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Assessing Automation in Rural Communities: An Economic Impact Assessment

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Abstract

Automated technologies are rapidly challenging assumptions about the form and function of global, national, and local economies and labour markets. Increased digitization and international events, including global pandemics and fluctuations in commodity prices and financial markets, are putting pressure on economies to adapt rapidly or face unemployment and economic downturn. Rural communities face particular challenges, as their economies are often built around a common industry, and the lack of broadband access and digital literacy can create significant barriers. This project asks: what are the implications of automating acquisition, production and/or sales for rural businesses and labour in rural Canada? How prepared are rural business communities for automation? In response, we present a localized assessment of how rural businesses view the scale, nature, and impacts of automation in a rural community in Western Canada. Our analyses find that many business owners and managers are unprepared for technologically-driven disruptions, and are less likely to adapt, adopt, or innovate in a rapidly changing business and economic environment. This may compound already-present challenges to both employer and employee futures in rural communities.

Keywords: automation, emerging technologies, rural development, rural labour, Alberta

1.0 Introduction

With the proliferation of automated technologies such as artificial intelligence and machine learning across almost every industry worldwide, it has become necessary to monitor the impact of automation on national and local economies and labour forces (Manyika et al., 2017a; Vincent, 2017; Pettinger, 2019). While each country, region, and local municipality faces different challenges as a result of the widespread application of automation,¹ factors such as economic diversification, population size and demography, and implementation of education and policy frameworks all influence how easily a local or regional economy can adapt to changes resulting from automation (Manyika et al., 2017b; Blit et al., 2018). For example, areas with more economic diversification and a concentration of workers in sectors not very susceptible to automation are better positioned for technological change (Wyonch, 2018; Younglai, 2017).

Typically burdened with reduced access to skills training and lower levels of digital literacy, rural areas are often hit hardest by technological change (Mullin & Lamb, 2018; Lamb et al., 2019; Huynh & Malli, 2018), and when faced with job displacement, rural populations often do not migrate to higher growth areas (Elis, 2019; Lund et al., 2019). This dynamic compounds both the immediate challenge of reduced employment opportunities in rural areas, as well as the broader social and health costs of economic decline. As a result of these immediate and more distal challenges, it is important to assess how rural businesses view automated technologies and the implications for local business development and shifts in both labour and technology.

The Albertan economy is susceptible to automation because of the high concentration of the workforce in resource extraction (Lamb & Lo, 2017). Within the province, many rural communities have strong economic connections to both conventional economic activities (agriculture, retail, services) and resource extraction, and may be particularly vulnerable to shifts in technology. As a result, it provides a strong foundation for an examination of automation in rural communities. In turn, this study is focused upon a community of approximately 19,000 in Central Alberta as a case study for a number of reasons: (1) artificial intelligence, machine learning, and other types of automation are expected to have a significant impact on agricultural, health and manufacturing sectors that currently provide the economic base for the City (Rotz et al., 2019; Nichols Applied Management, 2018; Lamb & Lo, 2017; Manyika et al., 2017b); (2) as a retirement-destination, the community reflects broader demographic and economic patterns consistent with many rural communities (Moazzami, 2015); and (3) the community serves as an economic hub for a broader region, but is also within commuting distance of larger centres such as Edmonton and Red Deer.

Interviews were conducted with 60 local businesses (N=718) in 2018–2019 to ascertain how prepared they are for disruptions in normal business function caused by the application of full or partial automation technologies². The results are organized around three key themes in the automation literature that speaks to the preparedness of businesses for technological disruption: (1) employee skills sets; (2)

¹ Automation can be defined as the “... process of automatically producing goods through the use of robots, control systems and other appliances with a minimal direct human operation” (Pettinger 2019).

² The interview guide is available upon request.

business relationships with educational institutions; and (3) the localized impacts of technological implementation on business operations. Specifically, it was found that businesses in the study community: (1) are largely orientated to the status quo, (2) have varying understandings and orientations towards automation, and (3) anticipate only modest changes (if any) to their business as a result of new, automated technologies. These results are aligned with the existing literature, and suggest that rural places may not be prepared for, nor have the necessary skills to address coming challenges related to the introduction of automated technologies. These results are also reflected in an innovation assessment of the local business community, which also finds a strong trend toward small-scale, localized change.

2.0 Methodology

2.1 Project Design

Project design took place from September to October 2018, with ethics approval granted in October 2018³. Staff recruitment and interviewer training occurred from October 2018 through May 2019. Data collection commenced in June 2019 and continued until October 2019, with an emphasis upon the larger employers in key sectors in the community. Participating businesses had to meet the following inclusion criteria: they had to (a) be a registered business with the City; (b) be operating within City limits; and (c) be owned or managed by someone who spoke English. Specifically, given the large number of very small (1–3 employees) businesses in the City, this project focused upon recruiting participants from the primary employers in the region. The three largest sectors in the community are services, construction, and retail, while financial, transportation, and real estate are the smallest. Many of the interviewees self-identified as part of multiple sectors—as a result, the sector named in the list of locally Registered Businesses was used. Using the selection criteria noted above, 336 businesses were contacted of the 718 businesses in the community (see Table 1).

Table 1. *Business Profile and Response Rate*

Business Sector	Total Businesses	Total Contacted	Total Interviewed	Percentage Interviewed of Total Businesses	Percentage of Businesses Contacted
Services	246	131	15	6.10%	53%
Construction	177	65	11	6.21%	37%
Retail/ Hospitality	161	9	6	3.73%	6%
Health	67	61	7	10.45%	91%
Financial	20	18	5	25.00%	90%

³ Funding for this project was provided by the Province of Alberta and the University of Alberta.

Table 1 continued

Transportation	14	4	4	28.57%	29%
IT/ Telecom	13	12	3	23.08%	92%
Industrial/ Consumer Manufacturing	8	26	3	37.50%	3%
Real Estate	7	5	2	28.57%	71%
Energy	5	5	4	80.00%	100%
Total	718	336	60	8.36%	47%

*Data taken from the 2017 community’s licensing list, as provided by the City

2.2 Interview Methodology

Participant recruitment of local businesses was conducted by telephone and in-person. The project was promoted to the local business community by the City, and recruitment followed a snowballing strategy (where participants recommend additional participants) as well as more generalized recruiting from the business license list. Of the 336 businesses contacted, 60 were successfully interviewed (see Table 1), providing a response rate of 17.86%. The participants came from the service (n=15), construction (n=11), health (n=7), retail/hospitality (n=6), financial (n=5), transportation (n=4), energy (n=4), IT/telecom (n=3), industrial (n=3), and real estate (n=2) sectors. Interview participants were business owners or managers, as these individuals held both decision-making authority and some degree of responsibility for business performance. Participants were interviewed in-person by a trained research assistant, with interviews lasting approximately 30–45 minutes. The interviews were digitally recorded, transcribed, and analyzed with SPSS, Excel, and NVivo software.

The interview protocol followed a semi-structured model, with a combination of defined and probing questions (see Appendix I) focused on three main areas:

- Section I focused on the interviewees’ businesses background. Participants were asked to identify in which sector their business belonged, how long their business had been in operation, and how many staff they employed.
- Section II addressed business forecasting. Participants were asked about their perceived future needs in terms of staffing, skill sets, and current or possible relationships with educational institutions.
- Section III was concerned with automation in the workplace. Questions focused on their perceptions and adoption of technologies, like artificial intelligence and/or machine learning, in their workplace and resulting implications. Participants were asked how automation could affect their future business, skill, and employment needs, and what strategies they could use to address the challenges.

2.3 Data Analysis

Data analysis began in 2019, as interviews were taking place, and continued through April 2020. For defined, closed-ended questions with pre-set categories, the coded data were entered directly into the database and analyzed using SPSS software. The open-ended, probing questions were categorized and analyzed by sector, question, and theme using NVivo software. First, the responses were separated by sector and question. Because the interviews were semi-structured and participants were encouraged to talk about their experiences, the responses were not always in chronological order as listed in the interview guide. After the responses had been separated, cross-cutting themes were identified inductively, through a reading of responses, initial annotations, and further review by the research team, before finalization. This thematic analysis helped determine patterns, and identify similarities and differences, across the responses. Due to the small sample size, the results are presented as descriptive and cross-tabular statistics where appropriate, with supplemental qualitative data used for explanatory and illustrative purposes.

3.0 Background

3.1 Business and Automation across Canada

While approximately 46% of the total Canadian workforce (7.7 million jobs) has the ability to be partially or fully automated, the impacts of automation are not distributed evenly across the country (Lamb & Lo, 2017). The industries that are the most susceptible to partial or full automation are accommodation, food services, manufacturing, transportation, and warehousing, agriculture, forestry, fishing, and hunting, and mining, quarrying, oil, and gas extraction (Lamb & Lo, 2017; Rotz et al., 2019). These sectors are equivalent to 2.5 million jobs (24% of automatable jobs) (Lamb & Lo, 2017). However, automation capacity and the impacts of technological disruption are not spread equally across Canada, as every province and region faces different challenges. Areas with more economic diversification and a concentration of workers in sectors that are not very susceptible to automation are better positioned for technological change (Wyonch, 2018). Thus, certain regions are much more susceptible to automation than others. This is due in large part to the type of industries and jobs concentrated in rural versus urban areas (Younglai, 2017).

A lack of economic diversification, the concentration of certain industries, and prevalence of easily automated jobs mean that rural populations and communities are typically made more vulnerable to the implications of automation. Overall, urban centers have more diverse economies, mobile populations, and educational and re-skilling opportunities than rural centers and thus, are less susceptible to economic and workforce disruption due to automation (Elis, 2019, Lund et al., 2019). Jobs that involve routine physical tasks (which makes them easy to automate) and some of the industries that are most susceptible to automation are concentrated in rural areas. Agriculture, forestry, fishing, and hunting, as well as mining, quarrying, and oil and gas extraction, are some of the industries identified as most vulnerable to automation (Lamb & Lo, 2017; Manyika et al., 2017). In Alberta, common industries present in rural areas are agriculture and oil and gas extraction and pipelining (Nichols Applied Management, 2018). While the recent loss of oil and gas jobs in the province is *not* solely due to the introduction of automated technologies, but to “exogenous shocks to oil prices,” other important industries, such as the agricultural sector, will be particularly impacted by automation (Lamb & Lo, 2017, p. 9).

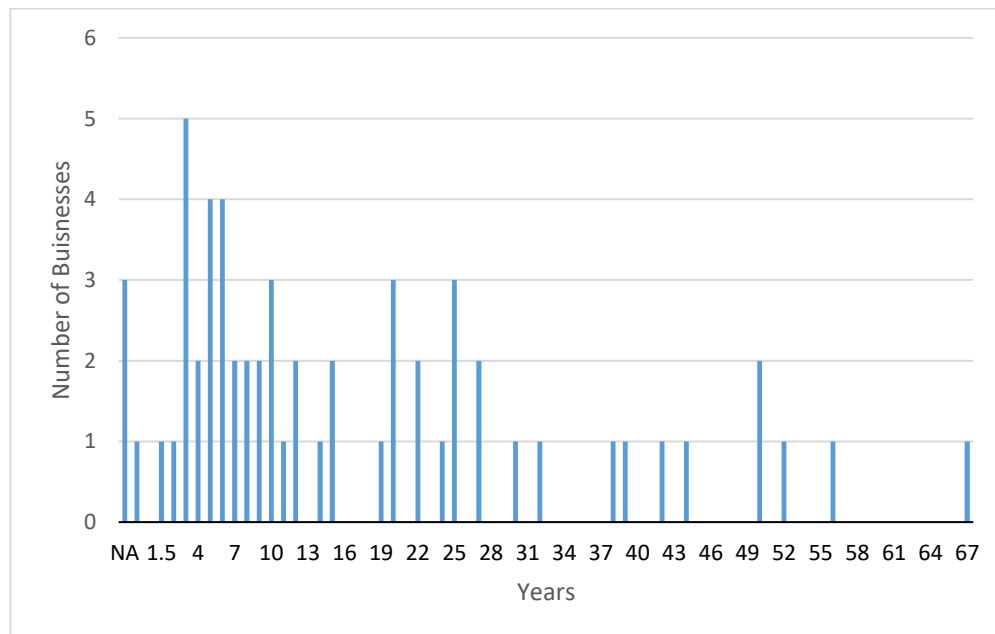
In the agricultural industry, automation provides unique challenges. A cost-saving method for farmers, automation typically replaces low-skilled jobs requiring manual labour (Rotz et al., 2019). When automated technologies are implemented, more workers who are considered “high skill” are brought in to help operate the computers associated with the work. This requires a “much more technologically savvy skill-set, which is already creating a gap between labour needs and labour supply” (Rotz et al. 2019, p. 116). For those whose jobs have been automated or for those who must go through the re-skilling process, this means that in addition to learning a new skill (usually digital technologies, programming or data analysis, and design technologies), they will also need to have a host of soft skills, in order to regain lost employment, and to compete in the labour market (Orol, 2020; Lamb et al., 2019).

3.2 A Rural Albertan Community Business Profile

The study community faces similar challenges as other rural places in Alberta. Automated technologies are expected to affect the City’s largest industries, including agricultural, service, and manufacturing sectors (see Table 1). For example, two of the largest industries in the City are the retail/hospitality and food services sectors, both of which are very susceptible to automation. Across the community, jobs susceptible to partial or full automation equal 23.9% of the total jobs currently in place.

Background information is provided for the 60 businesses that were interviewed through the study. This information provides insight into how the business communities understand their place in, and the economic future of, the community. Most of the 60 businesses interviewed are relatively new. Approximately one-half were less than 10 years old, and most of those were between 3–6 years old. Figure 1 shows that there is a “life-cycle” or “generated-cycle” to these businesses. The majority peak at 7–10 years, then there is a second “generation” or bubble around 20 years, and then a much smaller, long-term group of 30+-year-old businesses.

Figure 1. Business Years in Operation.



The majority of businesses (close to 90%) interviewed are classified as small businesses, as they employed under ten employees (Statistics Canada, 2015a). On average, each business employed 6.30 full-time employees, while many businesses were comprised of just one full-time employee. The number of new hires (in the last year) for business interviewed was typically one, with the exception of one business that hired 20 people. The majority of businesses had not hired in the last year. When asked about growth, businesses gave one of three distinct answers to the question of their staffing needs over the next 5–10 years: (1) 30 respondents (50%) anticipated staffing to increase; (2) seven anticipated staffing to decrease (12%); and, (3) 23 anticipated staffing to stay the same (38%).

The majority of businesses that foresaw a staffing increase over the next 5–10 years were typically 0–5 years old and anticipated needing between 1–2 new employees. Businesses that projected hiring more staff often attributed the increase to the economy or an increased demand within their sector, while the main cause for the decrease was retirement or technology taking their jobs (i.e., automation). Businesses that were decreasing in staff were the older businesses that were planning on exiting the market. These data are typical of a rural business community in Western Canada, where there is higher relative dependence upon small businesses and self-employment compared to urban areas, along with increasing rates of retirement as the workforce ages (particularly in rural areas), and growth rates which trend upwards due to the relatively more rapid growth rates in Western provincial economies (Chambers & Church, 2006; Statistics Canada, 2010; Statistics Canada, 2015b).

4.0 Results

Overall, our results demonstrate that businesses typically prefer the status quo in regards to valued employee skill sets, relationships with educational institutions, and technological adoption. Thus, they are less likely to be prepared for or innovate in response to coming challenges related to automation. For example, while the majority of respondents (58%) predicted that they would be early to adopt new automation technologies, many could not identify what these technologies are, nor how they would implement them. Businesses were also wary of the changes that technology will bring to their business environment. Many participants expressed concern that their staff would not be able to work with the new technology, which would ultimately lead to a decrease in quality of service.

4.1 Employee Skill Sets

Automation research conducted in recent years suggests that as automation replaces routine jobs, demand will increase for jobs that involve more abstract, creative, and less repetitive skills (Oschinski & Wynoch, 2017; Lamb & Lo, 2017; Lamb et al., 2019). Digital skills, such as proficiency with programs including Microsoft Word, Excel, and Office, and a knowledge of software development, are becoming increasingly desirable in today's digital workplace (Lamb & Lo, 2017; Parasuraman & Mouloua, 2009; Lamb et al., 2019). From 2012 to 2018, some of the most mentioned skills in Canadian job postings were: software/product development, system infrastructure, workforce digital skills, and basic data skills (which includes AI and machine learning, as well as data infrastructure) (Lamb et al., 2019; Chui, 2018; Wladawsky-Berger, 2019).

Employers are also looking for interpersonal skill sets. Lamb, Vu and Willoughby (2019) found that “soft skills,” such as organizational and communication skills, teamwork, collaboration, and customer service, appear in one third of all Canadian job postings. These “soft skills” may become increasingly important in the workplace as research suggests job positions where creativity and complex decision making are important may be at less risk of becoming automated (Oschinski & Wyonch, 2017; MaRS Discovery District, 2018; Sheridan, 2009; Orol, 2020).

4.1.1. Employee Skill Sets in the Study Community. Local participants largely conform to these broader patterns. When asked about skills, the top three current skills most valued/needed by each business are problem-solving, customer service, and communication or relationship-building (see Figure 2). Participants emphasized the importance of relationship-building within a small community as particularly important. A respondent from the health sector stated that “most of the clients that we have, they end up coming back... So relationship building is important.” A respondent in the service sector stated, “relationship building is probably number one...especially in a smaller community.”

When asked to consider future scenarios, however, respondents were inclined toward the status quo. The majority of businesses identified problem-solving (22), communication (23), and customer service (28) as the primary future skills (see Figure 3). For example, respondents stated that “I don’t think they’ll change” and “I would say they’d be the same.”

Figure 2. Skills Currently Most Valued by Businesses.

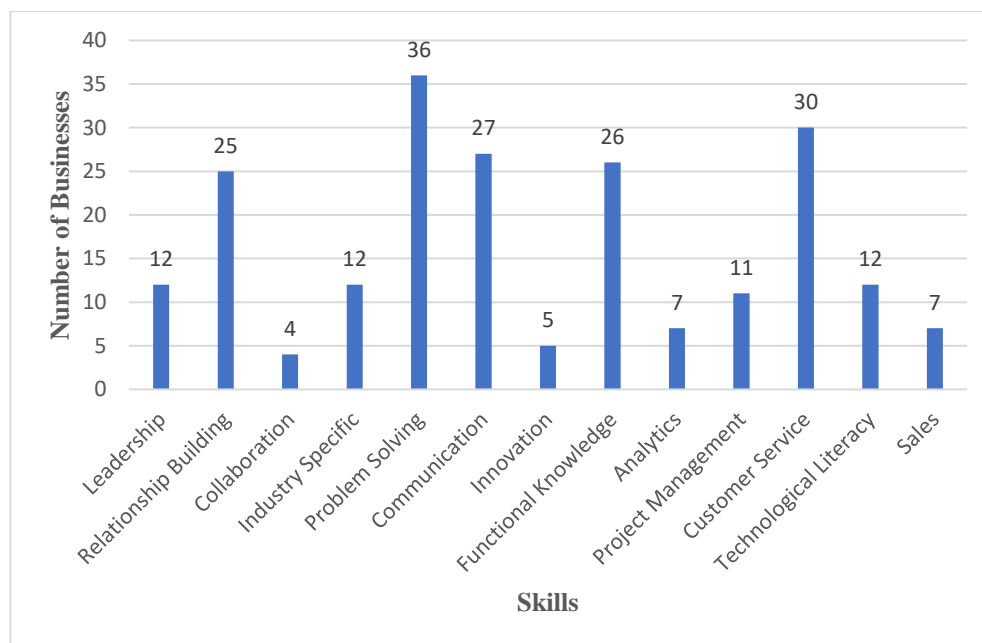
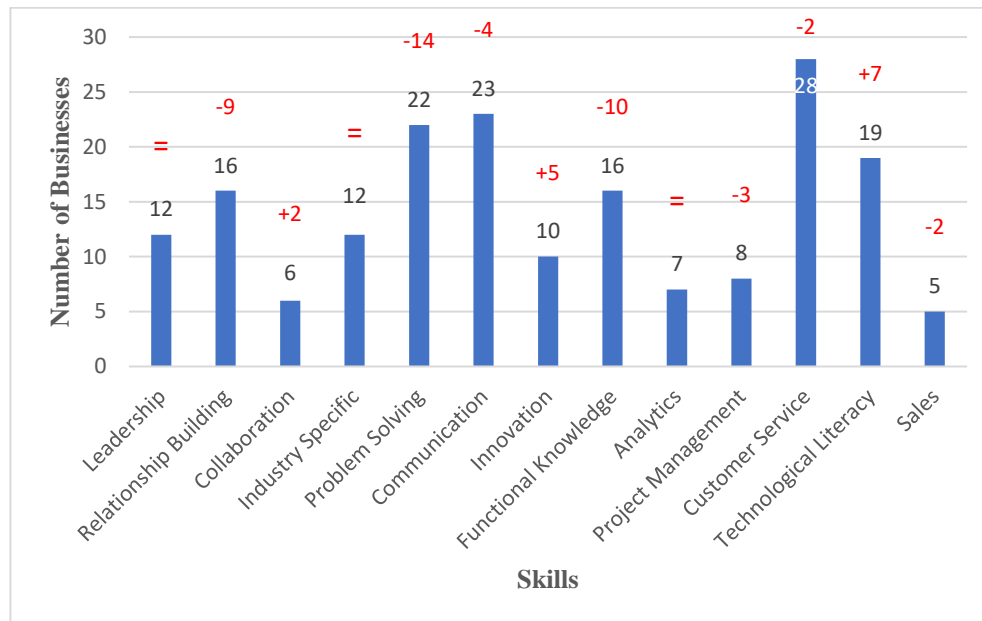


Figure 3. Skills Identified by Businesses as Most Important in 10 Years.

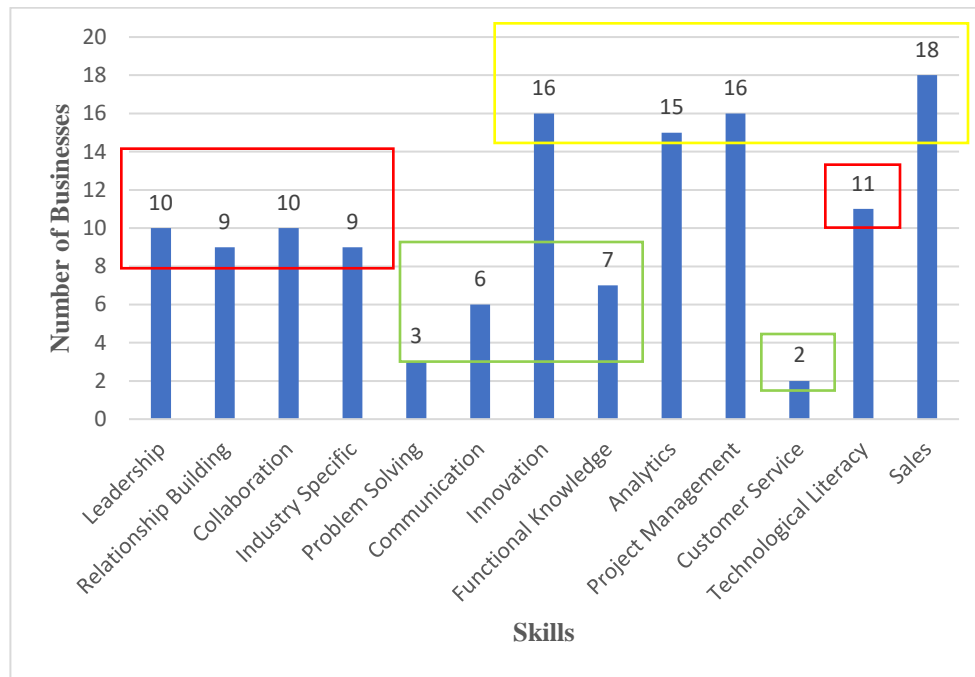


As seen in Figure 3, customer service and communication continued to be seen as central to business in the future. Respondents commented on the importance of these skills, stating that “communication ... and project management and customer service are what’s going to keep us in business, keeping customers happy...” and “when you’re self-employed it’s the customer that employs you – if you don’t have the customer skills, you won’t have any work.” Some participants recognized that technological changes would alter the skill needs of their employees. One participant stated,

Even in this day and age, even for an entry-level position, we would want someone that is tech-savvy and knows how to use the basics when it comes to Word, Excel, etc. Although we have our own software that we will teach but then it makes it a lot easier if you’re already tech-savvy.

As a follow-up question, businesses were asked which skills of those deemed most important in 10 years (as described above) are the least developed within their business and/or among their staff. Businesses stated that areas requiring development included sales, project management, and innovation (see Figure 4), which participants also listed among the least valued skills (see Figures 2 and 3). Businesses recognized that some of the least developed skills within their organizations were actually very important skills that are needed now and will be needed in the future. One participant in the health sector recognized that more technical skills would make their business more efficient, stating, “I wish that the technological literacy would be more [advanced] because we do everything by hand right now. We are just starting to scan all our documents to customers who can receive it by email.”

Figure 4. Skills Identified by Businesses as Least Developed.



Finally, respondents were asked about the skills needed as an employer over the next 5–10 years. The responses were in alignment with current research on the evolving nature of employment, as the majority of businesses interviewed believed that physical/ manual labour was more important now and would be less important in the future. Basic and high cognitive, social-emotional and technological skills were identified as important now and in the future. These findings align with the literature, which states the continued importance of non-digital soft skills in the workplace, even in highly digitized jobs (Lamb et al., 2019).

4.2 Education in the Workplace

Education is an important aspect of mitigating the negative impacts of technological change in the workplace. As new technologies are implemented, reskilling workers (where workers are retrained in their area of work) may become a popular tactic to keep individuals in their current positions as opposed to hiring new staff (Miller, 2018). Recent research suggests that by 2030, as many as 375 million workers globally may need to be reskilled to keep up with the changing reality of work (Illanes et al., 2018). Similarly, approximately 66% of business executives see “addressing potential skills gaps related to automation/digitization” as a top priority (Illanes et al., 2018, p. 2). The same study found that 62% of executives believe they will need to either reskill or replace more than 25% of their current employees in response to automation (Illanes et al., 2018).

Reskilling and re-education programs can be used in places that are particularly susceptible to job disruption caused by automation, such as many rural communities, and particularly for those who work low-skill, routine physical jobs (Lamb et al., 2019; Lamb et al., 2019; World Economic Forum, 2018). While many employees may be able to be reskilled, there are many barriers to the acquisition of new skills. The financial burdens of attending educational programs disproportionately impact

low-income populations. In addition, educational opportunities may be inaccessible for workers who live in rural and remote areas, far from post-secondary institutions, and without a reliable internet connection (Hallstrom & Heinrich, 2017; Oschinski & Wyonch, 2017). In order to determine the extent to which the business community was engaged in continuing education opportunities, respondents were asked if they had, or foresaw a future, a relationship with an educational institution.

4.2.1. Education in the Workplace in the Study Community. As seen in Table 2, the majority of businesses interviewed (69.5%) foresaw, or already had, a relationship with an educational institution, with the bulk of these relationships being in the form of student mentorship, apprenticeship, and internships. Only 26% of businesses said that they did not have nor foresaw in the future a relationship with an educational institution. While respondents largely spoke about their relationships with post-secondary institutions, some businesses did mention relationships they had with local junior high and high schools, which have different work experience programs. As seen in Table 2, some sectors have specific relationships with certain institutions and utilize some programs more than others. For example, seven businesses in the construction sector said that they had relationships with apprenticeship programs, while internships and student mentorship were more common in the service sector. Research-based programs were significantly less common among businesses, with only five businesses having such a relationship, than internship (17 businesses), apprenticeship (22 businesses), and student mentorship (24 businesses) programs.

Respondents had a lot to say about their relationships with educational institutes. For example, in the construction sector, relationships with technical institutes such as NAIT and SAIT were well established. One participant in the construction sector stated that, “We have a close relationship with the apprenticeship program.” Another person from this sector said that they would like to see more interaction between trades and university programs such as those offered at a local university campus. While not every sector has a strong relationship with post-secondary institutions, the majority of businesses had a relationship with some level of an educational institute. Those who did not often mentioned that they would be open to a partnership in the future. One respondent stated that, “We’re open to it... we’re always willing to do anything that benefits us and any educational institution whether it’s at the high school level or university level, or college level.”

4.3 Implications of Automation

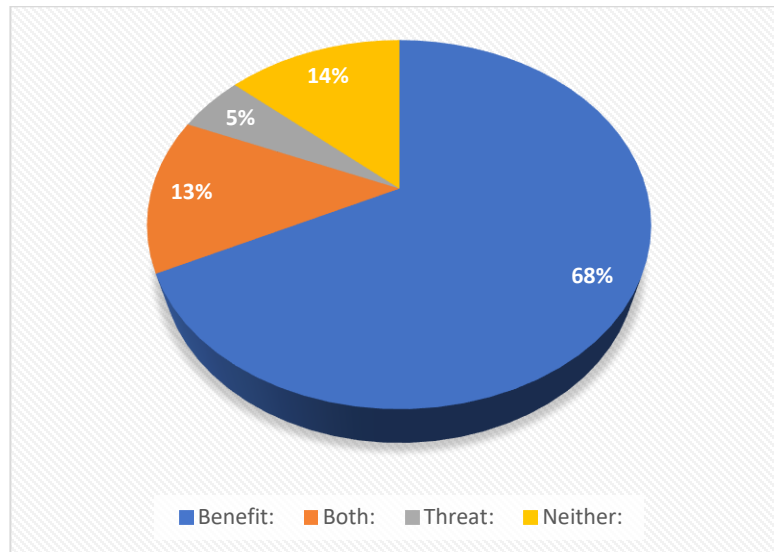
While the general consensus is that automation will displace workers in low-skill, routine jobs, the effects of new technologies on businesses in rural areas are not well-known. Jobs affected by automation does not necessarily translate directly into jobs lost to automation (Rieger, 2020; Lamb et al., 2019), and an aging workforce and slowing population growth in Canada present significant labour force issues that can compound the impacts of automation (Globerman, 2019). In response to this knowledge gap, respondents were asked about the specific and changing impacts of emerging automated technologies in their workplaces. Overall, their responses show that the majority of participants (68%) see automation as a benefit to their business; however, some are concerned with the potential implications of automation on employment and the cost associated with new technologies.

Table 2. *Educational Programs (Count by Businesses)*

Sector	Co-op Program	Internship	Curricular/Program development	Apprenticeship	Class-based Instruction	Student Mentorship	Community Service Learning	Faculty Development/Research	Other
Financial	1	2	0	0	0	2	0	0	0
Transportation	0	0	0	2	0	1	0	0	2
Real Estate	0	0	0	0	0	0	0	0	1
IT/Telecom	3	2	0	1	2	3	0	1	0
Services	1	7	2	6	5	7	1	2	3
Construction	4	2	2	7	3	3	1	0	1
Energy	1	1	1	2	1	2	1	2	0
Industrial/ Consumer Manufacturing	0	0	0	0	0	1	0	0	0
Retail	0	0	0	1	1	1	0	0	1
Health	0	3	2	3	0	4	3	0	2
Total	10	17	7	22	12	24	6	5	10

4.3.1. *Perceptions of Automation in the Study Community.* Across sectors, most businesses (38) think of automation as a benefit (see Figure 5). Participants noted improved efficiency as a primary benefit of automation and most respondents recognized that the adoption of automated technologies requires adaptability and preparedness. Other mentioned benefits included reduced travel time because of virtual meetings and increased convenience for clients. The most prevalent concerns with the adoption of automated technologies were the cost, the need to stay constantly up-to-date with new technologies, and potential job loss. One respondent had security and privacy concerns about the adoption of new technologies.

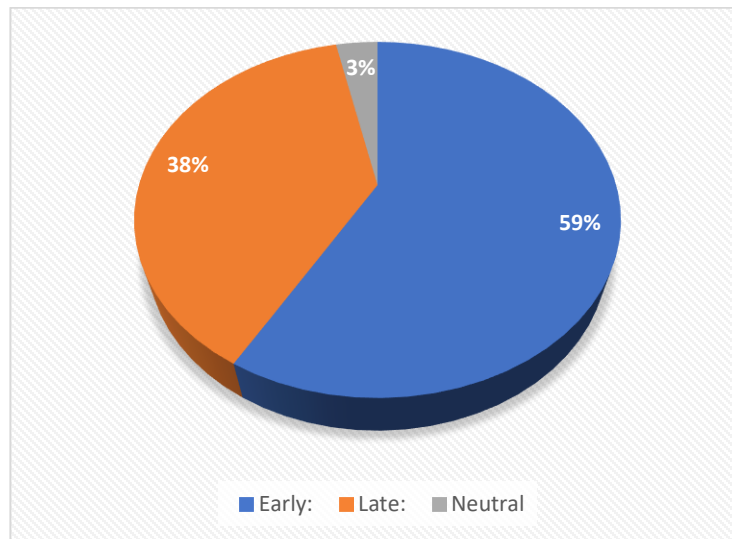
Figure 5. Perceptions of Automation as a Threat or Benefit.



Despite the challenges, many respondents displayed interest in technology and identified that they were early adopters of automated technologies (see Figure 6). While participants were encouraged to speak about automated technologies specifically, the respondents varied widely in their perceptions, understandings, and relationships to technology, whether automated or not. For example, business owners and managers demonstrated significant variation in terms of what new automation technology actually is, both within and across sectors. Some participants regarded well-established standard digital tools (such as scanning technology, email, and applications such as Word and Excel) as new technology, while others spoke about more recent technological developments, such as the risks associated with cloud-based data storage (this comment was made by a respondent from the financial sector).

Some of the variations may be dependent on the sector. As seen in Table 3, employers and businesses in certain sectors appear more open to technological adoption and automation than others. These findings point to a potential “lag” or gap in terms of not only where rural businesses stand in relation to their urban and rural competitors, but more generally in terms of how innovation and technological change are understood and framed by rural business leaders.

Figure 6. Business Perceptions as Early or Late Adopters of Technology.



4.3.2. *Web Presence in the Study Community.* Previous research demonstrates the importance of a reliable, fast broadband connection for the digital presence of businesses in rural areas. Broadband supports local income growth, opens new markets, and helps businesses overcome barriers related to geographical distances (Philip & Williams, 2019). Furthermore, “broadband deployment decreases regional disparities in employment opportunities and enhances the economic viability of rural regions” (Ivus & Boland, 2015; p. 1828). A lack of reliable, fast broadband service in rural Canadian communities constrains the ability of businesses to participate in the full potential of electronic commerce, including a web presence. Facing higher internet subscription costs, slower speeds, delayed or deferred connectivity, and lack of infrastructural accessibility, rural populations unwittingly face a complex digital divide compared to more populated settings (Hallstrom & Heinrich, 2017). Thus, rural business owners “tend not to utilize the full potential of the Internet and e-commerce given the difficulties accessing high-speed, broadband Internet” (Siemens, 2010, p. 72). Inadequate digital infrastructure is compounded by other reasons for lack of digital engagement, such as the age, income, and digital skills of rural populations (Philip & Williams, 2019).

However, as rural communities and regions gain broadband access and the digital divide is closing (in some regions), there continues to be a divide between rural and urban centers in the use of high-speed internet to implement digital business practices. Research suggests that “small businesses in rural areas have not and are not adopting the state-of-the-art business practices necessary to effectively reach the modern customer” (Richmond et al., 2017, p. 102). While there is limited research on website adoption in rural versus urban areas, the available literature suggests that rural businesses are significantly less likely to have an online presence than urban businesses. The websites in rural areas typically will also have less functionality than those in urban centers, and the use of social media by rural businesses is very low. This is problematic as “a website is one of the most basic customer-facing internet technologies a business can adopt” (Richmond et al., 2017, p. 96). Their evidence suggests that around 80% of customers use search engines to make purchase decisions and a web presence can significantly affect sales. Further, businesses without a web presence are unable to take advantage of online advertising and serve potential customers (Richmond et al., 2017).

Table 3. *Business Perceptions as Early or Late Adopters of Technology: By Sector*

Sector	Early	Late	Neutral
Financial	2	2	1
Transportation	4	1	0
Real Estate	1	0	0
IT/Telecom	2	1	0
Services	10	5	0
Construction	7	4	0
Energy	3	1	0
Industrial/Consumer Manufacturing	0	2	0
Retail	2	2	0
Health	3	3	1
Total	34	21	2
Percentage	59.6%	36.8%	3.5%

As a means of triangulating different conceptions of innovation and new technologies within the study community, this project conducted a quick survey of web presence as a proxy for relative technological adoption. While not perfect (but particularly relevant within the context of COVID-19), the results confirm some of the challenges for such businesses when faced with demand, interest, or concern with an online presence. As seen from Table 4, while the majority (75%) of local businesses had an email address, less than 10% had a website. While this may be a reflection of historical consumer patterns and bandwidth considerations, the reality remains that as of 2017, a quarter of local businesses did not use digital communications, and 90% did not offer a digital platform for their business. This aligns with research regarding: (1) the connections between inadequate broadband and a lack of digital commerce among rural businesses; and (2) the divide between rural and urban businesses regarding digital business practices.

4.3.3. Future Workplace Changes. When asked if their business structure would change in response to the implementation of automated technologies, 62% of respondents said yes, they would experience an organizational change, while 38% said they would not. Participants were also asked if they thought their employment strategies would change. 61% of participants indicated that their employment strategies would shift, while 37% said they would not change, and 2% were neutral. One respondent in the health sector explained how their approach to employment may change, saying,

Right now if I'm getting someone it would just be for their knowledge and skill as it relates to doing their job, but if technology comes into play, then I probably want to get someone whose skills are able to do the physical job but have the mental capacity to also enter it in the computer.

Table 4. *Business Online Presence*

Total Number of Businesses	Total Businesses with Websites	Total Businesses with Emails	Percentage of Businesses with Websites	Percentage of Businesses with Emails
718	68	538	9%	75%

*Data taken from the 2017 City licensing list, as provided by the City

Finally, respondents were asked to indicate whether their human resources (HR) capacity would be able to handle workplace changes. While 95% of businesses said that yes, HR would be able to handle any potential changes, many businesses were not large enough to have an HR department. This means that the manager or owner held that responsibility; so if they decided to make an employee structure change, they were making it on all fronts. When asked what their business skill needs in the future was, the biggest concern was that employees' skills would not be able to keep up with the new automated technologies and that businesses would not be able to attract or retain good employees (see Figure 7). Businesses worried that if they cannot find a viable solution to the concerns mentioned above, they would be unable to grow and expand their business and would suffer financially (see Figure 8).

Figure 7. Future Skills Concerns of Businesses.

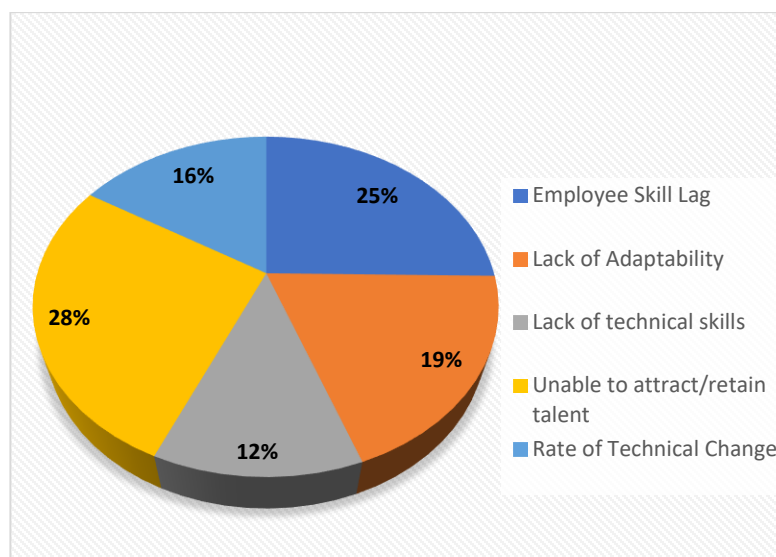
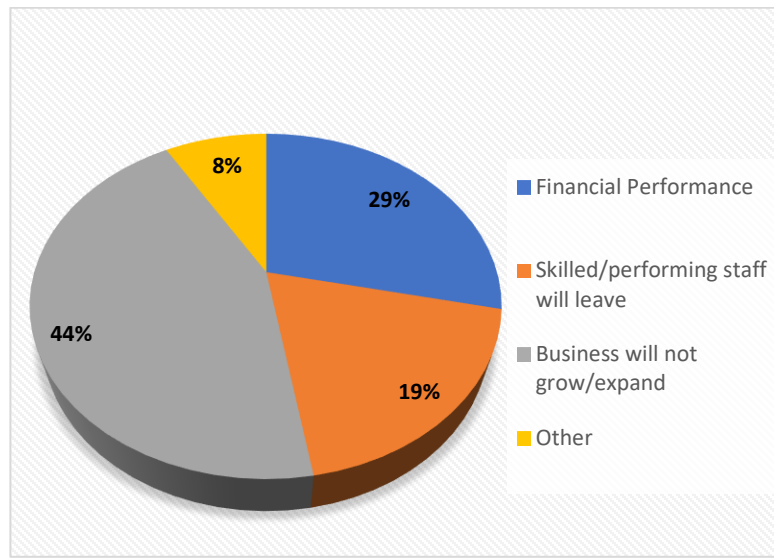


Figure 8. Anticipated Consequences of Automation for Businesses.

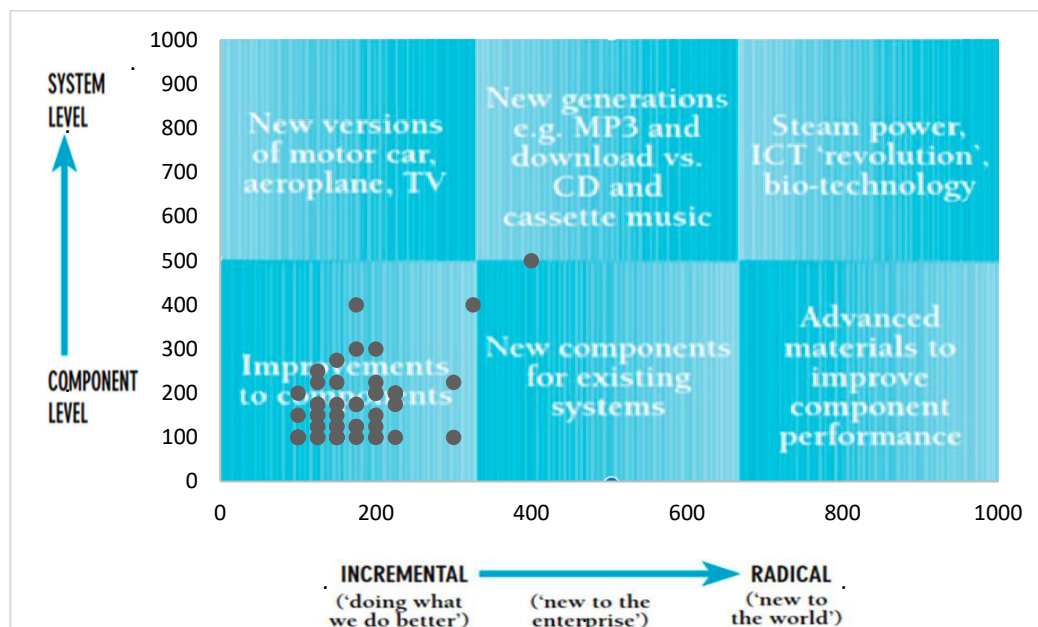


4.3.4. *Technological Change and Innovation.* Technological change and automation will impact local economies, whether they are prepared or not. This means that innovation, creativity, and change are likely to be critical factors in “future-proofing” or adapting to such changes. Previous research suggests that innovation “represents the core renewal process in any organization,” and continuous innovation is an important component of all successful businesses (Bessant et al., 2005, p. 1366; Dudic & Cvijic, 2017). However, innovation does not occur automatically within a business but requires active management and leadership to build organizational routines and practices (Bessant et al., 2005). As evident from the results presented above, although there are some businesses and sectors that were “forward-oriented,” there is uncertainty as to the nature of that orientation, how businesses view the future, the role of their business within the local economy and the trajectories already in place. In turn, while businesses were not asked specific questions regarding how they view innovation in terms of their sector, nor common business practices, the content of their interviews was assessed against two commonly used dimensions of innovation: scale and level (Dudic & Cvijic, 2017).

While innovation is considered in a number of different ways in the academic and grey literature, here, the primary concern is with understanding how the business community is “positioned” in terms of the work they do and the ways that innovation takes place. Using the two dimensions of innovation noted above, each interview was scored on a scale of 0–100 for each dimension: (1) the degree or scale of innovation (which ranges from modest, localized “self-improvement” (categorized below as “doing what we do, better”) to paradigmatic or radical change, in which completely new automated technologies are adopted; and (2) the level or “reach” of innovation, which may vary from highly localized improvements to components or “parts” up to systems-level change (i.e., revolutionary and cross-cutting innovations that extend beyond any specific sector). Dudic and Cvijic (2017, p. 131) describe radical innovations as “revolutionary and essential” because “they imply a completely new product, service or business processes that did not exist on the market until now.” Similarly, small improvements to existing products, services or processes, are considered to be “incremental innovations.”

The scores for all 60 interviews were then mapped onto a 2-axis representation of innovation. Almost all of the participating business cluster toward the bottom of both scales (see Figure 9). It follows that the common perspective toward innovation (as derived from the transcripts) point largely to a modest, localized, and incremental approach to innovation and change. Only 5/60 participants could be considered as aware of or working within integrated, systems-level, or “early adopter” thinking (noting the variation in adoption presented above), and only one firm identified a change that is broader in terms of both scale and level of adoption. While these results are not representative, they do speak to a cross-section of the business community that is largely oriented to the status quo, anticipating only modest changes to their businesses and potentially facing challenges when presented with higher-order demand for change.

Figure 9. Dimensions of Innovation.



*While businesses were scored on a scale from 0-100, the graph has been adjusted on a scale of 0-1000 for readability purposes (see also Dudic & Cvijic, 2017).

5.0 Conclusion

In conclusion, these findings align with the available literature on the impacts of automation on rural communities (see Rotz et al., 2019; Grigoli et al., 2020; West, 2018; Glick et al., 2020) and particularly the concern that: (1) many traditionally rural industries are extremely susceptible to automation; and (2) rural and remote communities may not be prepared, and/or have the necessary skills to address coming challenges. When asked about current and future employee skill needs and educational partnerships, businesses were largely oriented towards the status quo. While most businesses were open to and see the benefits of new technologies, overall, they are only anticipating modest changes, and no significant disruption, due to automation. Respondents varied widely in their perceptions and understandings of technology and few had an active digital presence. As the world confronts the impacts of COVID-19, we will see if the lack of digital presence of the business community impacts the local economy.

In order to mitigate the negative impacts of automation, adequate resources and preventative measures must be put in place by businesses, policymakers and governments who need to work together to figure out how to address the changing reality of work (Loewen & Stevens, 2019; Mialhe, 2017; OECD, 2019). While education and preparedness for an “automation revolution” is necessary to keep rural residents employed and economies running and competitive, governments and policymakers continue to disinvest from rural areas—as is evident in the continued lack of internet access and digital literacy outside of urban centers (Hallstrom & Heinrich, 2017). Automation can make businesses more efficient, but it does so at the risk of job disruption and potential unemployment, especially for industries that are prevalent in rural places. While adopting new technologies is vital for a healthy economy nationally and globally, addressing the possible effects of these changes in higher-risk areas, particularly less well-off and/or rural areas, is critical to mitigating the very serious and long-term impacts of job loss and unemployment on communities.

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