### IDENTIFYING TOP SKILLS IN DEMAND, CHALLENGES AND OPPORTUNITIES

# The Kootenay Advanced Manufacturing Sector Assessment







Publication Date: July 2023

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**Funder Acknowledgements**: We gratefully acknowledge the financial support of Mitacs, Discovery Foundation and Community Futures East Kootenays.

Acknowledgements: We would like to acknowledge DFAB students and survey participants.









On behalf of Selkirk College, I (we) acknowledge that we operate and serve learners on the unceded traditional territories of the Sinixt (Lakes), the Syilx (Okanagan), the Ktunaxa, and the Secwépemc (Shuswap) peoples.

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## **Executive Summary**

The Discovery Foundation's Advanced Manufacturing Program, in collaboration with the Kootenay Association for Science and Technology (KAST) and Selkirk Innovates, conducted a survey in the Kootenay Region of British Columbia with the objective of exploring the Advanced Manufacturing sector. This survey was designed to gather essential sector information, including its size, employment potential, general challenges faced by businesses, specific challenges related to recruitment and retention, and avenues for growth within the sector. The data collected provides valuable insights for KAST, enabling them to develop targeted strategies to support youth recruitment, business retention, and expansion within the Advanced Manufacturing sector. KAST aims to enhance awareness of career opportunities in Advanced Manufacturing among youth and identify key opportunities to strengthen the sector in the region.

A total of 72 businesses participated in the survey, with most responses (42%) originating from businesses located in the Central Kootenays, specifically in Nelson, followed by the Kootenay Boundary region, particularly Trail. Among the respondents, the Wood Product Manufacturing industry accounted for the highest percentage (18%), followed by the Beverage and Tobacco Product Manufacturing sector (14%). Lastly, most of the respondents have been operating for over 20 years.

The survey yielded the following key highlights:

- Despite sector potential, Advanced Manufacturing businesses face challenges. The primary challenges faced by the Advanced Manufacturing sector are limited access to funds for critical activities such as equipment testing, research and development, the absence of peer support, and a skilled workforce. These barriers are obstacles to the sector's growth and development.
- To overcome these challenges and advance along the Advanced Manufacturing Spectrum, businesses in the sector can find value and opportunity in developing networks and connecting with peers. Research and Peer networks serve as platforms for establishing connections and accessing opportunities such as securing necessary investments, grants, and other forms of funding support. Another important opportunity lies in the recruitment, training, and retention of skilled workers. While technology can help address labor shortages to some extent, creating stable jobs for highly skilled workers is crucial for progress. Additionally, businesses can benefit from funding support for capital expenditures and the implementation of wage subsidies.
- The Advanced Manufacturing sector encompasses different levels of technological sophistication, tools and application across a spectrum from Traditional to Advanced Manufacturing. There are various pathways for businesses to advance within this spectrum. These include the adoption of Advanced Manufacturing Technology, investing in research and development, prioritizing skilled workforce recruitment and training, implementing efficient production management techniques, collaborating with industry networks and peers, and incorporating sustainable manufacturing practices. By pursuing these approaches, businesses can progress and succeed within the dynamic and evolving field of Advanced Manufacturing.

By acknowledging the significance of these key skills, addressing the challenges associated with capital expenditure and workforce recruitment, and seizing the opportunities presented through networking and collaboration, businesses operating in the Advanced Manufacturing sector can thrive, move forward

along the spectrum, and make substantial contributions to the overall growth and advancement of the industry.

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## 1. Introduction

### Background

The Discovery Foundation's Advanced Manufacturing Program, implemented by the Kootenay Association for Science and Technology (KAST) in collaboration with Selkirk Innovates, conducted a survey to investigate the Advanced Manufacturing sector in the Kootenay Region of British Columbia. The primary objective of the survey was to gather essential sector information, including its size, employment potential, general challenges faced by businesses, and specific challenges related to recruitment and retention. Furthermore, the survey sought to identify potential avenues for growth within the sector. The data collected through this survey is instrumental as it offers valuable insights into the current state of the Advanced Manufacturing sector in the region and will serve as a guide for initiatives aimed at supporting its advancement.

This survey is part of a larger project called the Discovery Foundation's Advanced Manufacturing Program which is focused on connecting Advanced Manufacturing businesses with targeted programs and support systems for youth recruitment and retention. Furthermore, the project aims to promote Advanced Manufacturing as a promising career path for young individuals.

This report focuses on the results of the Advanced Manufacturing research survey and is structured into several sections. These sections include the methodology, summary of the literature and secondary data, creation of an Advanced Manufacturing spectrum, analysis of survey results, discussion of findings, recommendations, and concluding remarks.

### Region

For this project, the Kootenay Region includes businesses located within the three regional districts of the Kootenays (Central Kootenay, East Kootenay, Kootenay Boundary), and select municipalities from the Columbia-Shuswap Region including the municipalities of Golden and Revelstoke (see Figure 1).



Figure 1. Kootenay Region Map<sup>1</sup>

## 2. Methodology

This study consisted of three main parts: data collection, data analysis, and presenting recommendations for supporting businesses in the Advanced Manufacturing sector. In the data collection phase, online surveys, interviews, and a focus group discussion were conducted to gather information. The collected data was then analyzed to identify patterns and trends. Finally, a presentation of findings and recommendations for supporting businesses in the Advanced Manufacturing sector was presented to local partners in economic development and further articulated in this report. This report is intended to serve as a guidepost for future review of the Advanced Manufacturing sector in the Kootenay Region.

### **Data Collection**

Qualitative and quantitative data were gathered from businesses in the Advanced Manufacturing sector in the Kootenay Region.

#### LITERATURE AND SECONDARY DATA REVIEW

To begin, we conducted a literature review on Advanced Manufacturing to enhance our knowledge and understanding of the subject. We consulted various academic sources, including peer-reviewed journal articles and relevant reports. The review aimed to provide insights into the definition of Advanced Manufacturing and the necessary criteria for businesses to be considered part of this sector.

<sup>&</sup>lt;sup>1</sup> Source: Selkirk Innovates, 2022

#### DATABASE CREATION

We compiled a database of businesses identified as belonging to the Advanced Manufacturing sector based on various factors, including their products, services, and processes. This involved conducting web searches, reviews and recommendations from various networks. The database included a total of 197 businesses from the Kootenay Region.

#### SURVEY, INTERVIEWS, AND FOCUS GROUP

We created a survey that was approved by the Selkirk College Research Ethics Board. The survey was administered using two methods: an online distributed survey and invitations to complete the survey via one-on-one interviews. These methods were chosen to ensure a comprehensive representation across the regions and across Advanced Manufacturing sub-sectors and to gather detailed input through open-ended questions.

We sent email invitations to 20 companies for individual interviews and 160 businesses for online surveys. The online surveys were conducted using SurveyMonkey. The survey consisted of 29 questions and was divided into four sections: Business Information, Workforce, Operations, and Regional Economic Climate.

The interviews followed the same set of questions and were conducted through Zoom video conferencing. The duration of the interviews ranged from 30 to 45 minutes, and recordings were transcribed for analysis and data input. All interview participants were assigned a code to ensure their input remained anonymous. The transcripts served as a valuable source of qualitative data and were utilized to input the interviewee responses into the online survey tool, as well as to generate additional insights for analysis.

Out of the 160 businesses that were contacted for the online surveys, a total of 70 businesses provided responses. Of the 20 businesses invited for one-on-one interviews, only two businesses agreed to participate and provided their insights, while two other businesses were included in the 70 that responded to the online survey.

Using select questions from the survey, we conducted a discussion with Digital Fabrication students enrolled at Selkirk College. The focus group consisted of nine participants who actively contributed to the in-depth exploration of employees' perspectives. The focus group discussion spanned a duration of one hour, providing a platform for comprehensive insights.

### **Data Analysis**

The quantitative data gathered through the online survey and the qualitative data gathered through interviews and the focus group were analyzed using Microsoft Excel. The qualitative data collected from interviews and online surveys were categorized based on their related themes. This categorization enabled the identification of key areas of focus and facilitated the exploration of identified challenges, suggested solutions, and necessary supports. The categories were organized in a manner that allowed for an assessment of their degree of importance, providing further insight into emerging themes.

### Limitations and Recommendations

While this study has made considerable efforts, it is important to acknowledge its limitations. One limitation is the inability to determine the precise size of the population of businesses in the Advanced Manufacturing sector in the Kootenay Region. The database created for the study relied on our research and networks, and it is possible there are additional businesses in the region not included in the database.

Second, it is important to acknowledge the number of interviews were relatively small, thereby limiting the information obtained. In future research, conducting a larger number of interviews would be beneficial to gather a more comprehensive understanding of the topic.

Third, it is important to acknowledge a difference in the number of participants who completed the survey in part (70), versus those who answered all the questions (39). This limited response rate may have affected how accurately the findings represent the broader situation. Additionally, there were businesses that were eliminated from answering the survey as they did not identify themselves as part of the sector. This was a guiding factor for the development of the self-assessment tool as part of the AM spectrum.

Fourth, it is important to consider that KAST has a smaller presence in the East Kootenay Region compared to other areas. To address this, future research could focus on fostering collaborations between KAST and the College of the Rockies (COTR). By working together, they can encourage greater participation from the East Kootenay Region, leading to a more comprehensive understanding of the region's dynamics.

Lastly, the distribution timing of the survey and interview requests could have been improved to attract a larger number of participants. The invitations were sent during the end of tax filing season, coinciding with a busy period for businesses. Consequently, the response rate may have been affected, resulting in fewer respondents. Future research should carefully consider the timing of invitations to ensure optimal participation from potential participants.

Addressing these limitations in future research could enhance the robustness and comprehensiveness of findings in the investigated area.

## 3. Literature and Secondary Data Summary and Sector Profile

This section provides an overview of the existing literature on Advanced Manufacturing and presents a sector profile of the Advanced Manufacturing industry in the Kootenay Region.

### Literature and Secondary Data Summary

Traditional Manufacturing is defined as the process of transforming raw materials into finished products using manual or mechanized techniques. The main objective of traditional manufacturing design is to align design requirements with appropriate production processes (Katina et al., 2023).

In contrast, Advanced Manufacturing involves the utilization of technology to enhance efficiency and optimize product outcomes. According to Katina, et al. (2023), Advanced Manufacturing encompasses a

wide range of highly integrated, efficient, and tightly controlled processes that are implemented by competitive manufacturers and suppliers on a global scale. The success of AM relies on factors such as speed, precision, innovation, and automation, which contribute to improvements in both product quality and manufacturing processes. Moreover, Advanced Manufacturing emphasizes a management approach that promotes continuous improvement and the rapid integration of scientific, engineering, and technological advancements to enable the development of sustainable and environmentally responsible designs and manufacturing, including additive manufacturing, biomanufacturing, cyber manufacturing, green manufacturing, and space manufacturing (Katina et al., 2023).

Narasimha (2016) identifies several criteria that qualify a business as part of the Advanced Manufacturing sector. First, innovation plays a crucial role, as these businesses should have the ability to generate and implement new ideas, fostering a creative environment for innovations. Second, a skilled workforce is essential, requiring the establishment of effective training or education programs to enhance the capabilities of employees. Information technology also plays a vital role, as businesses should leverage and integrate IT systems across various areas of manufacturing and its subfunctions. Lastly, sustainability is a key aspect, encompassing the adoption of clean and green manufacturing technologies to address environmental and societal concerns. This involves considering the entire product lifecycle, including recycling aligned with environmental policies, as well as striving for energy efficiency with renewable energy sources and reducing processing time (Narasimha, 2016).

Katina et al. (2023), notes a preliminary definition of Advanced Manufacturing Management (AMM) entails an innovative approach that focuses on effectively controlling, communicating, coordinating and integrating technologies, methods and processes to improve the production of manufacturing goods and services. This definition encompasses various factors, including hardware and software technology, human elements, social dynamics, organizational aspects, political influences, and policy implications. The ultimate objective of AMM is to enhance the probability of achieving and sustaining higher levels of system viability and performance, even in the face of internal challenges within the enterprise and external turbulence in the manufacturing environment (Katina et al., 2023).

The significance of research and development and skilled workers in Advanced Manufacturing is well recognized. Research and development efforts continue to focus on refining various Advanced Manufacturing technologies, understanding the associated physical phenomena during part creation, expanding the range of usable materials, and exploring the fabrication of complex integrated systems (Calignano et al., 2017). Funding for innovation labs plays a crucial role as a testing ground for businesses, enabling early-stage innovations to be evaluated at a minimal expense, reducing risks associated with substantial investments. These labs also provide researchers and companies with an opportunity to solidify concepts before seeking additional investment or raising capital. Furthermore, innovation labs facilitate the certification and accreditation of products prior to market release. (Evans, 2017).

The human element is at the heart of innovation in Advanced Manufacturing. Continuous training of engineers is crucial to address the loss of traditional career pathways and to restructure engineering education to align with opportunities in sectors such as health, medicine, agriculture, and renewable energies (Evans, 2017). Additionally, there is a growing need to train a new manufacturing workforce, compounded by the approaching retirement age of the current workforce. Soft skills such as writing, problem-solving, and communication are among the employee training and development skills that are increasingly in demand (Javdekar et al., 2016).

In summary, there are several qualifications and criteria for businesses in the Advanced Manufacturing sector: emphasizing innovation, a skilled workforce, information technology, and sustainability. Research and development activities, funding for innovation labs, and the continual training of skilled workers are essential for the development of the Advanced Manufacturing sector. These efforts contribute to refining technologies, mitigating risks, nurturing innovation, and developing a competent workforce capable of meeting the evolving demands of Advanced Manufacturing (Calignano et al., 2017; Evans, 2017; Javdekar et al., 2016).

### **Sector Profile**

We also reviewed available secondary data on the scope of the manufacturing sector within the Kootenay Region. According to data from Statistics Canada (2022), in 2021 the manufacturing industry in the Kootenay Development Region (the 3 Kootenay Regional Districts) comprised a total of 801 businesses, out of which 239 have employed workers<sup>2</sup>. This suggests that the majority of the manufacturing businesses are small, with few or no employees.

The employment statistics indicate regional employment related to manufacturing is between 5% and 7.4%. There are approximately 7,100 (7.4% of the region) individuals working in the manufacturing sector as classified by the North American Industry Classification System (Statistics Canada, 2021). However, the 2021 Census Profile indicates that 3,710 (4.7%) jobs in Manufacturing and Utilities fall under the categories of labourers, machine operators, process operators, supervisors, or managers according to the National Occupational Classification (Statistics Canada, 2022). The difference between the two numbers is due to their areas of focus (industry versus occupation). Together the two indicate manufacturing is an important employer within the region.

According to the most recent Labour Market Outlook, five industries will generate over half of all BC jobs in the next ten years: Health Care and Social Assistance, Professional, Scientific and Technical Services, Retail Trade, Construction, and Educational Services (Work BC, 2022). Advanced Manufacturing has the potential to directly relate to Professional, Scientific and Technical Services<sup>3</sup> and Construction.<sup>4</sup> Currently in the Kootenays the largest employers are primarily service based, including Retail Trade, Mining, Education, Hospitals, and Specialty Trade Contractors (Work BC, 2022), indicating that there are regional Advanced Manufacturing opportunities aligned with Natural Resources and Trades.

The top five occupational groups in British Columbia are projected to account for the majority (73%) of job openings in the coming decade (Work BC, 2022). Ranked fourth among these five occupational groups are trades, including transport, equipment operators, and related professions, which, as noted above, align directly with Advanced Manufacturing. It is anticipated that this group will have approximately 12% of job openings, amounting to 117,100 job opportunities (p. 16).

<sup>&</sup>lt;sup>2</sup> This data reflects manufacturing businesses in the Kootenay Region and will increase when we include manufacturing businesses from Golden, Revelstoke, and Columbia Shuswap Regional District A and B.

<sup>&</sup>lt;sup>3</sup> Includes architectural, engineering and related services; computer systems design and related services; management, scientific and technical consulting services; and legal, accounting, design, research and advertising services (Work BC, 2022).

<sup>&</sup>lt;sup>4</sup> Includes residential building construction; non-residential building construction; heavy and civil engineering construction; and specialty trade contractors (Work BC, 2022).

According to the Labour Market Outlook (2022), the natural and applied sciences and related occupational groups, ranked sixth among the top occupational groups in British Columbia, are projected to experience faster workforce expansion compared to other groups. This growth is attributed to accelerated digitalization and increased automation. The employment in this occupational group is anticipated to grow at an average annual rate of 2.2%, outpacing the average annual employment growth of 1.3% for all occupations in the province.

## 4. Development of Advanced Manufacturing Spectrum

At the beginning of the project, we noticed that the definition of Advanced Manufacturing was not clear and precise. As we conducted further research and analyzed the survey data, we discovered that some businesses in the sector did not fit neatly into specific sub-sectors of Advanced Manufacturing, yet they still considered themselves part of the sector. This raised questions about how to determine if a business falls within the Advanced Manufacturing sector.

To better represent the diversity of the sector, we recognized that Advanced Manufacturing operates along a spectrum. This perspective acknowledges that businesses in the sector can vary in terms of their application of core advancement manufacturing criteria. Some businesses were at the forefront of technological innovation, while others demonstrated more moderate levels of advancement.

By recognizing this spectrum, we aimed to provide a more comprehensive and inclusive understanding of the Advanced Manufacturing sector. This approach allows for a broader range of businesses to be acknowledged and included, regardless of their position on the spectrum. It also highlights the dynamic nature of the sector, as businesses continuously adapt to new technologies, applications and approaches.

#### BACKGROUND

The Advanced Manufacturing sector operates along a spectrum that encapsulates different levels of sophistication and technological advancement, ranging from traditional manufacturing to mid-low, medium, mid-high, and Advanced Manufacturing (see Figure 2). While the adoption of Advanced Manufacturing technology for product development is a clear indicator of belonging to the sector, there are multiple pathways for businesses to advance within this spectrum. These pathways include engaging in research and development activities to foster innovation, prioritizing the recruitment, training, and retention of skilled workers, implementing Advanced Manufacturing production management techniques to enhance process efficiency, fostering collaboration with networks and peers within the Advanced Manufacturing sector, and incorporating sustainable manufacturing practices. These diverse approaches enable businesses to progress and thrive within the Advanced Manufacturing landscape.

By understanding and embracing the Advanced Manufacturing Spectrum, businesses can position themselves strategically and discover pathways to development. This involves recognizing different levels of technological advancement and actively engaging in activities that foster innovation, improve efficiency, and promote collaboration within the Advanced Manufacturing sector. Through their participation, businesses can make valuable contributions to the ongoing development of Advanced Manufacturing practices and drive positive outcomes for the industry.



Figure 2. Advanced Manufacturing Spectrum

#### ADVANCED MANUFACTURING SPECTRUM CATEGORIES

#### **RESEARCH & DEVELOPMENT**

Innovation is a vital criterion for businesses in the Advanced Manufacturing sector to progress along the Advanced Manufacturing Spectrum. Strategic focus on research and development enables companies to stay at the forefront of technological advancements and gain a competitive edge in the market. It allows for the development of new techniques and products, and can enhance their operational efficiency, optimize supply chain management, and reduce production costs, ultimately boosting profitability.

#### APPLICATION OF ADVANCED MANUFACTURING TECHNOLOGY - PRODUCTION & DEVELOPMENT

Technology integration plays a crucial role in the Advanced Manufacturing industry. Businesses operating in this sector should actively leverage and integrate technology across various areas of manufacturing and its subfunctions. This integration enables seamless data exchange, real-time monitoring, and enhanced automation, resulting in improved operational efficiency and productivity. Furthermore, technology integration enables businesses to embrace emerging technologies such as artificial intelligence, robotics, and the Internet of Things, which are poised to shape the future of Advanced Manufacturing.

#### SKILLED WORKERS: RECRUITMENT, TRAINING, AND RETENTION

To keep pace with the rapid evolution of the Advanced Manufacturing industry, businesses must prioritize investments in training and education programs to enhance the capabilities of their workforce. This necessitates providing ongoing opportunities for professional development to ensure that employees possess the latest knowledge and skills required for Advanced Manufacturing processes. In addition to technical expertise, the demand for soft skills such as problem-solving, communication, and writing proficiency is also evident. While technology can help address labour shortages, progressing along the Advanced Manufacturing spectrum requires the creation of stable jobs for highly skilled workers. Achieving this involves implementing strategic recruitment processes to attract skilled talent, offering cutting-edge training programs to enhance skills, and providing attractive benefits to promote employee retention.

#### ADVANCED MANUFACTURING PRODUCTION MANAGEMENT – PROCESS EFFICIENCY

In the context of Advanced Manufacturing, Advanced Manufacturing Management (AMM) assumes a crucial role in optimizing operations and bolstering the overall viability and performance of systems. Through effective management and integration of process efficiencies within the manufacturing process, AMM enables businesses to adapt and thrive in a rapidly changing environment. This includes the adoption of advanced computer software, streamlining production processes, fostering collaboration among stakeholders, optimizing resource utilization, and responding to evolving market demands.

#### ADVANCED MANUFACTURING NETWORKS & PEERS

Networking and collaboration are key factors for success in the Advanced Manufacturing industry. Given the complex and fast-paced nature of Advanced Manufacturing, businesses need to actively work together and build strong connections to stay competitive and drive innovation. Collaborating with other organizations and establishing networks allows businesses to overcome challenges such as accessing funding, finding grant opportunities, and sharing knowledge and resources. It also helps businesses stay updated on industry trends and emerging technologies, positioning them to progress in Advanced Manufacturing. These collaborative efforts not only benefit individual businesses but also strengthen the overall Advanced Manufacturing ecosystem.

#### SUSTAINABLE MANUFACTURING

Sustainability is a fundamental consideration in the Advanced Manufacturing sector. Businesses are expected to adopt clean and green manufacturing technologies that minimize their environmental impact. This involves considering the entire product lifecycle, from sourcing raw materials to the disposal or recycling of products. Implementing sustainable practices aligned with environmental policies, such as energy efficiency measures and the use of renewable energy sources, is crucial for reducing carbon footprints and promoting a more environmentally friendly manufacturing process. By applying sustainable manufacturing practices, conducting research and development towards sustainability, and implementing solutions that limit their environmental impact, businesses can both advance along the Advanced Manufacturing spectrum and make significant contributions to creating a more sustainable environment

## 5. Survey Results

### **Respondent Demographics**

Out of the 72 individuals who were initially considered potential respondents for the survey, some were excluded due to factors such as age, lack of consent, or incomplete data beyond the first two questions. As a result, a total of 57 participants remained for analysis in this section. Among these respondents, two individuals took part in an interview, while the remaining 55 participants completed the online survey. This section presents some key demographic findings based on these 57 respondents.

#### REGION

Figure 3 presents the distribution of businesses across different regional districts as documented in the database and the survey. Most respondents (42%) were businesses located in the Regional District of Central Kootenay, primarily in the municipality of Nelson. This was followed by businesses from the

Regional District of Kootenay Boundary (30%), particularly in the municipality of Trail. Notably, responses were received from all regional districts in the Kootenays. By comparing the survey results to the database, it can be concluded that the study achieved a reasonably representative sample in terms of geographic location.



Figure 3. Respondents by Regional District

#### YEARS IN OPERATION

As shown in Figure 4, the survey shows an established Advanced Manufacturing sector. Most respondents (47%) were businesses that have operated for more than 20 years, followed by businesses that have operated for five to nine years (19%) and 10 to 19 years (19%). The remainder was split between one to four years (11%) and less than one year (5%).



Figure 4. Years in Operation

#### BUSINESSES BY NUMBER OF EMPLOYEES, EMPLOYEE LOCATION, AND EMPLOYEE AGE

Most respondents indicated that their businesses have employees only within the Kootenay Region. Specifically, 60% of the respondents reported having one to 10 employees within the region, while 23% of the businesses had 11 to 25 employees in the same area. Additionally, a small number of businesses mentioned having one to 10 employees located outside of the Kootenay Region (see Table 1).

Number of employees	In the Kootenay Region: Number of employees	Out of the region, but within BC: Number of employees	Out of BC, but within Canada: Number of employees	International: Number of employees
0	1	36	36	38
1 to 10	26	7	7	5
11 to 25	10	0	0	0
30 to 99	3	0	0	0
100 to 250	3	0	0	0

Table 1. Count of Businesses and Number of Employees per Location

Table 2 illustrates that a substantial proportion of the respondents employ employees under 30 within the Kootenay Region. Specifically, 47% of the businesses reported having one to five employees in this age range, followed by 16% of them employing 16 to 40 employees. The remaining employees under 30 in the Kootenay Region are distributed among businesses that employ six to 15 (9%) and 41 to 80 individuals (5%). Furthermore, a small number of businesses mentioned having one to five employees under 30 located outside of the Kootenay Region.

		1 /		
Number of employees	In the Kootenay Region: Number of employees under 30	Out of the region, but within BC: Number of employees under 30	Out of BC, but within Canada: Number of employees under 30	International: Number of employees under 30
0	10	37	41	40
1 to 5	20	6	1	3
6 to 15	4	0	1	0
16 to 40	7	0	0	0
41 to 80	2	0	0	0

Table 2. Count of Businesses and Number of Employees Under 30 per Location

#### ADVANCED MANUFACTURING SUB-SECTOR

In terms of sub-sectors (see Figure 5), the Wood Product Manufacturing industry accounted for the highest number of respondents (18%), followed by the Beverage and Tobacco Product Manufacturing sector (14%), all of which were beverage manufacturers. Responses were received from businesses in all sub-sectors except for Non-metallic Mineral Product Manufacturing and Petroleum and Coal Product Manufacturing. Notably, the survey captured responses from businesses that do not strictly fall within the defined sub-sectors of Advanced Manufacturing, but still identify as part of the sector, with miscellaneous manufacturing representing 10% of the respondents. These miscellaneous manufacturing

businesses encompass a diverse range of activities, including natural resource management, cosmetics, public relations/consultations, and certain types of food processing facilities, among others.



Figure 5. Advanced Manufacturing Sub-Sectors

### **Business Climate**

In this section, an exploration of the needs, barriers, and potential solutions and supports within the advanced manufacturing sector is presented. One key area of concern is funding, where businesses may face challenges in accessing sufficient financial resources for various aspects of their operations. Another critical aspect is the workforce, which encompasses both business-specific challenges and broader regional challenges related to employee attraction, recruitment, and retention. Additionally, specific challenges related to engaging youth in the sector are also addressed. Lastly, the availability of suitable facilities and space for advanced manufacturing operations is examined.

#### FUNDING

#### **NEEDS OR BARRIERS**

The primary barrier identified by survey participants pertains to funding, specifically the insufficiency of working capital to facilitate business expansion and procure necessary funds for capital expenditure. This includes expenses related to the acquisition and evaluation of new machinery and equipment. Additionally, some respondents highlighted the absence of dedicated local investment initiatives aimed at supporting the growth of the manufacturing sector within the region.

#### SOLUTION AND SUPPORT

The survey respondents emphasized several measures deemed essential for addressing the identified challenges. These measures include opportunities for funding research projects, enhanced access to capital expenditure funding (particularly for early-stage or pre-profit companies), diverse forms of

support and grants, zero-interest loans, and industry-specific investments. By ensuring the availability of these necessary resources, manufacturers can enhance their operational capacities and facilitate sustainable growth within their respective organizations.

#### WORKFORCE

#### **BUSINESS SPECIFIC CHALLENGES**

As shown in Figure 6, challenges specific to employee attraction and recruitment included three primary obstacles: limited availability of local candidates, inadequate skills and educational qualifications, and a scarcity of industry-specific knowledge and experience. These obstacles can be addressed by overcoming the knowledge gap and identifying individuals who possess the requisite expertise and industry-specific background through targeted and incentivized recruitment. Additional challenges include managing unrealistic salary expectations and accommodating flexible work arrangements, among others.

This study revealed three prominent challenges around employee retention. First was the high turnover rate, characterized by employees not remaining with a company for an extended duration. Second was the importance of offering flexible schedules or work arrangements for retaining employees. Last, effectively managing realistic wage expectations was key to retaining employees. Additional challenges included the lack of allocation of resources for training and supervision, addressing issues related to poor work ethic, attitude, and a sense of entitlement, as well as addressing gaps in skill sets and education qualifications.

Last, when examining challenges specific to the youth demographic, three primary obstacles were discerned. These included the perception that young individuals exhibited poor work ethic, attitude, or a sense of entitlement, as well as unrealistic wage expectations. Additionally, there was a notable trend among youth to exhibit higher turnover, frequently transitioning from one position to another rather than maintaining long-term employment commitments. Further challenges identified include a deficiency in industry-specific knowledge and experience, as well as a lack of requisite skill sets and educational qualifications.



#### Figure 6. Business Specific Challenges

#### **BROADER REGIONAL CHALLENGES**

When examining the broader regional challenges (see Figure 7), housing and the cost of living surfaced as the primary concerns across the following categories: employee attraction and recruitment, employee retention, and challenges applicable to the youth. Regarding employee attraction and recruitment, as well as challenges specific to youth, transportation emerged as the third largest obstacle. For employee retention, employment opportunities for families were identified as the third key challenge. Additional challenges included childcare provision, availability of local healthcare services, as well as opportunities and educational resources for family members.

Furthermore, it is worth noting that the findings from the focus group conducted with the Digital Fabrication students were in alignment with the identified challenges surrounding employment in the Advanced Manufacturing sector in the Kootenay Region. Specifically, the participants echoed their sentiments regarding the top three challenges, namely the cost of living, housing, and transportation.



Figure 7. Broader Regional Challenges

#### **NEEDS OR BARRIERS**

The workforce emerged as the second largest barrier identified by survey participants. As previously mentioned, the primary challenges around workforce entail bridging the knowledge gap and identifying individuals who possess the industry-specific experience and expertise. Numerous businesses reported difficulties with staff shortages and locating qualified individuals to fill vacant positions.

#### SOLUTION AND SUPPORT

In response to workforce barriers, survey participants identified specific supports to assist with mitigation. These include increasing the number of locally trained employees and establishing training courses focused on supervision and planning alongside other programs intended to equip potential employees with essential skills and experience. These training interventions could be implemented

through in-house programs or external initiatives offering avenues for individuals to acquire the requisite competencies needed to overcome workforce barriers.

#### **OPPORTUNITIES**

The respondents highlighted opportunities around potential collaboration with Digital Fabrication students from Selkirk College, as well as the utilization of Selkirk Technology Access Centre (STAC) as a facility for student training. These opportunities hold promise for fostering synergistic relationships between industry and educational institutions, thereby facilitating the training and development of the key skills required by the Advanced Manufacturing field.

#### **RECRUITMENT STRATEGIES**

In addressing the workforce barrier, survey participants outlined recruitment strategies they currently employ. These strategies include raising recruitment awareness through word-of-mouth referrals, leveraging social media platforms, websites, and other relevant communication channels. Moreover, certain businesses adopted additional measures to attract employees, including the provision of diverse benefits such as flexible schedules or work arrangements, relocation allowances, above-industry-average wages, and even the provision of free housing for seasonal workers. Furthermore, some businesses promote training opportunities to enhance the skills of their employees contributing to employee professional development and growth.

#### SUPPORT FOR EMPLOYEE ATTRACTION

To enhance employee attraction and recruitment efforts, respondents provided recommendations around funding and support measures. These suggestions encompass the provision of housing support, wage subsidies and grants aimed at incentivizing individuals to pursue employment opportunities in the industry. Additionally, respondents emphasize the importance of increasing awareness through initiatives such as job fairs, the establishment of industry-specific job boards, and the creation of a comprehensive campaign dedicated to celebrating trades and technology. These measures aim to promote the industry, raise its profile, and attract a wider pool of qualified candidates.

#### SUPPLY CHAIN

#### **NEEDS OR BARRIERS**

Respondents identified the supply chain as the third largest barrier, with a particular focus on three key challenges. First, the rising cost of raw materials, which has experienced a substantial increase of approximately double the previous year's prices. Second, there is a scarcity of raw material supply, specifically in relation to fibre and logs. This scarcity poses a crucial challenge for businesses reliant on these resources for their operations. Last, shipping and transportation challenges, especially within the logistics and trucking industry, present obstacles for businesses, particularly those involved in the transportation of heavy products. The high costs associated with logistics make it challenging for these businesses to effectively ship their goods. These supply chain challenges collectively impact the overall operational efficiency and profitability of businesses in the industry.

#### SOLUTION AND SUPPORT

Considering the supply chain barrier, respondents underscored the importance of establishing robust and reliable logistics systems. Such systems would facilitate the transportation of products from producers to the market, ensuring cost-effectiveness and efficiency. By addressing the challenges inherent in the supply chain, businesses in the Advanced Manufacturing sector would benefit from improved operational effectiveness and enhanced overall performance. The development of stable logistics systems emerges as a critical factor in supporting the growth and sustainability of surveyed businesses.

#### FACILITIES AND SPACE

#### **NEEDS OR BARRIERS**

Respondents identified the availability of suitable facilities and space as the final notable barrier. This encompasses multiple aspects, including the size of premises, the scarcity of commercial real estate, insufficient infrastructure, and the lack of affordable commercial spaces suitable for businesses. Space constraints pose challenges for businesses to optimize their operations effectively as existing facilities fall short of meeting their operational demands. Consequently, there is a pressing need for improved access to adequate and affordable commercial spaces that align with the requirements of businesses in the Advanced Manufacturing sector.

#### SOLUTION AND SUPPORT

In response to these identified barriers around facilities and space, the respondents articulated necessary supports. These include the need for increased commercial developments and enhanced infrastructure. Moreover, the respondents emphasized the importance of specific funding initiatives or support programs designed to help manufacturers implement required changes or improve infrastructure to align with their growth and operational needs. By providing such supports, stakeholders can enable manufacturers in the Advanced Manufacturing sector address their unique challenges and foster an environment conducive to sustainable growth and competitiveness.

### **Regional Economic Climate**

This section of the report presents the findings related to the regional economic climate in the Kootenay Region. It includes an analysis of the strengths and weaknesses identified by the respondents.

When asked about the general business environment in the Kootenay Region (see Figure 8), most respondents (63%) described it as good, while 30% considered it fair. The remaining participants were divided between those who rated it as excellent (5%) and those who rated it as poor (3%).



Figure 8. Overall Business Climate in the Kootenay Region

#### **REGIONAL STRENGTH**

Results from the survey highlight several strengths identified by respondents in the Kootenay Region. First, the region's culture and lifestyle were highly praised, with a strong sense of community support and an excellent work-life balance. These factors were found to attract potential employees who were drawn to the Kootenay lifestyle and contributed to a higher quality of living.

Second, the region's environment, characterized by its natural beauty and access to recreational activities, was seen as a notable strength, with respondents expressing the desire for potential employees to stay in the area due to its attractive surroundings.

The survey also revealed that the Kootenay Region offers lower costs of living, including potentially more affordable rent and property tax reductions for new manufacturers. Compared to the Okanagan and Lower Mainland, respondents perceived the region to have slightly lower business operation costs, such as wages and overall cost of living.

Collaboration and support were identified as additional strengths, with a strong network of rural individuals and organizations facilitating effective networking. Sector-specific clusters, such as Outdoor Rec-Tech, Food Processors, and Battery Recycling, were also recognized as contributing to the region's economic strength. Finally, organizations like STAC, KAST, and Selkirk Innovates were appreciated for their efforts in raising awareness about change and opportunity, while social and community support services catered to the needs of the underemployed. These survey results collectively underscore the positive aspects of the Kootenay Region and highlight its potential for economic development.

#### **REGIONAL WEAKNESSES**

The survey results shed light on several weaknesses and challenges faced by the Kootenay Region, as identified by the respondents. Firstly, the supply chain was highlighted as a concern, with businesses experiencing difficulties in obtaining certain supplies, facing high transportation costs, and limited diversity in local timber supply.

Secondly, the workforce posed challenges, with respondents expressing difficulties in accessing technically trained individuals who are willing to work. High labour costs and a limited pool of skilled labour were also identified as areas of concern.

The local economic climate was found to present various obstacles, including a rising cost of living, limited housing availability, remoteness, and a low population density. These factors were perceived as hindrances to business operations and potential investment opportunities.

In terms of facilities and space, businesses expressed concerns about the high cost of acquiring industrial land or buildings and the lack of real estate development tailored to the manufacturing sector.

Furthermore, a lack of support and collaboration was noted, with respondents mentioning the absence of adequate funding support or grants. Additionally, the absence of a concentrated manufacturing and incubation hub within a condensed geographic location hindered collaboration between research entities, industry peers, and funding partners.

## 6. Discussion

### Determining the Sector Size

This study highlights the challenge of accurately determining the exact size of the Advanced Manufacturing business population in the Kootenay Region. The construction of the database relied on our research efforts and networks, which may have resulted in the omission of certain businesses. While the sector profile (see Section 3) indicates the presence of 801 businesses in the manufacturing sector, the database used in this study consists of only 197 Advanced Manufacturing businesses. As noted in Section 2, this difference could be due to the Advanced Manufacturing sector being smaller than the broader Manufacturing sector. However, it could also indicate that the Advanced Manufacturing sector is larger than what was identified in the database. Therefore, it is important to acknowledge that the findings may not fully represent the entire Advanced Manufacturing business landscape in the region. Table 3 presents a comparison of the number of businesses categorized by employment size range between the manufacturing sector as a whole and the Advanced Manufacturing sector. Both indicate that most of the region's manufacturing businesses are small, with few or no employees. However, analysis of the table reveals that further engagement of businesses with fewer than four employees and those with large numbers of employees (20+) could be valuable.

Number of employees	Count of Businesses (Sector Profile)	Count of Businesses (Survey Results)	
No employees	562	<b>0</b> ⁵	
1 to 4	101	11	
5 to 9	60	12	
10 to 19	37	11	
20 to 49	198	6	

#### Table 3. Comparison of Total Businesses by Employment Size Range

<sup>&</sup>lt;sup>5</sup> For the survey, single owners or sole proprietors were instructed to include themselves as an employee.

50 to 199	20	4
More than 200	5	2
TOTAL	801	46

It is worth highlighting that the statistics pertain to the broader manufacturing sector, which encompasses both Traditional Manufacturing and Advanced Manufacturing. However, these figures serve as a compelling testament to the potential influence and benefits that can be derived from engaging with manufacturing companies and facilitating their progression along the Advanced Manufacturing Spectrum. By supporting these businesses and their employees in adopting Advanced Manufacturing practices, they can harness the advantages offered by technological advancements, leading to industry growth and economic development.

According to the sector profile, industries associated with Advanced Manufacturing are projected to experience growth in the coming years, primarily driven by accelerated digitalization and increased automation across various sectors. However, the survey results reveal that many businesses in the Advanced Manufacturing sector face challenges related to staff shortages and the recruitment of qualified individuals to fill vacant positions. These businesses encounter difficulties in finding skilled workers who possess the necessary expertise and industry-specific experience. Additionally, bridging the knowledge gap is identified as a significant concern for businesses operating in the Advanced Manufacturing sector.

### Areas for Sector Improvement

Upon reviewing the survey results relative to the Advanced Manufacturing Spectrum (see Section 4), it became apparent that a considerable portion of the respondents belonged to the mid-high level of the Advanced Manufacturing Spectrum. However, despite their potential, these businesses encountered considerable challenges. One prominent issue they faced was limited access to funds for critical activities such as equipment testing and research and development. Moreover, there was a noticeable shortage of skilled workers, impeding their advancement. These businesses demonstrated a commitment to innovation and technological adoption, but the absence of peer support and a skilled workforce posed obstacles to their growth and progression along the spectrum.

Upon initial analysis of the data pertaining specifically to research and development and the adoption of Advanced Manufacturing technology, it was evident that a considerable number of businesses positioned themselves toward the higher end of the spectrum (see Table 4). However, once factors such as the availability of skilled workers and engagement with networks and peers were added, a leveling-out effect was observed, indicating a movement from the higher end toward the medium range. Notably, in areas such as skilled workforce recruitment and sustainable manufacturing practices a substantial portion of businesses appeared to be situated toward the lower end. This suggests that certain factors may be limiting their progress and positioning within the AM spectrum.

Table 4. Application of Advanced Manufacturing Spectrum to Survey Results



To facilitate the progress of businesses along the spectrum, the development of networks and peers emerges as a crucial opportunity. These networks serve as valuable platforms for establishing connections and accessing opportunities for securing necessary investments, grants, and other forms of funding support. Additionally, the recruitment, training, and retention of skilled workers play a pivotal role in advancing along the spectrum. While technology can alleviate labour shortages to some extent, the creation of stable jobs for highly skilled workers is instrumental in moving forward. By offering funding support for capital expenditure and implementing wage subsidies, businesses can be assisted in their advancement along the spectrum. This assistance is crucial, as their progression not only enhances employment opportunities but also contributes to the growth of the Advanced Manufacturing sector and the overall economy of the Kootenay Region and British Columbia.

## 7. Next Steps

The survey and Advanced Manufacturing spectrum work is part of a larger project called the Discovery Foundation Advanced Manufacturing Project focused on connecting Advanced Manufacturing businesses with targeted programs and support systems for youth recruitment and retention. Using the findings of the survey we have developed a comprehensive youth engagement package and business resources. These resources have been crafted to address the identified needs and insights from the survey results, focus group discussions, and ongoing conversations. The package includes a high-level overview of the survey results, key findings, graphs and data analysis specifically tailored for manufacturers. It also incorporates an Advanced Manufacturing Spectrum Self-Assessment, enabling businesses to determine their position on the Advanced Manufacturing spectrum and providing actionable steps for further advancement. Additionally, the package features an overview section dedicated to information on the Selkirk Technology Access Centre (STAC), emphasizing its role as a vital hub for accessing advanced technologies and fostering business innovation.

Furthermore, the package recommends future events to foster networking and collaboration between "makers" and local businesses, with a strong emphasis on building relationships and sharing best practices. The significance of the Kootenay Venture Network (KVN), an investment ecosystem for early-stage technology companies in the region, is underscored to raise awareness among businesses. Moreover, the package includes valuable information on grant and funding opportunities, sourced from

the Province of British Columbia and local agencies, to provide support for businesses in their technology application and workforce development endeavors.

The youth engagement package will be disseminated to the 197 businesses in the database, as well as other networks and associations. By doing so, we aim to achieve the overarching goal of supporting businesses in the Advanced Manufacturing sector and facilitating connections between Advanced Manufacturing enterprises and targeted programs and support systems for youth recruitment and retention. This holistic approach ensures that businesses receive the necessary resources and supports to thrive in the evolving landscape of Advanced Manufacturing.

Additionally, further studies can be done to answer the following questions:

- 1. How can we facilitate the progression of businesses in the Advanced Manufacturing sector along the spectrum?
- 2. What measures can we take to enhance the knowledge and awareness of local businesses regarding the opportunities and challenges in the Advanced Manufacturing sector?
- 3. What further comprehensive assessments of the local Advanced Manufacturing sector would be of benefit to businesses, community and economic development partners?
- 4. How can collaboration and networking initiatives be effectively implemented to foster knowledge-sharing and innovation within the Advanced Manufacturing sector?
- 5. What potential strategies and interventions can be employed to address the shortage of skilled workers in the advanced manufacturing industry and ensure a sustainable talent pool?

## 8. Conclusion

The Discovery Foundation's Advanced Manufacturing Program, in collaboration with the Kootenay Association for Science and Technology (KAST) and Selkirk Innovates, conducted a survey in the Kootenay Region of British Columbia with the objective of exploring the Advanced Manufacturing sector. This survey was designed to gather crucial information about the size and scope of the Advanced Manufacturing sector in the region. The data collected will serve as valuable insights for KAST, enabling them to develop targeted strategies to support youth recruitment, business retention, and expansion within the Advanced Manufacturing sector. KAST aims to enhance awareness of career opportunities in Advanced Manufacturing among young individuals and identify key opportunities to strengthen the sector in the region.

A total of 72 businesses participated in the survey, with most responses (42%) originating from businesses located in the Central Kootenays, specifically in Nelson, followed by the Kootenay Boundary region, particularly Trail. Among the respondents, the wood product manufacturing industry accounted for the highest percentage (18%), followed by the beverage and tobacco product manufacturing sector (14%). Lastly, most of the respondents have been operating for over 20 years.

The survey yielded the following key highlights:

• The primary challenge faced by the Advanced Manufacturing sector pertains to capital expenditure limitations and the difficulty in recruiting skilled workers. These barriers pose significant obstacles to the sector's growth and development.

- To overcome these challenges and progress further along the Advanced Manufacturing spectrum, businesses in the sector have a valuable opportunity to leverage the power of networks, engage in collaborations with relevant organizations, and implement structured training programs to enhance the skills of potential employees.
- The Advanced Manufacturing sector encompasses a spectrum of different levels of technological sophistication and advancement, ranging from traditional to Advanced Manufacturing. There are various pathways for businesses to advance within this spectrum. These include the adoption of Advanced Manufacturing technology, investing in research and development, prioritizing skilled workforce recruitment and training, implementing efficient production management techniques, collaborating with industry networks and peers, and incorporating sustainable manufacturing practices. By pursuing these approaches, businesses can progress and succeed within the dynamic and evolving field of Advanced Manufacturing.

By acknowledging the significance of these key skills, addressing the challenges associated with capital expenditure and workforce recruitment, and seizing the opportunities presented through networking and collaboration, businesses operating in the Advanced Manufacturing sector can thrive, advance along the spectrum, and make substantial contributions to the overall growth and advancement of the industry.

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## **10.** Appendices

### Appendix A: Advanced Manufacturing Questionnaire

#### Section #1: BUSINESS INFORMATION

1. Business Name: \_\_\_\_\_

2. Please confirm that you work in and/or own or manage a business or organization that operates in the advanced manufacturing sector within the Columbia Basin Boundary Region (the Region)

A. Yes – I confirm B. No, I do not

3. Are you answering this survey as a (select all that apply):

o Employee	
o Volunteer	
o Contractor	
<ul> <li>Business Owner</li> </ul>	
<ul> <li>Manager / Administrator</li> </ul>	
Other (please specify):	

4. Please provide the postal code of the business location: \_\_\_\_\_

5. Which sub-sector of Advanced Manufacturing does this business primarily work in? (Select one or more)

• Food Manufacturing Beverage And Tobacco Product Manufacturing o Textile Products O Clothing Products Leather And Allied Product Manufacturing • Wood Product Manufacturing • Paper Manufacturing O Printing And Related Support Activities o Petroleum And Coal Product Manufacturing • Chemical Manufacturing O Plastics And Rubber Products Manufacturing Non-metallic Mineral Product Manufacturing Primary Metal Manufacturing Fabricated Metal Product Manufacturing Machinery Manufacturing Computer And Electronic Product Manufacturing o Electrical Equipment, Appliance and Component Manufacturing Transportation Equipment Manufacturing Furniture And Related Product Manufacturing

Miscellaneous Manufacturing (Please Specify): \_\_\_\_\_

6. How long has this business operated? (Select one)

o Less than 1 year o 1-4 years
o 5-9 years
o 10-19 years
o More than 20 years

#### Section #2: WORKFORCE

7. Using 2022 as a point of reference, please estimate the total number of employees at this business (including yourself)\*?

\*Even if it is a sole proprietor with no employees this should be answered as "1".

 Full-time employees (#) \_\_\_\_\_

 Part-time employees (#) \_\_\_\_\_

 Casual (#) \_\_\_\_\_

 Seasonal (#) \_\_\_\_\_

8. Using 2022 as a point of reference, please estimate the total number of vacant positions at this business?

 Full-time employees (#) \_\_\_\_\_
 Part-time employees (#) \_\_\_\_\_

 Casual (#) \_\_\_\_\_
 Seasonal (#) \_\_\_\_\_

9. Using 2022 as a point of reference, please estimate the number of employees at this business by location and age:

	Number of Employees	Number of Employees Under 30
In the Columbia Basin Boundary		
Out of the region, but within BC		
Out of BC, but within Canada		
International		

10. How did the number of employees change in the last 3 years?

#### Fulltime

 ${\rm O}$  Decreased  ${\rm O}$  Stayed the same  ${\rm O}$  Increased  ${\rm O}$  Not applicable  ${\rm O}$  Unknown

Part-time, Casual, or Seasonal

 $\odot$  Decreased  $\bigcirc$  Stayed the same  $\bigcirc$  Increased  $\bigcirc$  Not applicable  $\bigcirc$  Unknown

Employees that are 30 years of age or under

 ${\rm O}$  Decreased  ${\rm O}$  Stayed the same  ${\rm O}$  Increased  ${\rm O}$  Not applicable  ${\rm O}$  Unknown

11. How do you expect the number of employees to change over the next 3 years?

Fulltime

 ${\rm O}$  Decrease  ${\rm O}$  Stay the same  ${\rm O}$  Increase O Not applicable O Unknown

Part-time, Casual, or Seasonal O Decrease O Stay the same O IncreaseO Not applicable O Unknown

Workers that are 30 years of age or under O Decrease O Stay the same O IncreaseO Not applicable O Unknown

- 12. Where does this business attract the majority of its workers from?
  - O Regionally
  - O Provincially
  - O Nationally
  - O Internationally

13. Please select any challenges this business has had related to employee attraction, recruitment, or retention (select all that apply)

	Employee Attraction & Recruitment	Employee Retention	Challenge applies specifically to Youth (<30)
Business Specific Challen	ges		
Don't stay with the			
company for very long			
Lack of skill			
set/education			
Lack of industry			
knowledge and			
experience			
Lack of local recruits			
Need for			
accommodating			
schedule or flexible			
work arrangement			
Not interested in the			
industry/company			
Poor work			
ethic/attitude/sense of			
entitlement			
Resources required to			
train and supervise			

Age restriction on		
equipment/insurance/i		
ndustry		
Lack of entry level		
positions		
Unrealistic wage		
expectations		
Challenges working		
with older employees		
(generation gap)		
There are no subsidies		
or other incentives to		
hire youth		
Other – please		
describe:		
Broader Regional Challen	iges	
Child Care		
Cost of Living		
Education for family		
members		
Employment		
opportunity for family		
Housing		
Local health care		
availability		
Transportation		

14. Please describe any recruitment strategies this business has undertaken; or supports/ programs that have been utilized to attract/recruit employees

15. Please suggest any supports that could help this business overcome issues with employee attraction/recruitment.

16. Does this business have specific diversity, equity and inclusion policies and/or equal employment opportunity requirements in regards to recruitment processes?

YesNoUncertain

17. Does this company provide training or a training budget in order to upgrade employee's skills?

o Yes o No o Uncertain 18. Considering anticipated trends, technologies, and significant changes in the next five years, what new training do you anticipate employees of this business may need in the future?

#### Section #3: OPERATIONS

19. Please select the most likely outlook for this business in the next 3 years: (select one)

O Expand
O Continue to operate
O Downsize
O Sell/transfer
O Merge with another company
O Close the business down
O Other (please specify):

20. [If expand was selected in #19] Please select the top 3 major constraints on your expansion?

Speed and quality of broadband	□ Finance
Identifying and accessing new market	s 🛛 Lack of skilled staff
Lack of suitable premises	Local regulations e.g. zoning
Other (please specify):	

21. Please describe how this business is innovative?

22. What research and development activities does this business undertake?

23. What needs or barriers are currently impacting the business? (open ended)

24. What opportunities are currently available to the business? (open ended)

25. What supports would help the business address these needs or take advantage of these opportunities? (open ended)

#### Section #4: REGIONAL ECONOMIC CLIMATE

26. Please rate the overall business climate within the Columbia Basin region:

o Poor
o Fair
o Good
o Excellent
o No opinion

27. What are the region's weaknesses as a place to do business and engage in the advanced manufacturing sector? (open ended)

28. What are the region's strengths as a place to do business and engage in the advanced manufacturing sector? (open ended)

29. Please indicate any other businesses/individuals working in the advanced manufacturing sector in the region that you recommend we contact to participate in this survey:

## Appendix B: Spectrum Document

Level of Manufacturing	Low - Traditional Manufacturing	Mid-Low	Medium	Mid-High	Advanced Manufacturing
Circle the description that best applies to your business's current <b>Application of</b> <b>Research &amp; Development</b> .	Relies primarily on traditional manufacturing methods with minimal exploration of emerging technologies.	Basic RBD activities focused an incremental improvements, cost reduction, and optimization of existing products or processes	Innovating for competitive edge, identifying and responding to industry needs and improving efficiency.	Engages in advanced research projects to develop new products, technologies, or processes.	Maintains state-of-the-art research facilities, hires top-notch researchers and scientists.
Circle the description that best applies to your business's current <b>Investment in</b> <b>Research &amp; Development.</b>	Primarily relies on external sources, such as industry trends, for technological advancements and innovations.	Limited investment in R&D resources, such as personnel, equipment, and facilities.	Invests in dedicated R9D activities, personnel and facilities to drive innovation	Established infrastructure for R&D, specialized equipment and skilled research team.	Significant investment in R&D activities and a commitment to innovation.
Circle the description that best applies to your business's current Adoption of Technology for Production & Development.	Relies primarily on traditional manufacturing methods, standard production techniques, and conventional product development practices.	Some adoption of emerging technologies and tools related to advanced manufacturing, such as automation, robatis, additive manufacturing, or digital manufacturing, in both production and product development processes.	Active implementation of advanced manufacturing techniques, including automation, robotics, additive manufacturing, or digital manufacturing.	Adoption of advanced manufacturing techniques, leveraging cutting-edge technologies like artificial intelligence (AI), Internet of Things (IoT), or advanced robotics.	Leading-edge technologies in manufacturing, such as autonomous systems, advanced data analytics, adaptive manufacturing, or advanced supply chain management.
Circle the description that best applies to your business's current Investment in Technology for Production & Development.	Minimal investment in exploring or adopting emerging technologies or innovative product development approaches	Incorporation of improved product development practices, such as computer- aided design (CAD) or simulation tools, to enhance the development process.	Investment in advanced product development tools and methodologies, such as virtual prototyping, rapid iteration, concurrent engineering, or design for manufacturability (DFM), to accelerate the product development process.	Utilization of state-of-the-art production techniques and product development practices, such as digital twin simulations, advanced data analytics, agile manufacturing, or cross-functional collaboration, to achieve operational excellence and innovation.	Continuous exploration of emerging technologies and methodologies to push the boundaries of manufacturing and product development.
Circle the description that best applies to your business's current <b>Recruitment</b> <b>practices.</b>	Relatively passive recruitment process with minimal efforts to attract highly skilled individuals.	Proactive recruitment efforts targeting individuals with relevant skills and experience.	Strategic recruitment initiatives targeting top talent, both internally and externally.	Proactive recruitment strategies, including partnerships with educational institutions, industry networks, and targeted talent sourcing.	Highly strategic recruitment practices, including talent scouting, employer branding, and leveraging innovative sourcing channels.
Circle the description that best applies to your business's current <b>Training practices</b> .		Basic training programs provided to new hires, with some investment in upskilling and professional development.	Well-developed training programs to onboard new hires and provide continuous upskilling opportunities.	Comprehensive training and development programs tailored to advanced manufacturing skills and technologies.	Cutting-edge training programs, including collaborations with educational institutions and internal centers of excellence.
Circle the description that best applies to your business's current <b>Retention</b> <b>practices.</b>	Low focus on employee retention strategies, resulting in higher turnover rates.	Initial retention efforts, such as competitive compensation and benefits, but limited focus on long-term retention strategies.	Efforts to enhance employee retention through career development pathways, performance-based incentives, and a positive work environment.	Robust employee retention initiatives, such as competitive compensation packages, mentorship programs, work-life balance initiatives, and opportunities for advancement.	Strong focus on employee retention, offering attractive benefits, comprehensive career development opportunities, and a supportive company culture.
Circle the description that best applies to your business's current <b>Investment in</b> <b>Process Efficiency.</b>	Minimal investment in process optimization, automation, or data-driven decision-making.	Some investment in process optimization, automation, or data-driven decision- making tools.	Significant investment in process optimization, automation, and data-driven decision-making technologies.	Extensive investment in cutting-edge process optimization, automation, and data analytics technologies.	Pioneering the use of revolutionary technologies and methodologies to optimize processes and achieve operational excellence.
Circle the description that best applies to your business's current <b>Implementation of</b> <b>Process Efficiency</b> .	Relatively basic production planning and control systems with limited integration of advanced technologies.	Introduction of basic production planning and control systems with limited integration of advanced technologies, such as machine monitoring or quality control systems.	Implementation of advanced production planning and control systems, leveraging real-time data integration, advanced analytics, and optimization algorithms.	integration of advanced production planning and control systems with the use of artificial intelligence (AI) machine learning, or predictive analytics.	Implementation of advanced systems, such as smart factories or cyber-physical systems, to enable seamless integration, automation, and optimization across the entire value chain.
Circle the description that best applies to your business's current approach to Quality Control of Process Efficiency.	Reactive approach to addressing process inefficiencies, with limited use of performance metrics and continuous improvement initiatives.	Initiatives for identifying and addressing process inefficiencies, with periodic performance monitoring and improvement projects.	Proactive approach to identifying and resolving process inefficiencies through continuous improvement methodologies, such as Lean or Six Sigma.	Continuous monitoring of key performance indicators, real-time process optimization, and proactive identification of inefficiencies using advanced analytics and digital twins.	Continuous improvement culture with real- time monitoring, predictive maintenance, and advanced analytics driving continuous optimization and innovation.
Circle the description that best describes your busines's current Access to Expertise.	Limited access to external expertise, cutting-edge technologies, or collaborative research opportunities.	Limited engagement with external experts, research institutions, or technology providers for specific projects or knowledge exchange.	Engaging in joint projects, partnerships, or technology exchanges with external experts, research institutions, or technology providers.	Actively establishing strategic partnerships, joint ventures, or research collaborations with external experts, research institutions, or technology providers.	Strategic alliances, joint ventures, or research partnerships with leading expents, research institutions, or technology providers to co-create advanced manufacturing solutions and drive industry advancements.
Circle the description that best applies to your business's current awareness of <b>Funding and Grants</b> .	Limited exploration of external funding sources for research, development, or expansion.	Limited utilization of external funding sources for specific initiatives, such as research projects or technology adoption.	Pursuit of external funding sources for various initiatives, such as R&D projects, technology acquisitions, or facility expansions.	Actively seeking external funding sources, such as government grants, venture capital, or private equity, to support R&D, innovation, and expansion efforts.	Proactively seeking and leveraging various funding sources, including government grants, strategic partnerships, venture capital, or public offerings.
Circle the description that best applies to your business's current relationships with <b>Investors or Financial Institutions</b> .	Minimal efforts to establish relationships with investors or seek venture capital.	Occasional networking with investors but with minimal strategic relationship- building efforts.	Building relationships with investors through targeted networking, pitching, and regular communication.	Establishing strategic relationships with investors, fostering long-term partnerships, and engaging in ongoing dialogue for mutual growth.	Cultivating strong relationships with investors, strategic partners, and industry stakeholders to faster innovation, drive growth, and attract significant investment.
Circle the description that best applies to your manufacturing business's current level of consideration toward <b>Environmental</b> Impact.	Minimal consideration of environmental impact or resource efficiency in manufacturing processes.	Some consideration of environmental impact and resource efficiency in manufacturing processes.	Significant consideration of environmental impact and resource efficiency in manufacturing processes.	Proactive consideration of environmental impact and resource efficiency throughout the manufacturing processes and supply chain.	Holistic approach to environmental impact and resource efficiency across all aspects of manufacturing operations.
Circle the description that best applies to your business's current <b>Adoption of</b> <b>Sustainable Technology.</b>	Limited adoption of technologies or practices that promote sustainability, such as energy-efficient systems or waste reduction initiatives.	Partial adoption of technologies or practices that promote sustainability, such as energy-efficient systems or recycling programs.	Adoption of advanced technologies or practices that promote sustainability, such as renewable energy sources, closed-loop systems, or life cycle assessments.	Implementation of advanced technologies and innovative practices that promote sustainability, such as carbon footprint reduction strategies, circular economy principles, or sustainable material sourcing.	Implementation of cutting-edge technologies and best practices that drive sustainability, such as smart energy management, zero-waste manufacturing, or eco-design principles.
Circle the description as it relates to your business's current use of Research & Development for Sustainability.	Minimal investment in research or development of sustainable manufacturing solutions.	Moderate investment in research or development of sustainable manufacturing solutions.	Active investment in research or development of sustainable manufacturing solutions and continuous improvement of sustainable practices.	Substantial investment in research or development of sustainable manufacturing solutions and active collaboration with external partners, industry groups, or sustainability experts.	Continuous investment in research or development of sustainable manufacturing solutions, active engagement with sustainability through teaders, and leadership in driving industry-wide sustainable manufacturing initiatives.