

# Surrey Advanced Manufacturing and Innovation Economy

## Labour Market Development Strategy



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## EXECUTIVE SUMMARY

### PURPOSE OF STUDY

The City of Surrey, in partnership with Simon Fraser University (SFU) and Kwantlen Polytechnic University (KPU), is working towards bringing its Advanced Manufacturing and Innovation Economy (AMIE) sector to the next level: Industry 4.0. To help prepare the sector for this transition, this study developed strategies to address the skills gaps and labour market shortages of AMIE companies in the City of Surrey.

### METHODOLOGY

Information used to prepare this report was collected from the following sources: literature review, key informant interviews and interviews with manufacturers in Surrey and the rest of the Lower Mainland.

### KEY FINDINGS

Many Surrey manufacturers are experiencing difficulties in hiring and retaining unskilled production line workers. Several manufacturers are also experiencing problems in hiring and retaining people in the trades. Some specific positions that are difficult to fill include machinists, welders, fabricators and millwrights as well as hiring people who understand advanced manufacturing systems including technicians and engineers.

### LABOUR FORCE DEVELOPMENT STRATEGY ACTION PLAN

The following chart provides a phased action plan that summarizes the strategies required to address the skills gaps and labour shortages of AMIE companies as well as other strategies to grow the AMIE sector in Surrey.

Phase 1	Phase 2	Phase 3
<ul style="list-style-type: none"> <li>➤ Conduct short-term training programs to increase supply of entry-level floor workers</li> <li>➤ Conduct part-time training program and other activities (e.g. international missions) to increase the knowledge and buy-in to Industry 4.0 by owners and senior management of Surrey manufacturers</li> <li>➤ Increase the use of co-ops and interns by Surrey manufacturers</li> <li>➤ Conduct a feasibility study of establishing a Centre of Excellence (COE) for Advanced Manufacturing in Surrey</li> </ul>	<ul style="list-style-type: none"> <li>➤ Increase the supply of tradespersons to Surrey manufacturers</li> <li>➤ Attract large manufacturers to locate in Surrey to establish an advanced manufacturing cluster</li> <li>➤ Upskill existing employees of Surrey manufacturers regarding Industry 4.0</li> <li>➤ Increase the degree of collaboration between Surrey manufacturers and local universities</li> </ul>	<ul style="list-style-type: none"> <li>➤ Ensure that technician, technologist and engineering programs include training in Industry 4.0 equipment, systems and processes</li> <li>➤ Implement a program to interest local high school students in a career in manufacturing</li> <li>➤ Increase the competitiveness of Surrey as a location for advanced manufacturing</li> </ul>

## NEXT STEPS

There currently exists momentum and support to implement the action plan from SFU, KPU, the City of Surrey and, most importantly, Surrey manufacturers.

The next step is to obtain Phase 4: Implementation funding from the Labour Market Partnerships (LMP) Program of the Community and Employer Partnership (CEP) administered by the Ministry of Social Development and Poverty Reduction (SDPR) to engage a consultant to assist in the implementation of the following aspects of Phase 1 of the Action Plan:

- 1. Work with Surrey manufacturers and KPU to develop a short-term training program for entry-level plant floor workers.** Once the training program is developed, funding for the delivery of this training program should be solicited from the Employer Sponsored Training Program or the Canada Job Grant Program administered by the BC Ministry of Advanced Education, Skills and Training.
- 2. Work with Surrey manufacturers, KPU, SFU and City of Surrey to develop a part-time training program and other activities to increase knowledge and buy-in to Industry 4.0 by owners and senior management of Surrey manufacturers.** Once the training program is developed, funding for the implementation of the training program should be solicited from the Canada Job Grant Program administered by the BC Ministry of Advanced Education, Skills and Training.
- 3. Increase knowledge and adoption of Industry 4.0 practices by Surrey manufacturers.** This step involves the development of a format for regular peer networking sessions of Surrey manufacturers that includes presentations by Industry 4.0 specialists as well as presentations by SFU, KPU and BCIT regarding their capabilities to assist Surrey manufacturers. It also includes the development of a plan for missions of Surrey manufacturers to Germany, Japan, US and other countries to learn about Industry 4.0 practices.
- 4. Work with Surrey manufacturers, City of Surrey, SBOT, SFU, and KPU to develop a communication and promotion program to increase use of co-ops and interns by Surrey manufacturers.**

The other action required is to obtain funding from the provincial government (e.g. Ministry of Jobs, Trades and Technology) and/or federal government (e.g. Western Economic Diversification Canada) to:

- 5. Conduct a feasibility study of a Centre of Excellence (COE) for advanced manufacturing in Surrey with the guidance of Surrey manufacturers, SFU, KPU, and City of Surrey.**

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## 1. Study Objectives and Methodology

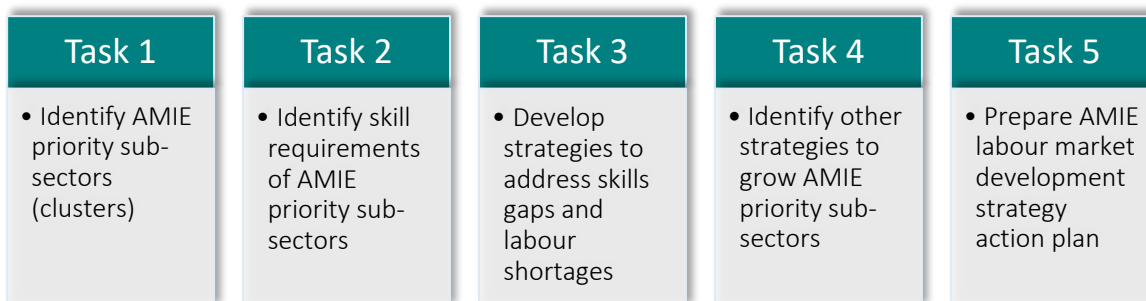
### 1.1 Purpose of the Assignment

The purpose of this study is to conduct research and identify strategies to address the labour market and human resources requirements of the Advanced Manufacturing and Innovation Economy (AMIE) in the City of Surrey. The focus of the study is to determine the skills required to bring the AMIE sector to the next level: Industry 4.0.

### 1.2 Methodology

The following tasks were employed to undertake this study:

#### Overview of Study Approach



The study used the following research methodologies: a literature review, key informant interviews and interviews with Surrey manufacturers and manufacturers from other parts of the Lower Mainland. The literature review looked at Industry 4.0 skill requirements, available labour market information and published data, information on drivers of employment growth, labour market outlook, current and projected skills shortages and labour force issues affecting AMIE, information regarding AMIE sub-sectors with growth potential, changes and disruptions that will impact AMIE priority sub-sectors and existing training programs and curriculum to support the AMIE. Successful labour market development strategies and successful cluster building initiatives in other jurisdictions were also studied.

During this study, 26 key informant interviews were conducted with representatives of industry associations, industry experts, universities, Labour Market Partnership Advisory Committee members, and municipal, provincial and federal government representatives. Key informant interviews were conducted in person or by telephone and tailored interview guides were employed for each interview. Appendix 1 provides a generic key interview guide that indicates the questions that were used to guide the discussions with key informants.

A total of 28 interviews were conducted with Surrey manufacturers in the priority sub-sectors as well as some other major manufacturers in the rest of the Lower Mainland. Appendix 2 provides a generic interview guide for these interviews which were conducted primarily in person while the rest were

conducted by telephone. In most instances, a tour of the manufacturing facilities was also undertaken to determine the level of technology and manufacturing equipment employed by the manufacturers interviewed.

### **1.3 Structure of the Report**

This report is structured as follows: Chapter 2 focuses on identifying AMIE priority-sub sectors that should be the focus of the labour market development strategy; Chapter 3 identifies the skill requirements of the AMIE priority sub-sectors; Chapter 4 presents strategies to address skills gaps and labour shortages; Chapter 5 identifies other requirements to grow AMIE priority sub-sectors and Chapter 6 provides a labour market development strategy and action plan.

## 2. Identification of AMIE Priority Sub-Sectors

This chapter describes the characteristics of the AMIE priority sub-sectors in Surrey that were the focus of this study.

### 2.1 Description of Surrey Manufacturers

Based on a review of the business licences maintained by the City of Surrey, the largest number (52%) of Surrey manufacturing companies produce fabricated metals products and machinery (Table 1). Other notable subsectors include companies that manufacture wood products and furniture (14%) and companies that produce food and beverages (6%). Most Surrey manufacturing companies are small, with an average of about 25 employees. Larger companies, those that have more than 100 employees, make up about 3% (25 companies) of the total of 894 manufacturing companies in Surrey.<sup>1</sup>

**TABLE 1:**  
**TYPES OF MANUFACTURING COMPANIES IN SURREY**

SUB-SECTOR	# OF COMPANIES	% OF TOTAL
<u>Fabricated metal products and machinery</u>	468	52%
<u>Wood products and furniture</u>	127	14%
<u>Food and beverage</u>	52	6%
Printing	48	5%
Computer and electronic products	33	4%
Clothing and textiles	33	4%
Non-metallic mineral products	29	3%
Transportation equipment	19	2%
Plastics and rubber products	17	2%
Other	68	8%
<b>Total</b>	<b>894</b>	<b>100%</b>

<sup>1</sup> WorkSafe BC

## 2.2 Identification of AMIE Priority Sub-sectors

The following criteria were used to select the AMIE priority sub-sectors:

- Current size of sub-sector
- Existence of anchor companies in Surrey
- Competitive advantages of locating in Surrey
- Sub-sectors with growth potential

Based on these criteria, the following were identified as AMIE priority sub-sectors:

- Metal fabrication/machinery
- Wood products and furniture manufacturing
- Food processing/agri-innovation
- Health technology
- Clean technology
- Automation and control/computer and electronic products

## 2.3 Description of AMIE Priority Sub-sectors

The six tables on the following pages describe the size of each priority sub-sector, its anchor companies, competitive advantages of locating in Surrey and the growth potential of the sub-sector.



**TABLE 2:  
PRIORITY SUB-SECTOR #1: METAL FABRICATION AND MACHINERY MANUFACTURING**

SIZE OF SUB-SECTOR	ANCHOR COMPANIES	COMPETITIVE ADVANTAGES OF LOCATING IN SURREY	GROWTH POTENTIAL
<ul style="list-style-type: none"> <li>▪ 468 metal fabrication and machinery manufacturers in Surrey</li> <li>▪ One half (52%) of total number of manufacturing companies in Surrey</li> </ul> <p><b>Products include:</b></p> <ul style="list-style-type: none"> <li>▪ Conveying systems</li> <li>▪ Construction cranes</li> <li>▪ Wood panel production equipment</li> <li>▪ Aluminum railings</li> <li>▪ Concrete mixing plants</li> <li>▪ Wire products</li> <li>▪ Heavy equipment add-ons</li> <li>▪ Silos and hoppers</li> <li>▪ Sheet metal products</li> <li>▪ Steel beams and trusses</li> <li>▪ Chain link fencing</li> <li>▪ Bulk material handling equipment</li> <li>▪ Chains and roller bearings</li> <li>▪ Hydraulic press brakes</li> </ul>	<ul style="list-style-type: none"> <li>▪ Base of manufacturing capabilities (e.g. machining) can support new innovations</li> <li>▪ Niche capabilities in industrial equipment manufacturing</li> </ul> <p><b>Leading companies:</b></p> <ul style="list-style-type: none"> <li>▪ Allied Blower &amp; Sheet Metal</li> <li>▪ Falcon Equipment</li> <li>▪ Robar Industries</li> <li>▪ Northwest Sheet Metal</li> <li>▪ Railcraft International</li> <li>▪ Tri Metal Fabricators</li> <li>▪ Murray Latta Progressive Machine</li> <li>▪ Industrial Equipment Manufacturing</li> <li>▪ CWS Industries</li> <li>▪ Halkin Tool</li> <li>▪ RAS Industries</li> <li>▪ Kadant Carmanah</li> <li>▪ Ivey International</li> </ul>	<ul style="list-style-type: none"> <li>▪ Largest (38%) portion of vacant industrial land in Metro Vancouver</li> <li>▪ R&amp;D infrastructure including SFU and KPU’s Siemens Mechatronics Systems certification program (<a href="https://www.sfu.ca/mechatronics/services-and-training/siemens-mechatronic-systems-certification-program.html">https://www.sfu.ca/mechatronics/services-and-training/siemens-mechatronic-systems-certification-program.html</a>); SFU’s research in sensors and automation with manufacturing applications; KPU’s Faculty of Trades and Technology; and KPU’s International Innovation and Manufacturing Enterprise Zone</li> <li>▪ Centrally located in Metro Vancouver, home to 2 US border crossings with excellent access to rail, air, water and major road networks</li> <li>▪ Affordable housing for employees</li> </ul>	<ul style="list-style-type: none"> <li>▪ Significant growth potential due to strong economy in BC and export potential</li> <li>▪ Using advanced equipment (e.g. 3D printing) and automated systems to deliver new products in the areas of product quality, improved costs and precision</li> <li>▪ Projected growth of 5-8% per annum in industrial, factory and process automation manufactured products</li> <li>▪ Potential growth areas include LRT, port, and aerospace</li> <li>▪ Customized products, short cycle, low volume at low cost and quick turnaround</li> <li>▪ Support services including R&amp;D, engineering and design</li> </ul>

**TABLE 3:**  
**PRIORITY SUB-SECTOR #2: WOOD PRODUCTS AND FURNITURE MANUFACTURING**

SIZE OF SUB-SECTOR	ANCHOR COMPANIES	COMPETITIVE ADVANTAGES OF LOCATING IN SURREY	GROWTH POTENTIAL
<ul style="list-style-type: none"> <li>▪ 127 wood products and furniture manufacturers in Surrey</li> <li>▪ Second largest group (14%) of manufacturing companies in Surrey</li> </ul> <p><b><u>Products include:</u></b></p> <ul style="list-style-type: none"> <li>▪ Doors</li> <li>▪ Mouldings</li> <li>▪ Veneers</li> <li>▪ Pallets</li> <li>▪ Cabinets</li> <li>▪ Wood panel board</li> <li>▪ Wood furniture</li> <li>▪ Upholstered furniture</li> <li>▪ Cedar lumber and panel products</li> <li>▪ Hemlock for interior and exterior house construction</li> </ul>	<ul style="list-style-type: none"> <li>▪ BC’s wood manufacturing industry includes innovative companies across the province. In 2012, the value-added wood sector provided close to 12,500 full-time jobs with estimated sales of \$2.8 billion.</li> </ul> <p><b><u>Leading companies:</u></b></p> <ul style="list-style-type: none"> <li>▪ Teal Jones Group</li> <li>▪ S &amp; R Sawmills</li> <li>▪ Fraserview Remanufacturing</li> <li>▪ Cedarline Industries</li> <li>▪ Merit Kitchens</li> <li>▪ Sunrise Kitchens</li> <li>▪ Pentco Industries</li> <li>▪ Mako Wood Furniture</li> <li>▪ Van Gogh Furniture</li> <li>▪ W Kreykenbohm Corporation</li> </ul>	<ul style="list-style-type: none"> <li>▪ Access to ample supply of raw material from BC forest industry</li> <li>▪ Largest (38%) portion of vacant industrial land in Metro Vancouver</li> <li>▪ R&amp;D infrastructure including SFU and KPU’s Siemens Mechatronics Systems certification program; SFU’s research in sensors and automation with manufacturing applications; KPU’s Faculty of Trades and Technology; and KPU’s International Innovation and Manufacturing Enterprise Zone</li> <li>▪ Centrally located in Metro Vancouver, home to 2 US border crossings and has excellent access to rail, air, water and major road networks</li> <li>▪ Affordable housing for employees</li> </ul>	<ul style="list-style-type: none"> <li>▪ Significant growth potential due to continued high level of building construction in the Lower Mainland and export potential</li> <li>▪ Using advanced equipment (e.g. 3D printing) and automated systems to deliver new products in the areas of product quality, improved costs and precision</li> <li>▪ New areas of business including wood hi-rise buildings</li> <li>▪ Manufactured products to support automation in the sawmills</li> <li>▪ Customized products, short cycle, low volume at low cost and quick turnaround</li> <li>▪ Services including R&amp;D, engineering and design to support manufacturing</li> </ul>

**TABLE 4:**  
**PRIORITY SUB-SECTOR #3: FOOD AND BEVERAGE PROCESSING/AGRI-INNOVATION**

SIZE OF SUB-SECTOR	ANCHOR COMPANIES	COMPETITIVE ADVANTAGES OF LOCATING IN SURREY	GROWTH POTENTIAL
<ul style="list-style-type: none"> <li>▪ 52 food and beverage processing companies in Surrey</li> <li>▪ Third largest group (6%) of manufacturing companies in Surrey</li> <li>▪ 500 farms in Surrey with sales of \$167 million dollars which is 22% of total gross annual farm receipts in Metro Vancouver</li> </ul> <p><b>Products include:</b></p> <ul style="list-style-type: none"> <li>▪ Poultry processing</li> <li>▪ Dairy products</li> <li>▪ Seafood</li> <li>▪ Herbs</li> <li>▪ Vegetables</li> <li>▪ Baked goods</li> <li>▪ Pasta</li> </ul>	<ul style="list-style-type: none"> <li>▪ Largest company is Sunrise Farms with 1,300 employees in 6 different processing plants located in Surrey, Abbotsford, Alberta and Ontario</li> </ul> <p><b>Other leading companies:</b></p> <ul style="list-style-type: none"> <li>▪ Punjab Dairy Milk Foods</li> <li>▪ SMK Farms</li> <li>▪ Pacific Salmon Industries</li> <li>▪ Mainstream Canada Aquaculture</li> <li>▪ International Herbs</li> <li>▪ Orca Specialty Foods</li> <li>▪ Zinetti Food Products</li> <li>▪ Nana’s Kitchen</li> </ul>	<ul style="list-style-type: none"> <li>▪ One third of Surrey’s land base is suitable for agriculture</li> <li>▪ Crop and feedstock availability to support innovation in crop sciences and food manufacturing</li> <li>▪ Access to local base of consumers in the Lower Mainland</li> <li>▪ R&amp;D infrastructure including BioPod Initiative (<a href="http://www.villagesurrey.ca/2016/04/16/biopod-initiative-in-surrey">http://www.villagesurrey.ca/2016/04/16/biopod-initiative-in-surrey</a>) to create new technologies and agriculture best practices and KPU’s research in sustainable agricultural techniques</li> <li>▪ Global connectivity via 2 international airports, international marine terminals, major east/west and north-south highways, and 2 international border crossings</li> </ul>	<ul style="list-style-type: none"> <li>▪ Sub-sector in BC has been growing fast and will likely continue as BC food manufacturing sales have increased by 48% from \$5.5 billion in 2006 to \$8.1 billion in 2016</li> <li>▪ Growth of 7.2% in foreign direct investment in Canada shows promise for this sector</li> <li>▪ New products and services in the area of automated systems (water and fertilizer systems, Augmented Reality (AR) - enhanced version of reality created by the use of technology to add digital information on an image of something, Virtual Reality (VR) (use of computers to create a simulated environment and automated systems) for existing business and Canadian farmers</li> <li>▪ Equipment and systems for vertical farming and precision organics/local products</li> <li>▪ Advanced production equipment manufactured for Canadian urban market</li> <li>▪ Services including R&amp;D, engineering and design</li> </ul>

**TABLE 5:  
PRIORITY SUB-SECTOR #4: HEALTH TECHNOLOGY**

SIZE OF SUB-SECTOR	ANCHOR COMPANIES	COMPETITIVE ADVANTAGES OF LOCATING IN SURREY	GROWTH POTENTIAL
<ul style="list-style-type: none"> <li>▪ 110 health technology companies in the Lower Mainland</li> <li>▪ Includes medical devices, digital health and independent living technologies</li> </ul>	<ul style="list-style-type: none"> <li>▪ Major anchor is Innovation Boulevard which includes one of Western Canada’s health technology accelerators (<a href="http://www.innovationboulevard.ca/innovation-boulevard-launched-as-western-canadas-first-healthtech-accelerator">http://www.innovationboulevard.ca/innovation-boulevard-launched-as-western-canadas-first-healthtech-accelerator</a>) and brings together health, business, higher education and government to create new health technologies in the region</li> <li>▪ Other major anchors are Surrey Memorial Hospital Campus and Fraser Health Authority</li> </ul> <p><b><u>Leading companies:</u></b></p> <ul style="list-style-type: none"> <li>▪ Medtronic Canada</li> <li>▪ Philips Healthcare</li> <li>▪ Conquer Mobile</li> <li>▪ NTBIO Diagnostics</li> <li>▪ Oto Hearing Products</li> <li>▪ Cambian Business Services</li> <li>▪ Target Tape</li> </ul>	<ul style="list-style-type: none"> <li>▪ One of leading North American cities for broadband connectivity and fibre infrastructure</li> <li>▪ Innovation Boulevard, which includes one of Western Canada’s health technology accelerators and an emerging network of technology labs with specialized expertise in brain technologies, health computing solutions, independent living and advanced medical imaging</li> <li>▪ 3 new Industrial Research Assistance Program (IRAP) Industry Technology Advisors (ITAs) are located at Innovation Boulevard to support commercialization of Canadian technologies</li> <li>▪ Access to research as SFU and KPU conduct world-leading research in fields such as neuroscience, medical imaging, community health, nursing and spinal injury diagnostics</li> </ul>	<ul style="list-style-type: none"> <li>▪ Health care spending in Canada is forecast to rise by 4.5% per year</li> <li>▪ Medical device manufacturing has increased 56% in the past 5 years and the trend will continue</li> <li>▪ Market opportunities for medical innovators will be focused on technologies that can demonstrate cost efficiencies in the public health sector</li> <li>▪ Demonstrated strengths in medical device and software development including brain vital signs monitoring, medical education simulation, aging, exoskeleton for rehabilitation, surgery falls prevention, and spine injury diagnosis</li> <li>▪ Services including R&amp;D, engineering and design to support manufacturing</li> </ul>

**TABLE 6:  
PRIORITY SUB-SECTOR #5: CLEAN TECHNOLOGY**

SIZE OF SUB-SECTOR	ANCHOR COMPANIES	COMPETITIVE ADVANTAGES OF LOCATING IN SURREY	GROWTH POTENTIAL
<ul style="list-style-type: none"> <li>▪ About 50 clean technology firms in Surrey</li> <li>▪ 10% of BC's clean tech sector is located in Surrey</li> </ul>	<ul style="list-style-type: none"> <li>▪ Anchor is Foresight Cleantech Accelerator, western Canada's only clean tech accelerator (<a href="http://www.foresightcac.com">http://www.foresightcac.com</a>)</li> <li>▪ Another anchor is Powertech Labs which provides one stop shop for technical engineering expertise, standards and code testing as well as quality testing and failure analysis services</li> </ul> <p><b><u>Leading companies:</u></b></p> <ul style="list-style-type: none"> <li>▪ Sola-Infra Systems</li> <li>▪ Delta Controls</li> <li>▪ Singer Valve</li> <li>▪ SP Power Farms</li> <li>▪ TBF Environmental</li> <li>▪ BI Pure Water</li> <li>▪ Crimeson Bioenergy Ltd.</li> </ul>	<ul style="list-style-type: none"> <li>▪ R&amp;D infrastructure including \$126 million SFU Sustainable Energy and Environmental Engineering Building and \$1.25 million Research Chair for Clean Energy in Smart Cities. SFU is home to world leading expertise in fuel cells and advanced materials</li> <li>▪ SFU's Fuel Cell Research Lab deals with advanced materials and manufacturing of fuel cell technologies</li> <li>▪ EcoNewton as a global hub for clean technology partnerships, innovation, demonstration and commercialization</li> <li>▪ Hosting of Greater Vancouver Clean Technology Expo &amp; Championship provides exposure to Surrey companies</li> </ul>	<ul style="list-style-type: none"> <li>▪ Clean tech sector in Canada is worth almost \$12 billion and could be a \$50 billion sector by 2022</li> <li>▪ Global market for clean technologies is expected to grow from \$1 trillion to \$3 trillion by 2020</li> <li>▪ New manufactured products and services in the areas of energy, automotive and bio-waste equipment</li> <li>▪ Manufacturing of products for smart city infrastructure</li> <li>▪ Manufacturing of renewable energy products</li> <li>▪ Manufacturing of system controls and sensors and automation software</li> <li>▪ Services including R&amp;D, engineering and design to support manufacturing</li> </ul>

**TABLE 7:**  
**PRIORITY SUB-SECTOR #6: AUTOMATION AND CONTROL/COMPUTER AND ELECTRONIC PRODUCTS**

SIZE OF SUB-SECTOR	ANCHOR COMPANIES	COMPETITIVE ADVANTAGES OF LOCATING IN SURREY	GROWTH POTENTIAL
<ul style="list-style-type: none"> <li>▪ 33 computer and electronics manufacturers in Surrey</li> </ul> <p><b>Products include:</b></p> <ul style="list-style-type: none"> <li>▪ Printed circuit boards</li> <li>▪ Motor controllers</li> <li>▪ Electrical control panels</li> <li>▪ Grading &amp; sorting machines</li> <li>▪ Sawmill control systems</li> <li>▪ Building automation systems</li> <li>▪ Water control valves</li> <li>▪ Food processing automated control systems</li> <li>▪ Industrial computers</li> <li>▪ Data loggers</li> <li>▪ Data integration software</li> </ul>	<p><b>Leading companies:</b></p> <ul style="list-style-type: none"> <li>▪ Western Robotics</li> <li>▪ Surtek Industries</li> <li>▪ SOFTAC Systems</li> <li>▪ Canadian Industrial Control Systems</li> <li>▪ Climatrol Solutions</li> <li>▪ Fortran Traffic Systems</li> <li>▪ Acura Embedded Systems</li> <li>▪ Modern Systems Management</li> <li>▪ Argus Control Systems</li> <li>▪ A C R Systems</li> <li>▪ Canadian Circuits</li> <li>▪ R C S Reliable Customized Solutions</li> <li>▪ Safe Software</li> <li>▪ Advanced Tracker Technologies</li> <li>▪ Basic IT Solutions</li> <li>▪ Posh Manufacturing</li> </ul>	<ul style="list-style-type: none"> <li>▪ R&amp;D infrastructure including SFU and KPU’s Siemens Mechatronics Systems certification program (<a href="https://www.sfu.ca/mechatronics/services-and-training/siemens-mechatronic-systems-certification-program.html">https://www.sfu.ca/mechatronics/services-and-training/siemens-mechatronic-systems-certification-program.html</a>) and SFU’s research in sensors and automation with manufacturing applications</li> <li>▪ Centrally located in Metro Vancouver, home to 2 US border crossings and has excellent access to rail, air, water and major road networks</li> <li>▪ Largest (38%) portion of vacant industrial land in Metro Vancouver</li> <li>▪ Affordable housing for employees</li> </ul>	<ul style="list-style-type: none"> <li>▪ Key sub-sector to provide automation and control products and enhance the advanced manufacturing capability (i.e. Industry 4.0) of the other five priority sub-sectors</li> <li>▪ New products (e.g. IoT (<a href="https://en.wikipedia.org/wiki/Internet_of_things">https://en.wikipedia.org/wiki/Internet_of_things</a>), manufacturing data analytics/ augmented reality and virtual reality, sensor integration and machine to machine processing)</li> <li>▪ New markets for manufactured products in Surrey’s growth areas of entertainment (film growth is set at 4-5%) and communications technologies</li> <li>▪ Services including R&amp;D, engineering and design to support manufacturing</li> </ul>

## **2.4 Impact on Other AMIE Sub-sectors**

Many other AMIE sub-sectors (e.g. plastics and textiles manufacturing) will benefit from the labour market development strategy because they will require similar skills and changes in manufacturing processes to comply with industry 4.0. They will need to employ technology (e.g. software, hardware, controls, data, etc.) but also processes (such as advanced design, agile development, LEAN manufacturing, product testing) and management and business development techniques that will allow current and new manufacturers to produce and sell products and services aligned with the same precision, quality and pricing demanded by customers. Most sub-sectors will see an increase in the use of plastic components which will be part of the growth of the advanced manufacturing sector. AMIE organizations that undertake R&D, engineering and design, will be required to support manufacturing activities in both priority and non-priority manufacturing sub-sectors.

### 3. Skill Requirements of AMIE Priority Sub-Sectors

This chapter summarizes the results of the literature review regarding the generic skills requirements for advanced manufacturers to adapt to Industry 4.0 and the unique skills requirements for AMIE companies in the priority sub-sectors identified in the previous chapter. It should be noted that findings resulting from skill requirements of the priority sub-sectors also apply to other AMIE sub-sectors (e.g. plastics and textile manufacturing) as well as AMIE organizations such as R&D and engineering/design that support manufacturing.

#### 3.1 Description of Industry 4.0

Industry 4.0 is the next phase in the digitization of the manufacturing sector, driven by various disruptions, including:

- Rise in data volumes, computational power, and connectivity
- Emergence of big data analytics and capabilities
- New forms of human-machine interaction (e.g. augmented-reality and virtual reality (AI/VR) systems, user interface and gaming systems)
- Transferring digital instructions to the physical world, such as advanced robotics and 3D printing
- Advanced processing and quality control
- Advanced materials
- Machine-machine interactions (Internet of Things (IoT) and smart devices)
- Precision machining

While Industry 3.0 focused on the automation of single machines and processes, Industry 4.0 focuses on the end-to-end digitization of all physical assets and integration into digital ecosystems with value chain partners. By connecting machines, work pieces and systems, businesses are creating intelligent networks along the entire value chain that can control each other autonomously.

Over 2000 leading global manufacturers surveyed in 2016 plan to double their average level of digitization within five years, from 33% to 72% - and they're investing over \$907 billion USD per year to do it. They will be investing in digital technologies, software, application manufacturing systems and training and skills development. They expect to see \$421 billion USD in cost reductions and \$493 billion USD in increased annual revenues as a result. Industry 4.0 is a 'qualifier to compete'. First movers will see game changing improvements. It is estimated that the Industrial Internet of Things (IIoT) will add \$14.2 trillion to the global economy by 2030.<sup>2</sup>

A lack of leadership is the biggest challenge facing companies in making use of data and digitalization. In 2016, over half of the world leading manufacturers (n=2000) indicated that they lack skills and competencies in their company's workforce to make full use of data analytics. In 2017, 31% of executives of manufacturing companies indicated their organizations are suffering from major IIoT skill gaps (n=350). The major areas of skill gaps include 'new' technical skills, data integration, data analytics, 'new' strategic thinking, understanding Industry 4.0, business concepts, rethinking existing business models, and

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<sup>2</sup> Price Waterhouse Coopers. 2016. Industry 4.0: Building the digital enterprise. <https://www.pwc.com/gx/en/industries/industries-4.0/landing-page/industry-4.0-building-your-digital-enterprise-april-2016.pdf>



rethinking of customer service models. Other areas of concern include cyber safety, data privacy and ownership, and data safety.<sup>3</sup>

A profound Industry 4.0 digital transformation is underway among leading manufacturers. By connecting machines, work pieces and systems, businesses are creating intelligent networks along the entire value chain that can control each other autonomously. The proportion of global companies surveyed with advanced digitization is projected to increase from 33% to over 72% by 2020.<sup>4</sup> Companies are using the following technologies to digitize their business:

- Advanced automation;
- Cloud computing;
- Sensors and 3D printing;
- Connected capability, including machine-machine and operations of the plant floor as a single integrated unit;
- Computer-powered processes;
- Intelligent algorithms;
- Internet of things; and
- Advanced manufacturing processes and advanced materials and composites.

About one half (55%) expect Industry 4.0 investments to pay back within two years, while 37% expect pay back in 2-5 years.<sup>5</sup>

There are some regions in the world where Industry 4.0 is especially accelerating. For example:

- Japan and Germany are leading in digitizing internal operations and have achieved gains in operational efficiency, cost reduction and quality assurance.
- US companies are investing more heavily in developing disruptive business models (i.e. an innovation that creates a new market and value network and eventually disrupts an existing market and value network, displacing established market leading firms, products, and alliances) and focus is more on digital revenue growth rather than efficiency gains.
- Chinese companies are involved in all aspects of digitalization and are expecting above-average cost reductions, as well as increased digital revenues through 2020.
- The Netherlands have made significant advances in advanced food processing.

There are key requirements for advanced manufacturers to participate in Industry 4.0. These include the following:

- Embedded software intelligence and connectivity of products through use of sensors to enable interaction with traditional products and their environment, such as people or machines;

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<sup>3</sup> Price Waterhouse Coopers. 2016. Industry 4.0: Building the digital enterprise.

<https://www.pwc.com/gx/en/industries/industries-4.0/landing-page/industry-4.0-building-your-digital-enterprise-april-2016.pdf>

<sup>4</sup> Price Waterhouse Coopers. 2016. Industry 4.0: Building the digital enterprise.

<https://www.pwc.com/gx/en/industries/industries-4.0/landing-page/industry-4.0-building-your-digital-enterprise-april-2016.pdf>

<sup>5</sup> Price Waterhouse Coopers. 2016. Industry 4.0: Building the digital enterprise.

<https://www.pwc.com/gx/en/industries/industries-4.0/landing-page/industry-4.0-building-your-digital-enterprise-april-2016.pdf>

- The use of analytics (e.g. for quality, process efficiency and maintenance) to get insight and decision support from data gathered by connected products and other sources; and
- The use of automation (e.g. robotics/augmented reality and virtual reality) and technology, such as sensors and control mechanisms embedded in machinery and 3D printing to increase manufacturing speed, precision, flexibility, quality and customization.<sup>6</sup>

### 3.2 Generic Skill Requirements for Advanced Manufacturers

In order to prepare the digital workforce to participate in Industry 4.0, staff must be trained how to use connected equipment, devices and wearables to be able to interact with their machines and work together in new ways. The industrial worker of the future must be trained to be a data-decision maker and supervisory presence on the factory floor, in the engineering centers or in the field servicing products. The workforce will also need to be trained to operate in human-machine-centric environments by creating a blended workforce, in which humans and machines collaborate dynamically. More complex skills such as data analytics and modelling, equipment development and equipment repair are also required.<sup>7</sup>

The workforce will need to be skilled at the following key technologies for Industry 4.0:<sup>8</sup>

- Connectivity, big data, artificial intelligence (AI) Cloud
- Sensors and embedded software
- Advanced data analytics using algorithm and patterning techniques
- Mobile wearables
- Augmented/virtual reality
- Additive manufacturing
- Drones and robotics
- Social media
- Integrated manufacturing technology skills
- Advanced process skills

There are certain types of employees that will be in greatest demand, including software programmers and engineers to create software connected products and machinery. Data analysts will be required to extract actionable data throughout manufacturing processes and functions, from supply chains to products in the field. Production workers adept in working with advanced automation, production line technicians and technologists experienced with advanced manufacturing techniques and processes will also be in demand. Specialized sales representatives will be required to sell, as well as to provide advice, service and training to customers, due to the increasingly complicated nature of connected products. Lastly, digital change managers will be needed to handle and push forward the epic change businesses will have to go through to become digitally transformed.<sup>9</sup>

Managers will need to be trained to be more fluid and adaptive. They will need to be collaborative with machines and humans, and agile at spotting gaps in the market in real-time and arranging digital processes accordingly. The top skills that managers will need to be successful include the following:<sup>10</sup>

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<sup>6</sup> Schaeffer, E., 2017. Industry X.0: Realizing Digital Value in Industrial Sectors, Kogan Page, London, UK.

<sup>7</sup> Schaeffer, E., 2017. Industry X.0: Realizing Digital Value in Industrial Sectors, Kogan Page, London, UK.

<sup>8</sup> Schaeffer, E., 2017. Industry X.0: Realizing Digital Value in Industrial Sectors, Kogan Page, London, UK.

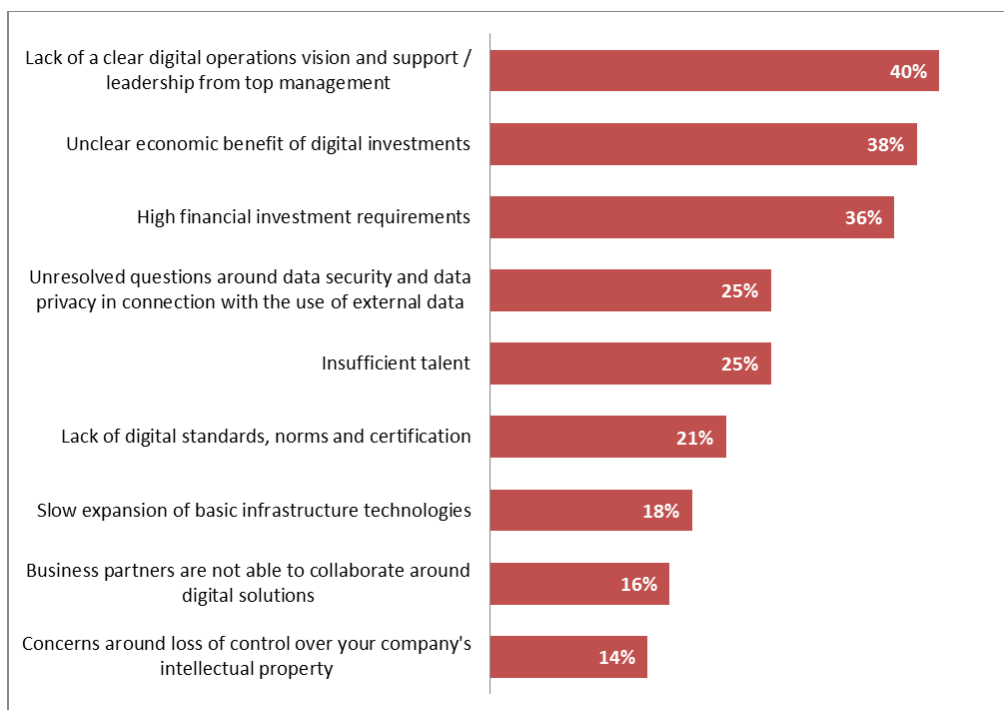
<sup>9</sup> Schaeffer, E., 2017. Industry X.0: Realizing Digital Value in Industrial Sectors, Kogan Page, London, UK.

<sup>10</sup> Schaeffer, E., 2017. Industry X.0: Realizing Digital Value in Industrial Sectors, Kogan Page, London, UK.

- Digital/technology;
- Creative thinking/experimentation;
- Data analysis and interpretation;
- Strategy development;
- Planning and administration; and
- Social networking.

The following chart depicts the challenges facing companies in digitalization. As indicated in Chart 1, the biggest challenge is the lack of a clear digital operations vision and support/leadership from top management.

**CHART 1:**  
**CHALLENGES FACING COMPANIES IN DIGITALIZATION**



*Source: PWC, Industry 4.0: Building the digital enterprise*

### 3.3 Skill Requirements for Advanced Manufacturers in Priority Sub-Sectors

The tables on the following pages indicate the key skills required for sample jobs in the priority sub-sectors, except the priority sub-sector dealing with automation and control/computer and electronic products. For this sub-sector, the skill requirements are similar to those for typical computer systems jobs. Overall, the skill requirements for advanced manufacturing are quite similar for the different priority sub-sectors.

**TABLE 8:  
SKILL REQUIREMENTS FOR TRADES AND PRODUCTION WORKERS**

JOB	SKILLS NEEDED	METAL FABRICATION	WOOD PROCESSING	FOOD PROCESSING	HEALTH TECH	CLEAN TECH
General	Computer control systems, 3D printing, robotics, precision machinery operations, electro-mechanical assembly, Red Seal level	x	x	x	x	x
Welder	Advanced welding (e.g. friction stir) equipment, automation working knowledge	X		X	X	X
Millwright	Advanced machinery, automation working knowledge		x			
Sheet metal worker	Advanced machinery, automation working knowledge	x		x	x	X
Plastics production	Advanced plastics moulding (e.g. electro discharge machines and computer numerical control(CNC) machines)		x	x	x	X
Machinist	Advanced machining (e.g. electromechanical, laser beam, plasma arc, ultrasonic), automation working knowledge	x	x	x	x	X
Electrician	Electrician certification, circuit board working knowledge	x	x	x	x	X
Tool and die maker	Advanced die making (e.g. geometric tolerancing, CNC milling, turning and programming), automation working knowledge	x	x	x	x	x

**TABLE 9:  
SKILL REQUIREMENTS FOR TECHNICIANS AND TECHNOLOGISTS**

JOB	SKILLS NEEDED	METAL FABRICATION	WOOD PROCESSING	FOOD PROCESSING	HEALTH TECH	CLEAN TECH
General	Computerised operating systems, 3D & CAD operations, embedded sensors and analytics, circuit boards, analytics for maintenance and product quality, quality control, Red Seal, ISO 9001 & 9100, robotics	x	x	x	x	x
Control System Technician 1, 2 and 3	Same as production, higher level	x	x	x	x	x
Environmental Technician	Same as production, higher level and environmental training	x	x	x	x	x
Instrument Technician	Same as production, higher level	x	x	x	x	x

**TABLE 10:  
SKILL REQUIREMENTS FOR COMPUTER AND SYSTEMS**

JOB	SKILLS NEEDED	METAL FABRICATION	WOOD PROCESSING	FOOD PROCESSING	HEALTH TECH	CLEAN TECH
General	Manufacturing systems, IoT integration, database development, data analytics, 3D printing, cloud computing, robotics/AR/VR, person/machine interfaces, chip and circuit boards, telecom, agile development, project management	x	x	x	x	x
Programmer	Technical languages for analytics, robotics/AR/VR, integration and manufacturing (e.g. Java, Python, SQL, C/C++, R, Perl)	x	x	x	x	x
Systems analyst	Business system and manufacturing systems design and build	x	x	x	x	x
User interface (UX) analyst	Designing and building interface between people and machines, robotics designing, and building data analytics	x	x	x	x	x
Hardware technician	Computers, circuit boards, integration with equipment, logic controllers, control systems, security firmware	x	x	x	x	x
Telecom technician	Wireless networks, mesh (IoT device communications) networks, Bluetooth, security software	x	x	x	x	x
Security technician	Normally built into other jobs but could be separate job	x	x	x	x	x

**TABLE 11:**  
**SKILL REQUIREMENTS FOR DESIGNERS**

JOB	SKILLS NEEDED	METAL FABRICATION	WOOD PROCESSING	FOOD PROCESSING	HEALTH TECH	CLEAN TECH
General	AR/VR design, user interface design including robotics, 3D modelling, simulation, process	x	x	x	x	x
Industrial designer	Product flows, workbench design, conveyor systems, tools and machines	x	x	x	x	x
User interface (UX) designer	Skills to build interfaces to make the person working with the machine as efficient as possible, includes behaviour and creative knowledge	x	x	x	x	x
Product designer	3D modelling and simulation, CAD, add to product designs for not only the end products being produced but also the equipment designs used in the production	x	x	x	x	x

**TABLE 12:**  
**SKILL REQUIREMENTS FOR ENGINEERS**

JOB	SKILLS NEEDED	METAL FABRICATION	WOOD PROCESSING	FOOD PROCESSING	HEALTH TECH	CLEAN TECH
General	Rapid and custom product engineering, process engineering, data analytics for maintenance, robotics, AR/VR, integrated technology, computer security, manufacturing processes and operation	x	x	x	x	x
Mechanical	Including mechatronics	x	x	x	x	x
Electrical	Including mechatronics	x	x	x	x	x
Computer	Software, firmware, database, network, hardware, devices	x	x	x	x	x
Telecommunications	Particularly in machine to machine communications and security as well as the high use of wireless telecom	x	x	x	x	x
Chemical	Use of composites and chemicals used in the manufacturing process or the end products (e.g. environmental processes and equipment)	x	x	x	x	x
Energy/Power	Renewables, carbon, battery, electricity, alternative energy	x	x	x	x	x
Environmental	Forestry, earth, water, ecology, geology, atmospheric, cleantech	x	x	x	x	x



**TABLE 13:**  
**SKILL REQUIREMENTS FOR BUSINESS**

JOB	SKILLS NEEDED	METAL FABRICATION	WOOD PROCESSING	FOOD PROCESSING	HEALTH TECH	CLEAN TECH
General	Predictive analytics, supply chain, cost management, large scale analytics, advanced manufacturing and maintenance, operations research, software and data design, marketing, financial, business management	x	x	x	x	X
Supply chain	Sourcing, materials, transportation, logistics, distribution/warehousing	x	x	x	x	x
Marketing and sales	Market analysis, customer analysis, online and social media	x	x	x	x	X
Financial	CPA, CA, CGA, financial analysis, public and private financing	x	x	x	x	x
Data analytics	Process, raw materials, machine and performance data algorithms and patterning	x	x	x	x	X
Management	Advanced manufacturing, data analytics, “as a service” business models	x	x	x	x	x

**TABLE 14:**  
**UNIQUE SKILL REQUIREMENTS OF PRIORITY SUB-SECTORS**

PRIORITY SUB-SECTOR	SPECIFIC SKILL REQUIREMENTS
Metal fabrication	<ul style="list-style-type: none"> <li>• Produce metal structures by cutting, bending, forming, machining, welding and assembling processes for a variety of metals</li> <li>• Produce wide range of products from metal structures and other materials including machinery, equipment, material handling, building construction, and transportation products</li> </ul>
Wood processing	<ul style="list-style-type: none"> <li>• Produce products using sawing, planing, gluing and assembly processes for a variety of wood, engineered wood and composite materials</li> <li>• Produce wide range of products including those used in building construction, furniture, cabinets, etc.</li> <li>• Knowledge of wood grading standards, building codes, load and stress tests, Canadian Standards Association (CSA) specifications, etc.</li> </ul>
Food processing	<ul style="list-style-type: none"> <li>• Produce and process food products using food production, washing, grading, processing and packaging process for a variety of foods, liquids and food ingredients</li> <li>• Produce wide range of food and beverage products</li> <li>• Knowledge of food handling and food safety procedures including Canadian Food Inspection Agency requirements</li> </ul>
Health tech	<ul style="list-style-type: none"> <li>• Manufacture variety of products including medical devices, equipment, supplies, health products, surgical products, etc.</li> <li>• Knowledge of Canada Food and Drugs Act, CSA and US FDA requirements</li> </ul>
Clean tech	<ul style="list-style-type: none"> <li>• Manufacture wide variety of products used in clean tech applications including production of energy, energy conservation, water conservation, remediation of air, soil and water, etc.</li> </ul>
Automation and control/computer and electronic products	<ul style="list-style-type: none"> <li>• Processes to manufacture variety of automation and control equipment and systems, computer (hardware and software) and electronic products (e.g. circuit boards)</li> </ul>

## 4. Strategies to Address Skills Gaps and Labour Shortages

This chapter provides an overview of the current state of manufacturing of Surrey companies in the priority sub-sectors, skills gaps and labour shortages of Surrey manufacturers, labour development requirements to enable Surrey manufacturers to adapt to Industry 4.0 and strategies to meet labour requirements and address skill shortages.

### 4.1 Current State of Manufacturing in Surrey

Employment in the AMIE sector in Surrey is estimated to be 18,090 in 2016, divided between advanced manufacturing at about 9,800 (54%) and the innovation economy at about 8,300 (46%). Based on the most conservative growth scenario, hiring requirements for the Surrey AMIE over the next decade are projected to be about 5,470, which is 30% of current employment. Most of this hiring (55%) is expected to occur with advanced manufacturers and the remainder (45%) with innovation economy employers. In the “high growth” scenario, employment would grow to about 36,200 over ten years, doubling employment in Surrey’s AMIE sector.<sup>11</sup>

There is a strong manufacturing industry in Surrey employing about 9,800 people in about 900 firms. Most of the companies are in the small and medium sized enterprise (SME) category although there are many large players. Several manufacturers interviewed have some computer numerical controlled (CNC) machines, computer aided design/computer aided manufacturing (CAD/CAM), robotics, advanced laser and cutting machines and plasma tables while the remaining manufacturers mostly rely on machines that are manually controlled. Very few manufacturers have automated systems that move and monitor materials from one manufacturing station to another or have automated systems that supply the raw materials required for manufacturing purposes. A few of the clean tech, health tech and agri-tech companies interviewed have reached the manufacturing stage while some other companies plan to eventually undertake manufacturing in Surrey.

The majority of the manufacturing workforce consists primarily of unskilled workers on the production floor and on-the-job training is provided by the company to these workers. There is high turnover of these workers. There is limited use of technologists and technicians. Semi-skilled and trades personnel are used for the operation of some manufacturing equipment and other production activities as well as equipment maintenance, repair and servicing. Engineers are used by a few companies primarily for product design and development. A wide range of management and administrative staff are employed by Surrey manufacturers including accounting, sales, production management, cost control, process design, supply chain, etc.

### 4.2 Skills Gaps and Labour Shortages of Surrey Manufacturers

Many manufacturers are experiencing difficulties in hiring and retaining unskilled production line workers. The following were most frequently mentioned as major skills gaps and labour shortages:

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<sup>11</sup> Surrey Advanced Manufacturing and Innovation Economy Phase 1 Report, January 2017.

- Production line workers were mentioned most frequently as one of the most difficult positions to fill and retain.
- Some manufacturers indicated that it is difficult to interest young people to consider a production line position and turnover is high for those positions.
- Several manufacturers are experiencing problems in hiring and retaining people in the trades due to higher wages paid by other industries and lack of sufficient trades personnel.
- Some trades that manufacturers are experiencing difficulties in hiring are machinists, welders, fabricators and millwrights.
- Some companies have difficulty in hiring people who understand the overall system such as technicians (for monitoring and maintenance), technologists (to take advantage of new equipment) and engineers to design and build.
- Some companies indicated difficulties in hiring technical sales, quality and process control and supply chain staff.

The following table shows the jobs most difficult to fill according to the manufacturers interviewed.

**TABLE 15:**  
**MOST DIFFICULT POSITIONS TO FILL BY THE MANUFACTURERS INTERVIEWED**

JOB	NUMBER OF COMPANIES
Production line worker (unskilled)	12
Fabricator	8
Machinist	7
Welder	7
Millwright	6
Technical sales/product design	6
Machine operators	5
Mechanical engineer	5
Electrical engineer	4
Software technician/programmer	4
Electrical technologist	4
Mechanical technician	4
Sheet metal worker	4
Software engineer	4
Field installers	4

The primary strategy employed by Surrey manufacturers to obtain unskilled production personnel is to hire locally via advertisements, word of mouth, relationship with local schools, etc. Several strategies are employed to hire trades personnel including the following:

- Hire workers from other businesses and competitors via word of mouth, advertisements, etc.;
- Hire graduates from trades programs (mainly BCIT and some from KPU);
- Hire trades from other areas of Canada (e.g. Alberta, Ontario); and
- For more skilled personnel, companies hire them from the local area and recruit graduates from local universities (e.g. engineers mainly from UBC and technologists/project managers mainly from BCIT).

Limited effort is made to recruit immigrants due to the level of effort and length of time required. Some effort is made to hire under-represented groups (e.g. females, First Nations, etc.). Because most companies are focusing on today's business, they are not investing in Industry 4.0 skills.

Most companies rely primarily on on-the-job training for existing workers, particularly with unskilled production workers. There is limited use of short-term training courses provided by external trainers (e.g. boot camps to learn Industry 4.0 skills) and limited use is made of the Canada Job Grant for the upskilling of existing employees. Considerable use is made of apprenticeships for trades positions; however, some companies do not have in-house people with sufficient experience to train them. A few respondents indicated lack of class space for apprenticeships results in delay of completion of apprenticeships. Limited use is made of co-op students or interns from local universities due to a lack of awareness (e.g. low awareness of SFU mechatronics co-op program) and high cost of students/interns.

There are several labour development requirements to enable Surrey manufacturers to adapt to Industry 4.0. The following requirements are necessary:

- Production line workers
  - Increase the supply of production line workers interested in a manufacturing career.
  - Increase skills of production line workers regarding use of advanced manufacturing equipment, systems and processes.
- Trades
  - Increase supply and capabilities of trades personnel to eliminate current labour shortages.
- Technicians, technologists and engineers
  - Increase skills regarding Industry 4.0 advanced manufacturing equipment, systems and processes as well as product design and development.
- Management and administration staff
  - Increase knowledge of Industry 4.0 relating to manufacturing processes, supply chain, sales, finance and management.
  - Equip companies with capabilities to sustain and grow their business.

The following pages discuss strategies to meet the labour requirements and address skill shortages.

### 4.3 Strategies to Meet Labour Requirements and Address Skill Shortages

This section describes the strategies to meet labour requirements and address skill shortages of Surrey manufacturers.

#### **#1. KPU in partnership with Surrey manufacturers should develop short term training programs to increase the supply and capabilities of production line workers for Surrey manufacturers.**

- Funding could be available from two different programs comprising the Canada Job Fund:
  - The Employer Sponsored Program could provide ongoing funding for a project that could be sponsored by industry and undertaken by KPU if the training focuses on unemployed or underemployed individuals (similar training programs are already being undertaken by KPU (Data Networking Technician and Low Voltage Wiring Technician Training programs) and the BC Alliance of Manufacturing (Manufacturing Production Level 1 Training for 2 months followed by a guarantee job).
  - The Canada Job Grant provides up to \$15,000 per person per year to employers who purchase training from an independent training organization (e.g. KPU or SFU) to train an unemployed person or \$10,000 to train an existing employee.
- Focus should be on plant floor and on-site installer positions, and businesses could provide the use of their equipment for training purposes.
- Short-term training programs should outline a career path for production line workers when they obtain additional experience and education that includes the following:
  - Entry-level production worker > trade apprentice > tradesperson
  - Entry-level production worker > technician/technologist > engineer/designer/production manager

#### **#2. Increase the current supply of trades apprentices from KPU and BCIT to address the current shortages of trades personnel experienced by Surrey manufacturers.**

- Trades in short supply include machinists, millwrights, fabricators, welders, industrial electricians and sheet metal workers.
- Need to address the current shortage of trades classroom spaces which results in delays of apprenticeships sponsored by Surrey manufacturers.
- KPU/BCIT should partner with industry to ensure trades can function in an advanced manufacturing environment and can deal with automated equipment. Options include establishing a partnership with CME to undertake a machinist's program similar to that undertaken in Ontario.

**#3. Ensure that technician, technologist and engineering programs are appropriate for Surrey manufacturers and include training regarding basic and advanced Industry 4.0 equipment, systems and processes.**

- Establish partnerships with local manufacturers to ensure that skills taught at SFU, KPU and BCIT reflect the production equipment and software purchased by Surrey manufacturers which includes equipment manufactured in Germany, Italy, Korea, etc. System wide capabilities are needed for Allen Bradley and Siemens technologies.
- Need to provide the technical skills necessary to design, build and operate equipment in the Industry 4.0 environment, and the business skills in process, analytics, quality and supply chain, as well as priority sub-sectors skills. Some specific examples of technical skills requested by Surrey manufacturers include the following:
  - Technical data analysis
  - Robotics
  - Predictive maintenance
  - Failure analysis
  - Product design and development (e.g. 3D level design), technology integration and quality assurance

**#4. Increase use of co-ops and interns to provide Surrey manufacturers access to skills at a reduced cost.**

- Level of awareness and uptake of co-op programs is very low by Surrey manufacturers.
- Establish partnership with industry and solicit funding from the BC government to pay for a portion of costs to increase use of co-ops and interns (similar to the program undertaken by BC Tech).
- The primary focus should be 8-month rather than 4-month co-ops, as they are more beneficial to companies.
- The City of Surrey Economic Development and Surrey Board of Trade should promote the value of co-ops and interns to Surrey manufacturers, as it can assist Surrey manufacturers in meeting labour requirements and adopting more advanced manufacturing techniques.

**#5. SFU/KPU should partner with local manufacturers to develop and undertake short training programs for operations and senior management personnel to equip them with Industry 4.0 skills and capabilities to enable Surrey manufacturers to survive and grow in the face of world-wide competition.**

- Funding is available from the Canada Job Grant program which provides up to \$10,000 per person per year to employers who purchase training from independent training organizations (e.g. SFU/KPU) for an existing employee.
- Training programs should range from specific equipment training, overall plant Industry 4.0 training and process and systems training.

**#6. Promote on-the-job training and upskilling of existing workers through greater use of the Canada Job Grant program.**

- Funding is available from the Canada Job Grant program which provides up to \$10,000 per person per year to employers who purchase training from an independent training organization (e.g. private trainers or universities) for existing employees.

**#7. City of Surrey in conjunction with industry, SFU and KPU should design and implement a program to interest local high school students in a career in manufacturing.**

- Need to increase awareness and understanding of careers in the manufacturing sector within the high school system to attract potential employees to the industry (similar to trades programs in schools).
- Program should include co-ops or plant tours to familiarize students with manufacturing operations.



## 5. Strategies to Grow AMIE Priority Sub-Sectors

This chapter describes issues other issues constraining development of AMIE in Surrey and outlines the strategies to address these issues and grow the sector.

### 5.1 Factors Constraining Development of AMIE in Surrey

Most companies are not investing in equipment and processes to take advantage of Industry 4.0 or for growth. There does not exist a sufficient number of large anchor companies in the priority sub-sectors (e.g. clean tech, health tech, agri tech) to create a cluster of competence and business interactions between companies in the cluster. Many manufacturers require assistance and advice to adopt Industry 4.0 practices. Most manufacturers lack understanding of SFU/KPU mechatronics capabilities. Some manufacturers require assistance in obtaining sufficient land and manufacturing space. Lack of frequent public transportation to Surrey's major industrial areas (e.g. Campbell Heights) makes it difficult to obtain a sufficient supply of production line workers. Some manufacturers are experiencing delays in obtaining permits for construction or expansion of manufacturing facilities.

### 5.2 Strategies to Grow AMIE in Surrey

#### **#1. Increase knowledge and adoption of Industry 4.0 practices by Surrey manufacturers.**

- Encourage Surrey manufacturers to join CME's Manufacturers' Executive Council which is an exclusive group of owners and senior executives from non-competing CME member manufacturers who meet monthly to gain strategic insights, share ideas, and learn from each other's experiences.
- Surrey Economic Development should organize regular peer networking sessions of Surrey manufacturers that include presentations by Industry 4.0 specialists as well as presentations by SFU, KPU and BCIT regarding their capabilities to assist Surrey manufacturers, including descriptions of co-op programs and research collaboration projects.
- Surrey Economic Development should organize missions of Surrey manufacturers to Germany, Japan, US and other countries to learn about Industry 4.0 practices.

**#2. Surrey Economic Development should undertake an aggressive campaign to attract large manufacturers to Surrey to create clusters.**

- Currently, there is not a sufficient number of large anchor manufacturing companies in Surrey.
- Need to provide incentives (e.g. provide ample supply of cheap industrial land for purchase as well as lease) and consolidate the industrial land available.
- Prepare and distribute a directory of manufacturers in Surrey to facilitate interaction between anchor companies and smaller companies.
- Establish a program or process to motivate clean tech, health tech and agri tech companies to establish manufacturing facilities in Surrey.
- To increase cluster capability and the skill base, investigate the feasibility of establishing a local equipment/systems maintenance capability.

**#3. Increase the degree of collaboration between universities and Surrey manufacturers to accelerate adoption of Industry 4.0 practices.**

- Promote increased use of Mitacs internships (<https://www.mitacs.ca/en>) which provide funding for Surrey manufacturers to hire university graduates skilled in Industry 4.0 practices.
- Increase the use of Natural Sciences and Engineering Research Council (NSERC) grants (e.g. Engage, Collaborative Research and Development (CRD) and Idea to Innovation (I2I) grants) for research collaboration between an industry partner and university researchers on research and development projects.
- Increase the use of the Industrial Research Assistance Program (IRAP) offered by the National Research Council of Canada, which provides advisory services and financial assistance to help SMEs undertake technology innovation (e.g. mechanical systems integration).

**#4. The City of Surrey should increase the competitiveness of Surrey as a location for advanced manufacturing.**

- Improve the frequency of public transportation to major industrial centres in Surrey (e.g. express bus service from the Skytrain station to Campbell Heights industrial park).
- Institute fast-track permitting of applications by manufacturers to establish or expand manufacturing operations.
- Leverage investments in infrastructure (e.g. LRT) to create business opportunities for Surrey manufacturing companies.
- Leverage investments in Clean Tech, Health Tech and Agri Tech to create opportunities for local manufacturing companies.

- Assist existing manufacturers in Surrey to develop new markets for their products such as exploring sub-contracting opportunities to larger companies outside of Surrey.

**#5. Assess the feasibility of establishing a Centre of Excellence (COE) for Advanced Manufacturing in Surrey.**

- The Centre should be led by industry but partner with the City of Surrey, SFU, KPU, BCIT, the BC Government and the Government of Canada.
- The different types of activities and services that could potentially be offered by the Centre of Excellence include the following:
  - Technical and advisory assistance to manufacturers (e.g. equipment and software selection, plant layout, etc.).
  - Advanced manufacturing equipment (e.g. 3D printers) that could be shared by companies rather than having to purchase their own.
  - Manufacturing space for start-up companies.
  - Low-interest loans to purchase advanced manufacturing equipment.
- Funding should be solicited from the provincial (e.g. Ministry of Jobs, Trades and Technology) and federal government (e.g. Western Economic Diversification Canada) for the COE feasibility study and to establish the Centre of Excellence.

**EXAMPLE OF CENTRE OF EXCELLENCE – SHERIDAN COLLEGE’S CENTRE FOR ADVANCED MANUFACTURING & DESIGN TECHNOLOGIES**

**Facilities**

- 28,000 square feet of space available at CAMDT for R&D projects.
- Integrated Energy Systems Laboratory provides students with opportunities to undertake applied research in emerging areas.
- Climetrix Product Innovation Centre features state-of-the art additive manufacturing equipment where SMEs can learn how to best leverage additive manufacturing to support product development initiatives by producing advanced prototypes, manufacturing tools and final end-use parts.
- Robots Centre featuring 18 robots provided by ABB with capabilities including: welding; picking, packing and palletizing; machine tending, material handling and product assembly; and advanced vision-related programming.
- Siemens Mechatronics Lab supports the Mechatronics Systems Certification Program, a comprehensive industry skills certification based on a System Approach, a special set of teaching and learning methods developed over 25 years ago in Siemens’ technical schools in Germany.

**Funding**

- \$10M in investments to date from Sheridan College, City of Brampton, Ontario Ministry of Economic Development and Trade and Industry to support CAMDT’s sustainability.
- \$490,000 received in federal and provincial funding for applied research.

**Performance**

- 70 CAMDT private-sector partnerships since 2012.
- 1,500 students learn about CAMDT’s equipment every year.

## 6. Labour Market Development Strategy Action Plan

The following section describes the labour market development strategy action plan in 3 phases.

### 6.1 Phase 1 of Action Plan

Phase 1 activities begin immediately. They can be implemented within the first 12 months and have a quick impact.

**ACTION #1: KPU, in partnership with Surrey manufacturers, should develop short term training programs to increase the supply and capabilities of production line workers for Surrey manufacturers.**

- Obtain commitment from Surrey manufacturers to participate in the training programs by providing input into curriculum design and being directly involved in the delivery of the training programs (e.g. pre-screening of participants, provision of guest speakers and panel members, practicum supervision, donation of equipment, site visits and mock interviews of candidates).
- Based on industry needs, KPU should develop a curriculum and course design for the short-term training programs (e.g. 8 to 10 weeks in length). The focus should be on plant floor and on-site installer positions. For example, the plant floor training program could include how to use basic hand tools and production equipment (e.g. drill press, welder, CNC machines), supply of materials (e.g. forklift), safety, etc.
- Prepare and submit a proposal to fund the short-term training programs to the Employment Sponsored Program or the Canada Jobs Grant Program delivered by the BC Ministry of Advanced Education, Skills & Training.

**ACTION #2: Increase knowledge and adoption of Industry 4.0 practices by Surrey manufacturers.**

- Encourage Surrey manufacturers to join Canadian Manufacturers & Exporters (CME's) Manufacturers' Executive Council which is an exclusive group of owners and senior executives from non-competing CME member manufacturers who meet monthly to gain strategic insights, share ideas, and learn from each other's experiences.
- Surrey Economic Development should organize regular peer networking sessions of Surrey manufacturers that includes presentations by Industry 4.0 specialists as well as presentations by SFU, KPU and BCIT regarding their capabilities to assist Surrey manufacturers, including description of co-op programs and research collaboration projects.
- Surrey Economic Development should organize missions of Surrey manufacturers to Germany, Japan, US and other countries to learn about Industry 4.0 practices.

**ACTION #3: SFU/KPU should partner with local manufacturers to develop and undertake short training programs (evenings, weekends) for operations and senior management personnel to equip them with Industry 4.0 skills and capabilities.**

- Obtain commitment and input from Surrey manufacturers regarding the most appropriate curriculum and format for the short training programs.
- SFU/KPU to develop curriculum and design for short term training programs requested by industry. Training programs could range from specific equipment training, overall plant Industry 4.0 training and process and systems training.
- A consortium of Surrey manufacturers or the Surrey Board of Trade in conjunction with SFU/KPU should prepare and submit a joint application to fund the short-term training programs to the Canada Jobs Grant program which provides a grant of up to \$10,000 per person per year to employers who purchase training from independent training organizations (e.g. SFU/KPU). Employers must pay one third of the training cost while the program pays the other two thirds. Funding application should be submitted by a consortium of employers or the Surrey Board of Trade.

**ACTION #4: Increase use of co-ops and interns to provide Surrey manufacturers access to skills at a reduced cost.**

- Establish partnerships with industry and SFU/KPU and solicit funding from the BC government to pay for a portion of costs to increase use of co-ops and interns (similar program undertaken by BC Tech).
- Develop a communications plan to promote increased use of co-ops and interns.
- SFU/KPU, in conjunction with the City of Surrey Economic Development and Surrey Board of Trade, should promote value of co-ops and interns to Surrey manufacturers to help meet their labour requirements and adopt more advanced manufacturing techniques. Primary focus should be 8-month rather than 4-month co-ops, as they are more beneficial to manufacturers.

**ACTION #5: Conduct a feasibility study of a Centre of Excellence (COE) for Advanced Manufacturing in Surrey.**

- Establish a Steering Committee to guide the feasibility study that consists of representatives of Surrey manufacturers, industry partners, the City of Surrey, SFU, KPU, BCIT, the BC Government and the Government of Canada.
- Funding should be solicited from the provincial and/or federal government (e.g. digital cluster funding) for the COE feasibility study. Some potential activities and services that could be offered by the Centre of Excellence include the following:
  - Technical assistance to manufacturers (e.g. equipment and software selection, plant layout, etc.).
  - R&D assistance for manufacturers, industry partners and schools.
  - Advanced manufacturing equipment (e.g. 3D printers) that could be shared by companies rather than having to purchase their own.
  - Manufacturing space for start-up companies.
  - Industrial land for anchor and start-up companies.
  - Low-interest loans to purchase advanced manufacturing equipment.

## **6.2 Phase 2 of Action Plan**

Phase 2 activities have a significant impact but require more time to fully implement. They would begin immediately and be fully implemented within a 12 to 24-month period.

**ACTION #6: Increase the current supply of trades apprentices from KPU to address the current shortages of trades personnel experienced by Surrey manufacturers.**

- KPU, in partnership with Surrey manufacturers, should meet with the Industry Training Authority to address the current shortage of trades classroom spaces which results in the delay of apprenticeships sponsored by Surrey manufacturers. The trades in short supply include machinists, millwrights, fabricators, welders, industrial electricians, and sheet metal workers.
- KPU should partner with industry to ensure trades can function in an advanced manufacturing environment and can deal with automated equipment. Options include establishing a partnership with CME to undertake a machinist's program similar to that undertaken in Ontario.

**ACTION #7: Surrey Economic Development should undertake an aggressive campaign to attract manufacturers, particularly large manufacturers, to create an advanced manufacturing cluster in Surrey.**

- Need to identify target companies and develop a proactive attraction strategy including incentives (e.g. provide ample supply of cheap industrial land for purchase as well as lease) and to consolidate the industrial land available.
- The focus of the campaign should be to increase the number of large anchor manufacturing companies in Surrey in order to create a critical mass of companies.
- Prepare and distribute a directory of manufacturers in Surrey to facilitate interaction between anchor companies and smaller companies.
- Establish a program or process to motivate clean tech, health tech and agri tech companies to establish manufacturing facilities in Surrey.
- To increase cluster capability and skill base, investigate the feasibility of establishing a local equipment/systems maintenance capability.

**ACTION #8: Surrey Economic Development and Surrey Board of Trade should promote on-the-job training and upskilling of existing workers through greater use of the Canada Job Grant program.**

- A communications plan should be developed and implemented.
- The key message that should be communicated is that funding is available from the Canada Job Grant program which provides up to \$10,000 per person per year to employers who purchase training from an independent training organization (e.g. private trainers or universities).

**ACTION #9: Surrey Economic Development and SFU/KPU should increase promotion of the following federal government programs to increase the degree of collaboration between universities and Surrey manufacturers to accelerate adoption of Industry 4.0 practices.**

- Mitacs internships to provide funding for Surrey manufacturers to hire university graduates skilled in Industry 4.0 practices.
- NSERC grants (e.g. Engage, Collaborative Research and Development (CRD) and Idea to Innovation (I2I) grants) for research collaboration between an industry partner and university researchers on R&D projects.
- Industrial Research Assistance Program (IRAP) offered by the National Research Council Canada which provides advisory services and financial assistance to help SMEs undertake technology innovation (e.g. mechanical systems integration).

### 6.3 Phase 3 of Action Plan

Phase 3 activities are important to start soon but require considerable time (more than 24 months) to fully implement and have an impact. Phase 3 activities are critical to providing the labour, skills and other requirements for Surrey manufacturers to implement Industry 4.0 practices and processes.

**ACTION #10: Ensure that technician, technologist and engineering programs are appropriate for Surrey manufacturers and include training regarding basic and advanced Industry 4.0 equipment, systems and processes.**

- Establish partnerships with local manufacturers to ensure that skills taught at SFU, KPU and BCIT reflect the production equipment and software purchased by Surrey manufacturers which includes equipment manufactured in Germany, Italy, Korea, etc. System wide capabilities is needed for Allen Bradley and Siemens technologies.
- Need to provide the technical skills needed to design, build and operate equipment in the Industry 4.0 environment, and business skills in process, analytics, quality and supply chain as well as priority sub-sectors skills. Some specific examples of technical skills requested by Surrey manufacturers include the following: technical data analysis, robotics, predictive maintenance, failure analysis, product design and development (e.g. 3D level design), technology integration and quality assurance.

**ACTION #11: The City of Surrey in conjunction with industry, SFU and KPU should design and implement a program to interest local high school students in a career in manufacturing.**

- The goal of the program should be to increase awareness and understanding of careers in the manufacturing sector within the high school system and parents in order to attract potential employees to the industry (similar to the existing trades program in schools).
- The program should introduce youth to manufacturing and includes plant tours and possibly co-ops to familiarize students with manufacturing operations. The program could also include the development and implementation of an online manufacturing aptitude test to attract students with the right interests to choose manufacturing as a career.



**ACTION #12: The City of Surrey should increase the competitiveness of Surrey as a location for advanced manufacturing.**

- Improve the frequency of public transportation to major industrial centres in Surrey (e.g. express bus service from the Skytrain station to Campbell Heights industrial park).
- Institute fast-track permitting of applications by manufacturers to establish or expand manufacturing operations.
- Leverage investments in infrastructure (e.g. LRT) to create business opportunities for Surrey manufacturing companies.
- Leverage investments in Clean Tech, Health Tech and Agri Tech and Digital Cluster funding to create opportunities for local manufacturing companies.
- Assist existing manufacturers in Surrey to develop new markets for their products such as exploring sub-contracting opportunities to larger companies outside of Surrey.

#### 6.4 Next Steps

There currently exists momentum and support to implement the action plan from SFU, KPU, the City of Surrey and, most importantly, Surrey manufacturers.

The next step is to obtain Phase 4: Implementation funding from the Labour Market Partnerships (LMP) Program of the Community and Employer Partnership (CEP) administered by the Ministry of Social Development and Poverty Reduction (SDPR) to engage a consultant to assist in the implementation of the following aspects of Phase 1 of the Action Plan:

1. **Work with Surrey manufacturers and KPU to develop a short-term training program for entry-level plant floor workers.** Once the training program is developed, funding for the delivery of this training program should be solicited from the Employer Sponsored Training Program or the Canada Job Grant Program administered by the BC Ministry of Advanced Education, Skills and Training.
2. **Work with Surrey manufacturers, KPU, SFU and City of Surrey to develop a part-time training program and other activities to increase knowledge and buy-in to Industry 4.0 by owners and senior management of Surrey manufacturers.** Once the training program is developed, funding for the implementation of the training program should be solicited from the Canada Job Grant Program administered by the BC Ministry of Advanced Education, Skills and Training.
3. **Increase knowledge and adoption of Industry 4.0 practices by Surrey manufacturers.** This step involves the development of a format for regular peer networking sessions of Surrey manufacturers that includes presentations by Industry 4.0 specialists as well as presentations by SFU, KPU and BCIT regarding their capabilities to assist Surrey manufacturers. It also includes the development of a plan for missions of Surrey manufacturers to Germany, Japan, US and other countries to learn about Industry 4.0 practices.

- 4. Work with Surrey manufacturers, City of Surrey, SBOT, SFU, and KPU to develop a communication and promotion program to increase use of co-ops and interns by Surrey manufacturers.**

The other action required is to obtain funding from the provincial government (e.g. Ministry of Jobs, Trades and Technology) and/or federal government (e.g. Western Economic Diversification Canada) to:

- 5. Conduct a feasibility study of a Centre of Excellence (COE) for advanced manufacturing in Surrey with the guidance of Surrey manufacturers, SFU, KPU, and City of Surrey.**

## References

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- PwC. 2016. Industry 4.0: Building the digital enterprise.  
<https://www.pwc.com/gx/en/industries/industries-4.0/landing-page/industry-4.0-building-your-digital-enterprise-april-2016.pdf>
- Schaeffer, E., 2017. Industry X.0: Realizing Digital Value in Industrial Sectors, Kogan Page, London, UK.
- Surrey Advanced Manufacturing and Innovation Economy Phase 1 Report, January 2017.

## APPENDIX 1: Interview Guide for Key Informants

Ference & Company has been engaged by the City of Surrey, Simon Fraser University and Kwantlen Polytechnic University to develop a labour market development strategy for the manufacturing sector in Surrey to ensure that local manufacturers have an adequate supply of labour and can adapt to industry trends such as Industry 4.0. Over the next few years, as advanced manufacturing becomes the industry norm Industry 4.0 will incorporate technology and practices to improve quality, increase precision in product manufacturing for industries like medical, clean tech and energy, rapid production of customized products, speed of production and reducing costs. These technologies being used by production workers, technologists/technicians, designers and engineers and business staff include: data analytics, industrial internet of things (e.g. sensors, device intelligence), machine learning, modelling and simulation, augmented reality/ robotics and precision design, machine control systems, advanced production (e.g. 3D printing), software and the use of advanced materials (e.g. engineering wood or ceramics). The processes in Industry 4.0 include advanced design, quality, production and maintenance processes as well as supply chain and management processes. We would like your advice regarding the most appropriate steps that should be taken by government and universities to assist Surrey companies in the advanced manufacturing and innovation economy in meeting their labour market requirements.

### A. Contact Information

Name	
Position/Title	
Company	
Email Address	
Phone Number	

### B. Future Skill Requirements

1. **What changes will Surrey manufacturing companies need to undertake over the next five years to adapt to Industry 4.0 and grow the advanced manufacturing sector in Surrey?**

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2. **What additional skills do you think are required to enable Surrey manufacturers to adapt to trends such as Industry 4.0?**

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**C. Labour Development Strategies**

1. Which of the following labour development strategies should be pursued by Surrey manufacturing companies to meet their future skills requirements in advanced manufacturing and what actions are required to implement these strategies?

	<b>Labour Development Strategies</b>	<b>Actions Required to Implement Strategy</b>
A	Hire graduates from local universities	
B	Use co-op students or interns (e.g. MITACS) from local universities	
C	Collaborate with university researchers and utilize their expertise and equipment at the university to undertake projects that will result in advances in the manufacturing capabilities	
D	Hire students graduating from trades programs	
E	Greater use of apprenticeships	
F	Hire experienced workers from other parts of Canada	
G	Recruit immigrants with specialized skills in advanced manufacturing	
H	Upgrading the skills of existing employees	
I	Undertake training program for company managers about how to adapt to Industry 4.0	
J	Hiring people who are transitioning from another career	
K	Hiring people from under-represented groups (e.g. females, First Nations, disabled, etc.)	

2. Do you have any other suggestions on how to improve the matching of qualified people with local manufacturing industry job opportunities?

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3. Do you have any suggestions about effective strategies that could assist Surrey manufacturers in retaining existing workers?

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**E. Recommendations**

1. What actions should be undertaken by the City of Surrey such as policies (e.g., around taxes, bylaws, permits) or initiatives like information sharing and capacity building to assist Surrey manufacturers in meeting their future labour requirements and assist in the development of an advanced manufacturing sector in Surrey?

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2. What actions should be undertaken by universities such as KPU and SFU such as degree vs. non-degree programs, as well as professional vs. trades programs to assist Surrey manufacturers in meeting their future labour requirements and assist in the development of an advanced manufacturing sector in Surrey?

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3. What actions are required by provincial and federal governments to Surrey manufacturers in meeting their labour requirements and assist in the development of an advanced manufacturing sector in Surrey?

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4. Do you know of training/capacity building programs in other jurisdictions that could be beneficial to local manufacturers, if offered in Surrey?

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5. Do you have any other comments or suggestions?

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[Thank you for your participation](#)

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## APPENDIX 2: Interview Guide for Surrey Manufacturers

Ference & Company has been engaged by the City of Surrey, Simon Fraser University and Kwantlen Polytechnic University to develop a labour market development strategy for the manufacturing sector in Surrey to ensure that local manufacturers have an adequate supply of labour and can adapt to industry trends such as Industry 4.0 which includes things such as advanced robotics, 3D printing, the ability of machines, devices, sensors, and people to connect and communicate with each other via the Industrial Internet of Things, advanced materials, and advanced processing and quality control. We would like your advice regarding the most appropriate steps that should be taken by government and universities to assist you in meeting your labour market requirements.

### A. Contact Information

<b>Name</b>	
<b>Position/Title</b>	
<b>Company</b>	
<b>Email Address</b>	
<b>Phone Number</b>	

### B. Current Labour Market Requirements

1. **What is the likely change in total employment in your company in the next three years?**  
  
 Current number of employees \_\_\_\_\_  
 Projected number of employees in three years \_\_\_\_\_
  
2. **What types of jobs/skills account for most of the new employees that you plan to hire in the next three years?**  
 \_\_\_\_\_  
 \_\_\_\_\_
  
3. **How many positions are currently unfilled in your company?** \_\_\_\_\_
  
4. **Which type of jobs are the most difficult to fill?**  
 \_\_\_\_\_  
 \_\_\_\_\_
  
5. **Which of the following sources of labour have you used the most to meet your requirements?**
  - a. New students graduating from universities
  - b. New students graduating from trades programs
  - c. Immigrants

- d. Experienced workers from the local area
- e. Experienced workers from other parts of Canada
- f. People who are transitioning from another career
- g. Promoting existing employees to more senior positions
- h. People from under-represented groups (e.g. females, First Nations, disabled, etc.)
- i. Other (specify \_\_\_\_\_)

**C. Future Skill Requirements**

1. What do you feel are current and imminent changes in your industry/market that are impacting or could impact your company?

\_\_\_\_\_  
\_\_\_\_\_

2. To what extent do you see your company changing over the next five years to adapt to Industry 4.0?

Not at all		Somewhat		Great Extent
1	2	3	4	5

If 3 or higher, please indicate how the manufacturing processes in your company are likely to change?

\_\_\_\_\_  
\_\_\_\_\_

If 3 or higher, what additional skills do you think are required to enable your company to make the projected changes in manufacturing/technology/business processes to adapt to trends such as Industry 4.0?

\_\_\_\_\_  
\_\_\_\_\_

If less than 3, please indicate why not?

\_\_\_\_\_  
\_\_\_\_\_



**D. Labour Development Strategies**

1. The following paragraphs provide different strategies to meet your future labour requirements, particularly in obtaining skills in advanced manufacturing. Which of the following labour development strategies are of greatest interest and what steps are required to implement them?

	Labour Development Strategies	Actions Required to Implement Strategy
A	Hire graduates from local universities who have specialized training in advanced manufacturing in your sector	
B	Use co-op students or interns (e.g. MITACS) from local universities who have specialized training in advanced manufacturing in your sector	
C	Collaborate with university researchers and utilize their expertise and equipment at the university to undertake projects that will result in advances in the manufacturing capabilities	
D	Hire students graduating from trades programs	
E	Greater use of apprenticeships	
F	Hire experienced workers from other parts of Canada	
G	Recruit immigrants with specialized skills in advanced manufacturing	
H	Upgrade the skills of existing workers	
I	Undertake a training program for company managers about how to adapt to Industry 4.0	
J	Hire people who are transitioning from another career	
K	Hire people from under-represented groups (e.g. females, First Nations, disabled, etc.)	

2. Do you have any other suggestions how to improve the matching of qualified people with your job opportunities?

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3. Do you have any difficulties in retaining existing workers? If yes, what actions should be taken to assist you in retaining existing workers?

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### **E. Recommendations**

1. What actions should be undertaken by the City of Surrey (e.g., taxes, bylaws, permits) or initiatives like information sharing and capacity building to assist your company in meeting its future labour requirements and assist in the development of an advanced manufacturing sector in Surrey?

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2. What actions should be undertaken by universities such as KPU and SFU (e.g. degree vs. non-degree programs, as well as professional vs. trades programs) to assist your company in meeting its future labour requirements and assist in the development of an advanced manufacturing sector in Surrey?

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3. What actions are required by provincial and federal governments to assist your company in meeting its labour requirements and assist in the development of an advanced manufacturing sector in Surrey?

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4. Do you know of training/capacity building programs in other jurisdictions that could be beneficial to local manufacturers, if offered in Surrey?

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5. Do you have any other comments or suggestions?

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[Thank you for your participation](#)