DIGITAL DIRECTIONS:

Towards skills development and inclusion of Indigenous Peoples in the new economy

TATA CONSULTANCY SERVICES

Canadian Council for ABORIGINAL BUSINESS

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Chapter 1 – Executive Summary

Digital technologies are transforming our jobs, businesses and economies in every industry across the globe. Companies are adopting cloud and automation to make their enterprise far more agile and responsive, in order to provide superior experiences to their consumers. While these exciting changes are under way, an important point to remember is that by 2022, 52% of all jobs are expected to require cognitive abilities such as creativity, logical reasoning and problem sensitivity as part of their core skill set.[1] In this new world of work, companies across almost all sectors have the responsibility to develop talent that engages in computational thinking, innovation excellence and is digitally fluent. With the rise of the innovation economy and higher demand for employees in Science, Technology, Engineering and Mathematics (STEM) related professions in recent years, Indigenous Peoples are facing yet another era of significant transformation. This changing economic landscape lays out two roads for Indigenous business and workers in Canada:

1. If ignored, the new economy will present sudden, unprecedented challenges to Indigenous businesses, slowing significant and hard-earned progress made over recent years.

2. Awareness and preparation in response to this change will allow Indigenous businesses to adapt and succeed in the evolving digital economy – solidifying them as a driving force in competitive global markets. This means working with government, community organizations and the private sector to train up the Indigenous workforce on relevant skills and ensure that the talent pipeline remains aligned with business needs.

According to the Canadian Council for Aboriginal Business (CCAB) research, the Primary, Construction, Manufacturing and Transportation industries account for 38%[2] of Indigenous businesses in Canada and represent some of the areas where technology is expected to most significantly impact the work landscape. The writing is on the wall that the rural economies in which most Indigenous entrepreneurs have established businesses are in flux. The Indigenous economy is also diverse, with technological disruption affecting communities differently depending on their resources and human capacity, as well as the sectors in which local Indigenous business and employment are concentrated.

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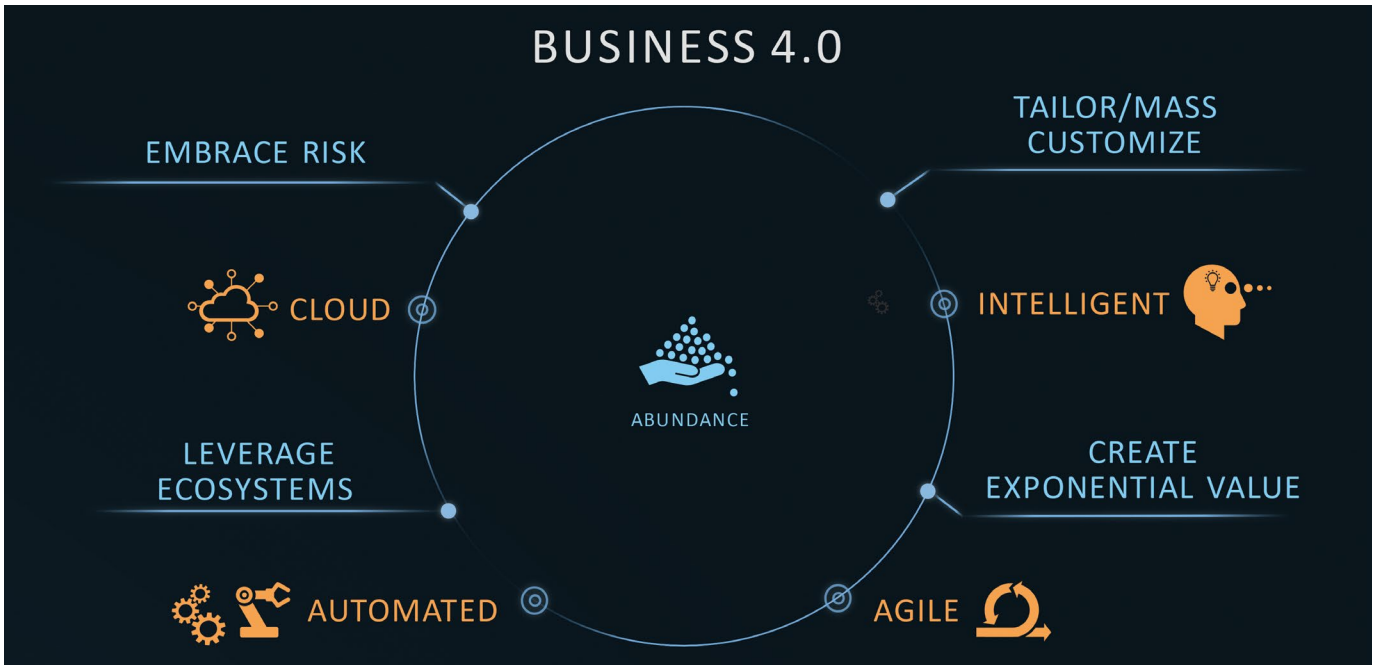
[1] World Economic Forum. (2016). *Skills stability.* Future of Jobs Reports. Retrieved from http://reports.weforum.org/future-of-jobs-2016/skills-stability/"reports.weforum.org/future-of-jobs-2016/skills-stability/

[2] Canadian Council for Aboriginal Business. (2016). Promise and Prosperity: The 2016 Aboriginal Business Survey. Retrieved from https://www.ccab.com/wp-content/uploads/2016/10/CCAB-PP-Report-V2-SQ-Pages.pdf



While already confronted with a series of educational, geographic and cultural challenges that act as barriers to entry into the current Canadian workforce; Indigenous Peoples must now also adapt to rapid technological change and a fundamental recasting of national and global economies. If Indigenous businesses can be evolved to take advantage of new technologies, such as cloud computing, machine learning and automation, they will position themselves as leaders in the Fourth Industrial Revolution. It is not necessary for every company to be at the cutting edge of innovation, but it is essential for every company to prepare for the future of work. Laying the groundwork for the future ensures businesses can increase efficiencies and scale growth. Without strategic planning around the future of work and ongoing technological revolution, there is a risk that Indigenous Peoples will not be included in the shared prosperity emerging from these evolutions.

While the changing nature of work could present a new series of challenges for Indigenous businesses and workers, it also presents unique opportunities. In an era where consumers are a 'segment of one' and demand nothing less than a digital-first-personalized-experience, enterprises are seeing the competitive advantage created by being intelligent, agile, automated, and on the cloud. Tata Consultancy Services (TCS) refers to this as Business 4.0 — a shift in mindset from 'optimizing scarce resources' to 'harnessing abundance' — abundance of talent, opportunities and innovation. Demographic characteristics, combined with a tenacity for innovation, position Indigenous businesses to prosper from changing labour markets and enhanced partnerships if provided the right support in developing skills that are and will be in demand by the market.

Indigenous businesses are well positioned to take advantage of the abundance of Business 4.0. According to the CCAB's Promise and Prosperity: The 2016 Aboriginal Business[3] Survey, 75% of Indigenous businesses surveyed reported a net profit, up 15 points since the 2010 iteration of the survey. Self-reported profitability and revenue growth have also continued to climb from 2010 to 2015, indicating that Indigenous businesses have become more successful at creating a distinct niche within these markets. Indigenous business owners and employees have made impressive gains across a variety of locations, markets, and industries in Canada for the past two decades.

[3] Guidelines for usage: The terminology used to describe the First Peoples of Canada is constantly in flux. The CCAB uses "Aboriginal" in conjunction with "Businesses" to refer to Indigenous-owned businesses based on the recommendation resulting from its membership survey. "Indigenous" is a broad term applying to persons with First Nations (North American Indian), Metis and/or Inuk (Inuit) heritage, and operates in the same fashion as the term "Aboriginal" in Section 35 of the Constitution Act. "First Nations" is used in contexts where First Nations people or communities specifically are under discussion.

JP Gladu, President and CEO (CCAB) introduces the Skills for the Future workshop

The Indigenous private sector now includes more than 43,000 businesses and the Indigenous population is the youngest, fastest growing demographic in Canada, with more than 46% under the age of 25.[4] The Indigenous population in Canada contributes over $31 billion annually to Canada's GDP, with the private sector economy contributing just over $12 billion.[5] 70% of Indigenous business owners are confident in the long-term success of their businesses; an outlook that did not waver between 2010 and 2015. Additionally, Indigenous businesses are three times more likely to introduce a new product or service and twice as likely to introduce a new process or way of doing things. This foundation of growth and culture of adaptation and innovation will allow Indigenous businesses to succeed in an evolving economy.

In the words of one key contributor and founder of an Indigenous owned digital agency, "That's one thing that Indigenous Peoples are uniquely gifted and skilled at, to adapt and change."

In an effort to address the challenges and opportunities emerging from technological innovations and advancements, TCS and CCAB co-hosted a workshop on April 23rd, 2018, entitled "Skills for the Future: Access & Opportunities for Indigenous Leaders." The purpose was to understand STEM education in an Indigenous context as a key driver of innovation and economic growth. Issuing forth from the interactive workshop, as well as several in-depth interviews with key stakeholders conducted up to November 2018, was a series of recommendations for enhancing pathways to Indigenous participation in STEM industries. To ensure that their voices were included in the research, CCAB and TCS targeted Indigenous entrepreneurs and business leaders in the STEM fields from across Ontario. Other participants came from a variety of professional backgrounds, such as banking, education and training, public office, social services, science and technology.

[4] Statistics Canada. (2017). *Aboriginal peoples in Canada: key results from the 2016 census.* The Daily. Catalogue no. 98-510-X2016001. Retrieved from https://www150.statcan.gc.ca/n1/daily-quotidien/171025/dq171025a-eng.htm

[5] TD Economics. (2015). *The long and winding road towards Aboriginal economic prosperity.* Special Report. Retrieved from https://www.ccab.com/wp-content/uploads/2016/11/TD-AboriginalEconomicProsperity.pdf

The fundamental ethos of business at TCS is to ensure all stakeholders are brought along on the journey towards access, equity and inclusion with a view to preparing populations for the future of work. Context is key in the Business 4.0 Framework, and when working with Indigenous communities, this could not be more imperative. Context informs the different approaches necessary to support the success of Indigenous community members at all stages of the talent pipeline – from middle school through the education system and into the workforce itself.

Through CCAB and TCS research, it was understood that many Indigenous Peoples and communities already face significant hurdles to full participation in the current economy. These challenges can be amplified by the demands of the new economy and make future participation appear increasingly limited. Research participants commented that before attention could turn to workforce preparation, Indigenous communities, non-Indigenous industry and all layers of government must focus on individual and collective well-being. Re-skilling and upskilling efforts to meet the emerging skills demand must begin by recognizing the barriers to basic needs.

This research solidifies the impression that Indigenous employment and workforce preparation are at a crucial stage, requiring fresh and collaborative approaches by corporate Canada, governments and communities. These approaches should include substantial investments into education and training, as well as public and family engagement. Despite the sense of urgency required by the future's competitive environment, Indigenous Peoples have been able to overcome systemic challenges in the past to break into key industries and own important pieces of them. These promising successes bode well for Indigenous participation in the future of work.

Chapter 2 – About CCAB and TCS

For the past seven years, CCAB's research team has worked throughout Canada to provide Indigenous people and business owners, government, corporate and academic communities with data-driven insights into the state of Canada's emerging Indigenous economy. In addition to in-depth research on the Indigenous private economy, CCAB houses the largest database of Indigenous businesses in Canada. This listing totals more than 10,000 businesses of varying sizes, sectors and locations.

In recent years, the research team at CCAB was instrumental in developing a $95 million investment from the Indigenous Economic Development Fund (IEDF) funded by the Government of Ontario that has served the interests of Indigenous businesses and communities in the province. Through other work, CCAB also helped turn the attention of researchers to Indigenous economic development as one of the focal points of the "Future Challenge Areas" initiative, started by the Social Sciences and Humanities Research Council (SSHRC). Currently, CCAB's research and government relations activities are organized into three main buckets:

- **Procurement of Indigenous businesses**
- **Indigenous trade and export**
- **Indigenous participation in technology, innovation and the future of work**

CCAB is emerging as the foremost thought leader and centre for data on the Indigenous economy, by striving constantly to improve our understanding of the myriad factors that contribute to the economic success of Indigenous Peoples and communities. CCAB Research has expertise in translating data to insights to action, providing policy recommendations for government, corporate and Indigenous economic leaders. For this work, CCAB has partnered with TCS to explore the impact of the innovation economy on Indigenous firms and the Indigenous economy's ability to adapt and excel.

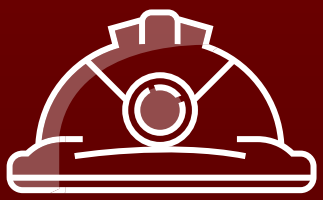
Balaji Ganapathy, Head of Workforce Effectiveness (TCS) makes keynote speech at the Skills for the Future workshop

Tata Consultancy Services is an IT services, consulting and business solutions organization that has been partnering with many of the world's largest businesses in their transformation journeys for the last fifty years. TCS offers a consulting-led, cognitive powered, integrated portfolio of business, technology and engineering services and solutions. This is delivered through its unique Location Independent Agile delivery model, recognized as a benchmark of excellence in software development. A part of the Tata group, India's largest multinational business group, TCS has over 411,000 of the world's best-trained consultants in 46 countries. TCS has been servicing the Canadian marketplace for 25+ years, serving its first client in 1991. Today, TCS is one of the nation's top 10 IT services providers, with facilities in Toronto, Montreal, Calgary, and Vancouver, serving almost one hundred leading Canadian enterprises. The company generated consolidated revenues of US $19.09 billion in the fiscal year ended March 31, 2018 and is listed on the BSE (formerly Bombay Stock Exchange) and the NSE (National Stock Exchange) in India. For more information, visit at www.tcs.com.

TCS' thought leadership initiatives have addressed the opportunity gap through research, insights, advocacy and policy. The company has mobilized the public, private and not for profit sector to address gender, ethnic and socioeconomic inequities and led the discussions around pioneering solutions to re-skill and upskill individuals that will help unlock multiple opportunities emerging from technology evolutions. TCS identified the unique challenges facing Indigenous businesses and employees within this context and sought to partner with CCAB, as the leading organization in Canada supporting the Indigenous economy, on researching the most appropriate ways the private sector can support the adaptability and resilience of the Indigenous economy and workforce.

Chapter 3 – The Changing Nature of Jobs

The role of Indigenous Peoples in the national economy has been the subject of ongoing debate in Canada. Indigenous Peoples are significantly under-represented in the national workforce, with participation rates far below the national average, fewer full-time jobs, lower salaries and limited employment mobility. While there have been major advances in certain sectors – such as mining, oil and gas, renewable energy projects and other resource fields – these have been limited by the continued challenges Indigenous Peoples experience when searching for work in broader corporate communities. Federal, provincial and territorial governments, educational institutions, training centres, and Indigenous governments have all developed numerous programs and initiatives to address these difficulties, but with only modest success of inclusion to date.



Over the past decade, debate has also erupted about the future of work, given the rapid development of labour-saving and process altering technologies. The list of transformative technologies grows significantly with each passing year. These innovations have been transformational, enhancing efficiencies and speeding growth. However, these evolutions have also shifted the skills demanded by markets. By 2022, 52% of all jobs are expected to require cognitive abilities such as creativity, logical reasoning and problem sensitivity as part of their core skill set.[6] 87% of workers believe it will be essential for them to get training and develop new job skills throughout their work life in order to keep up with changes in the workplace.[7]

Within this context, it is important to note that the successful realization of human capital optimization can be achieved through investment in the capacities of individuals through skilling and education. Digital fluency and computational thinking are especially relevant capacities to enhance the potential of individuals to access future-proof and productive employment, for men, women and minorities. These strengths, augmented by soft skills such as people management and emotional intelligence, will be essential to STEM training and education for securing jobs of the future. Preparing young workers for the new workforce will, of necessity, require a different focus and new priorities compared to the current approaches to learning.

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[6] World Economic Forum. (2016). *Skills stability.* Future of Jobs Reports. Retrieved from http://reports.weforum.org/future-of-jobs-2016/skills-stability/"reports.weforum.org/future-of-jobs-2016/skills-stability/

[7] Pew Research Center. (2016). *Skills and training needed to compete in today's economy.* The State of American Jobs. Retrieved from http://www.pewsocialtrends.org/2016/10/06/4-skills-and-training-needed-to-compete-in-todays-economy/

Case Study #1: Big River Analytics

Big River Analytics (BRA) is an Indigenous owned, interdisciplinary consulting firm based in Terrace, British Columbia (BC), that serves the private and public sector, including a number of Indigenous organizations across Canada. BRA brings together economists, statisticians and developers to provide clients with information to improve their performance, policies and positioning for funding success.

Despite operating from a remote region of Northwestern BC, most of BRA's clients are in Edmonton, Calgary, Vancouver, Victoria, Ottawa and Toronto. Northern BC was recently connected to a high-speed fibre optic line which has permitted BRA to grow both in terms of where their clients are located but also by allowing staff to live and work remotely.

For their technical work, BRA utilizes open source technologies exclusively: specifically, they use the R language and environment for statistical computing and data visualizations, a long list of open source web technologies, and Quantum Geographic Information Systems (QGIS) for spatial analysis and mapping. Utilizing and contributing to open source technologies has permitted BRA to find talent interested and fluent in these technologies while providing high-quality products and very competitive prices. By leveraging open source technologies, BRA has been able to deliver products and services normally reserved for nation-scale statistical agencies to small Indigenous communities in Northern BC.

In the summer of 2016, BRA had the rare opportunity to meet with Inuit artists during a study of the economic impacts of the Inuit arts economy in Canada. The study is the first to deliver insights into the arts economy in all 53 communities of the Inuit Nunangat, or Inuit regions of Canada. Collectively, Inuit art employs 4,230 artists adding $87.2 million dollars to GDP in Canada annually. BRA has found success by pursuing projects that benefit Canada's First Peoples, made possible through a synergy of computer and technological aids and contextual knowledge of Indigenous issues. They continue to incorporate telecommunications and software innovations into BRA processes to run a more flexible, effective and profitable business.

Case Study #2: goIT

There is enough precedence to demonstrate a need to revolutionize a student's learning environment and experience. As the demand for cross functional skills and computational thinking increases, learning organizations should focus on giving learners a deep understanding of how to apply and innovate with technology so they can play an active role in shaping the tools of the future. It is time to shift the focus to what else can be done with the skills learnt within classrooms.

TCS has been an early proponent of this approach — investing in its immersive learning experience, goIT, since 2009. Students work in teams to identify a problem, generate possible solutions, wireframe their prototypes, develop and test their mobile apps, and present their work to peers and judges.

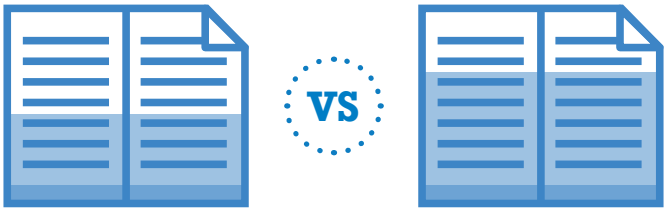
As a result, goIT participants are introduced to design thinking as a problem-solving framework, acquire the experience in critical evaluation while troubleshooting designs, improve their ability to cooperate and coordinate, and refine their communication skills through public presentations.

Students across the country learn the steps to produce inventive technology-enabled solutions to real-life problems and then go a step ahead by benchmarking their solutions against those that exist in the market, finally presenting their solutions to experts within the field. At its core, goIT is an inventive approach to develop problem solving skills using empathy, design thinking, mobile app development, and an entrepreneurial pitch process; which mimics the iterative, agile methodology of our customer innovation lifecycle. TCS combined its core capabilities of research excellence in consulting, technology expertise, skill-based volunteers and philanthropic investments into the program design of goIT.

Barriers to Indigenous Participation in the New Economy

Through its First Nations education transformation initiative, the Government of Canada is currently engaging First Nations governments, communities and organizations to review, re-imagine and refinance Indigenous school systems. Several needs have been identified, including significant new investment, the fair and reliable provision of public funds, and creation of a new system for delivering high-quality and culturally appropriate education that serves community interests. The time is ripe for sweeping changes to Indigenous elementary and secondary school systems, supported by a strong recognition of the need by government departments and agencies. While it may seem that innovation in education is difficult, major reform that encompasses both traditional knowledge, culture and a greater emphasis on STEM is more achievable than it currently seems.

48%
Of the Indigenous population in Canada with post-secondary education



65%
Of the non-Indigenous population in Canada with post-secondary education

Indigenous achievement levels currently lag well behind national achievements. The 2011 Canadian Census revealed that 48% of Indigenous people aged 25 to 64 have a post-secondary qualification compared to 65% of the non-Indigenous population.[8] Due to the tragic legacy of residential schools in Canada, the perception of education in Indigenous communities is fraught with mistrust. For Indigenous Peoples, school has been used as a tool of assimilation. During this dark chapter in Canada's history, more than 150,000 First Nations, Métis and Inuit children were separated from their parents, sometimes against their parents' wishes, and forced to attend government-sponsored religious schools. The first Indian Residential Schools in BC were opened in 1861 with boarding schools, ideological precursors, coming decades earlier. In 1996, the last of 139 Indian Residential Schools across Canada closed in Saskatchewan. The history of abuse at Indian Residential Schools is long-standing and the wounds are still raw. These schools were often established far from the students' homes and designed deliberately to sever cultural ties with the community. Indigenous healing and resiliency in the face of intergenerational trauma calls for robust involvement and leadership of Indigenous leaders in education, politics and business.

[8] Statistics Canada. (2011). *The educational attainment of Aboriginal peoples in Canada.* NHS in Brief. Catalogue no. 99-012-X. Retrieved from https://www12.statcan.gc.ca/nhs-enm/2011/as-sa/99-012-x/99-012-x2011003_3-eng.cfm

In addition to the deep-seated trauma resulting from residential schools, physical distance and lack of infrastructure act as other significant barriers to seeking educational opportunities. Funding shortfalls for schools on reserve are also well documented, preventing students from receiving the support they need to attain their educational goals. Many of the students in rural and remote Indigenous communities lack access to the upper division math and science courses that are projected to be the foundation for workers in the new economy. Indigenous participation in science and technology programs at the college, polytechnic and university levels is well behind national rates, which in turn puts Canada far behind major competitor nations. Furthermore, the infrastructure needed for active engagement with the high technology workforce, particularly reliable high-speed Internet, is rarely available in Indigenous communities, which face similar deficits in terms of professional and technological expertise. Indeed, participants lamented the lack of investment in online access, infrastructure and regional bandwidth capacity for some Indigenous communities.

There is an important distinction between Indigenous Peoples residing in semi-rural and high-capacity urban communities and more isolated rural and fly-in communities. The farther away from urbanized areas and infrastructure of built environment, the more likely technological disruption will present increased hurdles for Indigenous communities. The quality and availability of local networked and mobile data is highly scattered across provinces. Beyond the historic need for tailored programming, ensuring program fit is important based on the varying levels of internet connectivity. Strategies that work for one community with strong internet access may be irrelevant to a community with only limited access to the internet. According to CCAB's 2016 Aboriginal Business Survey, most Indigenous business owners have an internet connection, although less so in the Territories and the Atlantic provinces, as well as on reserves.

John Chasty, TDSB Superintendent of Student Voice, Parent and Community Engagement and Well-Being, discussing the role of education stakeholders at the Skills for the Future workshop

The situation facing Indigenous Peoples in the new economy can be summarized simply:

- **Indigenous privately owned and community owned businesses have flourished in the past three decades, a trend generally unnoticed by Canadian society, making impressive gains across the board but specifically in sectors that are proximate to Indigenous communities (i.e. forestry, mining, traditional and green energy, and construction);**
- **The contemporary economy and workforce in Canada have changed rapidly and will continue to change throughout the next decade;**
- **The tech-rich workforce within Industry 4.0[9] will require substantial improvements in education and training;**
- **Certain industries, including the resource sector, will have to work harder to ensure re-skilling pathways are made available that offset the marginalization of Indigenous business owners and workers;**
- **Indigenous workers and businesses with difficulty breaking through the barriers to regular, decently paid work will face greater challenges adapting to the requirements of the new economy.**

While there may be uncertainty emerging from an evolving economy, there are a range of possibilities that will now be accessible as a result of the technological, scientific, social and economic evolutions. The task at hand now is to generate awareness, create access to well rounded information on these transformations and offer diverse opportunities for Indigenous populations to invest in their own learning pathways.

Chapter 4 – Acknowledgement and Action

It will take a concentrated, collaborative effort by industry and community leaders, government and academia to ensure that Indigenous people and businesses are able to harness abundance from a digital revolution. For the future of work to empower Indigenous Peoples in Canada, education and training in sought-after disciplines must be reconsidered and overhauled in many cases. Based on our discussions with many Indigenous and non-Indigenous employers, educators, and business professionals, CCAB and TCS have compiled a list of best practices for developing culturally safe and relevant STEM programming.

The legacy of residential schools and the persistent underfunding of Indigenous education institutions represent major challenges to Indigenous people's ability to take advantage of the opportunities presented by the innovation economy. The history has created two main hurdles: a lack of trust in externally driven or owned educational initiatives and a lack of baseline capacity. Neither is insurmountable, but both are complex and will require thoughtful policy to address. The following recommendations will help to inform policy to stanch the cycle of harm done by residential schools and chronic underinvestment in Indigenous youth and potential.

[9] Industry 4.0 is another name for the Fourth Industrial Revolution, characterized by greater integration of automation, interconnectivity and traditional manufacturing technologies.

Understanding Culture and the Need for Co-Creation

In order to deliver education and training programs in STEM that are culturally safe and relevant to Indigenous Peoples, non-Indigenous industry efforts should be directed toward engaging specific communities and undertaking a process of co-creation that promotes trust, awareness and enthusiasm. Industry, government and program managers must expand beyond their current approaches by actively engaging teachers and community leaders, building relationships, and providing information about the new economy in understandable and relatable terms. One research participant commented on the importance of offering a menu of relevant options and incorporating feedback into workshop curriculum,

> *"Programming can work with the community to see what their needs are, and their level of interest is. We [an Indigenous digital firm] gave them some options and they wanted to do robotics."*

There is no "one-size fits all" approach to programming for Indigenous communities. What works for one community may not work for another and off-the-shelf programming will fail to capture the layers of complexity when it comes to engaging students with different experiences and backgrounds. Indigenous Peoples, broadly speaking, share similar worldviews and experiences of colonization. However, so-called "pan-Indigenous" programming should be avoided as the term obscures cultural, linguistic and historical differences that define different Indigenous communities while simultaneously denying the mixed heritage identity of many Indigenous people. Programs should be focused locally, given the opportunities for local employment and entrepreneurship offered by the digital economy, with an understanding that the relocation of Indigenous youth away from their communities to urban centres is not the desire of either Indigenous youth or communities. Another participant who has had a firsthand view of programs unfolding on the ground said:

> *"[Indigenous communities] are a lot more receptive to programming designed to keep youth within their area, however, still equip them with the knowledge, experience and expertise that they would need to be successful in the communities that they're from."*

To do so, companies and governments need to be aware of the specific and often pressing needs of the community they are collaborating with. Cultural sensitivity training and a dedicated Indigenous community liaison are a couple of the ideas participants put forward for strengthening communications and engagement with the community. When working on community engagement, successful programming needs to start on the ground by asking for input on program strategy, design, and execution from the community at large including students, teachers and local and regional leadership. Building sustainable, respectful relationships with the community is critical to ensuring the success of STEM-based programming.

Developing Meaningful Relationships

It is widely acknowledged that communities are more likely to embrace partnerships with industry if these are focused on co-creating transformational solutions designed to improve local ecosystems. Impact Benefit and Collaboration Agreements have been the driver for forging creative and flexible arrangements with industry for decades, particularly in the resource sector. Corporations and communities see these arrangements as being the foundation of long-term transformation. Alongside specific programming, industry leaders should commit to intent-based criteria to forge meaningful relationships with Indigenous communities. Like those outlined in most Impact Benefit Agreements, these criteria serve to evaluate corporate-community relationships in the form of education and training, professional development, hiring, procurement of local businesses and other corporate social responsibility strategies.

By making an organizational commitment and tracking community engagement, which includes offering opportunities for training, reskilling and upskilling, industry leaders can ensure that the talent pipeline for high-skill jobs grows at a pace consistent with employment demands in a rapidly changing and technologically-rich economy. Participants suggested seeking out consultation from community-based organizations to create targeted approaches that are aligned to community vision, values and goals:

> *"From a cultural sensitivity perspective, if a corporation is working within a target region, they should contact the local Indigenous community close to them in terms of proximity. Most actually have employment-based agencies that can share what types of challenges, opportunities and programs that are developed specific to them that they can offer. I would encourage thoroughly that these organizations and corporations work in collaboration to develop programming specific to the Indigenous individuals that they're looking to upskill."*

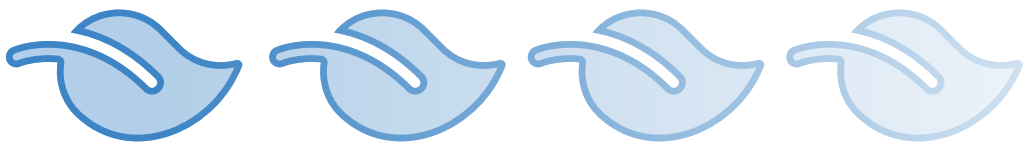
Fostering Sustainability

Indigenous communities have historically been impacted by piecemeal, parachute and short-term programming that has had limited vision and continuity. This kind of program structure has been largely unsuccessful in adequately preparing Indigenous Peoples for employment, who could greatly benefit from mentorship, skills-training, youth support initiatives, and work-integrated learning. The Truth and Reconciliation Commission's Calls to Action #8 demonstrates a need for stronger commitment by the government to redress the lack of adequate federal funding for youth education on and off reserves and regain the trust of communities.[10]

In recognition of these recommendations, federal and provincial governments have developed numerous initiatives to tackle these issues and corporate Canada has been increasingly stepping in. There was widespread agreement among participants that the ownership of programs could eventually reside with the community, promoting local empowerment through initiatives such as train-the-trainer program models. It was also mentioned that industry initiatives must be community led or deeply integrate the community on a path to local leadership.

The process should be tailored to local communities and economies in a way that engages local businesses as well. Given the proximity of rural communities to great natural wealth, these firms often operate in the mining, forestry and construction industries and are often Indigenous privately owned or community owned. There is an urgent need to engage and collaborate with these local actors to maintain and enhance program operations and outcomes. This will improve trust and critically improve the likelihood of sustainability by integrating with existing economies and local leaders that have a vested interest in local growth. Contributions from local firms can supplement the funding shortfalls experienced by community programs and effectively couple student candidates with open positions in businesses that operate close to home.

An alternative option for industry leaders is to support existing programming designed by and for Indigenous Peoples. Where these Indigenous-led programs exist, industry can contribute time and resources, while promoting local facilitation and ensuring meaningful engagement with Indigenous communities.



[10] Truth and Reconciliation Commission of Canada. (2015). *Call to Action #8*. Education. Retrieved from http://www.trc.ca/websites/trcinstitution/File/2015/Findings/Calls_to_Action_English2.pdf

Case Study #3: Aurora College– Arts, Crafts, & Technology Micro-Manufacturing Centre (ACTMC)

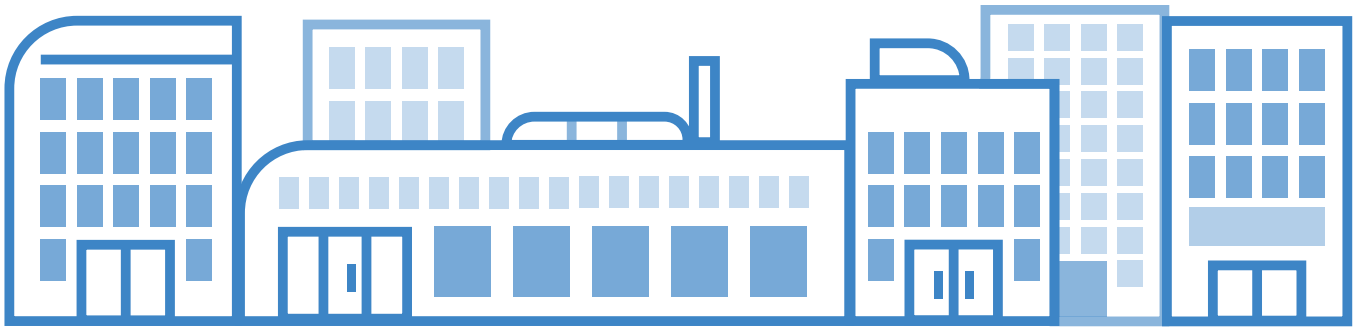
When the Aurora Research Institute in Inuvik, NT, approached Verna Pope, Manager Education for the Gwich'in Tribal Council and Sue McNeil, Manager of the Inuvialuit Community Economic Development Organization under the Inuvialuit Regional Corporation, about investing in a Micro-Manufacturing Centre, they wanted to make sure the initiative would create tangible benefits to the local community. The Micro-Manufacturing Centre is modeled after a Maker Space like the one in Whitehorse, YT but with a focus on supporting artists and craftspeople in the manufacturing of cultural products targeted at the tourist industry. The Centre houses a versatile array of state-of-the-art equipment including a laser cutter, 3D printers, and Computer Numerical Control (CNC) milling machines. A Maker Space is a place where people with an interest in computing and technology come to share ideas, knowledge and equipment.

McNeil and Pope had a vision of how access to modern manufacturing technology could help the local Indigenous artisan community, but they foresaw barriers to participation. First, they recognized the need for a formal training course in graphic design, as well as introductory Computer-Aided Design and Manufacture (CAD/CAM) skills. They wanted to ensure participants had experience with a variety of equipment to produce their products using the digital design skills they were developing. Participants realized their designs in print, 3D printing, silk-screening on numerous mediums, CNC milling, and laser engraving. This ensured that the equipment was not just theoretically available, but that it was practically accessible to community members by giving them the exposure and training to pursue their own creative projects, and in some cases, support for business. These technologies also provide opportunities for artists with mobility issues to manipulate shop tools by using graphic design while reducing the physical harm of manual labour.

Second, prerequisites are often a hurdle into education and training programs. Many Indigenous artists do not have the pre-requisites, despite a wealth of knowledge and experience within their area of interest. This lack of formal education has not stopped learners, ranging from youth to elders, from applying hands-on experience to unleash their creativity as artists and designers. As McNeil notes, education at its core is a passion for learning. Unlike many post-secondary courses offered through colleges, the program does not require a high school diploma or equivalent. Students are excited to interact with the equipment, often requesting extended hours of operation. Students, reportedly, share resources and information with each other and continue to work after the course end time.

The technology has been a boon to the self-employed, making their artwork more accessible, prolific and cost-effective to produce. It has enabled folks making a living for themselves in the cultural industry — designing and manufacturing their own merchandise, rather than importing from abroad. Nothing can recreate the beauty of a hand-carved wooden sculpture, but with the help of modern manufacturing techniques, technology can provide an effective way to ensure these traditional artistic practices are sustainable and continue to influence the next generation.

To complement the initiative, independence, and creativity promoted by the Centre, the program also offers an entrepreneurship component that builds on skills for self-employment. The Micro-Manufacturing Centre and associated Merging Arts and Crafts with Technology and Manufacturing program have been impactful because they addressed a local need and were implemented to the greatest benefit of community members. An abundance of passion and creativity was already evident in the community, but with relevant design and technological innovations, local freelance artists have created efficiencies in their work and obtained a competitive edge in an ever-growing cultural goods market.



Approaching Intersectionality

Broad spectrum Indigenous participation and perspectives, especially those of Indigenous women, are crucial to technological development and innovative capacity. Close to 80% of female Indigenous business owners interviewed by CCAB in 2016 reported a net profit in their most recent fiscal year.[11] The success of Indigenous women entrepreneurs underlines the economic benefit of supporting Indigenous women in business. Also, considering the surge in Indigenous women's participation in the labour force, but relatively low involvement in the STEM fields, industry actors need to identify the needs and challenges of women to increase access to education and training for the skills of the future.[12] [13]

The contribution of Indigenous women to STEM is both advantageous and necessary in imagining the design and function of the long-term technological landscape. That Indigenous females are performing better in high school than Indigenous males suggest that greater engagement with Indigenous women will enhance overall Indigenous participation in these disciplines. Enhancing Indigenous participation in the new economy is a complex matter, containing myriad issues of gender, race, ability, isolation, social and economic class. Finding the right path forward will require a concentrated level of investment, community outreach, educational innovation and corporate engagement that has never been seen before in Indigenous education, training and workforce development.

[11] Canadian Council for Aboriginal Business. (2016). Promise and Prosperity: The 2016 Aboriginal Business Survey. Retrieved from https://www.ccab.com/wp-content/uploads/2016/10/CCAB-PP-Report-V2-SQ-Pages.pdf

[12] Statistics Canada. (2015). *The surge of women in the workforce*. Canadian Megatrends. Statistics Canada Catalogue no. 11-630-X2015009. Retrieved from https://www150.statcan.gc.ca/n1/en/catalogue/11-630-X2015009

[13] Statistics Canada. (2015). *Gender differences in science, technology, engineering, mathematics and computer science (STEM) programs at university*. The Daily. Statistics Canada Catalogue no. 75-006-X. Retrieved from https://www150.statcan.gc.ca/n1/pub/75-006-x/2013001/article/11874-eng.htm

Chapter 5 – Education & Evolution

Recognizing Fundamental Problems

Indigenous student and entrepreneur, Zaffia Laplante, relates her passion for capacity building with Indigenous Peoples

Before Indigenous Peoples can look to the future, they have to be able to address the issues of today. Research participants highlighted the role of social determinants of health and infrastructure, particularly in rural and fly-in communities. Health services, housing, and other essentials have to be brought up to national standards and sustained at an appropriate level. It is impossible for Indigenous communities, with unique historical circumstances, to secure national and international competitiveness in the future of work without removing existing health inequalities. Enabling Indigenous businesses to compete with their non-Indigenous counterparts in Canada and abroad will lead to improved social indicators. This will empower communities to overcome the divide, and equally capitalize on national investments in the new economy. In other words, addressing these basic needs will ensure Indigenous inclusion in Canada's future prosperity.

Industry 4.0 presents an opportunity for Indigenous Peoples. By providing all groups with a vision of what the future will look like, we can help to ensure no one is left behind. The Indigenous education systems and training programs will benefit from significant investment in this area. There is a current focus on providing Indigenous Peoples with basic skillsets, but there is also a need to raise awareness of the skills required in light of technological advancement. We can prepare youth for the jobs of tomorrow and the skillsets that tomorrow's market will demand. The best way to do this is in partnership with the industry leaders that have a clear view of what those skillsets will be.

With certain skills becoming exceptionally relevant, we are faced with a daunting gap between the skills instilled by education systems today and those that are necessary to be productively engaged in the jobs of tomorrow. Most current education systems are based on models put in place over a century ago. They need to be revised, reformed and modernized to address this growing gap. All efforts to address this opportunity gap have to be grounded in providing access to education that is relevant and contextual. To be effective, curriculum materials should be co-developed with communities, capitalizing on the richness of Indigenous cultures and their connectedness with the natural world. This recommendation embodies the spirit of TRC's Calls to Action #62 and #63 to support and implement "Indigenous knowledge and teaching methods into the classroom."

> ***Call to Action #62:*** *We call upon the federal, provincial, and territorial governments, in consultation and collaboration with Survivors, Aboriginal peoples, and educators, to: Provide the necessary funding to Aboriginal schools to utilize Indigenous knowledge and teaching methods in classrooms.*

Intuitively, an Indigenous-focused curriculum could be both a foundation for effective learning and the beginnings of an Indigenous approach to technological innovation. Done properly, this approach would make STEM education relevant and exciting for Indigenous students; providing them the opportunity to see how their culture is uniquely positioned to support innovation and an exciting future career path.

The nexus between education, training, aptitude, passion and career path needs to be explored. To create meaningful and sustainable work for Indigenous Peoples in this new economy, education needs to prepare students now for opportunities on the horizon, equipping them with the mix of classroom learning and hands-on experience needed to compete in a digital world. Promoting cross-functional skills and a career mobility culture will give students and workers the flexibility to succeed in the skills revolution. It is critical that new education initiatives are geared towards local economic realities and opportunities. This is best achieved through partnerships between local communities, educational initiatives, technology/innovation firms and business.

Increasing Teacher and Trainer Support

Educational success will also require a different approach to teacher training and selection. Major and sustained investments in the training of Indigenous teachers have done a great deal to Indigenize the delivery of community-level education. Most Indigenous communities still experience high levels of teacher turnover, a problem that is as severe as community-level poverty in determining student outcomes. The requirements are considerable – technological proficiency, scientific and mathematical competence, local cultural knowledge, and sensitivity to the challenges facing community members – but so is the need. Furthermore, support for teachers cannot stop with education and recruitment, but must extend to long-term professional development and assistance. The aim is to empower teachers to feel comfortable to own the content in their classrooms and to make real-world connections for their students to what they are learning. These targets, all admirable, will be difficult to achieve. There are serious deficiencies in all these areas and more, including in student attendance, parental support, elementary math and science preparation, teacher salaries, and school facilities. Indeed, the review of the teaching situation in Indigenous communities makes it clear that the challenges are formidable, the costs are considerable and the likelihood of meeting the needed targets is small without a concentrated and collaborative effort from industry, government and academic parties.

Case Study #4: Ignite my Future in School (IMFIS)

Understanding the importance of this workforce and the value it can deliver is what led TCS to partner with Discovery Education to develop Ignite My Future in School (IMFIS). IMFIS builds on TCS' robust community initiatives that have inspired more than two million young people in STEM education and careers.

A first-of-its-kind initiative strategically designed to enable educators, administrators and school districts to become ambassadors of a transdisciplinary approach and introduce computational thinking within the context of core subjects such as English, mathematics, social studies, science, and the arts. Through this program, educators will be provided with high quality professional development content that aligns with existing curricular requirements, enabling them to reach students in a compelling, hands-on manner. As an industry partner and expert within its field, TCS brings much needed context to the classroom, and can help create hands-on experiences with skills that are relevant for today's jobs. On a National level, IMFIS has a goal of engaging 20,000 teachers and one million U.S. students by 2021. As a first step towards this goal, TCS and Discovery Education announced that 10 U.S. school systems across the country joined the effort as early adopters of this transdisciplinary approach in a five-year educator training and learning commitment to help empower middle school teachers.

Chapter 6 – Business & Building

Demystifying Careers in STEM

The task of building Indigenous interest in the new economy requires a fundamental recasting of Indigenous aspirations and understandings about the path forward. Industry promoting the idea of STEM-based education and career-building needs to be explained in community-context and made plausible as employment alternatives for Indigenous youth. Career fairs and industry partnerships can introduce young people to STEM careers and attract them into the educational and training programs needed for preparation in the field.

Companies have been trying this in recent years as they search for engineers and scientists to work in the resource sector; governments and school districts have also attempted to promote science and technology-based alternatives. This effort will become more achievable when there are more practical, community-level demonstrations of the relevance of these careers and a coordinated effort between private sector, government and communities to provide this support. Education and training programs can introduce technology and entrepreneurship in rural communities where labour demand for lower-skilled jobs in natural resources dominates. In addition, programming can help clearly draw a line between learned skills and job opportunities in STEM, not as a distant prospect, but as a real, tangible outcome. Working closely with teachers, students and mentors to introduce the impressive array of STEM related careers can make it "cool" to become a software engineer or roboticist.

Case Study #5: Small Business Digitization Initiative – Information and Communications Technology Council (ICTC)

On April 6th, 2017, the Information and Communications Technology Council launched the Small Business Digitization Initiative (SBDI) in Ottawa with support from the Ontario Ministry of Economic Development and Growth. SBDI is a skills-based training program that matches post-secondary students seeking employment with local organizations that are looking to innovate and engage with new technologies. Originally, the framework was not specific to Indigenous students, but open to Indigenous, non-Indigenous and Francophone populations.

Since this program concluded, the framework has evolved into the Indigenous Business Digitization Initiative (IBDI), which is solely for the Indigenous population. The program operated in three regions in Ontario – Ottawa, Toronto and North Bay. It's structure appeals to both students and employers by providing businesses with staff resources and innovative processes, while giving students the practical training and business connections necessary for meaningful employment within their community.

Nathan Snider, Program Manager, Indigenous Outreach & Programming at ICTC reported that, in its first year, all five enrollees in North Bay secured permanent, full-time employment at a local business following six months of work-integrated learning. Alongside classroom training, students were immersed in experiential learning opportunities in a broad range of industries, such as retail, manufacturing, and mining and exploration. In one particularly instructive example, Snider describes a microbrewery that brought on a non-Indigenous student enrolled in the SBDI program. That student had a fine arts degree from university and was struggling to find employment due to a lack of transferrable skills. Throughout the course of the program there was a keen interest in developing the student's skillset and competency with Enterprise Resource Planning (ERP) software, a comprehensive digital application that comprises several components of a small business's operation. Although this type of software is generally more applicable to large, process-oriented organizations, such as a media corporation, the SBDI student was able to leverage their knowledge and training using ERP to drive efficiency in day-to-day operations for the microbrewery. The student carved out a permanent role for themselves as Junior Operations Manager due to the significant value add they were able to provide for the business.

As Snider says of the program, "the proof is in the pudding." SBDI programming effectively engages local businesses in North Bay, connecting them to students that are eager to use new digital skills to increase productivity and value for organizations. The SBDI program laid the framework for the IBDI program which is designed to cater to the Indigenous population specifically, connecting unemployed Indigenous youth ages 17-29 with Indigenous employers in key industries to support communities from within. It's a win-win scenario where Indigenous youth can gain practical skills and knowledge in innovative disciplines, and local businesses are able to increase their bottom line while creating efficiencies through innovation.

Fuelling Indigenous Mentorship

Indigenous students need to be aware, as entrepreneurs, business people, scientists and technicians, that there are new pathways available that can lead to career achievement and long-term success. Having access to successful Indigenous role models and mentors in STEM fields is crucial, for it builds on long-standing Indigenous traditions of young people learning from Elders and those with practical experience. When asked about the importance of mentorship in building STEM education and career opportunities, one program manager recognized that:

> *"That challenge is actually universal, so Indigenous or non-Indigenous, not having an opportunity to seek guidance professionally outside of your employer's purview, that's something that's super important and that's paramount to an individual's success in any type of skills development program."*

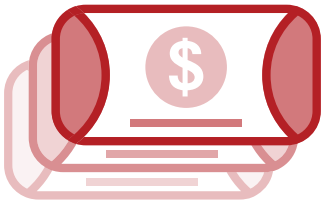
Some Indigenous tech entrepreneurs have seen the value in lending their time to share their passion with students:

> *"As long as I've been in business since 2003 and before that, I've always participated in job fairs and career fairs and youth conferences and putting on workshops, trying to get youth interested, planting some seeds that technology and entrepreneurship are a fantastic career path."*

Workshops, formal and informal mentoring programs, and career expos targeted at Indigenous youth, particularly with exposure to business leaders that have succeeded from the community, can go a long way toward convincing Indigenous students that there is a future for them in technology-based careers.

Enhancing Employability

CCAB and TCS research showed deep Indigenous interest in combining social science, humanities and fine arts training alongside training in the hard sciences, technology, engineering and math. There is a prevailing assumption, reinforced by statements from tech entrepreneurs, that a combination of soft skills and technical abilities are required for success in the future of work. Also, job security in the real world is said to depend on empathy and superior interpersonal skills, for which cultural communication is a foundational requirement. Ideally, the cultivation of a culturally diverse workplace can lead to the development of new products and services, while also improving social cohesion. Soft skills can compliment technical skills by promoting effective interaction with supervisors and coworkers in a dynamic and integrated workspace, in addition to enabling an agile workforce that can adapt as new technologies, and required skillsets, are introduced to the economy.



Increasing Investment

Given that Indigenous communities live with sizeable educational and infrastructure deficits, it is clear that governments have to be prepared for substantial, long-term investments at the community and national levels supported by private sector engagement. What is needed are innovative and collaborative solutions to existing problems. CCAB and TCS see this as a breakthrough opportunity for the business community — both Indigenous and non-Indigenous — to take a leadership role in bolstering Indigenous communities' access to critical skillsets, while addressing labour shortages and growing local economies. This can be done in partnership with municipal, provincial and Federal governments, as well as local academic institutions. The issue is not entirely about the quantity of funding, important as that is to the improvement of Indigenous circumstances. It is more important that money be spent strategically, with substantial community input and strong preparation for a constantly evolving world of work and economic development for Indigenous populations.

Developing High-Technology Infrastructure

The tech infrastructure deficit in Canada is substantial. Indigenous communities in rural and northern Canada often don't have access to the digital infrastructure such as high-speed broadband connections. Equally, Indigenous communities rarely have a sufficient number of well-trained technical support personnel. A number of excellent programs are working to address this, keeping in mind that the new economy is technologically rich and driven by elements as ubiquitous as the Internet and smartphones.

Industry and government can collaborate to bring high-speed Internet services to remote communities by supporting training and funding for technical support. Specialized training programs, including those aimed at community members and Elders, could drive Indigenous inclusion and ensure a positively trending role in the Canadian economy. Through meaningful and sustained commitments by all involved and a willingness to adapt to the needs and aspirations of local communities, change will be imminent. To create community-wide resilience to technological changes and truly support Indigenous Peoples in the future of work, it is critical that we support positive reinforcing cycles of education. Supports must be in line with evolving market needs and lead to career trajectories and entrepreneurship that reinforces the value of innovation in future generations.

Chapter 7 – The Path Forward

Elder Duke Redbird, Willa Black (Cisco), Balaji Ganapathy (TCS) converse at the Skills for the Future workshop

We are currently in the Fourth Industrial Revolution, universally revolutionizing the way business is done. Transformative technologies have changed the way we engage with work and traditional job roles and functions. Above all else, they have made necessary a wide range of skills for succeeding in an increasingly digital world.

Indigenous private businesses and development corporations have been successful at entering into supply chains and creating prosperity for local communities. With the rise of cloud technology solutions, widespread automation and machine learning algorithms, these industries will meet new challenges that require immediate remedy.

Indigenous Students, workers, and communities in Canada will need to make fundamental changes in their approach to education, training and workforce integration in order to remain competitive and ensure inclusion in the new economy. CCAB and TCS have identified a number of key recommendations for governments and corporate stakeholders interested in taking a leadership role in the inclusive innovation economy.

Key recommendations include:

- **All Stakeholders**
  - Develop national, culturally appropriate, content with flexible structures to be adapted locally. These local structures should ensure the engagement of key community groups, such as youth, political leadership and Elders;
  - Engage regional stakeholders and create a working group to align goals and drive measurable outcomes among universities, businesses, and governments. These stakeholder groups should ensure collaboration with all levels of government, especially on education and talent pipeline (Federal, provincial, municipal);
  - Identify and educate on the shift in industry-specific workforce needs;
  - Recommend further cross-sector dialogue and research on the support of the Indigenous STEM Talent Pipeline, preparedness for the future of work and the longitudinal effects of technological change and adaptation;
  - Provide examples of learning instances and success stories of private-sector companies working with different Indigenous groups in Canada to implement diversity and inclusion approaches;
  - Enhance credibility with government departments and agencies by working together to find training solutions that benefit both Indigenous community and non-Indigenous corporate partners.

- **Corporate**
  - Comply with recommendation #62 from the Truth and Reconciliation Commission. Private-sector actors aiming to support the sustainable development of the STEM Talent Pipeline within Indigenous communities to promote economic reconciliation should first actively engage Indigenous communities and local educators to accurately determine relevant needs of that community;
  - Avoid engaging communities with "parachute programs," but instead through a holistic community engagement co-created by the actor and community of interest. As part of this engagement, private sector actors should co-create comprehensive programs and properly incorporate Indigenous teachings, culture and language into content to augment the delivery and resulting impact; thus, empowering Indigenous teachers to deliver key concepts in a relatable, sustainable and innovative way;
  - Align expertise or content provided for education or training with the evolving future of work needs in their industry (e.g. computational thinking vs. current computer programming);
  - Comply with recommendation #92 from the Truth and Reconciliation Commission. The private sector should provide employees skills-based training in intercultural competency to support the review and enhancement of recruitment, reskilling and retention practices to ensure Indigenous youth and workers are aware of current and upcoming job opportunities.

- **Government**
  - Actively engage industry and Indigenous communities in discussions about how the future of work will impact the Indigenous labour force as well as how cross-sector partnerships can encourage the success of Indigenous Peoples in this ever-evolving reality;
  - Work with industry and Indigenous stakeholders to establish relevant connections to STEM curriculums delivered in Indigenous communities, professional development for Indigenous educators and role models for Indigenous students through Public-Private Partnerships, apprenticeship opportunities and entrepreneurial support programs.

Sam Damm, President (FoxWise Technologies Inc.) addresses a room of education, business and technology stakeholders

While there may be multiple transformations emerging from the Fourth Industrial Revolution and some unknowns for the future, what we do know is that technological advancements present real opportunities that are approaching rapidly. The future of Indigenous employment and community economic development depends on the joint efforts of industry, government, and Indigenous communities to develop relevant and impactful education and skills-training programs for Indigenous Peoples in STEM disciplines. The government's previous efforts can be supported by industry-leading companies that have greater market insights on the relevant skills for the future. This in turn can lead to more comprehensive support for Indigenous students' career development, building the Indigenous workforce, and Indigenous community relations characterized by integrity and mutual prosperity. This report does not mean to suggest that Indigenous firms need to evolve into tech companies or that they all need to be at the forefront of change. What will be critical to success is understanding the changes that are coming and integrating useful technologies and tools into everyday operations, business decision-making and tangible corporate strategy. Through effective programming co-created by corporate, government and Indigenous communities, we can work together to alleviate the risks from both community and industry perspectives — ensuring a resilient future for Indigenous Peoples in the new economy.

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