small and medium-sized businesses to pay for the kind of AI they need. *(Forbes, 2025).* When we look at the SMB experience in the Signals report, we see a group of companies struggling to adopt, integrate, and make use of basic AI tools. This story is partly about money, but it's also about connections, 30% of small businesses don't even have a working internet connection *(Microsoft AI, 2025).* Government grants and funding initiatives are emerging to support SMB AI adoption *(Government of Canada, 2024).*

Implications: The pace of digital transformation is slow because many small enterprises are unable to invest in AI. This lack of access to AI, and therefore to the kinds of solutions and efficiencies that drive cost savings and enhance competitiveness, is widening the gap between small businesses and large firms. According to a recent McKinsey report, 50% of small businesses in the U.S. can't even afford the kinds of AI and digital solutions that are necessary for driving efficient transformation. That's getting left behind in a big way.

Drivers (D)	Enablers (E)	Frictions (F)	Turners (T)
Efficiency gains through AI adoption Alaas & No Code AI	Government AI funding programs. AI-as-a-Service (AIaaS) or no code AI platforms lowering adoption barriers by declining costs. Cloud-based AI tools offering scalable solutions for SMBs.	High initial investment costs of AI integration and ongoing maintenance expenses. Limited AI literacy among small business owners.	AI monopolization by large enterprises

TABLE 08: DEFT ANALYSIS FOR FINANCIAL BARRIERS FOR SMALL BUSINESS ADOPTION

Extrapolations: Federal funding for AI will increase by 2028 and encourage small and mid-sized businesses to find affordable AI options. AI solutions as a service will be commonplace, and small firms will rely on them to get the most critical AI capabilities, without having to spend a ton on them. AI-powered financial forecasting tools will help small and mid-sized firms understand the ROI of AI initiatives before they undertake them. No-code, low-cost AI platforms will be the new normal, and the upshot will be that AI will be a competitive requirement for all but the most niche businesses.

Political Trend: AI Policies and regulatory Frameworks

Overview: The uptake of artificial intelligence in the food and drink sector is increasingly shaped by government regulations, data privacy laws and ethical frameworks for AI governance. Policymakers are introducing stronger rules on AI-based decision-making, data usage and transparency to ensure that AI systems are fair, responsible and meet ethical standards. Nevertheless, legal uncertainties and compliance costs create challenges, especially for small businesses integrating artificial intelligence.

Signals: Canada's AI and Data Act requires more accountability and transparency from AI in automated decision-making. With regards to data privacy, decision-making, and consumer protection, the European Union's AI Act is establishing international standards. In order to guarantee impartial food recommendations, equitable pricing, and responsible automation, regulatory agencies are demanding AI audits *(Toronto Food & Beverage Manufacturing Sector Road Map 2020 - 2030 Collaborating to Enhance Pathways to Innovation and Growth, n.d.).* Consumer support for AI ethics is increasing, which is pushing legislators to enact more stringent guidelines for AI compliance.

Implications: For AI-driven food personalization, pricing, and automation to be transparent, businesses must use AI explainability measures. increased expenses associated with compliance for SMBs implementing AI-driven food innovation, logistics, and customer engagement. Government-sponsored regulatory sandboxes and AI audits enable companies to test AI models in controlled settings prior to full implementation. Growing public apprehension about algorithmic decision-making and AI bias in sustainability, restaurant recommendations, and food supply chains.

Drivers (D)	Enablers (E)	Frictions (F)	Turners (T)
Demand for Open source, transparent AI. Government enforcing Ethical AI usage. Global tech races & competition in AI Leadership. Economic recovery initiatives	AI auditing tools ensuring compliance with ethical standards in automation. Government-led AI oversight committees setting industry benchmarks.	Fragmentation of AI a development, Unequal access to AI resources. Unclear AI liability in decision-making compliance difficult for small businesses.	Global inconsistency in AI regulations may hinder innovation.

TABLE 09: DEFT ANALYSIS FOR AI POLICIES AND REGULATORY FRAMEWORKS

Extrapolations: Global AI governance frameworks will be standardized by 2030, necessitating that companies abide by laws pertaining to global AI ethics and transparency. AI certifications and compliance audits will be required for food companies that use AI for pricing strategies, workforce automation, and menu personalization. Food services will be shielded from discriminatory AI-based pricing and customer segmentation by stricter AI bias detection regulations. To ensure the ethical application of AI, government-funded AI regulatory organizations will supervise AI-driven food production, sourcing, and decision-making.

Political Trend: AI Innovation Clusters & Ecosystem Growth

Overview: Innovation clusters serve as collaborative hubs where startups along with corporations, research institutions and governments unite to speed up AI integration within the food and beverage industry. The integration of technological advancements with regulatory support and funding opportunities creates an ecosystem where AI-powered food innovation and supply chain automation can thrive alongside sustainability solutions.

Signals: Canada promotes AI adoption and commercialization through innovation clusters (Innovation, 2025b). Minister François-Philippe Champagne announced the initiation of the AI Compute Access Fund. Federal initiatives to fund AI innovation clusters. Small and medium-sized enterprises (SMEs) will receive up to $300 million through this Fund for affordable access to computing power to develop AI products and solutions made in Canada (Innovation, 2025b). Businesses are encouraged to advance their AI systems through the adoption framework by developing explainable and responsible AI models that prioritize transparency (Responsible AI | Google Cloud | Google Cloud, n.d.). Public-private partnerships dedicated to AI development are increasing according to Scale AI | Canada's AI Cluster, Promoting Artificial Intelligence (Scale AI | Canada's AI Cluster, Promoting Artificial Intelligence, n.d.).

Implications: AI advancements will accelerate between 2025 and 2035 through innovation clusters enabling faster market release of recipe-making tools and supply chain management systems that enhance food safety. Through innovation clusters the food sector will receive strong AI standards and ethical guidelines to ensure compliance while maintaining transparent operations for responsible AI deployment. AI technologies enable cross-sector collaboration between agriculture, retail and logistics to establish connected smart food ecosystems which enhance supply chain efficiency and support sustainability as well as resilience.

Drivers (D)	Enablers (E)	Frictions (F)	Turners (T)
AI clusters accelerating industry-wide collaboration, research, and commercialization. Increased AI funding for food tech startups and SMBs.	Public-private AI partnerships fostering innovation and knowledge sharing. AI-focused accelerators and incubators supporting emerging food tech solutions.	Unequal access to AI resources among small and large businesses. Concentration of AI development in tech hubs, limiting regional participation.	Limited participation of small businesses in AI

TABLE 10: DEFT ANALYSIS FOR AI INNOVATION CLUSTERS & ECOSYSTEM GROWTH

Extrapolations: AI innovation clusters will drive transformation within the food industry by fueling rapid advancements and creating job opportunities while reshaping global food ecosystems.

Values/ Ethical Trend: Ethical AI & Responsible Food Technology

Overview: The food and beverage industry now sees ethical considerations rise to prominence because of deep AI integration. Consumers expect AI systems to improve food sourcing processes along with fair wages and sustainable supply chains while maintaining transparency. Businesses utilize AI-powered traceability tools to achieve ethical sourcing while fair-trade initiatives adopt AI technologies to monitor product origins. However, mistrust lingers. Consumers express doubts about AI involvement in making choices regarding ingredient sourcing together with pricing algorithms and food personalization methods. Mishaps demonstrate the dangers of excessive automation dependence as well as impersonation and privacy issues which lead to growing skepticism.

Signals: The AI-powered drive-thru system at McDonald's experienced operational difficulties because it misunderstood customer requests leading to 15% of orders being mishandled *(abbie@lalacommunications.com, 2024)*. AI models generating fake user identities have led to debates about impersonation risks and privacy violations (Eliot, 2025)**.** The implementation of ethical AI practices in supply chain management has enhanced transparency according to Scale AI and the Government of Canada in 2024 *(Scale AI | Government of Canada, 2024)*. Fair-trade initiatives began to use AI tracking systems *(AI in Food and Beverage – Smart Secret Ingredient, 2024)*. Artificial intelligence systems enable restaurants to prevent unethical food sourcing according to TasteGPT 2023 *(TasteGPT, 2023).*

Implications: AI driven transparency may become standard. To maintain consumer trust businesses, need to disclose the extent of AI involvement in food sourcing, production processes, and supply chain operations. The use of AI for ingredient selection and sourcing has potential to unintentionally reinforce existing biases which could influence pricing and availability. Real-time verification of ethical sourcing is now possible because AI systems authenticate fair-trade practices. The risk of losing business credibility emerges when AI systems incorrectly interpret customer preferences or mishandle orders like the errors seen with McDonald's AI drive thru. The increased use of AI in food ethics may lead to governments requiring AI transparency laws that enforce business accountability.

Drivers (D)	Enablers (E)	Frictions (F)	Turners (T)
Consumer demand for AI ethical practices Increased scrutiny on AI bias and ethics.	AI-driven fair trade verification tools & certification systems for sustainability.	Bias in AI-driven pricing models affecting fair access to food. Concerns over AI controlling food supply chain decisions leading to Preference for local and traditional food sourcing.	Loss of consumer trust due to AI opacity

TABLE 11: DEFT ANALYSIS FOR ETHICAL AI & RESPONSIBLE FOOD TECHNOLOGY

Extrapolations: AI-powered ingredient sourcing will be the backbone of the sector by 2035, guaranteeing ethical supply chain verification in real time. With the use of blockchain technology and artificial intelligence, each meal will have a digital footprint that enables customers to follow ingredients from farm to table. To gain credibility, companies might have to reveal how AI affects pricing and sourcing, and ethical AI certifications are the gold standard. To ensure equitable access to food, AI-powered bias detection will protect fair pricing and distribution. Global AI regulation requires companies to strike a balance between ethics and innovation to keep food from becoming just smart but also equitable, sustainable, and profoundly human.

Legal Trend: AI Governance, Compliance & Data Privacy Regulations

Overview: Reduction of PIPEDA's jurisdiction, the area where the law applies might be the new norm, even as Ottawa intends to make compliance costlier for AI-driven small businesses, and businesses using AI, anyway, under a slew of new oncoming laws, like the Canada AI and Data Act. Despite Ottawa's intention, the new law and other new laws could significantly harm small businesses and the larger small business sector. Lawsuits have the potential to harm small businesses in the AI sector, too, through significant legal costs and by serving as a disincentive to invest in and commercialize new technologies.

Signals: The PIPEDA law limits AI-driven data collection in Canada while the AI and Data Act establishes rules for AI use *(Innovation, 2025)*. The Canadian Artificial Intelligence Safety Institute established ethical AI policies for nutrition and health tech applications in 2024 *(Canadian Artificial Intelligence Safety Institute, 2024).* Small businesses must now follow newly implemented AI accountability measures *(Microsoft AI's Impact on CPG, Food and Beverage Manufacturing, and Retail*, 2024). The widespread adoption of AI personas that mimic users has sparked worries about impersonation threats and privacy violations. Public attention has repeatedly centered on risks and failures stemming from AI technologies throughout the previous year. The AI Incident Database and the OECD AI Incidents Monitor are among new tools developed to track AI incidents *(Eliot, 2025).*The proposed legislation for AI transparency targets data collection procedures *(Canada Foodservice Market Size | Mordor Intelligence, n.d.).* Global emergence of new customer interaction AI ethics policies *(Chacko, 2023).* AI-driven dietary control systems and health algorithms expose privacy risks and create dependencies for users. Training expenses remain high while public trust in AI systems is challenged by existing biases (*Economic Potential of Generative AI | McKinsey*, n.d.-b). According to Paul Lipman, CEO of BullGuard small businesses remain vulnerable to cyber-attacks because they fail to treat security as a top priority and therefore become frequent targets. Protecting data against unauthorized access can be straightforward but fixing breaches after they occur proves more difficult *(BullGuard, 2023).*

Implications: Small businesses struggling with the same changing regulations as everyone else might find themselves a little less able to keep up when it comes to the burgeoning artificial intelligence space. The first thing you ought to know is that the use of AI in your operation could lead to some pretty big benefits, most of which we will outline later in this guide. But as with anything else, there are a few things to watch out for when it comes to using AI. These things involve training, which we will discuss in Section 6; making decisions that your work—and the work of the AI—are to be held accountable for; and ensuring that you maintain the kind of low risk, high reward ratio that makes operating a small business worthwhile. If you were to do all this in a vacuum, you might be okay. But trust me: it's best to avoid vacuums altogether.

Drivers (D)	Enablers (E)	Frictions (F)	Turners (T)
Rising concerns over AI's impact on data security and AI-driven personalization ethics. Stricter AI regulations enforcing transparency and accountability in food tech.	AI compliance tools ensuring regulatory alignment. Consumer opt-in mechanisms enhancing AI trustworthiness.	Legal uncertainty around AI liability. Fear of lawsuits. High cost of regulatory compliance. Balancing Innovation & regulation	Legal penalties for AI-related privacy breaches.

TABLE 12: DEFT ANALYSIS FOR AI GOVERNANCE, COMPLIANCE & DATA PRIVACY REGULATIONS

Extrapolations: Over the next five years, AI in food service will be about compliance as much as innovation. The enforcement of stricter AI data privacy regulations will necessitate the express consent of consumers for AI-driven data collection and personalization. For companies that use automated decision-making for food sourcing, pricing, and recommendations, AI ethics audits will become required. Legal liability frameworks that specify who bears responsibility for mistakes made by AI in automated food preparation and customer interactions will come into existence. The expenses and investments required for compliance may deter small businesses from implementing AI. The companies that do it correctly will be at the forefront of the next wave of responsible, intelligent food service. Governments may need to provide grants and funding to small businesses to encourage the ethical use of AI.

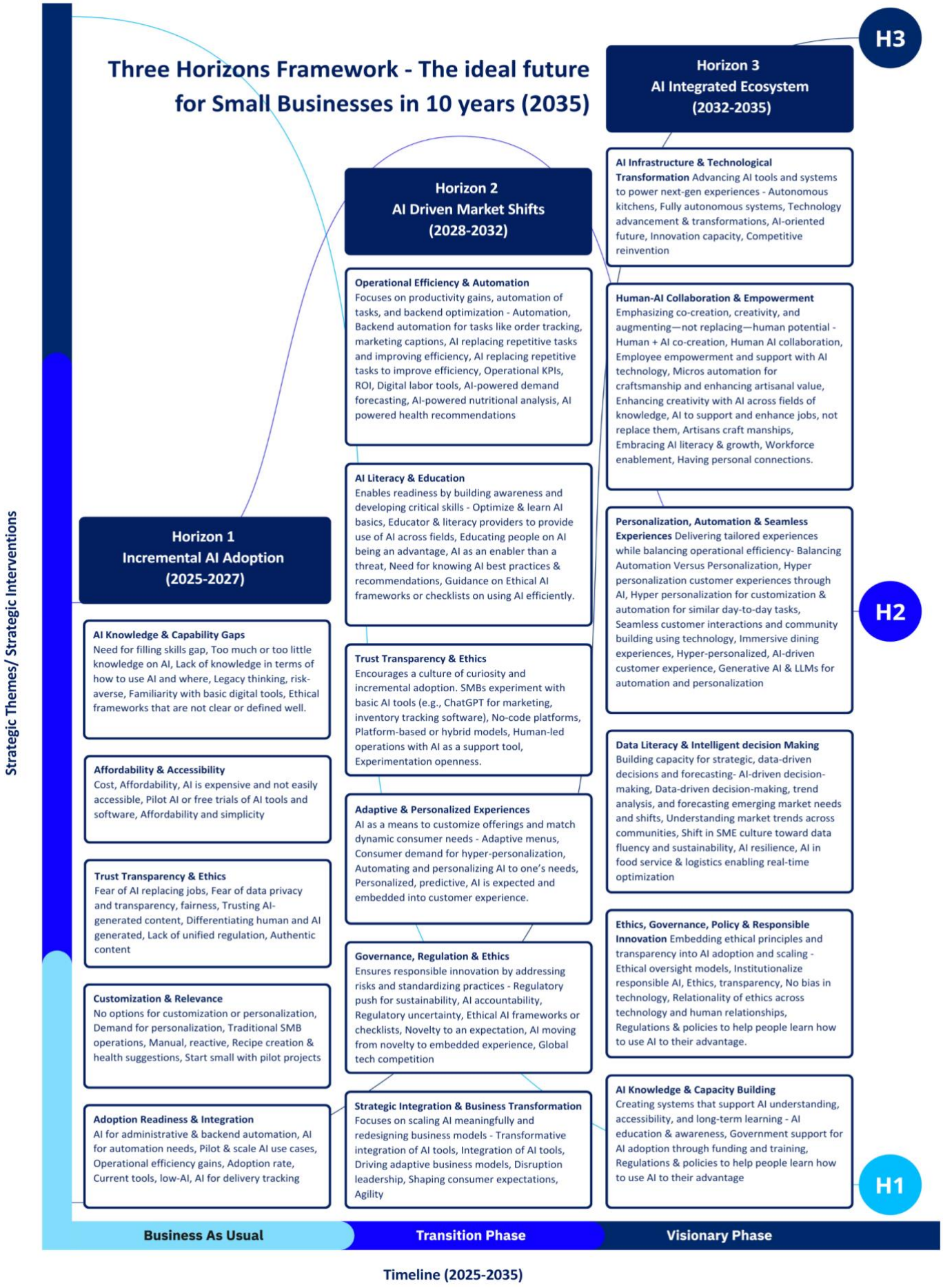
DEVELOP - CREATING AI ADOPTION STRATEGIES

As SMBs explore AI adoption, the final step in the Technology Acceptance Model (TAM) is actual system use, strategically integrating AI-driven automation to enhance efficiency while preserving human-centered business practices. To develop an effective implementation strategy, we apply McKinsey's Three Horizons Model, a growth framework designed to help businesses navigate the future in a structured and coordinated way. In the context of transformations there are always three horizons in play offering insights into possible alternative futures. Y axis is what's dominant and X axis tracks time. H1 is Business as Usual where small businesses are today? H3 Visionary future, the future where we want small businesses to be? and H2 is arena of transition phase a space of change from H1 to H3.

By leveraging Horizon Scanning and Field Research, we identify three distinct horizons that map out a future roadmap for SMBs in the F&B sector, envisioning AI-driven growth by 2035. This structured approach allows us to challenge existing growth strategies, define innovation pathways, and ultimately address our core research question: **How might small businesses in the Food & Beverage sector leverage AI to automate operations and deliver hyper-personalized customer experiences, ensuring sustainable growth and competitive advantage by 2035?**

Three Horizons Framework: Guiding AI Adoption and Growth

FIGURE 7: A DEMONSTRATION OF THREE HORIZONS DEPICTING IDEAL FUTURE FOR SMBS CREATED BY ME – VISIONING THE FUTURE



The above visual represents a Three Horizons framework mapping the transformation of small businesses toward an AI-integrated future by 2035. First phase of analysis involved mapping data received from field research to the Horizons to define the right path (Appendix B: Three Horizons Mapping Field Research to Future Horizons). These data were further synthesized into themes for ease in defining the roadmap and win/win strategies for transformation. The Timeline from 2025-2035 outlines:

- **Horizon 1 (Business as usual or Incremental AI Adoption):** Challenges such as skills gaps, affordability, and lack of AI knowledge dominate, though early innovations like pilot projects and automation tools are emerging.
- **Horizon 2 (Transition Phase or AI Driven Market Shifts):** Focus shifts to scaling AI adoption through education, ethical frameworks, adaptive tools, and efficiency-driven solutions.
- **Horizon 3 (Visionary Future or AI Integrated Ecosystem):** Envisions a human-AI collaborative ecosystem featuring hyper-personalized experiences, ethical AI, autonomous systems, and sustainable innovation—while retaining artisanal values and transparency.

Each block highlights system elements to transform, reuse, or sustain, offering a structured pathway from today's constraints to a preferred future.

Where small businesses are today? H1 Business as usual (2025 - 2028) Incremental AI Adoption

This horizon represents the status quo, where small businesses face a range of challenges that inhibit AI adoption. Horizon 1 innovations are generally short-term that generate results in 1-3 years (2025 -2028). Most small F&B businesses are currently situated in Horizon 1, where AI adoption is incremental, cautious, and cost-driven. The focus is to explore the need of AI and optimizing existing operations with AI to improve efficiency, reduce costs, and personalize consumer experiences without disrupting existing workflows or industry disruptions. This stage is about experimentation and evaluation of organizational readiness with AI.

Signals of Misfit - What signs in the system that we have today no longer fit for the future?

- **Systemic friction –** Manual processes are slow, and that worked smoothly are now slow, redundant and costly. For example: Manual inventory systems struggling to keep up with real time delivery or omnichannel demands of customers.
- **Digital Inequality –** Disparities exist between tech savvy, early adopters and traditionally run establishments still learning digital basics and relied on manual processes.
- **Mismatch between expectations & capabilities –** Today's stakeholders, whether customers, employees, or partners/suppliers—demand fast, seamless, and personalized experiences that many current systems simply can't support. Small businesses often struggle to keep up with the pace, juggling manual inventory tracking, order management, and limited-service hours. As consumer expectations evolve; seeking variety, health-conscious options, and AI-powered personalization; manual processes become bottlenecks. The demand for 24/7 availability and real-time customization highlights the gap between what stakeholders expect and what traditional, human-only systems can deliver. Automating key operations isn't just a convenience, it's a necessity to stay relevant and competitive.

- **Over Reliance of Legacy systems –** Change is inevitable; and businesses that fail to adapt risk being left behind. Small businesses that continue to depend on outdated systems and manual processes may find their growth, agility, and delivery speed significantly hampered. Holding onto the mindset of "this is how we've always done it" can quickly shift from being a tradition to a liability. In today's fast-evolving landscape, even small, strategic investments in modern technology can make a big difference. For example, during the COVID-19 pandemic, many small businesses without digital infrastructure struggled to pivot online, resulting in lost revenue and, in many cases, permanent closure. Embracing change is no longer optional, it's necessary for resilience and maintaining a competitive edge.
- **Limited AI Integration & Low AI maturity –** Adoption is focused on simple, affordable tools like automated social media captions, basic inventory management, chatbot support. Many businesses are in pilot or testing phases, unsure about Return on Investment and long-term impact.
- **Unified Regulation:** AI offers significant benefits, but the lack of a consistent regulatory framework hinders adoption, especially for small businesses with limited resources. While well-designed regulations can promote trust and reduce risk, fragmented policies create barriers. Balancing innovation with compliance remains a key challenge, calling for clearer, more cohesive governance to support responsible AI growth.
- **Overwhelming change & Rising Complexity:** Increased complexity (regulations, customer behaviors and technologies overwhelm existing businesses & processes. What technology to follow and what to adapt becomes a challenge for many small businesses.
- **Fragmented Customer Journeys -** Fragmented customer journeys impact business performance, where customer experiences become disjointed across digital and physical touchpoints. For example: Social media engagement is strong, but conversions drop due to poor checkout UX or lack of predictive insights.

What are the values and practices helping to prop up the current system?

- **Experiment & use cost effective solutions:** Small businesses may start or continue to experiment with basic AI tools (e.g., ChatGPT for marketing, inventory tracking software) to build familiarity measure operational efficiency. AI usage is limited to cost-effective, user-friendly tools. AI adoption is financially cautious with AI investments being minimal, ensuring tools align with affordability goals (e.g., $10–$30/month subscriptions).
- **AI for administrative & Backend Automation:** AI adoption remains gradual and cost-driven, focused on backend automation. SMB's use AI for Backend automation for tasks like order tracking, marketing captions. Automation supports administrative tasks like order tracking, social media posting, and inventory management.
- **Start small with Pilot Projects:** Small businesses could evaluate & test organizational readiness to AI adoption by determining task opportunities that can scale. They can start with familiarizing and educate themselves and the team with basic digital tools simple tools where some manual operations remain dominant, with AI complementing human-driven tasks rather than replacing them.
- **Automation of repetitive tasks -** AI technologies automate routine tasks to support customer management. It may also help bakers craft baking/food accessories such cake toppers, suggest management of packaging, branding etc., while maintaining personal touch. Use of manual operations but experiment with simple inventory or scheduling tools. Discover how AI can create Instagram captions that save time while preserving authenticity of the content.

Where we want small businesses to be? H3 Visionary Future (2032 - 2035) - AI Integrated Ecosystem

In Horizon 3, Small businesses venture a fully AI integrated ecosystem by 2035. This horizon focusses on AI-driven, autonomous ecosystems with a focus on ethics, workforce transformation, and governance. This is the ideal future that we foresee for small businesses in food and beverage industry which earns their competitive advantage. Although we can envision multiple possible futures, this inspiring values-led vision provides a defined strategic direction towards Horizon 3. Here are the key characteristics of H3:

What vision of the future are there & what values are we going to stand for & how can we collaborate with others to make our vision a reality?

- **AI integrated across multiple operations of small business -** AI integrates across all small business areas, marketing, production, customer services, with minimal human intervention.
- **AI for hyper personalization -** Small Businesses use AI for hyper-personalized customer experiences and data-driven innovations e.g., menu identification, calorie counter for health friendly customers, flavor customization based on AI-analyzed trends.
- **Ethical and responsible AI –** There is a need for promoting and educating on fairness, bias, consent, and data privacy. SMBs are provide d with Ethical AI implementation toolkits and resources to ensure they adhere to transparency and inclusivity in technology adoption. Regulations such as explainability standards and consent-based personalization frameworks have been adopted to encourage responsible AI practices that guide SMBs to design solutions with openness principles, accountability and values that reflect the community.
- **Inventory & logistics Management -** There is AI-driven end-to-end inventory and logistics management, enhancing sales and market expansion.
- **Human AI Co-creation -** Small businesses explore above and beyond possibilities by using AI for multiple ventures that enhance operations such as experiments with 3D printing for toppers and robotic kitchen assistants while maintaining creative oversight.
- **Sustainable AI practices -** AI helps businesses grow sustainably, reduce food waste, energy use, over production and prioritize local sourcing. Innovation is used to restore ecosystems, not just extract from them
- **Employee empowerment and support with AI technology -** Technology empowers people—not replaces them. AI serves underrepresented communities, enables diverse food cultures, and supports equitable entrepreneurship. Technology enhances the pleasure, taste, and connection that food creates it never replaces the human magic of a good meal or a warm welcome.
- **AI education & awareness -** Customers and staff understand how AI works and what data is used. They are guided and kept up to date on tools and how to use them.
- **Resilient systems –** Systems that can withstand uncertain times such as pandemic, climate change and adapt easily.
- **Building cross sector partnerships & collaborations -** Technology providers, small business and community organizations can collaborate to create AI tool that are affordable and reflect real business practices and local community and cultural needs.
- **Fostering Community Co-Creation Through Shared AI Experiences -** Creating a strong community of practice can empower small food businesses to adopt AI more confidently and collaboratively. By sharing both successes and challenges—especially in areas like inclusive innovation, sustainability, and ethical AI use—entrepreneurs can learn from each other and accelerate responsible adoption. The use of storytelling sessions, workshops, webinars,

and peer-to-peer knowledge exchanges through community experts and technology experts can enable these small businesses to establish a transparent and trustworthy environment within their workflow. This approach prioritizes community co-creation by involving customers, staff/ teams, and local ecosystems in decision-making processes which fosters bottom-up innovation that matches real needs and values. This approach prioritizes community co-creation by involving customers, staff, and local ecosystems in decision-making processes which fosters bottom-up innovation that matches real needs and values.

- **Unified regulatory policies and Government support –** can enhance AI innovations and advocate for better infrastructure investments such as open-source tools, defined ethical policies, AI certifications for small businesses practicing ethical and responsible AI and. Funding and regulatory checklist can help and guide small businesses on right usage and validations.

How will small businesses get there? H2 Transition Phase (2028 - 2032) - AI driven Market Shifts

To reach Horizon 3; a fully AI-integrated, autonomous, and ethically governed future; for small businesses in the food & beverage (F&B) industry, we need targeted interventions that remove systemic barriers and build transformative capacity over time. Horizon 2 is a fragile space; it's where tomorrow is being negotiated. To reach a future that is equitable, sustainable, and human-centered, we must actively protect and steward transformative innovations from being diluted by old systems.

What innovations do we need to make sure aren't just captured (H2-)?

- **Consumer demand for hyper-Personalization & Consumer demand for AI ethical practices -** Can be used as a marketing engine for upselling or data extraction. Ensuring that AI is inclusive and provides value than profit. To embed customer consent, transparency and fairness. Embed ethical review boards in AI adoption processes.
- **AI for workforce Integration -** Risk is that it can be used solely for efficiency and layoffs, not for human-AI collaboration. We can protect this by designing & adopt AI systems to augment creativity and decision-making. Train employees to work with AI, not be replaced by it.
- **AI for sustainability & Regulatory push for Sustainability -** Monitoring food wastage may alone not help in sustainability; we need supply chains to be redesigned to fit the AI adoption across channels. Measuring AI outcomes across carbon reduction, sourcing and waste mitigation could help in protecting sustainability goals.
- **AI Powered Nutritional Profiling & Food Innovation -** Currently they are only accessible and affordable to high end customers and businesses. Rising health inequality. Innovating affordable solutions, culturally diverse, and inclusive food AI tools (such as smart nutrition and allergy scanners) accessible to all. These can also be shared through collaborations and partnerships with health & technology experts.
- **Local innovation hubs & AI ecosystems -** AI tools and infrastructure dominated by large vendors or platforms, locking out local players. Support community-owned data sets, open-source food AI tools, and localized innovation hubs. Local businesses pool data and insights to build AI tools specific to their region (e.g., taste preferences, dietary needs). Co-owned platforms enable food entrepreneurs to access and benefit from shared AI models.
- **AI clusters accelerating industry -** wide collaboration, research, and commercialization - Customer data used primarily for profit (resold, tracked) without customer benefit. Stricter & unified AI regulations enforcing transparency and accountability in food tech. Innovate customer owned data models with privacy. Create Affordable and Accessible tools.

Which ones will be growth points of the future system we want (H2+)?

Horizon 2 focuses on transformative integration of AI tools, driving adaptive business models and shaping consumer expectations. Horizon 2 will involve lot of drivers of change impacting the market shifts towards pushing AI adoption across small businesses.

- **Building AI systems & Tools are affordable -** Technologist could create cost-effective AI tools & pilot affordable AI solutions tailored to varied small business domains & needs (e.g., marketing, inventory management). Implement hybrid AI solutions where AI automates backend tasks, but humans retain customer engagement. Such solutions can lower the entry barriers and demonstrate the tangible benefits of AI.
- **Human-AI Collaboration -** AI is used to Augment not replace Jobs. Autonomous kitchen uses Ai to optimize recipes, while chefs focus on personalization and creativity. AI as an enabler than a threat
- **Customer demand for interactive experiences & personalization -** Use of AI for personalization, targeted marketing, product standardization Innovations might involve adapting technology, processes, or revenue stream structures that already function well in other industries to one's own. The interaction between retailers and customers improves when chatbots and intelligent voice assistants are implemented. Small businesses have access to advanced training programs and workshops that help them develop AI implementation strategies and define automation rules while preserving customer personalization.
- **Demand for personalized nutrition plans and AI-driven meal recommendations:** Businesses of smaller scale apply AI technologies to compute calorie content in products along with gathering feedback after delivery and executing marketing targeted toward specific customer groups.
- **Increasing demand for automation & AI replacing repetitive tasks to improve efficiency:** Small Businesses achieve balance between automation and human-centric strategies to ensure AI functions as a supportive tool while maintaining trust and compliance and protecting jobs. Through AI automation businesses can both expedite repeat ordering processes and tailor products with current data analysis. The implementation of AI-enabled technologies improves products and services by adding new features and characteristics.
- **AI is expected and embedded into customer experience**: There will a shift from a novelty to an expectation! Artificial intelligence will be an enabler for entrepreneurs. As corporate responsibility and consumer demand for sustainability grow, AI-driven solutions will no longer be an option; they'll be a necessity.
- **AI driven Influencer analytics improving Rate of Investment (ROI) and audience targeting -** small businesses could define rulesets to categorize where to automate and where it can be personalized. Small businesses learn and adapt Interactive experience for customers by creating precise profiles and market segmentations through AI. They leverage AI for product standardization and marketing efficiency, prepping for store expansions.

Intervention Model across three horizons

This Major Research Project (MRP) positions AI adoption as a transformative journey for small food and beverage (F&B) businesses—not just a technical upgrade. The Intervention Model serves as a strategic bridge between research insights and real-world action, organizing complex challenges (e.g., ethics, affordability, literacy gaps) into a cohesive roadmap. Anchored in the Three Horizons Framework, it outlines a time-layered approach, from early experimentation to systemic transformation. The diagram below visualizes six interconnected domains of intervention, each scaling from operational pilots to broader cultural, institutional, and ecosystem change.

FIGURE 8: ILLUSTRATION OF SIX STRATEGIC INTERVENTIONS CREATED BY ME FOR SUCCESSFUL AI ADOPTION ACROSS SMALL BUSINESSES

Mapping Implementation Strategies with Strategic Themes using Intervention Framework approach

The AI integration roadmap that is the win/win strategy for small businesses emerged from mapping intervention strategies across three interconnected levels of the system, which include Micro (Small business), Meso (industry, Technology and Community actors), and Macro (policy, governance and infrastructure). Successful AI implementation demands concrete actions that correspond with strategic goals for a defined timeline. The objective is to help small businesses understand AI adoption as an organizational transformation rather than simply a technological enhancement. The below table details the implementation strategies and actionable steps that for small business to adopt AI efficiently.

Intervention Model: Strategic Themes and Actionable Intervention strategies			
Intervention Strategies	**Horizon 1 (2025–2028)**	**Horizon 2 (2028-2032)**	**Horizon 3 (2032–2035)**
Infrastructure & Technological Transformation	Advocate for the adoption of no-code solutions along with artificial intelligence plugins including ChatGPT, Canva AI, and Square AI. Stakeholders: Micro (F&B SMBs), Meso (Digital Tool providers & technology experts, educators, AI Community leaders).	Explore AI implementation for in menu optimization, R&D work, smart kitchen operations, and automated marketing while ensuring platform-level interoperability. Stakeholders: Micro (F&B SMBs); Meso (Interoperability standards groups, Cloud service providers, automation vendors, POS ecosystems).	Move toward fully autonomous, self-optimizing systems; enable interoperability with smart cities and supply chains. *Stakeholders: Meso (Global innovation networks, Global technology leaders; Macro (Policy Regulators).*
Human–AI Collaboration & Empowerment	Introduce affordable, AI-enhanced tools, Curate plug-and-play AI toolkits tailored to industry. Promote a culture of innovation by sharing positive narratives about AI as a creative assistant and not a threat. Stakeholders: Micro (F&B SMBs); Meso (community influencers, digital literacy trainers, Digital Tool Providers).	Establish hybrid human-AI collaboration roles by scaling AI integration & training for AI-augmented processes. Stakeholders: Micro (F&B SMBs); Meso (Educational bodies, UX strategists, employment unions).	Institutionalize human–AI co-creation as a cultural norm and competitive advantage in F&B experiences. Support collaborative innovation. Stakeholders: Micro (F&B SMBs); Macro (Policy makers, labor ministries, chambers of commerce).
Personalization, Automation & Seamless Customer Experience	Pilot personalization features into the workflow by determine specific business functions where personalization can be applied. Automate routine backend operations that take up time. Stakeholders: Micro (F&B SMBs); Meso (Tech startups, POS system providers, software vendors).	Implement personalization at scale with loyalty and context awareness while blending automated systems with emotional intelligence capabilities in customer experiences. Stakeholders: Micro (F&B SMBs); Meso (Customer Experience consultants, data scientists, service designers).	Enable seamless & hyper-personalized interactions using predictive and relational AI. Stakeholders: Micro (F&B SMBs); Meso (AI personalization platforms, Experience researchers and analysts, customer advocacy groups).

Intervention Strategies	Horizon 1 (2025–2028)	Horizon 2 (2028-2032)	Horizon 3 (2032–2035)
Data Literacy & Intelligent Decision Making	Incorporate AI dashboards and analytics training modules into regular work processes. Promote market-based AI-driven approaches for pricing and inventory forecasting through experimentation. Stakeholders: Micro (F&B SMBs); Meso: Technology experts, Digital Tool Providers; Macro (policy Regulators & governance).	Implement real-time analytics capabilities and trend-mapping instruments to monitor supply and demand variations. Normalize AI-supported strategic planning and ROI tracking. Stakeholders: Micro (F&B SMBs); Meso (AI developers & consultancies); Macro (Policy regulators & innovation accelerators).	Develop predictive ecosystems through shared datasets enhanced with AI capabilities for adaptive menus and micro-innovations. Promote data transparency as a brand differentiator. Stakeholders: Micro (F&B SMBs); Meso (Technology experts, cloud infrastructure partners, community experts).
Ethics, Policy, Governance & Responsible Innovation	Promote & educate on fairness, bias, consent, and data privacy. Provide starter templates for ethical AI use (e.g., terms of use for customers). Stakeholders: Micro (F&B SMBs); Macro (Legal aid clinics, privacy advocates, digital policy educators).	Adopt explainability standards and consent-based personalization frameworks; introduce feedback-informed ethical frameworks. Stakeholders: Meso (Technology experts & digital Tool providers. Macro (Policy advocates, Public advisory Board, human rights tech groups).	stablish ethical AI usage practices throughout the organization and ensure conformity with objectives related to equity and environmental sustainability. Stakeholders: Macro (Regulatory bodies, ethics councils, ESG-focused investors, municipal leaders)
AI Knowledge & Capacity Building	Host community AI education workshops and tool demo sessions; focus on literacy and awareness by delivering AI literacy through educational bodies, libraries, and colleges. Stakeholders: Micro (F&B SMBs); Macro (Educational bodies, local educators, tech experts, community leads, innovation hubs).	Introduce SME-targeted training, certification programs and strategic foresight workshops. Stakeholders: Micro (F&B SMBs); Meso (Education bodies, SMB networks, and AI alliances); Macro (governments, Employment of Canada).	Embed lifelong AI learning into vocational and policy frameworks. Stakeholders: Micro (F&B SMBs); Macro (Government agencies, nonprofit foundations, private sector tech companies).

TABLE 13: INTERVENTION MODEL: STRATEGIC THEMES AND ACTIONABLE INTERVENTION STRATEGIES

Day in a Life - A Small F&B business in 2035

"**BIZBOT**" Buzzing…. Its 6:00 AM. As the sun peeks over the Toronto skyline, Anna, owner of **"The Conscious Crust",** an ecofriendly bakery, and a mother of two; wakes up with a mobile reminder coming from her hyper personalised AI Assistant BizBot. While she sips her almond milk latte made by her AI driven expresso station. Before the day begins, she checks her AI dashboard through BizBot. Overnight, the system analyzed local weather data, foot traffic predictions, social media chatter, and dietary trends to optimize today's menu. The AI recommends a limited batch of pistachio-matcha croissants (rising in popularity among Gen Alpha) and tweaks the staff roster based on predicted customer flow. No waste. No burnout. Just insight.

The Automated storage units' pings Anna mobile with notifications on some organic ingredients needing replenishments. Her AI assistant Biz Bot automatically places a zero-emission drone delivery request with a local vertical farm, after a quick authorization from Anna. This automatically syncs in with her inventory management software keeping supplies up to date. Everything by 2035 is traceable and integrated into the business model. Blockchain powered sourcing ensures ingredients are used ethically and provides certified guidance and transparency on usage across delivery channels to the customer. Sustainability isn't buzzword anymore, its embedded in the operations.

As usual customers walk in, pre-registered privacy compliant automated facial recognition and voice based LLMs welcome and greet them. "Good morning, Mike. Do you want to fancy your Almond butter smoothie with Turmeric today?" or would you like to try something else from the menu that is trending? The AI assistant adapts the space using customer moods and demographic patterns to create ambience with music, lighting and even aroma diffusers. All powered by a multimodal system that are ethically trained on micro interactions and user preferences. It also reminds Anna on the stock; user trends & patterns and helps her plan for Lunch time.

Its 12:00pm - Lunch Rush. Anna multitasks while her AI tracks market trends, guiding/ providing suggestions on menu pricing in real time based on supply chain fluctuations, demand signals and online data scanning through her competitors. With Integrations across platforms - The Conscious Crust website, social media, food blogs, and AR previews, customers can browse, taste & feel the space (visually), and order before they even reach the door.

2:00 PM, Rush hour is reduced, and employees move on to staff co-pilot training and learning about maintenance of AI systems. AI doesn't just assist, it mentors. Anna's team uses wearables such an AR headset for real time guidance and task support. New hires get onboarded in less than hour, thanks to Ai guided micro learning tools and simulation models that adapt to each employees learning style.

It isn't just for employees, Annas by 4:00pm also gets mentored by her AI assistant BizBot on Personalized LLM trained on her historical performance, customer feedback and financial goals. It highlights that engagement dips on seasonal days such as rainy or a snowstorm weather and suggests a loyalty program tied to weather forecasts. It even drafts campaigns copy and provides guidance on scheduling marketing strategies for festive occasions with amazing deals and promotions via omnichannel tools.

By 7:00pm sunset, Anna reviews the days performance - sustainable goals (carbon footprint) achieved for the day, food wastage below 1%, high employee satisfaction scores, Increase in revenue by 15%. YoY! She ends her day with a quick session in her AI guided mindfulness Pod and feels happy for what she achieved.

DELIVER – IMPLEMENTING AI ADOPTION

The Deliver phase represents the final stage of the Double Diamond framework which connects the process of ideation with practical real-world implementation. Here insights become actionable steps and solutions materialize into concrete formats. The Deliver phase concluded with a creation of a strategic AI Adoption Playbook which was co-created using AI tools and tailored to small businesses to provide both educational and empowerment benefits.

Strategic Outcome: A Win/Win Strategic Roadmap for AI Adoption

Small food and beverage businesses can now follow this roadmap to implement AI in a manner that balances financial feasibility with impactful outcomes. The goal? AI adoption must be tailored to fit small businesses' long-term goals of growth and customer personalization while driving efficiency.

BizGuide AI Adoption Playbook: A Strategic Enabler for AI Adoption

The development of the AI Adoption Playbook required deep involvement through field research and systems thinking while incorporating stakeholder insights. My approach went beyond researching AI adoption challenges, leading to a path of co-creating solutions with small business community that help them navigate their complex digital environment and uncertainties. This Playbook functions as a foundational resource featuring curated tools and best practices to facilitate effective AI integration.

What does "BizGuide" Playbook offer to small businesses through this research?

- Collection of curated case studies of AI applications within food & beverage businesses.
- Learn how to select and apply AI tools through detailed instructional guides
- Literacy-building resources to demystify AI
- A repository proven, best-in-class tools optimized for practical applications which support non-technical teams.

Field research revealed that innovation exists not in spreadsheets but through real business owners' daily challenges and achievements. The Playbook provides a dual function as both a resource and a strategic conversation tool which enables small businesses to understand and apply AI confidently and independently.

Future-Ready SMBs: A Win/Win Roadmap for Strategic AI Integration

Guided by Roger Martin's **"Playing to Win"** Strategy Framework, this Win/Win Strategic Roadmap outlines how small businesses can successfully adopt AI with clarity and purpose even in VUCA environment (Volatile, uncertain, complex and ambiguous). Thriving in the future landscape of AI requires SMBs to adopt technology alongside a strategic approach that is founded on clear decisions. This roadmap is built around the five key questions from Playing to Win: How Strategy Really Works by A.G. Lafley and Roger L. Martin (*Playing to Win: How Strategy Really Works (A.G. Lafley, Roger L. Martin) .Pdf*, n.d.) addressed below. The roadmap enables small businesses to innovate and expand while creating a responsible and inclusive environment for AI adoption across multiple sectors.

1. What is the winning aspiration for small businesses?

Win for small businesses: AI-driven businesses to become more competitive and resilient by improving customer experiences, operational efficiency and sustainable practices. Here are some initial steps to follow:

- **Culture and Mindset Shift to embrace innovation & digital experimentation:** Small businesses can achieve success by replacing manual operations with AI-powered business models. Foster a business environment that supports innovation through experimentation and learning. When organizations adopt digital transformation and risk-taking attitudes, these foundational changes will support widespread AI technology implementation.
- **Shift from survival to strategic growth:** Businesses should redefine AI to stand out through unique customer experiences with hyper-personalized services along with smart order systems and adaptive menus. AI applications enhance environmental performance through reduced food waste and optimized operational efficiency while providing smart sourcing solutions.

Win for Eco-system (tech providers, policymakers, communities): Expand inclusive innovation initiatives which reach underserved markets to build scalable models that ensure ethical and successful local AI applications.

- **Educational & Awareness Programs to build literacy and confidence -** A lack of understanding about AI technology makes many small business owners reluctant to implement it. We can build genuine confidence by offering hands-on workshops and low-risk pilots while delivering plain-language training to demystify AI. The programs should move beyond basic tool training by enabling teams to investigate and experiment with AI and understand it as a beneficial opportunity instead of a threat.
- **Toolkits & Guided Adoption led by industry experts:** Receive expert tool recommendations which will be applicable across different fields to avoid independent research efforts. Demonstrating AI's return on investment (ROI) with practical examples helps skeptical business owners realize its value by illustrating AI's potential to enhance efficiency and drive innovation which creates guided AI adoption toolkits and training workshops.
- **Data readiness and system upgrades for effective AI deployment:** The foundation of AI deployment rests on creating strong data management frameworks along with solid cybersecurity protections. Small businesses can maximize their AI capabilities and protect their systems when they have the right infrastructure in place.
- **Tailored Financial Programs:** Create financial assistance programs that specifically support SMBs in their AI adoption initiatives. Financial assistance programs could involve subsidized loans and targeted grants together with tax breaks to reduce adoption costs. The provision of support will speed up experimentation while helping successful projects to expand. Connect digitally inquisitive SMBs alongside immigrant-owned businesses and Indigenous entrepreneurs through regional clusters and available grants.

2. Where can small businesses play?

Small businesses should begin their AI journey by implementing accessible pilot projects in marketing, customer service chatbots, or demand forecasting specifically in the food and beverage industry. Businesses should focus on digital-first customers who are early adopters because they better respond to experiences enhanced with AI. Connect with regional accelerators, BIAs and innovation hubs to seek community support for pilot initiatives. Developing a well-defined market strategy for your pilot projects will maximize AI experimentation benefits through high-return low-risk opportunities and support from community ecosystems for growth.

3. How can small businesses win?

To remain competitive small food businesses, need to expand their strategic vision beyond mere survival. Small food businesses need to deploy AI technologies to create unique market offerings while enhancing operational efficiency through personalized menus and smart order fulfillment solutions. Businesses that don't have internal expertise should build strategic partnerships with technology providers to fill the expertise gap. A well-defined roadmap combined with AI-driven insights and continuous feedback loops enables small businesses to sustain innovation as their enduring competitive edge.

- **Sustainable Strategic Positioning:** The strategic use of a logic flow framework helps small businesses determine their sustainable market positioning through a methodical examination of their where-to-play and how-to-win decisions. The strategy logic flow framework requires
    - analysis of industry dynamics along with customer needs and channel preferences.
    - A comparison between their cost structures and capabilities with those of competitors
    - Potential competitive responses and market shifts
    - SMBs who analyze strategic potentials through reverse engineering could have necessary conditions for success by creating informed and sustainable choices that firmly establish AI as a tool for long-term value creation.
- **Early Integration of accessible tools:** Small businesses can secure victory through the development of an organizational readiness strategy for AI integration. Businesses need to assess and pinpoint precise AI applications that will enhance their operations in areas like marketing and supply chain management. Begin with the early integration of accessible AI tools which include no-code/low-code AI platforms to bypass complexity through applications like chatbots and demand forecasting to serve as a starting point. The demonstration of tangible benefits builds confidence and promotes further adoption by focusing on early adopters and digital-first customers.
- **Pilot and Scale Projects with measurable ROI outcomes:** Small businesses launch minor AI pilot programs to examine application effectiveness within real-world environments. After successful outcomes are shown begin phased expansion to integrate AI across every operational aspect.
- **Collaborative Partnerships between SMB, academia and tech providers:** Industry players should establish collaborative connections with academic institutions alongside technology suppliers and government entities. These partnerships enable knowledge sharing while providing resources and best practices which simplify the AI adoption process. Choose vendor partners who provide straightforward modular systems that are both affordable and require no coding.
- **Personalization & Productivity**: AI technology enables businesses to deliver customized experiences while enhancing cash flow projections and customer support operations alongside reducing waste.

To summarize, small businesses should gain advantage through cost-effective innovation combined with personalized solutions and precise operational performance enabled by AI. Winning Formula: a sustainable AI advantage could be a combination of easy access AI tools with their strategic relevance and measurable outcomes.

4. What capabilities must be in place? What are the Core Enablers?

The Capability Focus will establish an AI environment that people without expertise can access and use with confidence. Below are key capabilities that need to be place, which act as core enablers to initiate AI integration:

- **Skill Development and Talent training for AI readiness:** Workforce training and talent development investments are vital to build digital confidence. By providing employees with digital skills and AI knowledge we create internal champions who lead ongoing innovative efforts.
- **Infrastructure Investments:** Allocate resources to improve digital infrastructure systems which enable AI functionality. The plan includes improving data interoperability while enhancing cloud services and cybersecurity systems.
- **Ethical AI adoption practices ensuring transparency & inclusivity:** The establishment of ethical AI frameworks promotes transparent and inclusive technology adoption practices. Develop AI certification programs that teach small businesses how to responsibly integrate AI technology into their work processes. The given support helps overcome financial barriers and knowledge deficiencies.

5. What management systems are required?

Implement system support mechanisms to scale operations using an adaptive adoption model that incorporates feedback loops and measurement alongside strategic governance. Key Management systems required to win:

- **Governance & Measurement**: By tracking ROI outcomes and user feedback businesses can engage in iterative development and scaling processes.
- **Unified Regulatory framework for AI compliance and accessibility:** Through a streamlined and consistent regulatory framework organizations experience reduced uncertainty. When businesses understand regulations clearly, they find it easier to build trust while reducing challenges small enterprises encounter in complicated legal environments.
- **Regulatory Sandboxes for AI experimentation in controlled settings:** Regulatory bodies create safe testing environments called regulatory sandboxes where businesses can explore AI technology without significant risk. Post-pilot evaluations enable small businesses to refine their tools and policies while overcoming obstacles and driving innovation.
- **Supportive Policies & Funding initiatives:** Policymakers can significantly support small business owners by providing funding opportunities while developing policies that facilitate AI understanding through dedicated training programs.

BizGuide Playbook: A Strategic Enabler for AI Adoption

The rapid pace of business development presents small food and beverage enterprises with new technology adoption opportunities and challenges. Artificial Intelligence (AI) stands out as a revolutionary technology that boosts operational efficiency while simultaneously fostering smarter decision-making and enhancing customer experiences. Many small business owners find the process of adopting AI technology to be intimidating and difficult to navigate. That's where the **AI Guidebook for Small Businesses** comes, which provides strategic and practical solutions through field research and human-centered design methods enhanced by AI insights. At the core of this research, lies the **"BizGuide Playbook",** a foundational tool designed to support small business owners in transitioning from AI curiosity to confident implementation. Disclosure that "BizGuide AI Adoption Playbook" was co-created using mix medium of Gen AI tools for desired result. Tasks incorporated AI for were content creation, editing & review process; AID statement *(Weaver, 2024).*

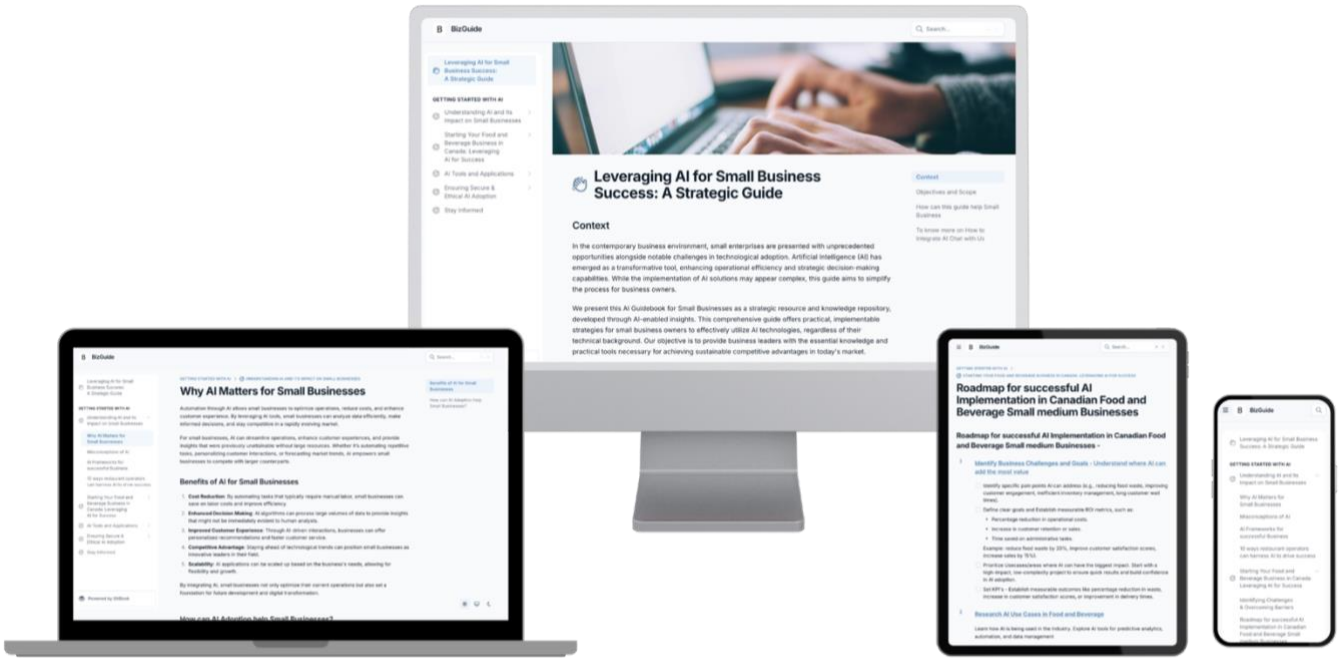


FIGURE 9: AI ADOPTION PLAYBOOK "BIZGUIDE" ACROSS PLATFORMS

This **"BizGuide playbook"** is a user-friendly, easy to use online manual hosted at "GitBook". It helps them sort out, record & expand the operations game with clarity and persistence. This dynamic playbook enables business adaptation through its editable structure which allows sharing and evolution in concert with business growth. Bizguide delivers straightforward templates to automate both planning and workflow management tasks. In addition to free blueprints and What if we provide a Bizguide for happiness?" It follows those who press this door with a light in their eyes into pursing the field of human experience; and where small businesses are poised to be beneficiaries and investors in such routine production. Although small companies still operate in a "wilderness" that is without borders they are finally gaining power to develop their own tools; several of which have become standard on the US supercomputer, the Cray. Bizguide attempts to arm small-business owners with AI-like technology, which has long been trusted by large companies across various branches or sectors. A detailed list of chapters from the BizGuide Playbook can be found in the Appendix C: BizGuide – AI Adoption Playbook Overview and Content & Ethical Readiness checklist in Appendix D: Ethical AI Readiness Checklist, Template for SMBs.

CONCLUSION

Since the rise of the Web and the subsequent advent of AI and Generative AI technologies, it is fair to say that we stand on the threshold of some new era. AI, work which once seemed only to hold promise or potential in the abstract, now appears realistically in software agents that know what you are feeling and in systems predicting what will happen next. It has also appeared as a co-author for creative works. In a word, AI changes the way we live and do things. AI as an advantage, no longer exists in the food and beverage industry, instead it's become just one reason a company needs to stay ahead. By looking at this paper, I have charted a strategic, human centered and gradual method of AI integration for small and medium food businesses in Canada: it is not just about the **"why"** but **how on AI readiness**. Adopting the Three Horizons Framework, this study presents that AI transformation is not a one-time shift but a multi-stage journey. It starts from optimizing current operations, moves to adapting market disturbances and ends in a future where AI is embedded into the entire business creation process.

As AI and Generative AI technologies rapidly evolve, we stand on the cusp of a paradigm shift. No longer confined to abstract potential, AI is now manifesting in emotionally intelligent agents, predictive systems, and creative collaborators, redefining how we interact, make decisions, and build businesses. AI adoption in the food and beverage industry has evolved from a competitive advantage to a business imperative. Through this research, I have mapped a strategic, human-centered, and phased approach to AI integration for small- and medium-sized food businesses in Canada; highlighting not just the "**why,"** but the **how of AI readiness.** By using the **Three Horizons Framework**, this study demonstrates that AI transformation is not a one-time shift, but a **multi-stage journey**; from optimizing current operations, through adapting to market disruptions, to reimagining a future where AI is embedded into every layer of business value creation.

"The best way to predict the future is to design it—together" – Bill Sharpe (IFF).

AI is crucial for the food and beverage industry to survive in the long term and to be competitive in the short term. The positioning of the study is strategic insights an AI roadmap for Canadian food SMBs can thus be equipped to navigate through an industry that is being transformed by AI. As small to medium-sized enterprises in snack food prepare themselves for the era of artificial intelligence, the future is by no means clear. This study introduces actionable strategies and an AI adoption roadmap for Canadian food SMBs, tailored their own future in which they can remain masters of their own destiny.

By replacing uncertainty with structured foresight, SMBs in the F&B sector can embrace AI confidently to at their own pace and explore same to suit their drive. Small and medium-sized enterprises in the F&B sector are in an enviable position to adapt AI- built on three lines short-term efficiency, medium-term transformation, and long-term sustainability. With the Three Horizons Model, AI strategies are practical and flexible in keeping with human-centered business values allowing the small businesses community to progress from imitation to innovation and then dominate within the eco system. I have incorporated a Winning Strategy for SMBs based on Play to Win by Roger Martin (*Playing to Win: How Strategy Really Works (A.G. Lafley, Roger L. Martin) .Pdf*, n.d.), outlining clear strategic choices for AI adoption, including winning aspirations, play areas, competitive differentiation, required capabilities, and management systems. The result is a practical AI Adoption Playbook.

What the Research Revealed?

This research explored the central question: “How might small businesses in the food and beverage sector adopt AI to automate operations and enhance hyper-personalized customer experiences for sustainable competitive advantage by 2035?” Through a strategic foresight approach, leveraging the Double Diamond, Three Horizons Model, and the Technology Acceptance Model (TAM), this study mapped a phased journey toward AI adoption. The following insights directly address the secondary research questions:

Identifying Challenges and Overcoming Barriers: To explore the question “How might we identify the specific challenges small- and medium-sized businesses in the food and beverage sector face with AI adoption and help them overcome these barriers?” This study applied the Technology Acceptance Model (TAM) as a guiding analytical framework. TAM helped uncover two critical determinants of AI adoption: **Perceived Usefulness (PU) and Perceived Ease of Use (PEOU).** By conducting field research and stakeholder interviews, this study identified key adoption barriers such as low perception. Many SMBs questioned the tangible benefits of AI by showcasing low perception, particularly when weighed against their operational constraints, tight margins, and customer expectations for personalized, human experiences. A lack of technical expertise, fear of complexity, and limited access to affordable, user-friendly tools discouraged experimentation with AI technologies.

This study developed the "BizGuide Playbook" to address these challenges—a human-centered toolkit offering clear strategies for increasing both PU and PEOU. It includes real-world application cases such as AI's operational and experiential values, a step-by-step adoption roadmap tailored to SMB capabilities. For example: AI services that are available through such platforms as Bing or Goole Gemini with accessible, low-code/no-code AI solutions can help to lower the usability threshold for many firms. It should be possible to have educational resources and ethical guidelines to build trust and readiness by aligning strategic foresight with TAM insights. This study moves beyond simply identifying barriers. Instead, it offers actionable frameworks for boosting AI acceptance and meaningful adoption in the Canadian food and beverage SMBs sector.

Integration of AI Adoption & Implementation: This study demonstrates how AI readiness strategies need policy support to match national innovation goals along with small business assistance programs like the Canada Digital Adoption Program (CDAP) and Scale AI. The BizGuide Playbook functions as an additional resource which food and beverage SMBs can utilize to access practical frameworks that support ethical and inclusive AI integration. The Playbook tackles organizational readiness and capability deficits to provide structured automation planning pathways while supporting operational enhancement and low-code/no-code AI tool deployment which maintains regulatory compliance and sector-specific cultural standards. The approach enables organizations to implement AI solutions with confidence by emphasizing sustainable practices, responsible development, and extended durability.

Ensuring Authenticity & Trust in Hyper-Personalization: This research illustrates how AI-powered personalization can meaningfully elevate customer experiences without diluting the authenticity that defines small food businesses. The BizGuide Playbook provides application use cases from (1) AI-driven menu customization (2) Smart loyalty programs - that demonstrate how personalization can remain human-centered when designed with clear oversight mechanisms. For instance, tools like Tastewise AI and Restoke have helped Canadian restaurants deliver contextual recommendations while ensuring chefs and staff retain creative and relational control. Through responsible design and transparency, SMBs can build long-term trust, safeguard brand values, voice and avoid the risks of over-automation or mechanization.

Government and Industry Support for Responsible AI Use: A key finding of this study is the vital role of a supportive ecosystem comprising government grants, upskilling programs, and regulatory guidance in accelerating responsible AI adoption across Canada's food and beverage sector. This aligns with national priorities set forth in the Pan-Canadian AI Strategy (Pan-Canadian AI Strategy - CIFAR, 2023) alongside the Digital Charter Implementation Act (G. of Canada, 2022), which emphasize inclusive innovation, ethical AI deployment, and equitable access for small and medium businesses (SMBs). Strategic initiatives such as the Canada Digital Adoption Program {CDAP} (I. Government of Canada, 2025) and Scale AI (Scale AI | Canada's AI Cluster, Promoting Artificial Intelligence, n.d.) {Canada's Global Innovation Cluster for Supply Chains} are helping close the digital divide by providing tailored funding, digital advisors, and sector-specific training. Regional entities like Food and Beverage Ontario further reinforce this support through targeted education, automation pilots, and industry-specific guidance.

The BizGuide Playbook builds on these policy foundations, translating federal guidelines into practical adoption and usable pathways for food SMBs. It offers implementation toolkits, partnership templates, and compliance checklists that help businesses align with both operational goals and national innovation mandates. Case examples from Ontario-based cafés and food manufacturers illustrate how public-private alignment enables AI adoption that enhances customer satisfaction, strengthens supply chains, and supports long-term sustainability, without overwhelming internal capacity and aid in empowering small business to take the advantage of AI to make better their business strategy.

From Uncertainty to Strategy: A Roadmap for the AI-Driven Future

By applying strategic foresight, this MRP positions AI adoption not as a single leap, but as a phased transformation guided by strategic foresight. Using the Three Horizons Framework, it maps a practical and visionary pathway for food and beverage SMBs to navigate change with confidence:

- Horizon 1 Business as Usual: Organizations should implement digital systems to handle routine operations while optimizing their resources to create strong digital foundations which will lead to better financial performance and decreased operational inefficiencies.
- Horizon 2 Transition Phase: Implement ethical frameworks and adaptive tools alongside personalized customer experiences to expand AI adoption and create distinctive customer satisfaction.
- Horizon 3 Visionary Phase: Imagine a future where artificial intelligence becomes an integral part of food innovation by supporting sustainable practices and collaborative creation while continuing to honor traditional craftsmanship and remain transparent.

This roadmap enables small businesses to progress at their own pace, turning uncertainty into strategy and innovation into impact. Here is some further detail for what that means:

Embrace Uncertainty as an Opportunity:

- **Positive Reframing:** See uncertainty as a golden opportunity rather than an impending threat, to uncover where risks lie and how they might evolve into creative solutions of your own invention.
- **Focus on Opportunities:** Ask "What's the path to highest impact?"

Develop a Strategic Approach to Uncertainty:

- **Strategic Alignment:** Make sure that innovation spending and the chances created get thrown into alignment with firm strategic goals for both the short- as well as long-term future.
- Envisioning a Range of Futures: Think through every possibility and devise strategies to cope with them effectively.
- **Risk Management:** Rigorous plans are needed to manage risk. Without them, the management will have no solution when a disaster strikes.
- **Anticipation and Preparedness:** Use hard trends (future facts) as well as soft trends (future possibilities) to be prepared and anticipate change in time.

Leverage Innovation to Reduce Uncertainty:

- **Testing and Learning:** Use innovation as a means of testing your guesswork, gathering insights and changing tack if required.
- **Embrace Experimentation:** Encourage small-scale trials, so that you can learn quickly and improve your ideas according to the test results.
- **Organizational Readiness**: Ensure that the organization has the resources to execute the innovation strategy.

Drive Innovation with Impact:

- **Structured Innovation Processes:** Put in place structured ways of identifying, developing and implementing innovative solutions.
- **Stakeholder Engagement**: Seek out relevant stakeholders to gain their perspectives and make sure that the strategy for innovation represents what they think best.
- **Measure and Evaluate:** Track the impact of innovation efforts and act as needed.

So What? – Strategic Implications & Future Directions

This research provides a foundation for phased digital transformation, but it also opens the door to deeper inquiry into AI's long-term impact on the sector. This study also introduces a Winning Strategy for AI Adoption grounded in Roger Martin's "Playing to Win" framework (*Playing to Win: How Strategy Really Works (A.G. Lafley, Roger L. Martin) .Pdf*, n.d.) clarifying where to play, how to win, and what capabilities are required to succeed. The AI Adoption Playbook offers a practical, customizable tool for small food businesses to align AI strategies with their purpose and community goals.

Possible Expansions to the research – Firstly would be to test and reiterate the Bizguide – AI adoption playbook with small business to understand how they serve the need and what modifications in the playbook could help the use of successful integration. Given the research scope allows one to explore the future methodology of scenario planning with 'Dator 4 'futures is probably a certainty. In the future there must be a transition to explore radical shifts in AI role in F&B (e.g., AI enhancing human roles by adding and replacing certain roles, ethical dilemmas, decentralized AI regulation). We would have to better our assumptions and image a non-linear future beyond conventional market adoption i.e., this future incorporates governance, policy and philosophical implications of AI on our society. A combined approach: merging business foresight with socio-technical futures, will give us a more complete grasp of AI's potential to not just revolutionize business, but to redefine the relationship between technology and people and even food.

Final Reflection: A Call to Action

In a world of accelerating change, this MRP is a call to action for small business owners, policymakers, designers, and technologists. Start where you are, Scale with strategy, and Design with purpose. AI isn't just about efficiency; it's a way that we can reimagine how to produce, distribute, and provide for our people. When AI is framed with ethics and diversity in mind, small businesses can not only survive but prosper. This MRP is a guide for how to achieve these enterprises work style, to shift gradually from where they are, into future ventures, and design an AI guided future that support their values, vision, and community influence.

AI is not just about efficiency but devising a new model for our food service industry, one that is creative, responsible and embraces collaboration to make people more engaged in a local environment and concentrate on their niche markets so that they can leverage the advantages of better customer engagement. AI algorithms can analyze website traffic, user behavior, and conversion data to generate personalized CTAs. AI can personalize CTAs based on individual user profiles and preferences. For example, AI-powered chatbots can guide customers through the purchase process or provide personalized recommendations.

Move beyond viewing emerging technologies as "just" technology issues. They pose critical and more profound questions requiring SMB adaptation and societal transformation. Leverage the mindset of "get there fast" (mainly from business) with "get there safely" (primarily due to the public values at risk). The food and beverage SMB sector needs the transformational power of AI to meet the best combination of public and private interests to enhance the deliverables.

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APPENDICES

Appendix A: Casual Layered Analysis (CLA)

As part of my research, I employed Causal Layered Analysis (CLA), a prominent futures studies methodology introduced by Sohail Inayatullah (1998), to explore the underlying cultural myths, systemic challenges, and deeply rooted industry-specific values or mindsets that hinder AI adoption. CLA is a structured technique that deepens understanding by examining issues across multiple layers - litany, systemic causes, worldviews, and myths/metaphors, enabling a more holistic exploration of complex problems. This approach ensured that potential AI solutions were aligned with human-centered operations within small and medium-sized businesses (SMBs). Mapping CLA across the Pyramid, helped challenge cultural narratives and systemic biases against automation in artisanal businesses.

FIGURE 10: SHOWCASING HOW CAUSAL LAYERED ANALYSIS TOOL WAS USED TO ANALYZE AND DEFINE THE RESEARCH QUESTION.

Appendix B: Three Horizons Mapping Field Research to Future Horizons

Mapping key findings from the field research (TAM Integration) with Three Horizons Modal to define actionable steps across phases. The picture below shows the raw data of the findings, encapsulated into thematic strategies which act as Interventions, which was further is used to create the roadmap and win/win strategy for small businesses.

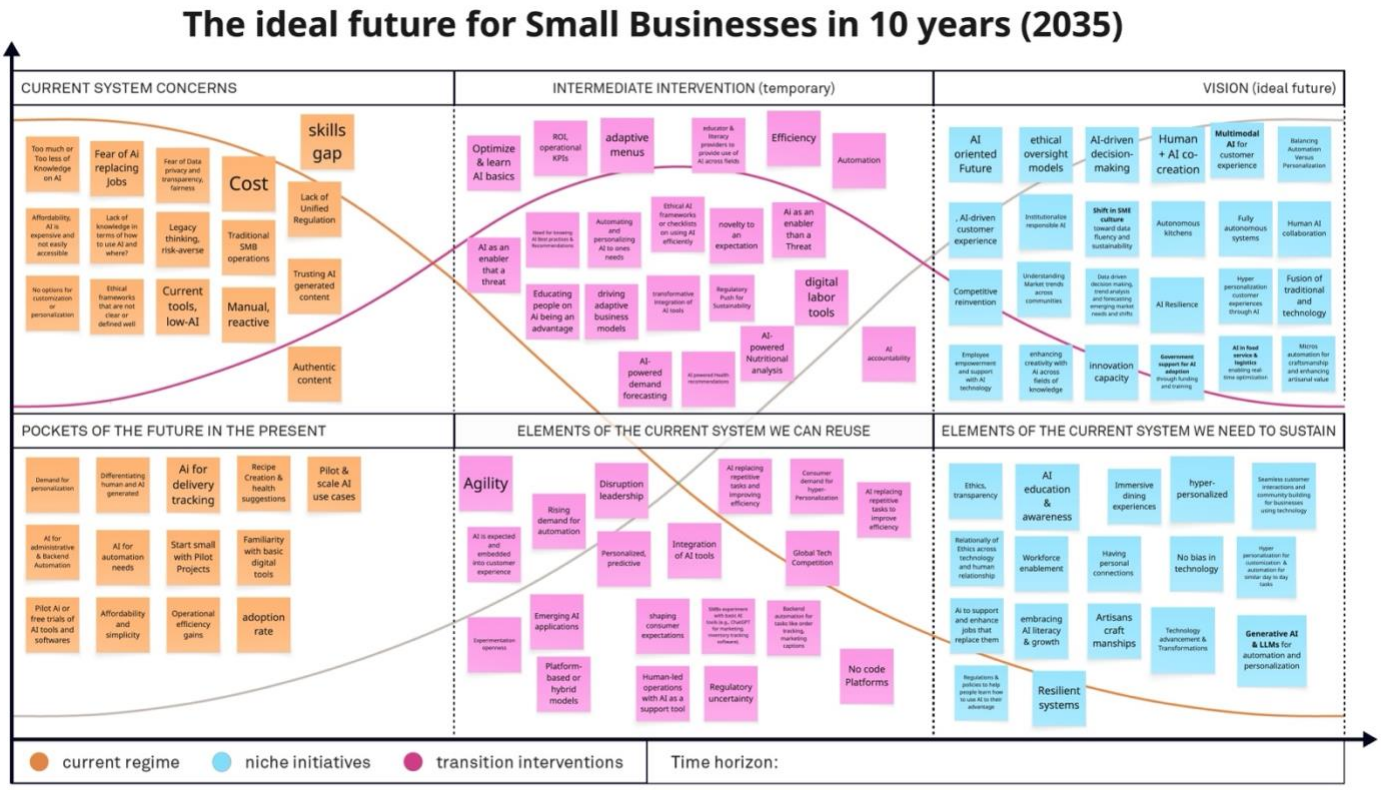


FIGURE 11: THREE HORIZONS MAPPING – FIELD RESEARCH TO FUTURE HORIZONS

Appendix C: BizGuide – AI Adoption Playbook Overview and Content

This section highlights the chapters of "**BizGuide – the AI adoption Playbook"** defined and prioritized based on the need emerged during the field research phase (TAM) with the participants on the expectations from the system. This was further integrated to plan the phases of integration across three Horizons. The chapters defined below are carefully chosen to guide small businesses in successful AI adoption across the phases of Horizons. It also provides guidance on right practises, templates and frameworks curated by combining online database, research repositories, policies, Canadian strategies and priorities for 2025. This playbook was co-created with use of AI tools such as Microsoft Co-pilot, Notion AI and Grammarly as varied mediums to explore, refine and hence co-create, the right resources required for practical use. Below are chapters for preview -

Table of Contents

1) Leveraging AI for Small Business Success: A Strategic Guide
   a) Introduction and highlights of the playbook
2) **Understanding AI and Its Impact on Small Businesses**
   Artificial Intelligence (AI) is no longer a concept of the future; it is a transformative technology that is shaping how businesses operate today.
   a) **Why AI Matters for Small Businesses:** Automation through AI allows small businesses to optimize operations, reduce costs, and enhance customer experience.
   b) **Misconceptions of AI**: Common misconceptions include the idea that AI is overly complex, too expensive, or poses a threat to jobs.
   c) **10 ways restaurant operators can harness AI to drive success:** Personalized Marketing, Dynamic Pricing, Inventory Management, Customer Service Chatbots, Staff Scheduling, Menu Optimization, Voice Recognition Ordering, Predictive Analytics for Customer Insights, Food-Safety Monitoring, Enhanced Delivery Logistics.
3) Starting Your Food and Beverage Business in Canada
   Leveraging AI for Success - From market research to identifying niche opportunities, AI can help entrepreneurs make data-driven decisions.
   a) **Identifying Challenges & Overcoming Barriers:** Adopting AI in the food and beverage industry presents unique challenges for Canadian small and medium-sized businesses (SMBs).
   b) **Roadmap for successful AI Implementation in Canadian Food and Beverage Small medium Businesses:** Identify specific pain points AI can address (e.g., reducing food waste, improving customer engagement, inefficient inventory management, and long customer wait times).
   c) **Identify Business Challenges and Goals:** The food and beverage (F&B) industry faces unique challenges and opportunities that AI can address effectively.
   d) **Government Support & Grants:** Sources to all the government grants and support available.
   e) **AI Case-studies:** AI Successes & Failures
   f) **AI Adoption Toolkit for SMBs:** AI Adoption Checklist, Measure Rate on Investment (ROI)

4) **AI Tools and Applications**

What are the Benefits of using AI Tools and what applications supports best use of AI for efficient adoption? List of areas where AI could be used with potential Benefits and Tools.

a) Optimizing Business Operations
b) Inventory Management
c) Supply chain optimization
d) Customer service automation, Personalization & Engagement
e) Marketing
f) Social Media Management
g) Creative Design and Prototyping
h) Sales and Customer Relationship Management (CRM)
i) Predictive maintenance
j) AI-driven food safety checks
k) Finance and Accounting
l) E-commerce & Retail
m) Legal and compliance monitoring
n) Human Resource and Hiring
o) Demand Forecasting, Strategy and Decision Making
p) AI Literacy & Capacity Building – Get Trained on AI

5) Ensuring Secure & Ethical AI Adoption

The Importance of Ethical and Responsible AI for Small Businesses in the Food and Beverage Industry.

a) Checklist for Ethical AI Usage: Key Considerations
b) Ethical Successes & Failures
c) Data Privacy and Security Guidelines
d) Bias in AI: How to avoid unintentional bias in AI tools
e) Sustainable AI: Encouraging environmentally friendly AI practices

6) **Stay Informed**

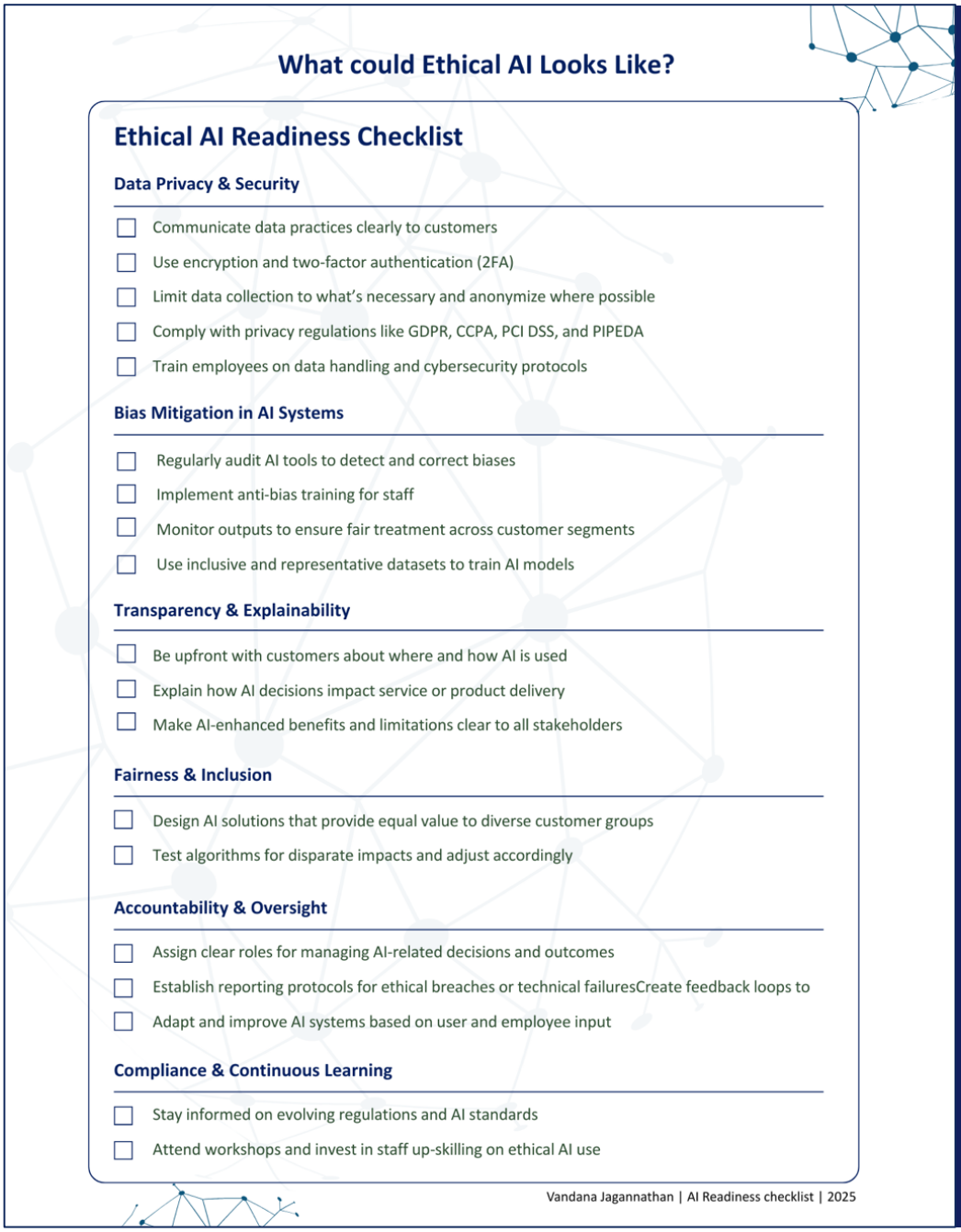
This section talks about, how small business can stay informed on the latest updates on AI applications, usage, policies and regulations for successful adoption? What mediums and industry collaborations would help them on right education, literacy and capacity building.

Disclosure that "BizGuide AI Adoption Playbook" was co-created using mix medium of Gen AI tools for desired result. Tasks incorporated AI for were content creation, editing & review process; AID statement (Artificial Intelligence Tool: Microsoft co Pilot, Canva, Notion AI & Grammarly; Writing – Review & Editing: The AID was used only to reframe the text written through research process and for revising and editing of the sections).

Appendix D: Ethical AI Readiness Checklist, Template for SMBs

The “Bizguide – AI adoption Playbook” focuses on ethical AI implementation and shares templates/frameworks for small businesses to adopt AI efficiently. For small food and beverage businesses, ethical AI matters because it builds trust, reduces risks and drives innovation. The playbook hosts checklist template that helps businesses implement AI ethically & responsibly while adhering to regulations. This ensures proper data protection, operational efficiency, and customer loyalty as businesses use AI to streamline operations and enhance customer experiences. Below image shows the AI checklist template designed for small businesses. Link to Playbook - "BizGuide - AI adoption Playbook" *(Vandana Jagannathan, BizGuide - AI Adoption Playbook, 2025).*

FIGURE 12: ETHICAL AI ADOPTION CHECKLIST CREATED FOR SMALL BUSINESSES.



Disclosure that “BizGuide AI Adoption Playbook” & templates associated was co-created using mix medium of Gen AI tools for desired result. Tasks incorporated AI for were content creation, editing & review process; AID statement (Artificial Intelligence Tool: Microsoft co Pilot, Canva, Notion AI & Grammarly; Writing – Review & Editing: The AID was used only to reframe the text written through research process and for revising and editing of the sections).