Participant Survey Study

Part 2 of a two-part study

An Analysis of Economic Outcomes in Youth Innovation Projects Supported by geekStarter / Tech Futures Challenge

Prepared By:

David Lloyd, DCL Consulting, March 2025

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In the spotlight – Big thank you to our ***Transformer Level*** funding partners, who believe that investment into youth innovation is a critical factor in building our best economic futures.

Executive Summary

The Organization for Economic Cooperation and Development (OECD), 2022, ranks Canada as the second most educated country in the world, in the 24- to 35-year-old population, with 67.0% of adults meeting the OECD criteria. Korea has the highest percentage at 69.6%, followed by Japan with 65.7%, and the USA at 15th with 51.3%, noting the OECD average is 47.4%. It follows that a more highly educated adult population would correlate to a similar trend in overall innovation status. However, according to the World Intellectual Property Index 2022 (WIPO), Canada ranks only 15th in its total innovation output capacity, out of 132 OECD countries; and critically, lower than its OECD peers including Korea, Japan and the USA (WIPO, 2022, p. 50).

For young people to feel motivated about the economy; they need access to skills and training that bridge them into academic learning and training that prepares them for the realities of the future of work. From Canada's report, *Building a Nation of Innovators* (2019), "Innovation is key to competitiveness, productivity, economic growth...jobs, and making life better for all Canadians. To become one of the most innovative countries in the world, Canada must build a culture of innovation, where Canadians can embrace change and have the right skill sets and tools to …compete in the global economy," (Innovation, Science and Economic Development Canada, 2019, p. iii).

MindFuel has focused on making the innovation space more accessible to youth under the age of 30. Critically, youth-driven technology innovations offer strong potential for investment opportunities and economic growth. However, talent retention remains a pan-Canadian concern as all regions of Canada continue to experience brain-drain of talent to other markets, most notably to the USA. Therefore, MindFuel, a national leader in youth innovation programming, has commissioned this study to help stakeholders understand and address the challenges related to creating youth focused programs that create the desired tangible outcomes such as talent retention and economic growth, and to understand the opportunities to open the aperture of access to the innovation ecosystem to better support women, newcomers, and racialized entrepreneurs and innovators.

The aim of this study was to examine the Canadian entrepreneurial landscape and determine key programming elements that support increasing youth innovation success. In compiling information for analysis, the three key areas of data gathering included conducting a background assessment on the Canadian youth entrepreneurial landscape; incorporating findings from a post 10 year longitudinal analysis of geekStarter (gS)/Tech Futures Challenge (TFC) program participants and, finally, conducting in depth interviews (IDI) with nine company founders who are gS/TFC program alumni. The ultimate outcome of this study was to understand what correlations exist between investments into youth innovation programming and tangible economic outcomes and social progress in context of Alberta's innovation ecosystem.

Specific to the IDIs, five key areas of economic outcomes were of interest and included gathering data specific to the following tangible outputs: company creation, intellectual property creation, investment capital attraction, employment creation, and GDP contributions (revenues). As mentioned above, this study summarized prior findings (MindFuel and GenomeAlberta, June 2023) regarding generalized economic and social progress outcomes in a 10-year post program survey analysis of participants.

Alberta, particularly Calgary and Edmonton, has emerged as a leader in youth entrepreneurship, driven by programs like geekStarter (rebranded to Tech Futures Challenge). These initiatives, which nurture young talent and translate innovative ideas into real-world applications, have significantly contributed to Alberta's standing in tech innovation and entrepreneurship. Critically, the combination of TFC program and The International Genetically Engineered Machines (iGEM) Competition, in which Canadian teams, particularly from Alberta, have excelled, highlights the impact of strategic support on youth entrepreneurship.

A survey of 83 respondents from 76 projects supported by MindFuel (2008-2019) found that 35% of participants commercialized new technologies and 22% started companies during or after the program. Of the respondents, 24% identify as entrepreneurs, and 13% launched companies directly from competition projects, reflecting a 10% conversion rate from projects to startups. Additionally, 22% of respondents founded a company post-program,

showcasing the initiative's success in fostering venture interest. Diversity is another key outcome, with 22% of female participants and 40% of non-white respondents involved in commercialization. Most participants remain in Canada, contributing to the local economy and reducing brain drain.

A noteworthy finding is that most participants (90%) stayed in Canada, with a majority located in Alberta (79%), counteracting the broader trend of brain drain. The programs catalyzed the creation of 9 startups, originally all based in Alberta, and 22% of respondents reported starting a company post-program. Of these companies, 9 were analyzed in detail, showing high resilience, with 56% still active, far outperforming the national average of startup survival. These companies, primarily in life sciences, biotechnology, and clean-tech, raised $32.5 million CAD, generated $13.2 million in revenue, and created 138 jobs, with significant support from the geekStarter/Tech Futures Challenge program. Additionally, these companies developed intellectual property through 20 patents (filed, pending or issued) and three Trade Secrets events.

The program's mentorship, funding, and skill-building can be associated with entrepreneurial successful outcomes, with a 5:1 return on investment in Alberta and 7:1 in Canada. Key findings from this analysis indicate that continued investment in youth innovation and entrepreneurship programs is essential for advancing Canada’s innovation economy.

Additionally, throughout the ten year period of program analysis, new opportunities have been identified regarding ways to further support start-up creation for youth talent teams, critical to driving forward more development of Canada’s innovation economy and, specifically, Alberta’s broader youth innovation and entrepreneurship ecosystem.

Background and Overview

The Canadian Entrepreneurial Ecosystem is Unique - Full of Global Leadership and Opportunities For Growth

This post-10 year analysis aims to understand the impacts from investments into youth technology innovation and entrepreneurial programming to resulting outcomes in terms of real, tangible, measurable indicators of economic success. To do so, it is important to build the context of Canadian entrepreneurs today, their trends and needs in the community. This data was collected from the lens of identifying opportunities to better support, and thus expand, Canada's youth entrepreneurs and technology innovators.

Entrepreneurs have largely existed as the backbone of the Canadian economy touting an impressive 3.5 million entrepreneurs in Canada that exist from small to large businesses that power our economy. These exist largely as small businesses, technology entrepreneurs and university spin outs from our academic organizations. Significant numbers of small businesses, technology entrepreneurs and university spin outs drive our communities. *(Startup Canada, 2018)*

Specifically, for those who are technology entrepreneurs, their journeys are usually driven by advancements in Canada's innovation academic sector, meaning that they often extend the technology and learning advancement of those academic institutions generating new intellectual property or providing centres of learning throughout the ecosystem. These tend to be concentrated amongst urban centers where technology innovation occurs in a more concentrated way. It would then follow that most entrepreneurs in the Canadian context tend to concentrate in urban areas across the major cities of Canada. *(Breschi et al. 2018)*

These technology entrepreneurs often provide the commercial translation needed for driving innovation into the private sector in Canada. It is more important than ever to understand what impacts these entrepreneurs have on our economy and in what ways government agencies are looking to make investments in this area. For example, the current federal government has looked to investments into developing technology innovation infrastructure, generating key support in research and development, and supporting commercialization / early innovation market development activities through various agencies largely under the National Research Council. Previous investments into this sector have resulted in Canada becoming ranked high in innovation investments. For example, the World Intellectual Property organization (WIPO) ranked Canada as 9th in the highest investments made into innovation infrastructure. However, the same index shows that Canada's innovation output only ranks at 23rd amongst various countries. (*Global Innovation Index 2022 : What is the Future of Innovation-driven Growth?*), and cites Canada as having very low investments in K-12 and Tertiary Education as the primary cause. While Canada has a strong innovation driven economy that is largely focused on making significant innovation based investments and driving early stage growth of companies, it consistently lags in investing in K-12 and Tertiary Education programming.

Canada is also a unique place for specific types of innovators and entrepreneurs to flourish. The Global Entrepreneurship Monitor places Canada as a leader in Total Early-Stage Entrepreneurial Activity (TEA) positions Canada 8th amongst 47 country economies it monitors. *(GEM - Entrepreneurship in Canada 2023)* In 2024, Canada has also been noted to be one of the most attractive destinations for immigrant start-up founders of all the OECD countries. *(Legal500, 2024)* Alberta ranks high amongst the provinces in entrepreneurial ambition. Specifically, those who are driving forward with business creation and entrepreneurial thoughts. Provinces such as Ontario, Alberta and British Columbia are given high grades which outcompete numerous country's same output. These indicate high ranks of early-stage entrepreneurialism which are critical in driving forward innovation into economic productivity. *(Conference Board of Canada - Entrepreneurial Ambition)* Understanding the drivers for these particular differences in innovation output is critical to help support future entrepreneurs and innovators as we build towards a more prosperous outcome.

One of these critical factors is Canada's innovation mindset - being the skills, attributes and competencies to enter the innovation economy. Canada is falling behind when it comes to ensuring there is a growing supply of talent who have an innovation mindset, which can be correlated to WIPO's (2022) findings of Canada's consistently low investments into K-12 and Tertiary Education. The need for engagement throughout the Canadian economy to support mindset and competencies to reduce barriers to entry is critical. (*Rideau Hall Foundation - Canada's Culture of Innovation 2019*)

There is a clear opportunity to meet these challenges by creating bridges between innovation and entrepreneurial activity in the Canadian context. In particular, Canada is a clear winner in innovation inputs and driving early stage activities within the technology space compared to other countries. However, this conversion of activity into output, driving innovation as a mindset and cultural norm, and supporting entrepreneurs through their growth is an area for development. For Canada to continue to develop overall - further programs, policies and guidance are needed to catalyze a next wave of innovators and entrepreneurs to produce further impact to our communities. Canada is vast and different impacts are necessary across the country, making it important to specifically look at the various key drivers at the provincial level.

Who Are Canadian Entrepreneurs?

The landscape of Canadian entrepreneurs is significantly changing. Younger Canadians are jumping into entrepreneurship in large numbers, while baby boomers are choosing entrepreneurship late in their careers. At the same time, more newcomers, women and highly educated Canadians are turning to entrepreneurship. These can be driven by economic changes, the changing landscape surrounding the culture of entrepreneurship and also the lowered barrier to entry with technology accessibility becoming more common.

Since 2008, entrepreneurial involvement has been on the rise. In particular, there has been a significant increase in the number of young entrepreneurs. Between 2014 and 2018 there was a 43% growth rate in new entrepreneurs aged 25 years or less. This equates to approximately 3.3 out of every 1,000 young Canadians starting a business in 2018. *(BDC Entrepreneurs Report 2019)* Compared to many other types of entrepreneurs, these young Canadians are more technology native

and tend to be quick adopters of analytics with many being more educated than their predecessors. (*RBC Youth Entrepreneurs Snap-Shot)* Interestingly, Canada has had a long standing practice of seeing educated youth entrepreneurs enter the market at a higher rate. For example, a 2001 study from the OECD suggested Canada was the leading country of entrepreneurs who founded a company within four years of the start of their BSc. program compared to other countries. *(Breschi et al. 2018)* This is consistent with data that suggests that Canada leads early entrepreneurial activity and provides opportunities for commercial growth for entrepreneurs. This innovation driving force is a key theme in the Canadian entrepreneurial ecosystem driving towards early youth involvement in innovation and entrepreneurship over the past decade. *(Piva et al. 2020)*

In addition, entrepreneurs are becoming more diverse - there are significantly more female entrepreneurs, in a recent study by the BDC, 28% of entrepreneurs identified as female which has more than doubled compared to 40 years ago as well as increasing in overall diversity. (*BDC Entrepreneurs Report 2019)*

Overall, a shift in age, diversity and competencies are unlocking early-stage entrepreneurship primarily for youth. Youth based entrepreneurial activity is a place where Canada can excel by fostering youth innovation and entrepreneurship and creating space for the shifting demographics of entrepreneurs, which can lead to the change needed to have more impact on Canada's economy.

Challenges to Canada's Youth Entrepreneurs

While Canada continues to lead youth entrepreneurship compared to other countries there are numerous challenges that are faced by these individuals towards their organizational development. Young entrepreneurs have particular challenges that are faced by their struggles associated with challenging economic times. Specifically, young Canadians are shouldering more debt which creates obstacles to success. (*RBC Youth Entrepreneurs Snap-Shot)* External struggles and personal concerns are much more interrelated to early entrepreneurs. Accessing funding and creating opportunities for early-stage investments in entrepreneurs represent significant impediments to current development. More than just financial resourcing is the need for guided education, mentorship and support throughout their journey. For example, in a recent survey early youth-entrepreneurs spoke about the wide variety of available resources that is generally available to entrepreneurs, but due to the vast volume, the result is overload leading to "information paralysis". (*Startup Canada 2021 Entrepreneur Census Report)* Streamlining supports for entrepreneurs by creating more specialized mentorship programs allow for more actionable insights to be created and have better impacts to businesses. From a rural lens, innovation is also happening in various parts of Canada but at a slower pace. In Alberta, where there is a strong need to access digital skills, opening up new opportunities to engage in the entrepreneurial community and support building businesses that are more community centric has been identified as an opportunity. (*Seeding Rural Innovation - ICTC 2023)* There is generally a need for stronger and more robust opportunities for small communities to enter into the innovation ecosystem where different challenges exist.

Youth entrepreneurs have access to new forms of materials, support and mechanisms not available to previous counterparts, however, there is a key gap in specific and specialized growth opportunities

for these particular entrepreneurs. Canada has also experienced what has now come to be known as the "brain-drain" phenomena, which is an export of Canadian talent, innovation support and company growth towards other countries such as the USA. (*A primer on the canada tech brain drain and how to solve it. Randstad 2023)* This has been well documented from various sources and shown that continued support is needed to have not just innovators stay in Canada but also to impact the job market (largely in software technology, engineering and advanced degree holders) within the Canadian economy. (*Brock University, Reversing the Brain Drain)* Youth entrepreneurs need to compete not just for local talent and venture capital, but also within the context of the global economy driving where they will start their organizations and also develop organizations into the future.

Looking at the Western Canadian Context

This report is focused particularly on the impacts that have been generated within Western Canada, largely because of the longitudinal data that was collected specifically from the Alberta program teams. Because of this, the Alberta and Western Canadian impacts of entrepreneurship were further evaluated. Western Canada is particularly high in youth-based innovators and entrepreneurs compared to other provinces and Alberta ranks high in youth entrepreneurial activities as reported by the Global Entrepreneurship Monitor (*Global Entrepreneurship Monitor - Entrepreneurship in Canada 2023)*. Alberta has also been growing a centre for entrepreneurship in general over the past few years. For example, Calgary was ranked 28th in CBRE's North American Tech Talent Ranking and 912 tech companies exist in the city, up 26% from even the previous year (2021 to 2020). Edmonton ranked 53rd in North America while Calgary ranked 43rd according to Startup Blink, which tracks city's innovation ecosystems**.** *(as reported by Calgary Economic Development and Startup Genome)* Alberta has an opportunity to diversify an entrepreneurial community led by youth innovators. Support in this area needs to be uniquely tailored to challenges identified and this study aims to better understand how programming in this space has made an impact on the Alberta economy.

MindFuel and the iGEM Competition

Measuring Impact of Innovation and Entrepreneurship from a Longitudinal Perspective

Organizations such as MindFuel have made significant investments through programs such as geekStarter (gS), Tech Futures Challenge (TFC), Young Entrepreneurs' Boot Camp, Build It! Dream It! Expand It!, Founders Fundamentals, and more to supply high school and collegiate students with curricular and extracurricular programs focused on STEM skills development, ideation, design thinking, entrepreneurialism, and financial literacy, coupled with advisory services and support mechanisms to build competencies and compete on the international stage in deep technology competitions. These investments and educational support for youth entrepreneurs has been occurring since the early 2000's and participants in these programs have gone on to pursue various careers throughout Canada's economy. These programs have been aligned to various challenges within the Canadian entrepreneurial journey primarily focusing on:

- **Entrepreneurial spirit** - creating confidence and support mechanisms for founders as advised by major studies - particularly in supporting mentorship driven areas of need

- **Removing barriers** - providing economic supports project design and development align with skill building
- **Creating academic bridges from innovation to entrepreneurship** - project supports lead to spin-outs and increased productivity
- **Creating Economic Impacts** - demonstrated by the ability for youth to engage in entrepreneurship early, fail fast and build companies.

Providing specific mentorship, guidance and support is critical to supporting Alberta based youth entrepreneurs through various mechanisms of activity.

One such key competition that has been funded is the International Genetically Engineered Machines Competition (iGEM), formerly based out of MIT in Boston. Critically, the competition provides student teams the opportunity to develop a synthetic biology (biotech, clean-tech, agri-tech, health tech, etc) approach to a real-world problem, giving student teams from around the world the opportunity to participate in a science Olympics environment to impact communities across the globe.

iGEM teams have made strides and critical innovation impacts throughout their careers. There have been numerous startups that have been catalyzed by the competition as reported by the iGEM startup lists published on their website (www.igem.org) where students have catalyzed cutting edge student-based research into opportunities for growth. iGEM participation has the ability to extend novel innovations into development opportunities for technologies to reach the market. iGEM represents a unique model for over 2,000 teams that have participated globally towards synthetic biology development (*Barabasi et al. 2023)* iGEM can be used as a model for innovation output and how this supports entrepreneurial growth. *(Jainarayanan et al. 2021)*

This research and innovation output has catalyzed various startups from all over the world. Canada has had a unique ability to catalyze these early-staged opportunities through the competition. For example, Synbiobeta suggests that; "iGEM teams from Canada have catalyzed almost as many startups as teams from the United States," in 2015. (*Synbiobeta "iGEM: Catalyzing Entrepreneurs and Startups in Synthetic Biology" 2015)* Further to this, Alberta in particular, has a history of sending teams and producing high output opportunities in competition winnings and numerous examples exist of teams who have been ranked in the top 6 in this global competition.

geekStarter/Tech Futures supported the output of the iGEM teams and through participant reflection, made a critical contribution towards team success. Programs such as geekStarter and the Tech Futures program have a strong ability to influence iGEM team members' experiences and outputs in the Alberta economy. Ultimately, these iGEM students went on to grow innovations within their communities and drive forward to success.

The projects developed by Canadian teams have won significant awards and participants in these programs have gone on to lead VC backed start-up companies in biotechnology and various other industries. This study evaluates the innovation outputs of these student participants from 2008 - 2022, analyzing their impact to Canada's innovation ecosystem.

Study Design and Aims

Study Methodology

Overall, 757 students were identified as being part of 76 Alberta-based iGEM projects from 2007-2022 of which 440 individuals were surveyed and 162 responses, or 21%, were collected. Critically important is that each of the 76 biotechnology projects were represented by team members who participated in the full survey. Participants ranged from a wide background and all Alberta iGEM teams were represented. The survey probed into attributes of the iGEM experience, and the respondent's journey from student to professional, and critically, determining the impact that iGEM and geekStarter (Tech Futures Challenge) had on the participants post-secondary, career and/or innovation journey. These survey respondents were segmented based on their unique responses to the survey and follow ups were performed to identify the particular actions taken within the innovation ecosystem post competition.

A total of 29 founders were self-identified throughout the survey results. Each individual was contacted for additional follow up and a total of 9 in-depth founder interviews were completed. These formed the basis for information regarding geekStarter alumni companies and data was anonymized. For comparison data, datasets from various Statistics Canada were used.

Study Limitations

The data collected during this survey represents an approximation of the remaining 757 students who were part of the outreach in this work. Bias may be introduced based on those responses generated from participants who were more active in the competition/program. This retrospective study involved identifying the participants and through outreach, examining their journey over the period 2008 - 2019. Note that data collected has been from a subset of respondents. Not all companies responded to be interviewed and as such there may be additional examples of companies with unique experiences not reflected in this data. Data collected was interrogated against third party datasets cited where applicable throughout this results section.

Study Aims

The primary aims of this study were to identify those survey respondents who participated in Canada's innovation economy and generate insights into:

- The innovation productivity of these entrepreneurs and individuals that catalyzed organizations.
- Measure a level of investment attraction or local participation in the entrepreneurial ecosystem where they were located.
- Determine the level of job creation that was generated through these studies.
- Determine the impact of support programs in the entrepreneurial ecosystem based on programs like geekStarter/Tech Futures Challenge.

Results - Entrepreneurs

geekStarter - Tech Future participants are Entrepreneurial:

With overall 76 projects and with respondents that represent almost each of these projects overall, 83 respondents completed all questions in the survey and almost 50% were found to have been involved in new technology development during or post the work in the program. Approximately 25% of these respondents were involved in company during or post analysis and that today approximately one in four of these respondents continue to consider themselves entrepreneurs.

% of respondents who:

Commercialized new technology during or post program	**35%**
Were involved in starting a company during or post program	**22%**
Consider themselves entrepreneurs	**24%**
Consider themselves intrapreneurs	**12%**

Catalyzed Entrepreneurs are Diverse

We found that 22% of all female respondents (representing a third of all responses) have been involved in commercializing a technology compared to 48% of those who are male. As a guiding benchmark, nationally, 17% of women have started a company, although this is only a guideline and not direct comparison. While female rates of commercialization are higher in Alberta than the national average, there still exists a significant gender gap.

APPROXIMATELY 1-IN-3 OF THOSE WHO COMMERCIALIZE TECHNOLOGY ARE FEMALE, MUCH HIGHER THAN FEMALE INNOVATORS IDENTIFIED BY THE CANADIAN INTELLECTUAL PROPERTY OFFICE AND SIMILAR TO DATA FROM WIPO.

When asked about the respondent's Racial Background, close to 40% of respondents were of a different racial background than "White". This is important for the purposes of identifying diversity amongst those who have participated in the iGEM competition and how to move forward with continued involvement in the future.

These metrics are consistent with the growing consensus that youth-entrepreneurs are diverse compared to their previous counterparts.

geekStarter/Tech Futures Supported Entrepreneurs are Staying in Canada

Overall, those participants who were part of geekStarter and/or Tech Futures Challenge programming remained largely in Canada as well as in Alberta where they received their support. This is significant given current Canadian data suggests that entrepreneurs and highly skilled labour are at risk through brain drain into the USA or other international geographies.

79% REMAINED IN ALBERTA **91% REMAINED IN CANADA**

Of the start-up companies identified and catalyzed through the study; all of these formed companies were mostly located in Alberta and, overall, these companies remained in Alberta (Canada) for the period of development. Many of the responses attribute their needed support to mentorship, community and local support from various organizations to help support their growth as an entrepreneur.

Entrepreneurial Involvement Leads to Company Creation

Of the respondents, **11 out of 83** respondents specifically started a company spun out directly from the competition project which represents approximately **9 unique companies** in the Alberta ecosystem which from identifiable sources represents a 13% conversion rate from projects to start-up organizations.

An additional **18 individuals** from the survey results or 22% of the respondents reported starting a company after their involvement in the geekStarter/Tech Futures challenge opportunity. These included a variety of opportunities from small consultancies, to early-stage start-ups throughout Canada.

Results - Company Creation

Who are these Alumni Companies

Of the 29 companies that were identified through this study, a dataset was created for 9 start-ups based on direct outreach and in-depth interviews (IDIs) to learn more about these organizations. This included three examples of where a gS/TFC affiliated project was continued and spun-out of a university into a startup company and 6 "post-iGEM" experience companies, where gS alumni went on to start companies after their academic experiences. In the latter case, company creation started relatively shortly after the iGEM experience **(between 2 - 8 years, averaging approximately 4 years)**.

Similar to the trends noted in the entrepreneur section, these companies tended to be headquartered predominantly in Alberta. Of the 9 companies interviewed, 6 companies were Alberta based, 1 in Quebec, and 2 in San Francisco. This is unsurprising given the location of co-founders and communities developed during academic experiences. These entrepreneurs often mentioned that co-founders were local, support systems and networks were within their community, and they looked to grow their companies based on what supports were locally available. Some of these Alberta program participants went on to continue academic training in other locations and then started companies in these new geographies.

Company Development, Commercialization of Solutions and Focus Area

The 9 contacted companies were incorporated between the years of 2012 - 2019 and represent founders who participated in geekStarter/Tech Futures Challenge between 2009 - 2016. The majority of these companies aimed to commercialize a product or service in the **life science or biotechnology sector**. Other examples included biomanufacturing and clean-technology companies. The company focus included novel biosensor technologies to DNA gene synthesis technologies and tissue engineering. All of the were B2B (business to business) focused companies and generally were focused on internal sales of their solution into the North American market.

Most companies had a **strong academic affiliation** and either licensed technology out of a university or developed technology which was taken through an academic licensing process. Only 3 examples of these companies developed out of non-academic settings and mentioned utilizing a start-up accelerator service or some type of incubator to support development activities. These companies reported **approximately 20 patents** that were developed either through academic involvement licensed into the company or independently through corporate research programs. It is interesting to note that many of these companies highlighted that the primary source of IP protection used most often was trade secrets, which may be due to the complexity of the patent cycle, applicability to their industry/product offering or cost related to these applications. Almost half (10) of these patents came from one company during analysis of the data.

These companies also showed a high degree of **longevity in the market**. Of the 9 companies interviewed, 5 of these companies (or 56%) were still active in the market much higher than what has been reported by typical failure rates amongst Canadian companies where typically 80% of start-ups do not last their first year in business (SPD Load: Startup Reported Failure Rates 2024). The products

and services being commercialized by these companies fell into various Technology Readiness Levels (TRL) where more developed companies typically had higher TRL levels (as high as TRL 9) demonstrating that these companies have seen adoption into their associated markets and seen commercial scaling. Companies which failed had low TRL (1-3) and these founders tended to cite challenges in commercialization surrounding market or product (see more below).

Overall, these companies tended to be involved in industries that were similar to work done within the iGEM experience, companies have demonstrated successful commercial entry for their products/solutions throughout the experience and generally these companies tended to outperform the average start-up failure rates compared to other Canadian companies.

Investment, Non-Dilutive Capital and Economic Productivity

Of the nine contacted companies, four reported equity financing events from accredited investors (friends and family, angels and/or venture capital). As of December 2024, a **total of ~$32.5 million CAD has been raised through venture capital investment** in these companies of which $15.5 million of this investment has been made into Alberta firms. In Canada, $27.5 million in investments have been made ($12 million in venture financing in Quebec added to the Alberta startup financing). These entrepreneurs reported financing in Friends and Family, Pre-Seed Series, Seed Series, and Series A financing events. Funding size varied based on company, industry and stage the largest of which was $12 million in total funding for a bio-manufacturing company application. None of these companies reported a M&A (merger and/or acquisition) event, however, entrepreneurs noted that this was largely the goal for their organization. This total raise amount is significant given the economic activity that new investment providers to local communities and these entrepreneurs tended towards staying in Canada to develop their businesses.

Venture groups who made investments into these companies tended to split between local investment as well as international investment opportunities. For Alberta based companies, approximately 60% of all investment tended to be from international sources. These companies demonstrated a source of venture capital attraction to local businesses in Alberta.

All Canadian companies also reported accessing non-dilutive capital instruments (this was not reported for the San Francisco based companies) ranging from local municipal grants, provincial funding supports to federal agency programs such as NRC-iRAP, GreenSTEM program, MITACS, SR&ED and other related programs largely accessed throughout their growth program. Access to grant funding varied considerably.

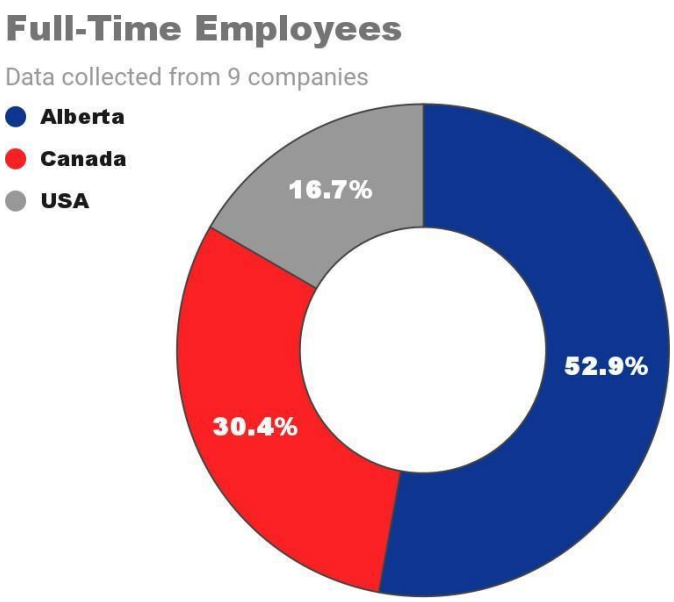
While the stage and commercial readiness of the solution being developed by this company varied significantly throughout the companies, several had already found business models which supported revenue production. Annual revenue of these businesses ranged from CAD $0 (pre-revenue) to $7,000,000. The total reported revenue of all companies was $13.2 million and tended to be attributed towards later staged organizations who had already raised or were close to raising a Series A round. Business models ranged from hardware products, SaaS (software as a service), to licensing and service delivery models for development. Several companies with larger revenue than their

cohort discussed their customer base being highly North American centric with a focus on the USA and Canada demonstrating a level of export development.

With 44% of these companies raising venture capital funding and attracting much of these funds from international sources of funding, it is clear that these companies are important contributors to the Canadian economy. While these numbers are likely underestimated given that only a subset of gS/TFC supported companies have been reported on, there is strong evidence to suggest that other investments have occurred from these alumni. These companies have generated revenue from various sources including export development activities into, largely, the USA marketplace showing successful commercialization of new products and services into core offerings.

Employment

Overall, there were a total of 138 new jobs created as a result of company activity from those interviewed. Each company ranged from 1-52 employees with 15 per company on average. Typically, most full-time employees (FTEs) were based out of the same location where the company was headquartered. Smaller companies were mainly composed of founding team members and 1-2 technical employees while larger companies tended to have a more structured organizational chart that included technical, operational and sales/marketing functions throughout the organization.



Local talent tended to be more focused on operational and technical functions. Most companies reported hiring deep technical expertise such as molecular biology, engineering and other skills. This is likely due to the highly sophisticated nature of the product or service that is offered and founders tended to look in their local communities to acquire talent in the workplace. ***One co-founder, CEO indicated that "seeing geekStarter/Tech Futures Challenge experience listed on the person's resume was a 'top of pile' candidate."*** More sales/marketing functions tended to be less central and more distributed (for example, some companies reported virtual employees who worked within their core market area).

As a result of company creation, 73 new Alberta-based employee jobs were created and 115 in Canada. As discussed earlier, **Canada has largely experienced issues with brain drain. Having companies in local communities that are working to establish opportunities for various skill sets is critical to growing opportunities for the Canadian workforce.**

Challenges to Companies - Examining Failures

Four of the nine companies experienced a wrap-up or failure during their development. These entrepreneurs in particular, cited various reasons for this occurring. The most common was product/market fit. Generally, there were concerns about the size of market or how the product would be able to meaningfully service the segment of interest post-commercialization. One of the additional major themes for three of these companies was the stage and level of investment required for the technology to move forward. Often seeking financial support for generating sufficient data to develop the solution in very costly sectors of industry (such as biotechnology and life science) made it difficult to pursue technology development. Finally, a significant theme was a lack of advisorship, knowledge and skill building of the company towards success. Whether for purposes of patenting or for market access and knowledge, entrepreneurs recognized upper boundaries to their own knowledge and the related difficulty in accessing meaningful support to drive forward their commercial development. Other factors were also noted including co-founder team issues and access to central infrastructure.

These generally represented fairly consistent points of failure expanded by previous research in why start-ups tend to fail during early development.

Measuring the impact of the geekStarter/Tech Futures Program

Clearly alumni of the geekStarter/Tech Futures programs have gone on to start companies and develop important brands and organizations that are developing new innovations and solutions based in the Canadian market. Even a subsampling of the >700 individuals who have been part of these programs think entrepreneurially and are interested in company creation.

But what was the impact of the geekStarter/Tech Futures Challenge program on company creation and ultimately the success of these entrepreneurs towards their goals? During our interviews we heard a resounding response that the iGEM program and geekStarter/Tech Futures Challenge support system was critical. In addition, previous survey data showed that 86% of respondents agreed or strongly agreed that “geekStarter/TFC and/or MindFuel contributed positively to [their] iGEM experience”. Participation in iGEM and achieving success at the competition helped to support entrepreneurial activity and catalyze company creation.

For the entrepreneurs involved in iGEM related spin-out activities the relationship was clear. Had the team not formed at the local high school or academic institution, had the students not been given the opportunity and supports to develop their synthetic biology technology (prototype) towards the competition, then the spin-out/start-up would likely not have occurred after the competition. ***One of the CEO’s stated that, “The company is directly an outcome of participating in the iGEM competition and the geekStarter (Tech Futures Challenge) programming was critical to help us be successful at that competition. Had we not received this funding and support our company would not have existed”.***

For those entrepreneurs who were involved in a separate company creation event after their iGEM experience, founders reported a resounding experience where these supporters helped them think differently about the competition. One interviewed CEO specifically mentioned that iGEM is what

provided him the “entrepreneurial bug” and recounted a lived experience from the geekStarter/Tech Futures Challenge program from over 10 years ago that specifically impacted their desire and interest in pursuing an entrepreneurial journey. **All of the interviewed founders agreed that iGEM and support programs that assisted in this development had an impact on their development as an entrepreneur.** Overall, the programming helped support future scientists, researchers and startup founders to think differently, expanding their knowledge and lived experiences to support moving forward with their aspirations whether they were directly a result of programming or a future opportunity for growth.

The geekStarter/Tech Futures Challenge program made financial investments into these teams year-to-year providing project funding and travel bursaries to attend events/competitions, and mentor/advisor/skills development support for teams throughout their innovation journey. This included skill-based training, workshops from experts in industry and innovation, as well as a jamboree style competition with expert judges to support iGEM teams during their route to the competition at MIT.

Catalyzing these companies demonstrates the need and desire for important programming that can inspire and develop start-up founders towards pursuing the next part of their innovation journey. Investments into this program resulted in company development, new FTEs and local investments made from significant players in the life-science and environmental industry. Within a ten-year period it is estimated that each dollar contributed through the gS/TFC program can be associated with **investment into new organizations at** 5:1, but this does not include future growth, job creation or revenue growth, which all are added economic outcomes/benefits to this program.

In Alberta, every dollar invested into geekStarter/TFC is associated with an investment return at a rate of: **5 to 1***

In Canada, every dollar invested into geekStarter/TFC is associated with an investment return at a rate of: **7 to 1***

**These assessments were based on an assumed in-kind and financial contribution made to competition teams during the 2008 - 2019 competition seasons for iGEM. Particular levels of support varied from year-to-year and team-to-team and an assumed average contribution was compared to reported investment capital of the respondents.*

Concluding Insights

Looking back at the state of the Canadian ecosystem and the broader context of the innovation systems locally, all of these geekStarter/Tech Futures Challenge alumni companies represent youth-entrepreneurs with unique challenges and opportunities. This fits directly into the **fastest growing area of entrepreneurial growth - youth entrepreneurship** and creating mechanisms for their involvement into future development to drive product and solution innovation in our communities. These entrepreneurs hire locally, build opportunities for export and drive intellectual property creation.

A validated model that delivers economic impacts: geekStarter/Tech Futures Challenge is a validated model for supporting high school and post-secondary education innovation through a competition support model whereby young students (ages 15 to 25) are given the opportunity to think differently, ideate solutions to real world problems, develop and pitch a prototype solution, receive project funding and mentorship, and expand their horizons and develop new solutions into the marketplace. Providing support through targeted advisors, meaningful feedback and skill building sets students up for success as they contribute to our future economy and development.
Therefore, based upon these summary findings, there exists significant opportunities to increase youth talent development, in support of innovation and entrepreneurship, especially with continued investments into the programs that support this objective.

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