Technology Implementation Guide for the Ontario Food and Beverage Processing Sector

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MNP

Technology Implementation Guide for the Ontario Food and Beverage Processing Sector

Prepared by FBO and MNP LLP

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1. INTRODUCTION TO THE GUIDE

1.1. Purpose of the Guide

One of the major challenges facing the Ontario food and beverage processing sector ("the Sector") is a shortage of labour, which impedes food and beverage processors in operating at their full capacity and also stagnates the growth of the Sector. The COVID-19 pandemic amplified existing labour challenges within the Sector and has put human health and safety in food processing operations at risk, while further impacting the Sector's labour productivity.

Innovative technologies can bring about positive change to reduce the risk of COVID-19 transmission if implemented in the Sector and bring co-benefits to help address the sector's labour challenges. However, many food and beverage processors are still unaware of the innovative technology available to them or how to begin their technology implementation journey.

Given these challenges, Food and Beverage Ontario ("FBO") and MNP LLP, a business advisory firm, embarked on developing a technology implementation "how-to-guide" ("the Guide") for the Sector. The purpose of the Guide is to provide Ontario food and beverage processors with information to better equip them for implementing technology in their operations and, in doing so, address short-term to longer-term labour challenges while also mitigating COVID-19 risk factors. Further, this Guide examines top innovative technologies and supports that are available to the Sector together with the outcomes that can be realized, best practices, and other considerations in implementing such technology. Also included within this document are case studies of food and beverage companies that have implemented innovative technologies in their facilities. Their journeys along with words of wisdom are included for learning purposes.

1.2. Organization of the Guide

The remaining sections of this Guide are organized as follows:

- **Introduction to Technology Implementation.** This section introduces why food and beverage processors should implement technologies and the benefits along with challenges of technology implementation.
- **Innovative Technologies Available to the Sector.** This section includes a table listing some of the different technologies available to the Sector with the most significant potential to address short-term and long-term labour challenges as well as COVID-19 risk factors.
- **Key Considerations for Technology Implementation.** This section includes an overview of the key considerations, best practices, and success factors for businesses looking to adopt technological change.
- **Case Studies.** This section highlights three case studies of companies that have successfully implemented innovative technologies in their facilities that help address labour and/or COVID-19 challenges.

- **Technology Implementation Resources and Support.** This section outlines some available resources for food and beverage processing companies to help assist with technology selection and implementation.
- **Appendices.** The appendices provide a list of primary and secondary sources informing this document and additional background information about FBO and MNP.

1.3. Limitations of the Guide

This report is provided for information purposes and is intended for general guidance only. It should not be regarded as comprehensive or a substitute for personalized, professional advice.

We have relied upon the completeness, accuracy and fair presentation of all information and data obtained from representatives consulted as part of this project as well as from public sources. The accuracy and reliability of the findings and opinions expressed in the report are conditional upon the completeness, accuracy and fair presentation of the information underlying them. As a result, we caution readers not to rely upon any findings or opinions for business or investment purposes and disclaim any liability to any party who relies upon them as such.

Additionally, the findings and opinions expressed in the report constitute judgments as of June 2021 and are subject to change without notice. FBO or MNP are under no obligation to advise of any change brought to its attention, altering those findings or opinions.

2. INTRODUCTION TO TECHNOLOGY IMPLEMENTATION

2.1. Why Implement Technology?

Why would you want to consider implementing novel or innovative technologies? This subsection provides a summary of the potential benefits and challenges of technology implementation.

Benefits	Challenges
There are numerous reasons to consider procuring and implementing new technology. These include: **Addressing Labour Shortages and Turnover** Numerous processors face challenges with high staff turnover and finding enough workers, often citing repetitive, mundane work as the root problem.[1] Implementing technology that automates processes can engage skilled workers, which can reduce turnover and attract more staff. **Re-skilling and Developing Employees** Automation can present an opportunity to re-skill your workforce to more engaging and exciting work than manually intensive processes, providing your employees with development opportunities and possibly increasing retention in your facility.[2] **Reducing Pandemic Impacts** Several available technologies can reduce viral and bacterial transmissions by cleaning the air, re-engineering staff flow, and using rapid antigen testing. Preparing processes that slow the spread of infections makes you more resilient against future pandemics. It can also improve long-term health for your workers, again making your plants more attractive to work at and leading to fewer disruptions in schedules and processes. **Increasing Your Productivity** Technologies can help increase the productivity of your plant by reducing its reliance on human	There are also challenges that you may face in implementing new technology. These can include: **Adding Costs** While technologies can provide many benefits to your company's safety and bottom line, they often come at a high initial cost, both in time and resources. Buried costs, such as ongoing training, maintenance, upgrading, retooling, and change management, can also impact a technology's rollout. As such, it is essential to make realistic estimates of the effort and investment required and to schedule enough time to make the necessary changes (e.g. pausing operations in a plant may be required for technology implementation).[4] **Finding the Right Solution** The market is saturated with many different options, making it challenging to find the correct solution for your plant. Not all solutions will work for your plant. For example, AI and automation still face challenges, and some limits may remain before technologies fully live up to their potential. There may not be a single solution for what you require, as many tools and software are designed for general use.[5] Accordingly, taking the time to review the available solutions and systems can make the difference

[1] MNP Case Studies.
[2] Manyika, J., Sneader, K. "AI, automation, and the future of work: Ten thing to solve for" McKinsey and Company. June 1, 2018. https://www.mckinsey.com/featured-insights/future-of-work/ai-automation-and-the-future-of-work-ten-things-to-solve-for
[4] MNP Case Studies.
[5] Manyika, J., Sneader, K. "AI, automation, and the future of work: Ten thing to solve for" McKinsey and Company. June 1, 2018. https://www.mckinsey.com/featured-insights/future-of-work/ai-automation-and-the-future-of-work-ten-things-to-solve-for

Benefits	Challenges
labour, lowering errors, reducing downtimes, and improving the quality and speed of processes.[3] This has the potential to reduce fixed costs and make you more competitive. **Improving Traceability of Your Supply Chain** Technology can aid in traceability, which can help you meet consumer demand for food production transparency, enhance your ability to identify, respond, prevent food safety issues, optimize your supply chains, and reduce food loss. **Creating Safer Workplaces** By reducing your reliance on workers to complete repetitive manual tasks, your company can create a safer environment. Furthermore, reducing staff on the floor decreases the risk of disease transmissions and the risks related to overcrowding on production lines.	between a successful implementation and long-term disruptions to operations. **Operating With Unclear Objectives** When selecting a technology solution, it can be easy to focus on the immediate needs of the plants or the advertised promises of a given piece of technology. Any technology implementation should begin by observing the current job routine, noting the parts of the work requiring users to make decisions, discussing with workers the aspects of the work they find challenging and rewarding, and examining how a given process relates to others.[6] This ensures that the investment addresses clear, bona fide issues and helps foster buy-in from workers and managers, a critical factor in any successful technology implementation project. **Lacking Technology Readiness** As addressed, introducing new technology-related processes is costly in both time and money. It disrupts the status quo, so it is crucial to get employees' hearts and minds into what you are trying to do and make it clear how the implementation impacts the broader organization. Change management is a critical factor. This includes engaging with staff early on to gather requirements, socializing the change, and having clear, salient objectives. Preparing your organization for large-scale changes can be time-consuming and costly,[7] but, in the long term, it ensures successful adoption and full utilization of any investment in technology.

[3] "A Future That Works: Automation, Employment, and Productivity," McKinsey & Company. January 2017. https://www.mckinsey.com/~/media/mckinsey/featured%20insights/digital%20disruption/harnessing%20automation%20for%20a%20future%20that%20works/a-future-that-works-executive-summary-mgi-january-2017.ashx#:~:text=Automation%20of%20activities%20can%20enable,as%20it%20has%20done%20historically.

[6] Leonard-Barton, D., Kraus, W.A. "Implementing New Technology." https://hbr.org/1985/11/implementing-new-technology

[7] Manyika, J., Sneader, K. "AI, automation, and the future of work: Ten thing to solve for," McKinsey and Company. June 1, 2018. https://www.mckinsey.com/featured-insights/future-of-work/ai-automation-and-the-future-of-work-ten-things-to-solve-for

3. INNOVATIVE TECHNOLOGIES AVAILABLE TO THE SECTOR

3.1. Examples of Innovative Technologies Available to the Sector

This subsection provides a high-level overview of some of the innovative technologies available to the sector. It details how these technologies can help streamline your operations, increase safety, reduce COVID-19 risk factors, address labour shortages, and improve employee morale and retention.

For many food and beverage processors, implementing innovative technologies is not a high priority, especially for small- and mid-sized businesses that must stretch resources to meet the upfront costs for implementing technologies. However, adopting innovative technologies and taking long-term views on return on investment can enable businesses to become more agile and resilient as well as to stay competitive over time.

The COVID-19 pandemic accelerated the adoption of innovative technologies in many parts of the food and beverage sector, having brought to light challenges such as labour shortages, workplace safety, and vulnerabilities in the supply chain.

Below, we provide some examples of the technologies used by sector leaders to address some of these challenges.

Artificial Intelligence

Artificial Intelligence ("AI") has the potential to transform industries and how people work. While AI is an often-misunderstood concept, it generally refers to machinery capable of tasks traditionally requiring human contemplation, judgement, and intention.[8] Effectively, AI amalgamates information fed to it from a variety of sources to make sophisticated decisions.

Examples of AI's growing applications in manufacturing include:

- Analyzing employee data regarding what scheduling arrangements enable the most efficient organization, keeping employees safe.
- Predicting demand patterns that help processors meet unpredictable demand surges and drops, using data from Enterprise Resource Planning (ERP) software and consumer data.
    - For example, Danone Group has used machine learning to achieve a 20% reduction in forecast error, a 30% reduction in lost sales, and a 50% reduction in planners' workload.[9]
- Predicting when equipment will fail and recommending optimal times to conduct maintenance.
    - General Motors, for instance, analyzes images from cameras to detect signs of component wear to pre-empt unplanned outages.[10]

[8] What is Artificial Intelligence? The Brookings Institution. West, D. October 4, 2018. https://www.brookings.edu/research/what-is-artificial-intelligence/
[9] 10 Ways AI is Improving Manufacturing in 2020. Columbus, L. May 18, 2020. https://www.forbes.com/sites/louiscolumbus/2020/05/18/10-ways-ai-is-improving-manufacturing-in-2020/?sh=75dcbf061e85
[10] Ibid.

In the food and beverage sector, businesses should take a human-centred approach to AI initiatives; that is, organizations must focus on the needs and values of workers and managers, then adapt AI designs and models accordingly.[11]

Internet of Things

Internet of Things ("IoT") refers to the interconnection of items embedded with sensors, software, and other technologies to gather information. Nearly any item can be transformed into an IoT device if it can connect to a network or communicate information, including lightbulbs that can be switched on using smartphones, a smart thermostat, or a motion sensor that reports activity.

IoT takes full advantage of smart devices by integrating the data into the same system. This interconnection enables managers to make informed, strategic decisions using real-time data and achieve a wide variety of goals, including cost reduction, enhanced efficiency, and improved safety.[12]

Applied examples of IoT in manufacturing include:[13]

- Tracking tools and equipment to reduce the time employees spend looking for them.
- Monitoring automation tools via inbuilt sensors to enable predictive maintenance.
- Asset tracking, including inventory to enable automatic restocking orders.
- Visual, acoustic, and temperature monitoring, to support environmental controls and monitor for illnesses.
- Entrances, exits, and paths of personnel to aid security and contact tracing.
- Enabling use of systems such as a Warehouse Management System (WMS), predictive and remote maintenance of machinery, asset tracking, and connected logistics.[14]

IoT expands potential applications for AI by feeding diverse information to a central source.

Automation and Robotics

Many food and beverage processors have already automated some of their processes to tackle labour shortages and achieve efficiencies. This trend to utilize robotics, AI, and advanced software programs to automate many processes that once required human intervention will continue. Although implementing this technology requires capital investment and high upfront costs, it can pay off once fully adopted.

Consider a common scenario: a forklift driver enters the warehouse, lifts the products onto a pallet, and drives to the necessary location. Although it is common for workers to operate heavy machinery in enclosed warehouses, this process is inefficient and poses safety risks. Food and beverage companies can introduce

[11] Sharon Goldman, *Six Manufacturing Tech Trends To Look For In 2021*, Forbes, 2021. Available here: https://www.forbes.com/sites/sharongoldman/2021/01/12/six-manufacturing-tech-trends-to-look-for-in-2021/?sh=6910be2f43b9
[12] Martin Boggess, *11 Trends That Will Dominate Manufacturing in 2021*, Global Hitachi Solutions Blog, 2021. Available here: https://global.hitachi-solutions.com/blog/top-manufacturing-trends
[13] The Top 20 Industrial LoT Applications. Informa. Buntz, B. September 20, 2017. https://www.iotworldtoday.com/2017/09/20/top-20-industrial-iot-applications/#
[14] Stuart Watt, *IT/OT convergence and the digital supply chain*, Supply & Demand Chain Executive, 2017. Available here: https://www.sdcexec.com/software-technology/blog/20985656/itot-convergence-and-the-digital-supply-chain

robotic palletizers to automate the demanding manual labour job of sorting and handling multiple units for packaging, which reduces errors and safety risks.[15]

Enterprise Resource Planning and Manufacturing Execution Systems

By digitizing tracking technology, organizations can enable more sophisticated controls over their materials and processes and gain a competitive edge by meeting consumer interests.

Digitizing tracking information enables the application of systems like Manufacturing Execution Systems ("MES") and Enterprise Resource Planning. MES are computerized systems used in manufacturing to track and document the transformation of raw materials to finished goods on the processing shop. MES can aid in monitoring and protecting employee health to ensure businesses are taking the necessary steps to protect employee safety and can remain open. For food and beverage processors, a fit-for-purpose MES can also shift its company culture towards continuous improvement and action. Further, the MES system can be linked with IoT to gather greater insights.

Additionally, consumers are increasingly aware of their environmental footprint and desire traceability and greater levels of transparency across the food supply chain. As a result, businesses may need to digitize their record-keeping and make the data accessible in a secure format for other upstream and downstream businesses so that the entire supply chain can be tracked. One particular front that food and beverage processors can utilize technology on is tracing food packaging.[16] With increasing consumer focus on sustainable packaging, businesses can keep track of recycled content information, the number of times a container has been used, and other digital records to ensure consumers that the packaging is sustainable.

Voice Recognition Technology

Voice recognition technology includes controlling automated processes by voice as well as taking notes and records via speech-to-text. Both provide advantages, including:

- Reducing cross-surface contamination in compliance with COVID-19 protocols and ongoing health best practices.
- Boosting record-taking speed over pen-and-paper or keyboards.
- Eliminating the need to interrupt tasks to relocate or re-wash hands in clean environments improves efficiency in tasks such as inventory control, line-loading, and transfers. [17]

Cloud Platform

Cloud platforms essentially decrease the need for organizations to invest in and store high-capacity servers and instead outsource this task to remote servers by third-party providers. This can enable businesses to

[15] Deloitte, *Using autonomous robots to drive supply chain automation*, 2017. Available here: https://www2.deloitte.com/content/dam/Deloitte/us/Documents/manufacturing/us-manufacturing-autonomous-robots-supply-chain-innovation.pdf
[16] BCFood: The Top Food Technology Trends for 2020, 2021. Available here: https://www.bcfooderp.com/food-technology-trends-2020/
[17] Ibid.

be highly agile, digitally connected, and infinitely scalable. Cloud-based technology also makes digital transformation easier by assisting IT teams in making integrations and customizations less laborious.[18]

Technologies such as IoT generate a lot of data that needs to be securely stored and used by AI and other complex software platforms. Food and beverage processors can securely store lots of data and empower their workers by adopting cloud platforms and enabling software platforms and digital communication tools. This can enable maintenance of COVID-19 protocols, which can boost productivity and collaboration.

[18] Five 2021 technology trends for the food & beverage industry, 2021. Available here: https://www.infor.com/blog/five-2021-technology-trends-for-the-food-beverage-industry

4. KEY CONSIDERATIONS FOR TECHNOLOGY IMPLEMENTATION

4.1. Ensuring the Feasibility of the Implementation of Technology

This subsection provides some considerations and steps that your company can take to lay the groundwork and ensure a feasible and successful implementation of technology. The findings in this section were collected through interviews with subject matter experts and secondary research using industry reports and research.

Establish a Plan and Understand the Current State and Skillsets of the Technology Function

To ensure a successful technology implementation, your company must first understand the current state of the related functions along with past experiences with the implementation of digital technologies. Additionally, your company should begin to identify some key components of a technology plan.

The following table provides insights to the types of questions that your company stakeholders should ask themselves to ensure a successful and feasible implementation.[19]

Establishing a Plan	Understanding the Current State and Skillsets of the Technology Function

• What are the expected outcomes from the technology?
• What are the most critical outcomes?
• What pain points are you trying to solve? What is their root cause?
• What are your needs?
• What factors, if any, could slow the pace of your technology implementation efforts?
• How much funding and resources are available to support your technology transformation?
• What solutions are available to you?
• What resources are available to you (i.e. funding programs, financial lenders, technology providers)?
	• Is your company's technological transformation one of your top priorities? If not, why not?
	• Has your company undertaken any technology implementation projects to date?
	  ○ If so, what were they?
	  ○ What effect did they have on your company?
	  ○ What went well, and what didn't?
	• How well does the technology team at your organization support your company's digital transformation goals and objectives?
	• What expertise is your team missing? Can a partner help fill that gap?

[19] "How to Become 'Tech Forward': A Technology-Transformation Approach that Works," McKinsey & Company. November 2, 2020. https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/how-to-become-tech-forward-a-technology-transformation-approach-that-works

• What regulations apply to your solution? What are their impacts on costs and planning?	

Develop a Technology Readiness Assessment

Before implementing new technologies, it is recommended that your company develop a Technology Readiness Assessment ("TRA") to assess the ability to undertake large-scale technology changes. Best practice steps to develop this assessment include:[20]

- Design a technology maturity assessment approach for the project or the program.[21]
- Define the purpose and scope of the TRA, including developing a plan and assembling the team used to undertake the assessment.
- Select the technologies to be evaluated and include the criteria along with steps used to identify and select the technologies. A group of relevant stakeholders with expertise in technology should choose the appropriate technologies.
- Evaluate the technologies and provide explanations with details on the criteria, analytical process, people, and guidance to facilitate the evaluation.
- Prepare the TRA report and include information on how the report was created, submitted for approval, and communicated. Address how dissenting views were managed and reported.
- Use the TRA results to create steps and actions that serve as a road map to mature technologies so that they perform and provide the benefits as expected.

Perform Cost-Benefit Analysis and Overall Equipment Effectiveness Analysis

Interviewed subject matter experts ("SMEs") suggested that companies take the time to perform an Overall Equipment Effectiveness ("OEE") analysis and a cost-benefit analysis to determine the value of the various types of equipment available to you. An OEE analysis will allow you to numerically identify a production process' effectiveness by looking at the three key production losses: availability, performance, and quality. Some examples of resources to calculate your OEE are provided below.

- **World Class Manufacturing**, https://world-class-manufacturing.com/OEE/oee-calculation.html
- **OEE by Vorne**, https://www.oee.com/calculating-oee.html

[20] "Technology Readiness Assessment Guide: Best Practices for Evaluating the Readiness of Technology for Use in Acquisition Programs and Projects" U.S. Government Accountability Office. August 2016. https://www.gao.gov/assets/gao-16-410g.pdf#page=113&zoom=100,45,212

[21] Definition: A maturity assessment involves assessing the technologies readiness to operate across the environment, with the final objective of transitioning it to the user. It involves determining the fitness of a technology to meet your specific requirements and outcomes.

4.2. Best Practices of Technology Implementation

The following subsection highlights some of the best practices and essential considerations that your company should undertake when procuring and implementing technologies. The best practices were collected through telephone interviews with SMEs and secondary research through industry reports.

Align Technology with Your Company's Overall Strategy and Goals

Companies should take a long-term strategic vision to their automation journey. A research study on the imperatives for automation success showed that companies that successfully implemented technology or automation were almost twice as likely as others to say that they considered automation a strategic imperative and aligned their automation strategy with their overall business strategy. In contrast, companies that were not successful were mostly those that pursued automation for singular reasons such as cost savings, to become more competitive, or to improve the effectiveness of their operations.[22]

Interviewed SMEs on the topic of technology implementation echoed that you should have a long-term vision when implementing technology. Implementing a solution to fix a single pain point will lead to the development of automation silos, where various types of equipment are not interconnected, leading to potential reductions in performance.

According to one SME interviewee, companies often focus on the short-term, selecting solutions that may not properly connect with other systems. This leads to *automation islands*, isolated technologies throughout the plant that do not adequately interconnect to others. Due to this risk, your company should begin its technology transformation journey by building a foundation of systems that can connect seamlessly, thereby supporting additional technologies now or in the future. Interviewees stated that while "automation islands" may seem cheaper, they often increase costs in the long term. Building a long-term vision will allow you to implement technologies in phases, keeping costs low without affecting the overall performance and reliability of the technology network.

Plan to Meet Specific Goals

Provided your company has a well-understood overall strategy, begin by identifying which processes to automate to best support your overall strategy.[23] According to most interviewees, lack of upfront research and planning was the most significant potential pitfall. Your business should spend time understanding its short- and long-term goals to identify the best possible options. Some considerations and steps to take with you in your planning phase include:

- Identifying trends and factors affecting the entire Sector.[24]
- Observing what competitors in the Sector are implementing in terms of technology.

[22] "The Imperatives for Automation Success" McKinsey & Company. August 25, 2020. https://www.mckinsey.com/business-functions/operations/our-insights/the-imperatives-for-automation-success
[23] Ibid.
[24] Simić, M., Slavković, M. "Project Management Success Factors for Implementation of Advanced Manufacturing Technology" January 2020.

- Identifying the gaps in your current processes (whether technology-related or otherwise); the more specific you can be in pinpointing your pain points, the better your technology solution will be.[25]
- Setting benchmarks, based on the established pain points, for what the implementation should accomplish and when. This will allow you to track the success of the eventual technology or automation project.[26]
- Ensuring that the equipment/technology will fit in your existing space.
- Finding a solution that provides the required data analytics functionalities.

Establish a Robust, Dedicated Team to Lead the Change

Having leaders familiar with digital technologies along with dedicated experts committed full time to spearhead the change can translate to positive digital transformation. Leaders who are committed and more involved in the process can increase their companies change to have a successful implementation. Research suggests that organizations with an engaged chief digital officer to support their transformation were 1.6 times more likely than others to report a successful digital transformation.[27] Interviewed SMEs echoed these findings, stating that having an internal team including experts was crucial to a successful project.

Depending on the size of the technology implementation project, the following positions and groups should be established:[28]

- An Internal Project Manager who will champion the technology project. When selecting the internal project manager, seek a dedicated individual to support the project. Ownership and executive team members can sometimes be too busy to provide the technology vendor or contractor with necessary information – especially if technology customization is required – so interviewees stressed that the project manager needs to have the capacity to focus on the implementation and any questions that arise.
- A Project Team, comprising individuals responsible for the physical implementation of the technology. This will likely be a joint team of internal members and technology vendor support. Additionally, consider third-party support (see below).
- A Steering Committee, comprising the stakeholders who will utilize the technology solution when complete. Ensure potential power-users and early adopters are in this group, so they can train other staff in the future.
- A Project Sponsor, to act as an escalation point and the executive support. Again, this position should have the capacity to focus on the project if issues arise, as well as the authority to make decisions that cannot be made at the project or Steering Committee level.

[25] "4 Best Practices for Implementing New Technology." Bazzy, K. https://www.billhighway.co/4-best-practices-for-implementing-new-technology/
[26] 6 Steps to A Successful Technology Implementation Process. Wilson, K. June 13, 2019. https://www.coconutsoftware.com/blog/tips-for-a-successful-technology-implementation-process/
[27] "Unlocking Success in Digital Transformation" McKinsey and Company. October 29, 2018. https://www.mckinsey.com/business-functions/organization/our-insights/unlocking-success-in-digital-transformations#
[28] "Best Practices for Selecting & Implementing New Technology in the Life Sciences." Davis, D., Ph.D. November 2, 2020. https://www.meddeviceonline.com/doc/best-practices-for-selecting-implementing-new-technology-in-the-life-sciences-0001

Consider Including Third-Party Consultants in Project Leadership

Interviewed SMEs clarified that not all food and beverage companies have existing capacity to drive a technology implementation project and raised the importance of finding a robust and qualified partner to help guide them through the process. Including third-party consultants as part of the procurement and implementation team can also fill gaps in internal knowledge.

Interviewed SMEs noted that consultants sell solutions, not technology, whereas "equipment vendors [may] give you a sales pitch and get you stuck on an idea that doesn't work for you." An external, solution-agnostic partner will bring extensive knowledge of available solutions and help you narrow down feasible technology vendors. Additionally, they will bring expertise in engaging team members and gathering requirements, elements that should align the technology procurement with your overall strategy and guide the overall process.

Plan Regular Communication

Adding innovative technology means your processes will change. As such, clear and frequent communication is the cornerstone of successful technology implementations and digital transformations.

Your company needs to communicate the change story to members of the organization to help them understand the vision, goals, reasons, and importance of the change. Research suggests that organizations that follow this methodology are three times more likely to succeed in their implementation.[29]

SMEs echoed the importance of upfront communication, as this can be a powerful tool to maintain employee engagement throughout the change and help mitigate fears around potential job losses. When prompted on managing possible job losses, some SME interviewees stated that you should be upfront about this, as employees may become disengaged if they have suspicions that are not addressed in an open way.

Your organization should have robust communication mechanisms in place, as these are crucial to successfully implementing new technologies.[30] Transition from traditional communication channels only supporting one-way communication (such as company-wide emails) to interactive platforms that enable open and constant communication throughout the organization,[31] such as requirements-gathering sessions, focus groups, trials, and demos. Further, it is recommended to seek out individuals who will be open to change to function as advocates and change leaders.

Focus on Change Management

Beyond communicating the change that will arise from technology implementation, your management and project team must engage all stakeholders in the change's planning stages. This is a crucial step in successful technology implementation because floor staff may be aware of challenges not seen by your upper

[29] "Unlocking Success in Digital Transformation" McKinsey and Company. October 29, 2018. https://www.mckinsey.com/business-functions/organization/our-insights/unlocking-success-in-digital-transformations#
[30] Simić, M., Slavković, M. "Project Management Success Factors for Implementation of Advanced Manufacturing Technology" January 2020.
[31] "Unlocking Success in Digital Transformation" McKinsey & Company. October 29, 2018. https://www.mckinsey.com/business-functions/organization/our-insights/unlocking-success-in-digital-transformations#

management team. Furthermore, engaging staff can increase buy-in into the change, as people are more prone to support something they helped create.[32] It can also empower staff to upskill and retrain, rather than generate anxiety over potential job loss.

Some interviewed SMEs stated that you should work to understand the varying needs of stakeholders. Your company should understand these needs, as they can help you articulate the change vision to align with their pain points and areas of focus. Remember that change readiness may not be equal across the organization. One user group may be eager for change, while others may be more resistant.[33] In your change management plan, incorporate different levels of support to accommodate for this.

A dedicated, multi-level leadership team, as described above, aids change management by directly involving key personnel.

Conduct a Thorough Technology Procurement Process

Focus on Requirements

Interviewed SMEs emphasized that the chosen technology must be the best fit for your specific needs. To ensure that you select the correct technology solution, conduct a thorough procurement process centred on your company's short- and long-term goals.

As described regarding change management, engaging with your floor staff and managers early on will provide insight into the areas of work that require users to make decisions, the aspects of challenging or unsafe work, and areas of work that staff find rewarding. Garnering a holistic view of current processes and how they will transition to potential new practices will ensure the procurement focuses on clear, bona fide issues.

Seek a Long-Term Technology Partner

Ideally, the implemented technology will be an integral part of your operations for decades to come. The lifetime cost of ownership may include maintenance, upgrades, spare parts, and ongoing training and onboarding. So, the selected technology vendor must be a good fit for your organization. As one interviewee noted, "There are many technologies and many options… the key is finding a good partner." Consider their stability and customer service reputation, at a minimum.

Additionally, consider if a given vendor has the potential to furnish you with other products and technologies in the future. One SME interviewee described using the same partner and technology across three plants, producing an economy of scale, and reducing the number of critical components required to be kept in storage as backup.

Seek a partner, not a technology vendor: a partner will provide a solution, ensure fit, help you through implementation, and provide post-implementation support, while a vendor will sell you the technology.[34]

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[32] Lascola, M. "Three Strategies For Implementing a Successful Technology Shift." Forbes. February 20, 2018. https://www.forbes.com/sites/forbeshumanresourcescouncil/2018/02/20/three-strategies-for-implementing-a-successful-technology-shift/?sh=295a492b3e62

[33] "7 Best Practices With Implementing a Technology Solution." TechnologyHQ. April 2, 2021. https://www.technologyhq.org/7-best-practices-with-implementing-a-technology-solution/

[34] "4 Best Practices for Implementing New Technology." Bazzy, K. https://www.billhighway.co/4-best-practices-for-implementing-new-technology/

Create Win-Win Contracts with Your Technology Partner

Research suggests that technology purchasers and providers often create contracts not designed to provide a win-win outcome for both sides. So, consider the following when drafting agreements to pre-empt disagreements and improve relations with your partner:[35]

Steps	Recommendations
Establish a shared understanding of business goals and outcomes	• Establish clear business outcomes expected of all stakeholders. • Transform the Request for Proposal process to a Request for Solutions to establish an opportunity to identify critical problems and possible solutions collaboratively. • Develop a minimum viable contract that captures the expected business outcomes and continuously refine the requirements.
Focus on the long-term	• Both parties should share their long-term vision and strategic goals to create further opportunities for collaboration and mutually beneficial arrangements. • Maintain a log of requirements and goals and continuously re-assess changes and mutual expectations to ensure a continued strategic alignment.
Continuously collaborate on critical decisions	• Bring in SMEs from both sides to collaborate on possible solutions. • Coordinate sessions where you can collaboratively observe processes at the site to identify issues and solutions.
Pursue the transformation with a clear plan and continuous commitment	• Collaborate to design a road map to the implementation. • Include costs and non-financial goals within your plan. • Participate in detailed planning efforts to establish an operating model for the technology and a target cost level.
Develop a win-win contract	• Set mutually beneficial targets and economic objectives through transparency and communication.

[35] Jogani, R., Pande, A., Shirdade, V. "Five Ways to Unlock Win-Win Value from IT-Service Sourcing Relationships". McKinsey & Company. September 15, 2017. https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/five-ways-to-unlock-win-win-value-from-it-services-sourcing-relationships

	• Look at the overall pricing through a total-cost-of-ownership lens and do not focus solely on the capital cost of the equipment. • Continuously monitor adherence to the previously established outcomes and refine them as needed.

Complete Your Pre-Start Health and Safety Review Early in the Technology Implementation Process

According to Workplace Safety and Prevention Services ("WSPS") representatives, companies often overlook their legal requirements for a Pre-Start Health and Safety Review ("PSR") for new or modified pieces of equipment or technologies. A PSR is a detailed examination of new or modified pieces of equipment or processes for specific hazards by a professional engineer to ensure the safety of the workers before using the equipment or process.[36] Representatives stressed the importance of doing this early in the implementation process, as doing it near completion can be expensive if significant issues are identified. WSPS recommends that you follow the following six tips when looking at performing your PSR:[37]

- Understand all PSR requirements.
- Ask questions and probe further if your supplier states that their equipment is compliant, so you can understand why.
- Choose an engineer with the necessary qualifications to do your PSR.
- Document everything.
- Do not ignore your other health and safety requirements.
- Follow the recommendations of the engineer.

[36] "6 Things You Need to Know About PSRs" Workplace Safety & Prevention Services. August 10, 2017. https://www.wsps.ca/Information-Resources/Articles/6-things-you-need-to-know-about-PSRs.aspx
[37] Ibid.

4.3. Best Practices Beyond Implementation

The following subsection highlights some of the best practices and essential considerations that your company should undertake following the implementation of technology. The best practices were collected through telephone interviews with SMEs and secondary research using industry reports.

Upskill Existing Employees

Workers within operationally intensive sectors, such as food and beverage, require significant investment in the re-skilling of new staff following major technology implementation projects. Research suggests that organizations making re-skilling an integral part of their digital transformation are most likely to succeed in their technology implementation.[38] Therefore, it is recommended that you spend time re-skilling employees. In the long-term, re-skilling is more financially prudent and quicker than re-hiring and has the bonus of boosting employee morale and your business' long-term recruitment attractiveness and retention.[39]

Your organization should tailor and customize your training to match your organization's goals and the needs of individual learners. Training materials should be as specific as possible and cover a wide range of topics from the technology itself, tools, and business scenarios that your employees will face in their roles. Your content should be delivered using a combination of classroom, online learning, and on-the-job training. Your training should work to re-skill your employees, alter their mindset to teach them about new ways of working, and provide them with information on the professional growth opportunities available.[40]

When designing your skill transformation program, follow this three-phased approach:[41]

1. **Scout:** Analyze skills demand versus the available supply to deliver the strategy.
2. **Shape:** Design the program's architecture to close the demand by supplying the gap.
3. **Shift**: Shift the skills of your organization by designing and launching the infrastructure to re-skill at scale.

Interviewed SMEs raised the importance for an organization to train floor staff on the new technologies adequately. However, you should begin by training a few key personnel thoroughly, enabling them to become the trainers of all future staff. Interviewed SMEs expressed that they frequently receive calls to come and retrain staff on the technology, as the people who held the knowledge left the organization. Therefore, it is recommended that you train a large group of employees to mitigate any knowledge loss from turnover.

[38] Ellingrud, K., Gupta, R., Salguero, J. "Building the Vital Skills for the Future of Work in Operations", McKinsey & Company. August 7, 2020 https://www.mckinsey.com/business-functions/operations/our-insights/building-the-vital-skills-for-the-future-of-work-in-operations
[39] Ibid.
[40] Ibid.
[41] Hancock, B., Lazaroff-Puck, K., Rutherford, S., "Getting Practical About the Future of Work", McKinsey & Company. January 30, 2020 https://www.mckinsey.com/business-functions/organization/our-insights/getting-practical-about-the-future-of-work

Use Data Analytics as a Preventative Maintenance Tools

Interviewed SMEs stated that a best practice in technology implementation is employing technologies that provide robust data analytics tools that enable the equipment to predict required maintenance and possible breaks using integrated sensors and machine-learning techniques. They caution that you should understand your information requirements and the data already available to you before deciding to ensure that all solutions in your plant can seamlessly integrate into a single analytics package.

While this technology enables the operators to understand the cause of failures, some researchers caution that these tools may not fix all your issues. It requires considerable expertise and can be costly to develop accurate machine learning models that can accurately predict faults and breaks. Instead, researchers recommend that your company should work to fully transform your maintenance and reliability system through digital and advanced analytical techniques to make better use of the data available to you.[42]

Research suggests that you use a Digital Reliability and Maintenance ("DRM") framework, rooted in infrastructures, processes, and tools used to manage assets, data, and people to improve your equipment's reliability and maintenance performance. This framework requires you to:

- Adopt rigorous standards for asset identification and data recording.
- Make use of plummeting data storage costs to retain all data.
- Establish consolidated data services to collect and bridge data from numerous sources.
- Use and centralize digital tools for reliable analysis (such as cause-and-effect or failure-modes-and-effects analysis).

Additionally, research suggests that your organization should implement a digital performance-management system, as they are essential to the effective operation of a DRM program. Your organization can use digital performance management to generate and present key metrics and qualitative information autonomously.[43]

In addition to preventative maintenance tools, interviewed SMEs expressed the importance of working with your technology supplier to determine routine maintenance requirements, the availability of spare parts, expected performance, and how to operate the equipment safely.

[42] Bradbury, S., Carpizo, B., Gentzel, M., Horah, D., and Thibert, J. "Digitally Enabled Reliability: Beyond Predictive Maintenance", McKinsey & Company. October 4, 2018. https://www.mckinsey.com/business-functions/operations/our-insights/digitally-enabled-reliability-beyond-predictive-maintenance
[43] Ibid.

4.4. Technology Implementation Checklist

This subsection provides a checklist to help you assess your readiness to implement various types of technology.

When considering whether your company is ready for a technology procurement and implementation process, consider the following questions:

Alignment with Your Business

- ☐ Will implementing the new technology address specific challenges currently faced by your company?
- ☐ Is your management willing and prepared to dedicate significant time and resources to the implementation and change management efforts?
- ☐ Is your company, from the floor workers to executive, prepared to transition to new processes?
- ☐ Is your selected technology vendor a good fit for your company? Consider their stability for long-term support, customer service reputation, and potential to utilize their other products.

Budgeting and Planning

- ☐ Have you accurately determined the infrastructure upgrade and new equipment costs?
- ☐ Have you considered hidden costs such as change management, project management, training, disruptions to workflow, and training?
- ☐ Do you have the funds available to meet both short-term and long-term goals?

Your Technology Knowledge and Skills

- ☐ Have you researched available technologies in the past?
- ☐ Has the project leadership team led successful technology implementations in the past? If no, can you gain support from external sources?
- ☐ Do you have an implementation plan in place? If no, can you gain access to formal technology implementation planning support services?
- ☐ Have you prepared for the implementation through transparent communication of the planned goals and processes?

Your Project Team

- ☐ Have you defined the roles and responsibilities of team members?
- ☐ Have you prepared a project plan, including the frequency of meetings, milestones, and completion dates?
- ☐ Have you developed a communication and change management plan to ensure buy-in and universal adoption?

Training

- ☐ Do you have a clear set of training objectives and specific curriculum that workers will have to meet?
- ☐ Do you have a plan to manage the short-term training of existing staff to adopt the new technology?
- ☐ Do you have a plan to manage the long-term onboarding of new staff and the ongoing upskilling of current staff?
- ☐ If no to any of the above, how will you develop a comprehensive training plan(s)?

5. CASE STUDIES

This section presents three case studies on Ontario food and beverage companies that have successfully implemented technologies to help address labour and COVID-19 challenges. The companies featured in these case studies are:

- Bonduelle Americas
- Maple Leaf Foods
- Belmont Meat Products and Leadbetter Foods

The case studies provide background information, describe the company's journey to technology implementation, and highlight the company's successes and challenges along the way. Additionally, company representatives share some lessons learned from the implementation of technologies, as well as words of wisdom for other food and beverage companies looking to procure and implement new technologies. Information presented in the case studies was gathered through a series of telephone interviews with company representatives.

CASE STUDY

5.1. Case Study #1: Bonduelle Americas Long Life

Robotic Palletizing System

The Backdrop

Louis Bonduelle founded Bonduelle Americas Long Life ("Bonduelle") in 1853, and it remains a family-run business to today. Bonduelle is a current world leader in market share for ready-to-use vegetables, serving over 100 countries.[44] These vegetables are preserved through natural processes to align with the company's fundamental values of sustainability. Bonduelle strives to inspire a transition toward plant-based diets to contribute to people's well-being and the planet's health. In 2007, Bonduelle North America was created, now the Canadian leader in canned and frozen vegetable products. [45]

In recent years, Bonduelle has increased its adoption of innovative technologies within its plants to increase employee safety, engagement, and retention.

Bonduelle's robotic palletizing system

The Journey

In its Ontario-based processing facilities, and at the beginning of the journey, Bonduelle faced significant challenges with labour attraction and retention. The manual-intensive tasks in its palletizing area were a deterrent for new employees and a challenge as well for current production staff. As Don Haney, Operations Manager, at Bonduelle America describes, "No one wants to work up a sweat in a refrigerated environment and freeze on a 12-hour shift"; "people would work for a day and leave." Largely due to this work environment, Bonduelle relied on temporary employment agencies and short-term contractors, burdening the organization with constant hiring and training investment. The process of sorting, packing, and stacking goods onto pallets also led to significant health and safety concerns. Each plant had hundreds of forklift-pedestrian interactions per day, creating a high chance of incidents. As well, the manual processes added to the risk of repetitive strain injuries.

"Since this technology has been implemented, it's allowed me to feel more at ease having a consistent team working around me. This makes leaning on each other for help on challenging days easier because they're more knowledgeable about their tasks"

— Angela Fehr-Enriquez, Operations Technician, Bonduelle

In response, Bonduelle implemented a robotic palletizing system, a machine that automates the sorting, transferring, and stacking of goods or products onto a pallet. This system replaces labour-intensive manual forklift operations, reduces the reliance on workers and, accordingly, minimizes the

[44] Bonduelle, About Us, Available here: https://www.bonduelle.com/en/americas-long-life.html
[45] Ibid.

frequency of accidents and injuries. Haney recalls that "the ROI was a no-brainer." Bonduelle implemented this system at an initial plant in June 2019. Based on its success, they then rolled out the system in their other North American centres.

Bonduelle's facilities processing rutabaga

Bonduelle has increased its investment into training and development of their staff as a direct result of the automation. It now attracts and retains people who are "engaged and interested in feeding the world" with an accompanying interest in complex mechanics. Bonduelle has reduced the need to hire high numbers of workers and shifted from what were mundane, manual tasks to offering the attainment of specialized skillsets in the operation of complex machines. The Palletizing system also offers several other benefits, including lower work-related risks and injuries, more engaged employees, and cost reductions.

When asked how Bonduelle implemented this technology, Haney outlined the following:

- Communicated with staff and involved all those for which the new technology will directly or indirectly have an impact.
- Created a risk response team that will handle issues as they come forward.
- Held a technology implementation project kick-off meeting and continuously communicated with the project team and suppliers to share the purpose and desired outcomes of the project and to manage new ideas or areas of focus.
- Defined the work's details, such as the roles and responsibilities of those involved in the process.
- Created and followed a detailed technology implementation plan.
- Gathered constant feedback from frontline workers to ensure a fulsome view of all issues and considerations.
- Held a project wrap-up meeting to ensure that all goals were met.

Haney emphasized that Bonduelle leveraged its existing, internal expertise to implement the technologies successfully. This included site engineers who facilitated the implementation and monitoring of these new technologies together with a team of regional engineers who continuously worked to identify new technology opportunities. This broad collaboration affords Bonduelle a robust maintenance support system and decreases operating costs through resource sharing.

Challenges and Successes

Initially, despite strong buy-in from team members, the training for the new system was rolled out too quickly. Following its first implementation, Bonduelle re-imagined its process and focused on training key champions with outstanding attendance records. Once these staff had mastered the equipment, their role shifted to training others on the system. Bonduelle then introduced on-demand, short job task training videos, which employees can watch in real-time. This training and onboarding process has been successful

and, at the same time, has positively influenced the culture within Bonduelle through more engaged employees and better retention rates.

Haney also spoke of the importance of making difficult choices. Due to some implementation challenges, Bonduelle was faced with the tough decision to shut down its facility for a month or rush the technology's implementation. Bonduelle chose to shut down the plant, which allowed for a more robust adoption of the technology combined with the redistribution of supplies across its network and, potentially, some long-term cost savings from avoided equipment failure.

> *"Suffer through short-term pain to gain in the long-term. We had to shut down for a month, which was hard, but in the long-term, it gave us more engaged employees, better operations."*
>
> **—Don Haney, Operations Manager, Bonduelle**

Words of Wisdom

Bonduelle emphasizes a continuous growth mindset, exemplified by their engineering department, which monitors industry and technological developments with an eye to identifying improvements. They knew that implementing an automated system would require significant investment of time and resources along with buy-in from staff but understood the potential benefits. Bonduelle also attributes its success with the project to taking a holistic view of the processes and being able to envision new ways of achieving the desired outcomes.

They recommend that other companies consider the following when making technology decisions:

- **Take a long-term approach when implementing new technology**, as there can be upfront costs and temporary disruption in your production process. However, new technologies will make your system more efficient and safer, and you will earn dividends in the long term by reducing your costs, staff turnover, and worker safety risks (e.g. Bonduelle accepted the need to temporarily shut down a plant).
- **Consider support and maintenance needs.** With a long-term view of implementation, consider the lifespan of the system(s). Bonduelle selected a supplier they had used before and maintain a good relationship with, so they could trust the longevity of the investment. They also use the same pallet packing system across North America, reducing the amount of inventory of critical parts required.
- **Have frequent and transparent communication with staff** to send a strong message on the benefits of the new technology. Getting employee buy-in is critical when implementing new technologies. Take the time to gather feedback on the proposed changes and invest in employee training.
- **Foster a continuous improvement mindset, regardless of the size of your firm.** Always focus on how to improve your operations by doing research and getting frequent feedback from your frontline employees. Adopt a lean philosophy to make small, incremental improvements.

Bonduelle's staff

CASE STUDY

5.2. Case Study #2: Maple Leaf Foods

Smart, Connected Machines Combined with Augmented Reality Technologies

The Backdrop

Maple Leaf Foods ("Maple Leaf") is the largest producer of prepared poultry and meats in Canada, employing over 13,500 people.[46] Maple Leaf operates leading consumer brands throughout Canada, the United States, and Asia.[47] Through decades of experience as a familiar Canadian brand, Maple Leaf is known for quality, innovation, and continued growth in the agribusiness industry.

The Journey

In partnership with Harpak-ULMA ("Harpak"), Rockwell Automation ("Rockwell"), and PTC, Maple Leaf is carrying out a Live-Time Technology Pilot ("the Pilot") of Augmented Reality ("AR") for packaging operations. The goal of the Pilot is to assess if AR will significantly help alleviate a number of critical, sector-wide challenges. These include labour retention, employee training, and technical skills scarcity, as well as the health and safety risks associated with COVID-19.

This unique "design and experiment" partnership approach is anticipated to yield benefits not just for the organizations involved in the Pilot, but also the labour force serving the food and beverage processing sector. AR-based technologies have been demonstrated to improve staff training outcomes and upskilling efforts, as well as employee job satisfaction.

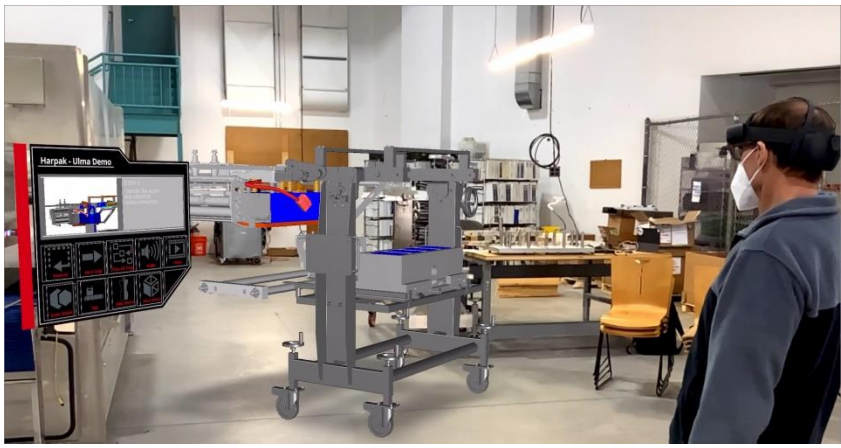
The key success criteria for the Pilot is achieving world-class Overall Equipment Effectiveness ("OEE") benchmarks in excess of 80%. OEE is considered the gold standard for quantifying manufacturing productivity improvements as it reflects the impact of any action taken to optimize production output. This can include upskilling staff through better training, fewer or shorter downtime events, increased first pass product quality, or faster mean-time-to-repair when machines fail. AR offers on-demand expert guidance; rich, visually based training anytime, anywhere; and even assurance on step-by-step compliance for complex tasks such as tool rebuilds.

> *"We're proud to be part of the team working with Maple Leaf to pilot augmented reality to increase efficiency and improve outcomes across various critical business practices. It's inspiring to see the positive impact that this technology has already had on training time and worker error."*
>
> — **Blake Moret, Chairman and CEO, Rockwell Automation**

[46] Maple Leaf Foods, About Us, Available here: https://www.mapleleaf.ca/carbonneutral/?gclid=Cj0KCQjwzYGGBhCTARIsAHdMTQx7s2WXFC2gmY_rJIV0VWebzhsgM81nM6s9Q7yhehUMzuBC5adeDaQaAuEKEALw_wcB

[47] Ibid.

Bringing AR to the Packaging Floor



A user goes through a virtual training experience on the HoloLens headset

Harpak' s packaging platform utilizes embedded smart, connected Rockwell controls technologies and the Vuforia AR software developed by PTC. In the first stage of the Pilot, Harpak-ULMA deployed its embedded OEE Application, which automatically calculates, monitors, and reports packaging line performance to benchmark machine performance. The entire library of PTC's AR applications is being deployed, including remote service enablement, AR-based training, guided service instructions (including step by step process compliance), real-time performance monitoring and diagnostics. AR allows staff to use tablets or smartphones to view real-time Key Performance Indicators and analytics. They can also be utilized for guided work instructions and training, but Microsoft's HoloLens headsets will be used to support hand-free capabilities and immersive virtual or mixed reality machine views. Embedded real-time remote communication and collaboration technologies are also employed. These technologies significantly reduce the need for on-site expert technical resources, while slashing response times and travel costs.

Most AR user-experiences are based on a machine's 3D Parametric CAD Model. These CAD models, coupled with HoloLens technologies and tablets, are the key to creating spatially oriented, interactive AR experiences by leveraging the machine's digital twin. Digital twins enable the rich, life-like animation that allows staff to simulate a maintenance routine or operation before ever touching the machine itself. They also make it possible to simulate "X-RAY Vison", allowing staff to virtually see inside a working machine to identify the location and operating condition of individual machine components without the need to "tag-out" or stop production.

"Maple Leaf Food's Automation Engineering strategy to standardize controls platforms, integration methodology while establishing collaborative long-term relationships with key suppliers allows for opportunities to pilot and implement new technologies with shared risk and learnings. Embracing emerging technologies, assists in enabling Maple Leaf Foods to adapt and evolve in our journey to be the most Sustainable Protein Company on Earth"

— **Peter Twigg, Director, Automation, Corporate Engineering Maple Leaf Foods**

One of the newer Harpak advancements provided to Maple Leaf are real-time, self-diagnosing machine OEE reports. The machine uses internal diagnostics and automatic assessment of downtime and error codes to produce a daily stakeholder Pareto report that identifies high-priority action items. Along with Maple Leaf's staff, the Harpak team leverage remote connectivity to monitor these reports on a daily basis. If a high-frequency stoppage is identified, the Harpak team can build remediation routines using Vuforia's Expert Capture, which can be used immediately to train onsite operators how to address the issue. This capability enables the Maple Leaf team to address machine problems in real time, and better plan maintenance to reduce line downtime and its associated negative OEE impact.

One of Maple Leaf's most anticipated AR benefits is a combination of reduced training cycles and improved outcomes/accuracy of manually driven processes such as tool changeovers, maintenance actions, or

machine operation. AR hardware, such as Mixed Reality headsets, smartphones, or tablets, enable an immersive, in-context and spatially oriented training experience. Visually-based training achieves much higher task retention in much shorter time frames – a big productivity boost as compared to legacy training efforts.

OEE by the Numbers

Harpak's smart, connected platform can significantly improve the OEE for food and beverage companies with high volume operations. For example, a smart, connected platform has the potential to increase the OEE by a 30-point difference from legacy packaging lines. A single point of OEE can often be measured in millions of dollars.

To illustrate the benefits of a smart, connected platform in a food and beverage operation similar to the one featured in this case study, highlights of an assessment that shows the financial impact of a 30-point difference in OEE include:

- Assuming all machines in a food processing operation can produce 120 packages per minute, we calculate the theoretically optimum production volume at approximately 57,000 per day (120 packages x 60 minutes X 8 hours) for a single shift.
- Assuming a 5-day per week schedule and 48 weeks of operation, that equates to a potential of 13,824,000 packages annually.
- A line running at 50% OEE means producing approximately 6,912,000 packages yearly.
- A line running at 80% OEE means producing approximately 11,059,000 packages yearly (4,147,000 more packages in the same period).
- A package at $3 would represent $12,441,000 in additional revenue for the company for that 4,147,000 increase in production.
- Assuming a 30% profit margins, the bottom line would increase by approximately $3,732,000.

** Please note this is just an example that is not specific to any particular food and beverage company.*

Knowledge, On-Demand

Using AR for on-demand, real-time visual guidance during complex service procedures has been shown to virtually eliminate operator error. AR guides staff through instructions step-by-step, even auditing completion if required. Maple Leaf has targeted three high-value activities for compliance enforcement in the Pilot: tool rebuilds, start-up and shut-down procedures, and sanitation preparation. Complex tool rebuilds are typically the purview of the Original Equipment Manufacturer, but the ability to display, enforce, and audit step-by-step procedures obviates the need for an outside expert. Ensuring that line start/stop, and sanitation procedures are followed and enforced in sequence helps avoid costly errors.

"We are thrilled with this opportunity to help an organization of Maple Leaf's stature and reputation achieve world class productivity through digital transformation. Together I expect us to define a new paradigm for leveraging AR technology to drive operational excellence."

— **Kevin Roach, CEO of Harpak-ULMA Packaging**

When it comes to both training and machine error diagnosis, AR enables staff to view a 3D- digital

twin model anywhere, anytime. More than a simple 3-D diagram, an interactive digital twin allows an operator or technician to view and interact with a real-time virtual model of the machine in operation. This means a technician located halfway around the world can diagnosis a running machine from a hotel room. It also means effective employee training is possible even before the employee enters the plant, much less touches the physical machine. A combination of interactive modelling combined with instructional videos virtually eliminates the need for in-person instruction. Numerous studies and pilots have demonstrated the effectiveness of visually interactive AR training technologies. Results not only reflect increased information retention and decreased training time, they support AR as an extremely effective approach for addressing the skills gaps for complex, or less accessible, machine operations.

Challenges and Successes

There are challenges associated with introducing AR to the food and beverage sector. One of the biggest challenges for most food and beverage companies is the lack of access to proprietary CAD models of OEM-sourced equipment required for the AR experience. In addition, many companies do not have the staff skills or tools needed to execute an AR project on their own. Harpak recognized these issues early on and elected to create its own machine-based AR experiences to help thought-leading food and beverage companies such as Maple Leaf take advantage of AR "as a service". This business model is unique in the sector today. Maple Leaf, Harpak Rockwell and PTC, are committed to collaboratively assessing the value and commercial pricing of AR as a service. This will be based on careful, detailed upfront performance benchmarking and subsequent comparison against the success criteria. All Pilot data will be documented and analyzed for its business impact.

AR-based training is already demonstrating promising results for Maple Leaf. For example, training with interactive visuals has helped minimize the impact of language barriers. It is already removing significant training uptake time, reducing worker error, and effectively combating the time and knowledge losses often seen in environments that experience high staff turnover. As it relates to COVID-19, significantly less in-person contact is required to equip employees with the necessary skills to perform their job safely and efficiently.

> *"AR is the ideal way for Maple Leaf Foods to deliver digital information to front-line workers in the context of their tasks. We believe their Pilot program results will underscore the huge opportunity for productivity gains while increasing staff job satisfaction."*
>
> — **Jim Heppelmann, CEO of PTC**

This is also true of OEM support. For example, similar to remote support and collaboration, smart, connected machine self-diagnosis combined with real-time machine status reporting via VPN limits the external resources required to maintain and assess the machinery. Operating costs are effectively reduced, as is the need for physical labour inside the plant – an additional benefit during the COVID-19 pandemic. The impact and costs associated with machine downtime is drastically reduced by lessening the wait time for technicians to troubleshoot a machine in-person. As an additional business value, smart-connected machines are capable of continuously enhancing their value by updating functionality overtime, unlike their traditional unconnected counterparts.

AR technology can equip internal employees with the skills to complete complex tasks, reducing operating costs, increasing machine flexibility, and providing better in-house operational control. When it comes to machinery, most food and beverage companies lack the infrastructure or skills to perform mission-critical machine tasks such as packaging tool rebuilds. But leveraging external OEM resources adds up, encouraging less than optimum maintenance cycles and increasing the risk of unplanned downtime – one of the biggest factors affecting OEE. The AR toolset changes the paradigm by putting an OEM's knowledge within easy

reach of a food and beverage company, making it both consumable and reliable. It removes the traditional challenges associated with delivering skills training, including resourcing, and allocating education time. The Pilot is demonstrating that involved tasks such as line changeovers can be accomplished faster and more accurately using guided instruction virtually prior to performing the same jobs on the plant floor.

Words of Wisdom

The Pilot will operate until the end of 2021. Together all four companies will continue to gather feedback, improve the technology, and assess commercialization of the program. The team offers the following recommendations for implementing AR technology:

- **Establish consistent style guides for AR interface creation and implementation.** Experience demonstrates that employing consistent user-facing styles on interface colour schemes, menu options, and other interface features makes for better comprehension and usability. Delivering a smooth and consistent user experience is essential for rapid uptake.
- **Understand AR resourcing and expertise.** Building AR experiences requires diverse skill sets. The complex interaction between the user experience, training plans and modules, and program engineering demand cross-functional teams and extensive collaboration. These skills, while currently in short supply in today's labor market, will become more available as AR becomes a mainstream technology.
- **Approach technological solutions from an agile perspective.** Not every piece of technology or implementation will be immediately successful, and assuming so limits the potential and results of the projects. A flexible approach is the most effective – experiment, refine, iterate. Be open to feedback and look for improvements that focus on project intentions.
- **Encourage a transparent and equitable partnership.** Wide-range support and skillsets are required to deploy AR effectively. This Pilot is the product of a collaboration among four thought leaders in the sector. Success depends on honest, open feedback between the partners, and a willingness to change or re-direct efforts. Each stakeholder owns not only the program's objectives, but its successes *and* failures as well. Above all, technology for technology's sake is a recipe for failure: the basis for any investment must constitute a compelling business case that delivers operational and financial value.

CASE STUDY

5.3. Case Study #3: Belmont Meat Products and Leadbetter Foods

COVID-19 Mitigation Technologies and Protocols

The Backdrop

Belmont Meat Products (Belmont) is a leading manufacturer and processor of meat proteins for foodservice and retail markets since 1966. Specifically, Belmont services numerous food service and retail market operators such as retail supermarkets, club/warehouse stores, specialty frozen food stores, and casual and fast-casual dining businesses.

Belmont's beef, chicken, and vegetable protein products are found across Canada as both private label offerings and Belmont-branded products. Its products are also exported to various North American and international markets.[48]

Leadbetter Foods (Leadbetter) is a Canadian meat company, operating since 1926. Specifically, Leadbetter manufactures specialty pork and beef products such as bacon, fresh and frozen burgers, and steaks. Since it began, Leadbetter has grown from a small family business to one of the largest employers in the city of Orillia, Ontario.[49]

Leadbetter and Belmont are sister companies under the Premium Brands Holdings Corporation.

The Journey

Belmont and Leadbetter's journey to implementing innovative technology to help mitigate COVID-19 impacts began with the standard safety protocols in January 2020, when it became apparent that the COVID-19 situation in China would pose a threat to other countries like Canada.

At that time – before the Federal government's direction – Belmont and Leadbetter launched their previously established SARS protocols and started to source the required equipment to keep its staff safe from COVID-19. This sourcing included personal protective equipment, hand sanitizers, and isopropyl alcohol. While Belmont and Leadbetter secured a small supply of N95 masks and sanitizers, worldwide supply chains could not keep up with demand. However, through some creative

> *"What we learned early in the pandemic was to move at the speed of COVID-19."*
>
> — **Doug Alexander, VP Technical Services, Belmont Food Group**

[48] Belmont Meats, About Us, Available here: http://www.belmontmeats.com/about-us/
[49] Leadbetter Foods, LinkedIn Profile, Available here: https://www.linkedin.com/company/leadbetter-foods/?originalSubdomain=ca

sourcing, Belmont and Leadbetter procured hand sanitizers, infrared red thermometers, and washable masks by February 2020.

In early 2020, Belmont and Leadbetter began implementing additional technology to supplement the initial protocols. They added active screening tools to reduce the risk of workers coming into its processing facilities while sick. Although the checklist was initially manually completed by staff, the process was then automated through a phone app called Get Ready, which is available commercially. Furthermore, Get Ready provided the facility with infection control training for staff, which focused on proper face shield use, hand washing, and information on how the virus spreads.

Belmont staff member in hand washing stations

With all of these protocols in place, Belmont felt well-positioned to take on the pandemic. However, in February 2021, a COVID-19 outbreak occurred at one of its facilities, prompting Belmont to re-assess all protocols and consider additional technologies. Through a vigorous contact tracing exercise, Belmont was able to identify areas of spread and improvements within their existing protocols. For example, through this review, they recognized that washable masks were ineffective in controlling the spread of COVID-19, leading to the purchase of KN95 masks and the development of safety visors. Belmont further realized that the virus was spreading through air particles in areas without mandatory mask-wearing, such as bathrooms and lunchrooms. Belmont responded by installing air sanitizers that use UV light, photo plasma, ozone, and safe levels of hydroxy radicals to sterilize the air. This was combined with increasing airflow throughout its plant by opening windows and increasing the smokehouse's exhaust fans' force.

Belmont and Leadbetter further implemented rapid antigen testing. Rapid antigen tests are self-administered tests that indicate whether someone should seek a formal COVID-19 polymerase chain reaction test. Belmont and Leadbetter established a series of isolation booths to administer these tests, filling one side with positive air pressure and another with negative air pressure. Employees enter the negative pressure booth in full PPE, test themselves, and pass the test into the positive air zone, where another employee checks the results. The employee in the positive airspace is entirely safe and is not required to leave the plant if an employee tests positive. Belmont and Leadbetter have also established a risk matrix to determine the likelihood that the person may have spread the virus to other staff, providing a rationale for who needs to be sent home in the event of a positive test.

> *"Belmont responded by installing air sanitizers that use UV light, photo plasma, ozone, and safe levels of hydroxy radicals to sterilize the air."*
>
> — **Doug Alexander, VP Technical Services, Belmont Food Group**

Challenges and Successes

Early on, Belmont and Leadbetter struggled with employee and executive hesitation and resistance in making the necessary changes, as the threat of COVID-19 was not immediately evident. This challenge was addressed by frequent and continuous demonstrations and communication of the benefits of these changes to normalize the new protocols among staff members and executives.

Words of Wisdom

Looking back, Belmont and Leadbetter are pleased with the journey they took to implement technologies and safety protocols to help address COVID-19 impacts, and they believe extensive planning is a major

success factor. The following include Belmont's and Leadbetter's top suggestions to other Ontario food and beverage processors looking to implement technologies and protocols to mitigate COVID-19 impacts:

- **Identify threats and act fast.** Belmont and Leadbetter caution other food and beverage processors against over-planning and not addressing the threats of COVID-19 (or future pandemics). They recommend immediately noting risks and implementing all possible avenues to contain the threats. Their philosophy for 2020 was to "be quicker than COVID." Similarly, remaining apprised of emerging trends in technology will allow similar organizations to take advantage of opportunities when they arise.
- **Monitor results of protocols and technology and adjust as needed.** As with any project, Belmont and Leadbetter followed the ongoing results of their processes and technologies and adapted as needed. When they found that their current processes weren't working as well as intended, such as during the outbreak at one of their facilities, they reviewed video footage and protocols to react timely and effectively.
- **Implement technology such as rapid antigen testing to identify issues early on.** Rapid antigen testing identifies threats quickly and efficiently, is easy to administer, and reduces the risk of asymptomatic spread.
- **Create a culture where people feel safe reporting their COVID-19 infections.** It is crucial to create a culture where employees feel encouraged to communicate if they have become infected. Provide them with assurances that their jobs are protected, and work to reduce the stigma of COVID-19 infections. Encouraging people to get tested and be honest about their illness will provide your plant with better control over potential infections.
- **Practice dry runs of all COVID-19 protocols.** This ensures that all staff and executives know the various protocols and provides confidence that these practices are effective and well understood.

6. TECHNOLOGY IMPLEMENTATION RESOURCES AND SUPPORT

This section presents a list of technology providers and consultants, along with grants and financial assistance programs, that provide Ontario food and beverage companies with resources to support their technology implementation initiatives.

6.1. Ontario Technology Providers and Consultants

Below is a list of various technology advisors and providers available to help your company implement new technologies.

Technology Advisors
Clarkston Consulting Clarkston Consulting is a consulting firm working in the consumer product, retail, and life science industries. They provide IT consulting services as well as full-scale project implementation skills and expertise that help clients achieve their strategic goals. For more information, see: https://clarkstonconsulting.com/
MNP Technology Solutions MNP is a leading professional services firm that provides digital solutions services. From strategy and selection to improvement in people, process, and technology, MNP works closely with clients to help them reach their goals, powered by technology. For more information, see: https://mnptechnology.ca/services/technology-advisory/
Manawa Manawa is an IT consultancy servicing the Greater Toronto Area. Manawa helps keep businesses safe from cyber-threats as well as with technology strategy and budgeting so that businesses can be more efficient and competitive. For more information, see: https://manawa.ca/
The Answer Company The Answer Company is a top ERP Consulting Group committed to propelling your business forward with customized ERP software solutions. For more information, see: https://www.theanswerco.com/

Technology Providers

ABB

ABB is a worldwide technology leader working closely with utility, industry, transportation, and infrastructure customers. ABB drives performance by connecting software to its electrification, robotics, automation, and motion services.

For more information, see: https://global.abb/group/en

Apex Motion

Apex Motion specializes in robotics, machine automation, and vision. They handle design fabrication, installation, testing, and support for all machines. Recently, Apex Motion developed collaborative robots for the baking industry.

For more information, see: https://apexmotion.com/

Emerson

Emerson is where technology and engineering come together to create solutions for the benefit of our customers, driven without compromise for a world in action.

For more information, see: https://www.emerson.com/en-ca

Grantek

Grantek specializes in smart manufacturing, industrial network, automation, and industrial safety for the food and beverage, consumer packaged goods, and pharma sectors.

For more information, see: https://grantek.com/

IFM

IFM develops, produces, and sells sensors, controllers, software, industrial automation, and digitalization systems worldwide.

For more information, see: https://www.ifm.com/ca/en

Implementation Engineers

Implementation Engineers partner with companies to address challenges and transform the Performance Excellence capabilities of an organization into a competitive advantage. Their solutions include cost per unit reduction, lean facility layout, high-performance management systems, asset performance excellence, process yield, and lean six sigma training.

For more information, see: https://www.implementation.com/who-we-are/

Lakeside Controls – Emerson Impact Partner

Lakeside Controls provides complete automation solutions to a wide range of industries. They help to

Technology Providers

optimize process efficiency while maintaining and prioritizing a high standard of safety. They have capabilities in process management, industrial automation, utilities, and digital transformations.

For more information, see: https://www.lakesidecontrols.com/

McRae Integration

McRae Integration is a controls system integrator, project management, and engineering company. Their services include system integration & automation, project management, robotic automation, OEM process skids, guarding & safety solutions, panel design & manufacturing, and MES solutions.

For more information, see: https://www.mcraeintegration.com/

Movement Strategies

Movement Strategies is a leading crowd dynamics consultancy. They help determine the flow of people in stadiums and plants to ensure proper social distancing and the re-engineering of spaces to maximize productivity and outputs.

For more information, see: https://www.movementstrategies.com/

Omron Automation

Omron Automation dedicates themselves to providing all necessary technologies for a complete, end-to-end automation solution for your industry. From controllers to robotics to machine vision, they provide strategic solutions to design your next successful application.

For more information, see: https://automation.omron.com/en/ca/

Phoenix Systems

Phoenix Systems delivers traditional core ERP components (Accounting/Finance, Manufacturing and Materials Management) using software that specializes in the unique challenges faced by manufacturers and distributors.

For more information, see: https://phoenixsystems.ca/

Proax Technologies

Proax Technologies is a leader in technical automation distribution, offering innovative product solutions in Automation and Robotics and Motion Control and Machine Safety.

For more information, see: https://www.proax.ca/

Qualtech

Qualtech is a team dedicated to mastering the processes to design, build and install intuitive, innovative and high-quality systems. Its expertise includes engineering, design, construction,

Technology Providers

installation and automation capabilities.

For more information, see: https://qualtech.ca/home/

Redzone

Redzone is a leading digital production system technology provider which empowers frontline workers using their proprietary solutions to connect operators, maintenance workers, and quality technicians via a native mobile app.

For more information, see: https://rzsoftware.com/

Rockwell Automation

Rockwell Automation is a provider of industrial automation and information technology. It provides everything from hardware and integrated control systems to software and lifecycle services to support long-term maintenance and assessment as well as implementation support.

For more information, see: https://www.rockwellautomation.com/en-us.html

Sinox

From process engineering to manufacturing and start-up, Sinox is the specialist in stainless steel food processing equipment.

For more information, see: https://groupesinox.com/en/

Superior Bakery Systems Inc.

Superior Bakery Systems is an industrial equipment company providing technology and equipment for the baking sector.

For more information, see: https://superiorbakerysystems.com/about-us/

Telus Agriculture

Telus Agriculture works to build agri-tech solutions and data-driven technologies to improve the efficiency and connectivity of food systems.

For more information, see: https://www.telus.com/en/bc/agriculture

Veolia Water Technologies

Veolia Water Technologies is a subsidiary of the Veolia group and is the leader in water treatment, designing and delivering drinking water and wastewater treatment plants and smaller water treatment equipment for industrial customers.

For more information, see: https://www.veoliawatertechnologies.com/en

6.2. Grants and Financial Resources

The following table provides a list of some financial resources (grants and loans) available to help you fund the investments required to implement innovative technologies. It also outlines each program's funding and delivery agencies, type of support, eligibility criteria, and funding models.

Financial Grants and Programs		
Program	**Description**	**Eligibility**
AgriInnovate Program	The AgriInnovate program provides funding to help businesses commercialize and/or adopt innovative agri-based products, technologies, processes, or services. Applicants may apply at any point during the life of the program, until available funds have been fully allocated. **Type of support**: Loans. **Funding amount**: Up to 50% of the funding towards eligible project costs. Total funding request cannot exceed $10 million. Combined government funding being applied towards total eligible project costs cannot exceed 75%. **More information about the program**: https://www.agr.gc.ca/eng/agricultural-programs-and-services/agriinnovate-program/?id=1515682916298	• Must be for-profit organizations incorporated in Canada. Eligible activities include: • Commercialization of innovative agricultural, agri-food or agri-based products, technologies, processes, or services where the innovations will be introduced to the market when the project is completed. • Adoption of innovative agricultural, agri-food or agri-based products, technologies, processes, or services where recent innovations are adopted and adapted to existing operations. • Demonstration of innovative agricultural, agri-food, or agri-based products, technologies, processes, or services, where all necessary testing and piloting has been completed.
Agri-Tech Innovation Cost-Share Program	The Ontario Ministry of Agriculture, Food, and Rural Affairs is investing $25.5 million dollars in technology to protect agri-food workers. The program supports the modernization of	An applicant must be either a farm or processing business as outlined below: • An established Farm

	workplaces by funding advanced or innovative technology projects to enhance worker protection against COVID-19, increase business efficiencies and productivity, and build the sector's resilience. **Type of support**: Grants. **Funding amount**: 35% of eligible costs for eligible projects, up to a maximum of $100,000 per business. Projects must have a minimum total value of $150,000. **More information about the program**: http://www.omafra.gov.on.ca/english/about/agritechinnovation.htm	Business that is a legal entity and produces agricultural commodities in Ontario under a valid Farm Business Registration Number (FBRN), or an allowable exemption. • An established Processor Business that is a legal entity that handles agricultural commodities, food, beverages, or agri-based products in Ontario. This includes primary food processing, i.e. businesses that manufacture products that cut, clean, package, store and refrigerate raw plant food. • Adopting an advanced automation or manufacturing technology.
Canadian Agricultural Strategic Priorities Program	The Canadian Agricultural Strategic Priorities Program funds projects that address national or Sector priorities, which help the industry mitigate emerging issues and capitalize on opportunities. **Type of support**: Loans. **Funding amount**: The funding will cover up to 50% of project expenses, for a maximum of $1 million in non-repayable government funding. **More information about the program**: https://www.agr.gc.ca/eng/agricultural-programs-and-services/canadian-agricultural-strategic-priorities-program/?id=1549325740130	• Must be a not-for-profit organization incorporated in Canada. • Project must involve or is supported by groups or individuals that represent the targeted agriculture and agri-food sector (national or sector-wide) and, ultimately, benefits the stakeholders of the targeted agriculture and agri-food sector.
Canadian Manufacturers and Exporters Association: Technology Assessment Program	The Canadian Manufacturers and Exporters Association (CME) advocates for and represents the manufacturing Sector of Canada. They provide lean training, workforce development programs, technology adoption services, peer councils, health and safety programs and training, and more. CME's Technology Assessment Program helps companies understand which technologies	• Must be a small to medium-sized manufacturer based in southern Ontario.

	are best suited to their needs and helps provide greater certainty on investments. **Type of support**: Grants. **Funding amount**: up to $25,000 in reimbursable funds. **More information about the program**: https://cme-mec.ca/technology_assessments/	
Eastern Ontario Development Fund	The Eastern Ontario Development Fund supports Canadian small to medium-sized companies in expanding their operations and creating jobs in Eastern Ontario. The funding can be used to invest in new capital equipment, improve existing operations and processes, and chase new market opportunities. **Type of support**: Loans and grants. **Funding amount**: For **loans**, up to 15% funding to a maximum of $5 million, interest free during the project period (up to 4 years). If you achieve your investment and job targets, up to 30% of the loan (to a maximum of $500,000) may be forgiven. For **grants**, up to 15% to a maximum: • Of $500,000 if your company has fewer than 100 employees and is based in rural Ontario (population of your community is less than 100,000 or population density is less than 100 people per square kilometre). • Of $1.5 million for strategic projects that are foreign direct investments or from companies competing against other jurisdictions (in limited circumstances). **More information about the program**: https://www.ontario.ca/page/eastern-ontario-development-fund	To be eligible, businesses need to: • Have at least 3 years of operations/financial statements. • Employ at least 10 people (or 5 if you are in rural Ontario). • Commit to creating at least 5 new jobs (or 30% increase for companies with fewer than 15 employees). • Invest at least $500,000 in their project (or $200,000 if you are in rural Ontario). • Be located in, or plan to locate in, a community in eastern Ontario.
FedDev Ontario Business Scale-up and Productivity Program	The FedDev Ontario Business Scale-Up and Productivity program helps offset the upfront costs of adopting new, innovative technologies that support scale-up, productivity, and development of and entry into new markets, which helps companies become globally	Applicants must be either: • A Canadian or provincially-incorporated business. • An Indigenous organization such as Indigenous-owned

	competitive. **Type of support:** Loans. Funding is a no-interest, repayable contribution. **Funding amount**: Up to 35% of project costs, to a maximum of $10 million. **More information about the program**: https://ontariobusinessgrants.com/loans/business-scale-up-and-productivity/	business. • A Co-operative. Applicants should also be: • Located in southern Ontario. • Legal entities capable of entering into legally binding agreements. • Able to provide a minimum of 65% project funding. • Normally employing a minimum of 5 full-time employees.
Next Generation Manufacturing Canada (NGen) Program: Cluster Building	NGen offers a variety of funding solutions that build on Canada's strategic advantages in research, technology, and manufacturing. Under their Cluster Building stream, funding is intended to facilitate broader collaboration and cooperation among small to medium-sized enterprises and supporting organizations to accelerate the implementation, scale-up, and commercialization of advanced technologies for manufacturing in Canada. **Type of support**: Grants. **Funding amount**: The program can reimburse up to 50% of the maximum value of the project. The maximum value of a Cluster Building project is $150,000. Only eligible costs as defined in the NGen Capacity Building Finance Guide will be reimbursed. **More information about the program**: https://www.ngen.ca/funding/clusters	• Must be a small to medium-sized enterprise that is a member of NGen (Canada's advanced manufacturing Supercluster). • Must be incorporated in Canada. • Must be either for-profit organizations or not-for-profit organizations that facilitate and fund research and development for whom over 50% of funding is received from private-sector organizations in the form of membership fees or similar. • For the purposes of NGen, a small to medium-sized enterprise is an organization with fewer than 500 employees.
Next Generation Manufacturing Canada (NGen)	NGen offers a variety of funding solutions that build on Canada's strategic advantages in research, technology, and manufacturing. Under their Pilot Projects and Feasibility Studies stream,	• Must be an small to medium-sized enterprise that is a member of NGen (Canada's advanced

Program: Pilot Projects and Feasibility Studies	NGen will help small to medium-sized enterprises scale-up project plans for implementation, prepare technologies for deployment in production, and de-risk technology adoption and scale-up. **Type of support**: Grants. **Funding amount**: The program can reimburse up to 50% of total eligible project expenses incurred. The total amount of the project should be between $100,000 and $500,000 for pilot projects or between $50,000 and $200,000 for feasibility studies. **More information about the program**: https://www.ngen.ca/funding/pilot-feasibility	manufacturing Supercluster). • Must be incorporated in Canada. • Must be either for-profit organizations or not-for-profit organizations that facilitate and fund research and development for whom over 50% of funding is received from private-sector organizations in the form of membership fees or similar. • For the purposes of NGen, a small to medium-sized enterprise is an organization with fewer than 500 employees.
Next Generation Manufacturing Canada (NGen) Program: Supercluster Projects	NGen offers a variety of funding solutions that build on Canada's strategic advantages in research, technology, and manufacturing. Under their Supercluster Project stream, NGen will invest $200 million of Supercluster funding in collaborative industry-led projects before the end of March 2023. **Type of support**: Grants. **Funding amount**: The program can reimburse up to 44.4% of eligible project expenses. Projects should cost between $1 million and $20 million. **More information about the program**: https://www.ngen.ca/funding/supercluster	• Must be a member of NGen (Canada's advanced manufacturing Supercluster). • Must be incorporated in Canada. • Must be either for-profit organizations or not-for-profit organizations that facilitate and fund research and development for whom over 50% of funding is received from private-sector organizations in the form of membership fees or similar.
Ontario Manufacturing Training Program	The Ontario Manufacturing Training Program provides funding to develop engineering skills through training on new software, hardware, or other tools supporting innovation in manufacturing. This training must clearly be linked to innovations leading to domestic supply chain enhancements or competitiveness, including	Eligible activities for southern Ontario manufacturers impacted by COVID-19: • Training that supports the adaptation of new technology, new processes or procedures, or a change

	expanding into new or enhanced domestic markets. **Type of support**: Grants. **Funding amount**: Provides non-repayable contributions to a maximum $100,000 towards eligible expenses. **More information about the program**: https://www.mentorworks.ca/government-funding/human-resources-and-training/ontario-manufacturing-training-program/	within the company to support innovation or retooling which would lead to the creation of new lines of production. • Training that supports and develops highly skilled personnel in any area that leads to innovation or productivity improvements or skilling-up resources.
Southwestern Ontario Development Fund	The Southwestern Ontario Development Fund provides support for projects and investments to businesses, municipalities, and not-for-profit organizations for economic development in southwestern Ontario. The funding can be used to support investment in new capital equipment, developing skills, enhancing productivity, and developing new infrastructure. **Type of support**: Loans and grants. **Funding amount**: For **loans**, up to 15% funding to a maximum of $5 million, interest free during the project period (up to 4 years). If you achieve your investment and job targets, up to 30% of the loan (to a maximum of $500,000) may be forgiven. For **grants**, up to 15% to a maximum of: • $500,000 if your company has fewer than 100 employees and is based in rural Ontario (population of your community is less than 100,000 or population density is less than 100 people per square kilometre) • $1.5 million for strategic projects that are foreign direct investments or from companies competing against other jurisdictions (in limited circumstances). **More information about the program**: https://www.ontario.ca/page/southwestern-ontario-development-fund	To be eligible, businesses need to: • Have at least 3 years of operations/financial statements. • Employ at least 10 people (or 5 if you are in rural Ontario). • Commit to creating at least 5 new jobs (or 30% increase for companies with fewer than 15 employees). • Invest at least $500,000 in the project (or $200,000 if in rural Ontario). • Be located in, or plan to locate in, a community in southwestern Ontario.

7. APPENDICES

Appendix A – Data Sources

This appendix lists the key data sources that MNP consulted during this study. Supplementary references are included in footnotes throughout the report.

Primary Data Sources

MNP conducted a series of telephone interviews and facilitated sessions with technology-related companies and food and beverage companies, namely:

- Eleven (11) interviews with subject matter experts on the topic of technology implementation.
- Six (6) interviews and facilitated sessions with representatives of Ontario food and beverage companies and technology-related companies that were featured in case studies.

The purpose of the interviews and sessions was to gather information regarding prominent innovative technologies and supports that are available to the Ontario food and beverage sector as well as the known outcomes, associated best practices, and other considerations in implementing such technology.

MNP conducted 11 interviews with subject matter experts on the topic of technology implementation.

Table 1 summarizes the interviewee profile.

Table 1: Interviewee Profile

Organization	Name	Title
Veolia Water Technologies	Aymeric Simon	Vice-President of Sales & Strategic Marketing
GHD	Jason Haelzle	Vice President
Lakeside Control – Emerson	Wakelin Fulford	Technical Sales Specialist
Lakeside Control – Emerson	Viktoriya Todorova	Technical Sales Specialist, Final Control & Digital Transformation
	Muneeb Tariq	Technical Sales Specialist - Reliability & Digital Transformation Solutions
	Ed Ladd	Director, Wireless Solutions Architect
Apex Motion	Martin Riis	Director of Sales Marketing
ABB	Stanley Wachon	Food & Beverage National Business Development Manager
	Mirvil Bruno	National Food & Beverage Segment Manager

Organization	Name	Title
Workplace Safety and Prevention Services	Michael Whitson	Certified Machinery Safety Expert
Workplace Safety and Prevention Services	Michael Wilson	Technical Project Management Specialist
Telus Agriculture	Sean Moore	Senior Account Manager
	Michael Dittrich	General Manager, Operations
Proax Technologies	Terrence Francis	GTA Sales Manager
Redzone	Steve Crews	Medium Enterprise Account Executive
	Lawrence Green	Vice President of Sales
	Ken Fisher	Vice President of Product Management & Solutions Consulting

MNP conducted six interviews and facilitated sessions with 14 representatives of food and beverage companies and technology companies featured in the case studies.

Table 2 summarizes the interviewee profile.

Table 2: Interviewee Profile

Organization	Name	Title
Maple Leaf Foods	Peter Twigg	Director Automation, Corporate Engineering
Maple Leaf Foods, Harpak-Ulma, and Rockwell Automation	Peter Twigg (Maple Leaf Foods)	Director Automation, Corporate Engineering
	Dana Armstrong (Maple Leaf Foods)	Corporate Engineering, Automation Lead
	Kevin Roach (Harpak-Ulma)	CEO and President
	Mary Ahlfeld (Harpak-Ulma)	Marketing Director
	Alexander Ouellet (Harpak-Ulma)	Innovation Engineer
	Matt Bauer (Harpak-Ulma)	Chief Communications Officer

Organization	Name	Title
	Martin Merker (Harpak-Ulma)	Regional Sales Manager
	Michal Mokros (Rockwell Automation)	Global Strategic Account Manager
	Christian Jesus Radillo Montiel (Rockwell Automation)	Global Technical Lead for Extended Reality
Bonduelle Americas Long Life	Don Haney	Operations Manager
	Lisa Hamilton	Health and Safety Coordinator
Belmont Food Group	Doug Alexander	Vice President Technical Services

Secondary Data Sources

The secondary sources used in this report are cited in the footnotes throughout the report. The following list includes each of the sources listed:

- "6 Things You Need to Know About PSRs" Workplace Safety & Prevention Services. August 10, 2017. https://www.wsps.ca/Information-Resources/Articles/6-things-you-need-to-know-about-PSRs.aspx
- "Innovation with a Purpose: Improving Traceability in Food Value Chains through Technology Innovations" World Economic Forum and McKinsey and Company. January 2019. http://www3.weforum.org/docs/WEF_Traceability_in_food_value_chains_Digital.pdf
- "Technology Readiness Assessment Guide: Best Practices for Evaluating the Readiness of Technology for Use in Acquisition Programs and Projects" U.S. Government Accountability Office. August 2016. https://www.gao.gov/assets/gao-16-410g.pdf#page=113&zoom=100,45,212
- "Unlocking Success in Digital Transformation" McKinsey and Company. October 29, 2018. https://www.mckinsey.com/business-functions/organization/our-insights/unlocking-success-in-digital-transformations#
- A Future That Works: Automation, Employment, and Productivity", McKinsey & Company, January 2017. https://www.mckinsey.com/~/media/mckinsey/featured%20insights/digital%20disruption/harnessing%20automation%20for%20a%20future%20that%20works/a-future-that-works-executive-summary-mgi-january-2017.ashx#:~:text=Automation%20of%20activities%20can%20enable,as%20it%20has%20done%20historically.
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- Manyika, J., Sneader, K. "AI, automation, and the future of work: Ten things to solve for" McKinsey and Company. June 1, 2018. https://www.mckinsey.com/featured-insights/future-of-work/ai-automation-and-the-future-of-work-ten-things-to-solve-for
- Simić, M., Slavković, M. "Project Management Success Factors for Implementation of Advanced Manufacturing Technology" January 2020.

Appendix B – About MNP

MNP is the fastest-growing chartered accountancy and business advisory firm in Canada. Founded in 1958, MNP has grown from a single office in Manitoba to more than 110 offices and 7,000 team members across Canada. MNP is a member of Praxity AISBL, a global alliance of independent firms, enabling us to access a broad range of Sector-specific expertise worldwide.

At MNP, our professionals are the driving force behind our success. They continue to demonstrate our culture and values, which are integral to the way we conduct business, both internally and externally. As such, MNP is proud to be recognized as one of the 50 Best Employers in Canada by Maclean's magazine.

MNP has a Food and Beverage Manufacturing Practice, consisting of a team of dedicated members with a successful track record of conducting industry studies, market research studies, and economic impact engagements in the food and beverage manufacturing sector. Our team consults on a range of agri-food related topics and has carried out assignments across Canada for businesses, industry associations, and government.

Appendix C – About FBO

Food and Beverage Ontario ("FBO") is the provincial professional leadership organization for food and beverage processors across Ontario.

Established in 2003 as the Alliance of Ontario Food Processors, FBO has evolved into the organization of choice for members of the processing community - a community that contributes over 42 billion dollars annually and is the number one employer in Ontario.

Governed by an industry-led Board of Directors and support from a dedicated staff team, FBO is a powerful advocate and facilitator of success for all categories of the Ontario processor business. Our goal at FBO is to promote and support a competitive Ontario industry locally and within the global marketplace.

FBO's focus is on the success, prosperity and growth of the food and beverage processing sector. We work collaboratively with our colleagues and partners across the agriculture and food sector.

For more information about FBO, please visit: https://www.foodandbeverageontario.ca/about-fbo