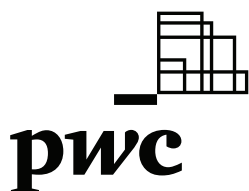# 2021 Alberta Technology Deal Flow Study

April 2021

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CEO's Message

The Alberta tech and venture capital industry has demonstrated encouraging signs of growth and maturation over the last two years, with record-breaking venture capital investment, and a significant increase in the number of technology companies operating in the province with more than 3,000 companies identified in this study. These critical milestones signal Alberta's future is bright. Investors are noticing the exciting opportunity to invest in Alberta's founders and the innovative companies they are building.

Alberta Enterprise Corporation (AEC) is helping to build a thriving and sustainable technology industry in Alberta, one that encourages diversity and inclusion, and that aims to change the way Alberta is perceived on the global stage. We encourage home-grown innovation and create greater access to venture capital for technology entrepreneurs.

While deal flow is a key indicator of a thriving technology ecosystem, it is often difficult to track and there is limited data available. To bridge this knowledge gap, and to provide deeper insight into the deal flow landscape in Alberta, AEC commissioned this study to build upon the 2012, 2016 and 2018 reports. The study offers invaluable insights on the participants, types of companies, funding, founder makeup and more.

The Alberta technology industry is showing exciting signs of maturity with almost 40% of Alberta tech companies exceeding annual revenues of $1M, a 66% increase since 2018! Alberta tech startups are also more likely than ever to receive funding with over 57% having undergone one or more rounds of fundraising and 43% having raised at least $US1 million to date.

The makeup of Alberta deal flow could be surprising to some, as 67% of Alberta companies are developing a software solution. Companies are also integrating digital technologies like Artificial Intelligence and Machine Learning (36%) and big data (27%) into their products and services. These are encouraging figures, reflecting Alberta's notable strength in Artificial Intelligence and Machine Learning, including Reinforcement Learning.

Female participation in Alberta's technology companies is staying strong with the proportion of female tech founders remaining at almost 30%, a trend consistent with the 2018 study. Alberta's female participation at the founder and co-founder level leads globally when compared to Crunchbase's 2020 report which found that 20% of global startups were female founded.[1]

Thank you to all the contributors, partners and organizations who not only made this study possible but work tirelessly day in and day out to improve the startup and venture capital ecosystem in Alberta. We hope the findings are valuable in your endeavours and help your organizations continue to support, fund and scale promising Alberta technology companies.

Kristina Williams
President & CEO, Alberta Enterprise Corporation

1 Crunchbase EoY 2019: Funding to Female Founders, Crunchbase, https://about.crunchbase.com/wp-content/uploads/2020/03/Funding-To-Female-Founders_Report.pdf, January 21, 2020.

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Executive Summary

The Alberta Tech Deal Flow Study is the most comprehensive view of technology-based companies in Alberta and is made possible by the contributions from tech companies, venture capital and angel investors, and service providers across the province. In 2021, we saw a significant increase in the number of submissions to the study which provided more context and accuracy than prior studies. We were excited to co-author the study with the same team who produced the PwC MoneyTree Canada Report, leveraging the significant subject matter expertise and additional networks of the PwC Canada team.

We augmented the 2021 Deal Flow Study methodology to uncover a more well-rounded view of the innovation ecosystem in Alberta. This enhanced methodology will provide more in-depth findings on the tech companies and their unique attributes across verticals, stages, and other dimensions.

A total of 3,083 tech companies were identified as meeting the criteria for the study, this result demonstrates a 149% increase over the 1,238 companies identified in 2018. In comparison to the 927 companies identified in 2012, we can observe a steep increase in the number of startups being created and enduring in our province. Calgary-based companies accounted for 58% (1,776) of tech companies identified compared to Edmonton which accounted for 30% (918) and other regions in Alberta which accounted for almost 13% (389).

Business-to-business (B2B) was found to be the most attractive business model to survey respondents (72%), and as software continues to be the leading enabling technology in a company's offering, utilized by 67% of the tech deal flow, we know that Alberta boasts a strong contingent of enterprise software companies. Companies identified their target customer industries being primarily concentrated in professional and other services (34%), followed by other industrials (23%) and energy and mining (15%).

The survey results suggest that Alberta's technology sector is becoming more mature and established, with almost 40% of the startups surveyed in the 2021 Deal Flow Study reporting greater than $1M in annual revenue (a 66% increase over 2018!). Further evidence of this steady growth is that while 43% of Alberta's technology startups are at the Pre-Seed or Seed stage, almost a quarter of Alberta startups have raised a Series A or later stage of financing. Through integration of the Startup Commons Development Phases into this year's study, we also found that over half of companies are at the Scaling Stage, while 29% are Validating, demonstrating that companies are moving into later stages of development beyond the Ideating, Concepting and Committing stages.

The static snapshot in time which the 2021 Alberta Tech Deal Flow Study provides can be further built upon with real-time data on the StartAlberta.com Deal Flow Platform, operated by the Venture Capital Association of Alberta (VCAA) and the A100, and supported by a consortium of ecosystem partners.

The 2021 Alberta Tech Deal Flow Study was made possible due to input from Alberta's tech and venture capital firms and numerous organizations that make up the Alberta ecosystem. Alberta Enterprise expresses its thanks to Alberta Enterprise portfolio venture capital funds, Western Economic Diversification Canada (WD), and to all those that contributed. We hope the study findings continue to be useful in supporting the growth of Alberta's technology sector.

Christiana Manzocco
Director, Industry Development, Alberta Enterprise Corporation

1 Introduction

1.1 Study Background and Objectives

Alberta Enterprise Corporation periodically produces an Alberta Deal Flow Study. The objective is to provide stakeholders with a shared understanding on the strength and make-up of technology deal flow across sectors, stages and regions in Alberta. The Deal Flow Study provides a leading yardstick for measuring the health, growth and composition of the Alberta technology and innovation sector. Previous Deal Flow studies were completed in 2012, 2016 and 2018 and were made possible due to the collective support from Alberta's tech firms and numerous organizations that make up the Alberta ecosystem.

Insights gleaned from the Alberta Deal Flow Studies also inform Alberta Enterprise's investment focus and industry development priorities and activities, as well as serve as a valuable benchmark for comparison to previous Deal Flow Studies in measuring the progress and maturity of the Alberta tech industry.

This year, PricewaterhouseCoopers LLP ("PwC") was commissioned by Alberta Enterprise Corporation to conduct this study of the technology industry in Alberta for 2021 (the "2021 Study").

1.2 Approach Overview

The 2021 Study was conducted by PwC in four major stages. The updated 2021 Deal Flow Study Methodology is explained in further detail in Appendix B Detailed Approach.

Stage 1 - Scoping and criteria development

For the purpose of this study, technology industry was defined to include software, hardware, equipment, devices, chemicals, health or life science product or service, and any product or service offerings that require development and / or research (but excluding value added resellers, integrators, distributors and resellers of high technology products manufactured by others).

The North American Industry Classification System (NAICS) was used to classify the identified companies' industry of operation.[2]

Stage 2 - Criteria and mapping

A list of candidate technology companies was compiled according to a number of company attributes, including location of headquarters, product offering and industry classification.

Stage 3 - Company screening and verification

Companies relevant to the 2021 Study were verified according to a number of attributes:

- Headquartered in Alberta
- Privately held
- Produced a tech based product or service
- Industry classification that does not include retailers, wholesalers, resellers and distributors.

Stage 4 - Detailed survey of sample companies

The last stage of the study was an in-depth survey of Alberta's tech sector. To this end, an online questionnaire was distributed to companies that meet the verification criteria.

Unless otherwise noted, all dollar amounts in this report are expressed in Canadian currency. Percentages presented in this report are rounded for simplicity.

Overall, 3,083 technology companies were found to be operating in Alberta in 2021 (referred throughout the report as "Identified Companies"), compared to 1,238 identified companies in 2018. The survey was completed by 350 in 2021, compared to 208 companies in 2018. Companies' whose details were captured in the detailed survey work are referred to in this report as "Survey Respondents".

Headquarters Location	Identified Companies	Companies Completing Online Survey
Calgary	1,776	217
Edmonton	918	123
Other Alberta	389	10
Total	**3,083**	**350**

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2 See https://www23.statcan.gc.ca/imdb/p3VD.pl?Function=getVD&TVD=1181553 for details about NAICS

2 Alberta's Technology Sector

This section provides an overview of Alberta's technology sector, including an industry and regional breakdown of the identified companies.

2.1 Overview of Alberta's Tech Companies in 2021

Based on the criteria used in this study, **3,083 technology companies were found to be operating in Alberta in 2021 ("Identified Companies")**. The following sections present summary statistics related to the Identified Companies.

2.2 Trends Over Time

The 2021 Study identified 1**,845 more technology companies than in the 2018 Alberta Deal Flow study**. The figure below compares the number of Identified Companies in the 2021 Study with the 2018 Alberta Deal Flow Study, including the industry breakdown.

Figure 1: Number of Identified Companies by Year and Industry Classification
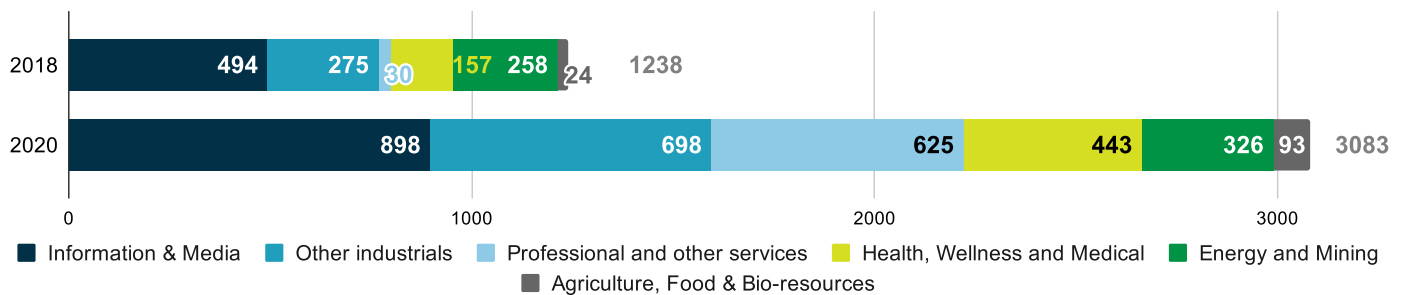
Note the industry classifications used in 2018 do not correspond to those used in the 2021 Study - we have assigned the 2021 classifications using best possible approximation.

Figure 2: Number of Identified Companies by Year and Headquarters Location
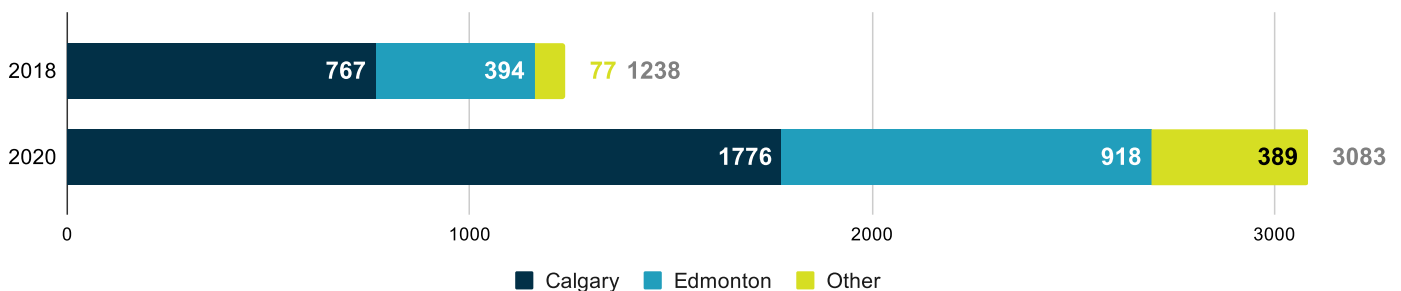
It should be noted that the regional and industry distribution of the technology companies in the 2021 Study is similar to the distribution in previous studies.

Several factors can explain the significant increase in the number of Identified Companies in the 2021 Study compared with the 2018 study, including:

- Use of same as well as additional data sources
- Broader industry classification used in 2021, and
- Organic growth of the technology industry in Alberta.

Refer to Appendix C for a more detailed explanation.

2.3 Regional Breakdown

Most Identified Companies are headquartered in **Calgary and Edmonton** - together, **these two cities account for approximately 87% of all Identified Companies in the list.**

Other cities within Alberta with Identified Companies' headquarters include Red Deer and Lethbridge, each accounting for approximately 1% of all identified companies. Other cities account in total for 10% of all Identified Companies' headquarters.

Calgary and Edmonton account for a vast majority of Identified Companies' headquarters locations regardless of the industry classification, though some differences exist. For example, 60% of Energy and Mining companies are headquartered in Calgary and 24% in Edmonton. In the case of the Health, Wellness and Medical Industry, Calgary accounts for 56% of the companies headquarter locations, while Edmonton for 30%.

Figure 3: Regional Breakdown and Top Industries

Other Alberta:
389 companies

12.6%

Information & Media - 29.6%
Other industrials - 23.1%
Professional and other services - 20.1%

Edmonton Region:
918 companies

29.8%

Information & Media - 29.5%
Other industrials - 22.4%
Professional and other services - 20.4%

Calgary Region:
1,776 companies

57.6%

Information & Media - 28.8%
Other industrials - 22.6%
Professional and other services - 20.3%
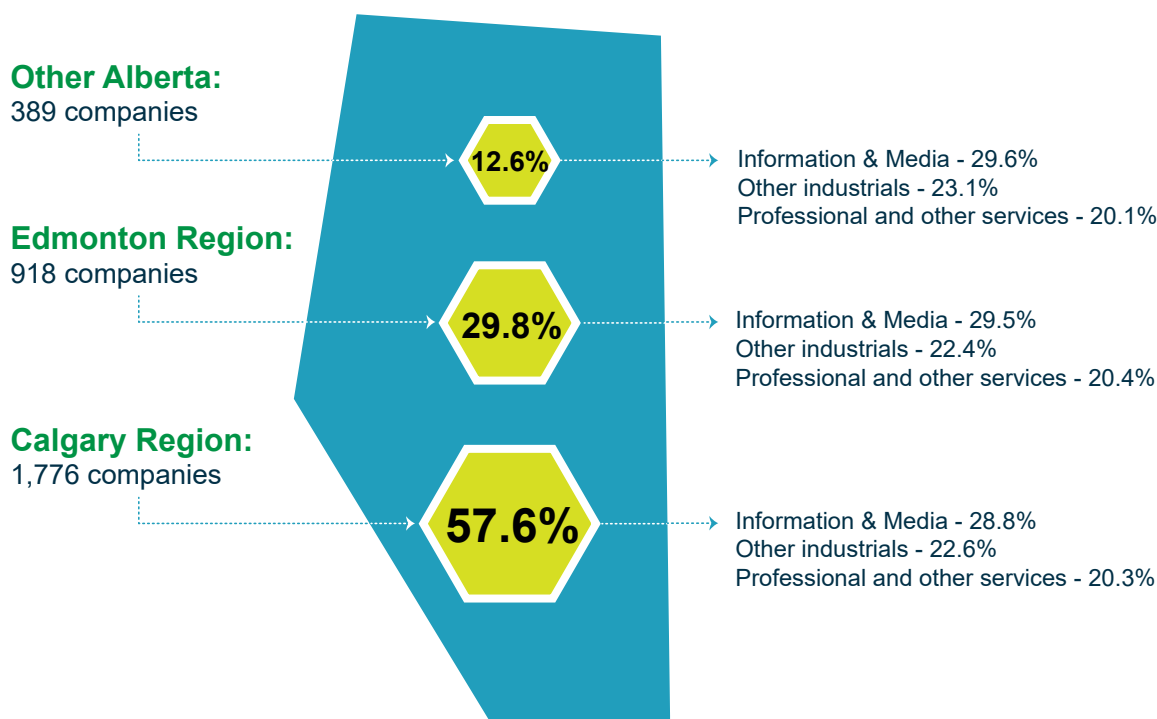
Compared to the 2018 Study, the share of companies headquartered in Calgary and Edmonton has decreased (62% in Calgary and 32% in Edmonton in 2018), while the proportion of companies headquartered elsewhere in Alberta has increased in 2021 (6% in 2018).

Figure 4: Number of Identified Companies by Industry Classification and Headquarters Location

Industry	Calgary	Edmonton	Other	Total
Information & Media	512	271	115	898
Other industrials	402	206	90	698
Professional and other services	360	187	78	625
Health, Wellness and Medical	249	135	59	443
Energy and Mining	196	97	33	326
Agriculture, Food & Bio-resources	57	22	14	93

■ Calgary ■ Edmonton ■ Other
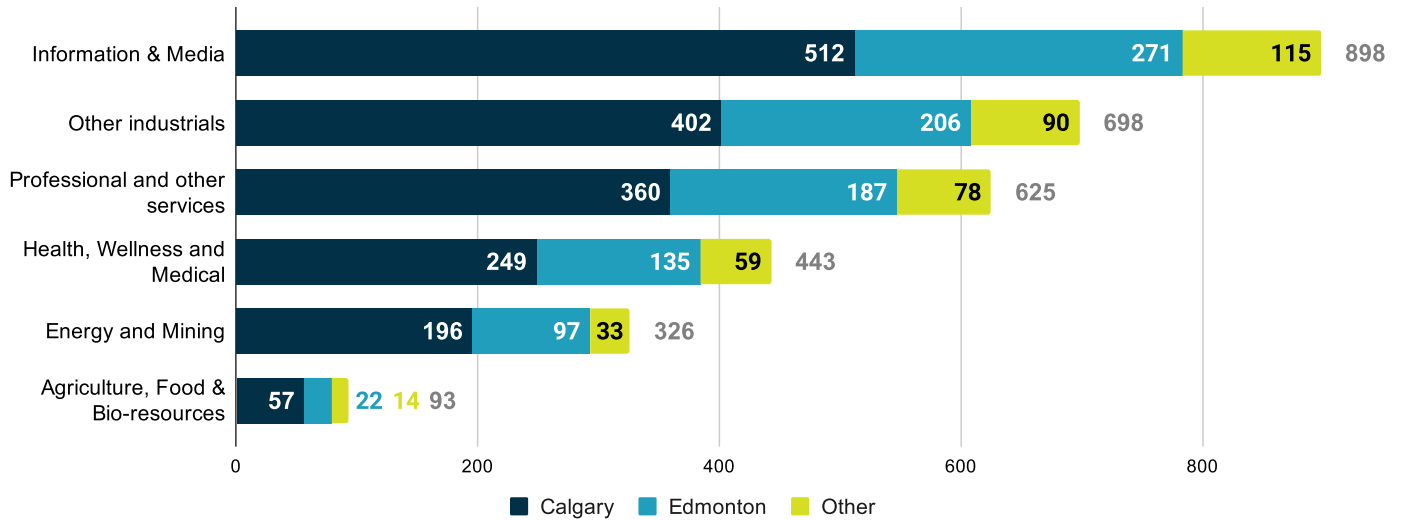
2.4 Industry Breakdown

Most of the Identified Companies operate in the **information & media industry** (29%), followed by **industrials** (23%), **professional and other services** (20%), **health and life sciences (**14%), **energy and mining** (11%), and **agriculture, food & bio-resources** (3%).

Each summary industry classification comprises multiple sub-industries. The following figures show the number of companies by detailed industry classification.

Figure 5: Percentage of Identified Companies by Summary Industry Classification

Agriculture, Food & Bio-resources
3.0%

Energy and Mining
10.6%

Health, Wellness and Medical
14.4%

Professional and other services
20.3%

Information & Media
29.1%

Other industrials
22.6%

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Information & Media

- Software publishing
- Data processing, hosting, and related
- Internet broadcasting and web search
- Communications
- Arts and Entertainment
- Publishing
- Media
- Broadcasting

Other industrials

- Manufacturing
- Non-energy utilities
- Internet and Telecommunications Infrastructure
- Construction
- Transportation
- Infrastructure

Professional and Other Services

- Management
- Technical and scientific services
- Other services
- Education
- Financial services
- Waste management
- Real estate
- Insurance
- Legal

Health, Wellness and Medicare

- Hospitals and health care delivery
- Health IT and analytics
- Pharmaceuticals
- Medical devices
- Medical devices - diagnostics
- Natural and conventional health and wellness goods and services
- Medical devices – therapeutics

Energy and Mining

- Conventional and alternative energy extraction
- Supply and transmission
- Mining

Agriculture, Food & Bio-resources

- Agriculture
- Food processing and manufacturing
- Forestry

3 Technology Founders and Employees

3.1 Overview

Company's characteristics presented in this and the following sections are based on the detailed survey results.

Average founder age is 43, while 58% of founders are between the ages of 31 and 50.

85% of companies have between one and three founders, and 75% have fewer than 25 employees.

87% of founders have technical backgrounds.

68% of founders have previous experience in establishing a startup.

27% of surveyed companies have at least one founder who identifies as a female.

50% of startups have at least one founder who identifies as a visible minority and 4% identify as Indigenous.

3.2 Founders

The average founder age at 43 is the same as in the 2018 Study. Over 35% of founders are age 51 and above.

Figure 7: Average Age of Founders

Age	Percentage
Less than 20 years	0.6%
20 to 30 years	5.2%
31 to 40 years	27.8%
41 to 50 years	30.4%
51 to 60 years	20.9%
61 to 70 years	10.3%
Not sure / Prefer not to say	4.9%
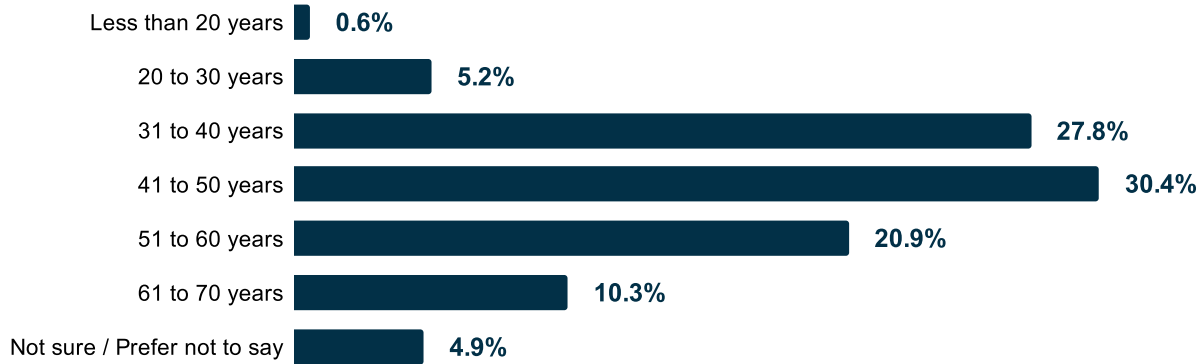
The vast majority of Survey Respondents have either one (22%) or two founders (41%). Only one in twenty companies were founded by five or more people.

Figure 8: Number of Founders

Number of Founders	Percentage
Five or more	5.0%
Four	9.0%
Three	22.0%
Two	41.0%
One	22.0%
Not sure / Prefer not to say	1.0%
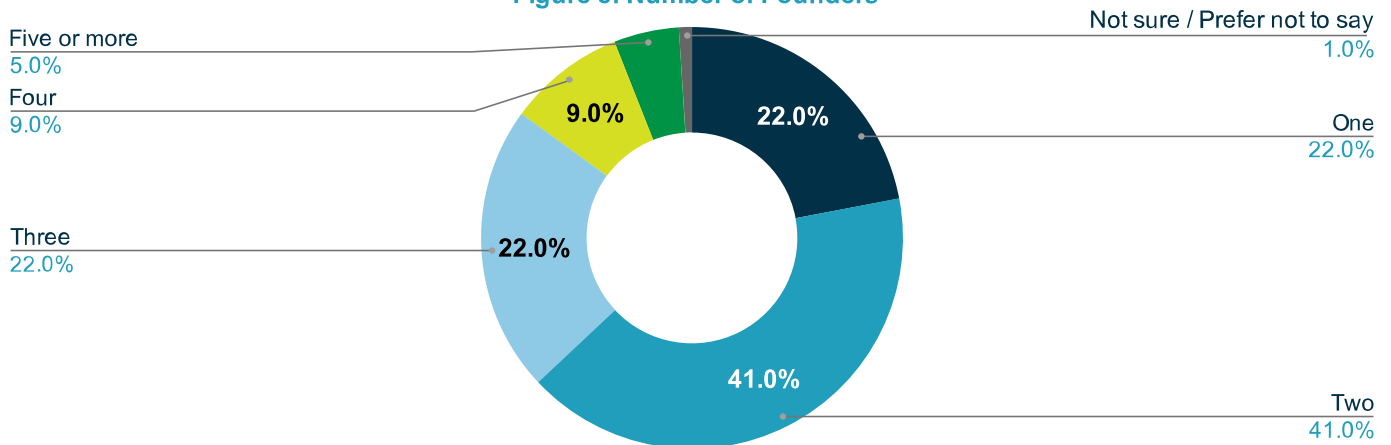
Technical backgrounds (87%) and previous startup experience (68%) are common characteristics of founders.

Figure 9: Founders' Technical Background and Previous Startup Experience

Do founders have a technical background?

■ Yes ■ No ■ Not sure / Prefer not to say

%	86.8% 12.1% 1.1%

0.0%   25.0%   50.0%   75.0%   100.0%

Do founders have previous experience with a startup?

■ Yes ■ No ■ Not sure / Prefer not to say

%	67.9% 29.8% 2.3%

0%   25%   50%   75%   100%

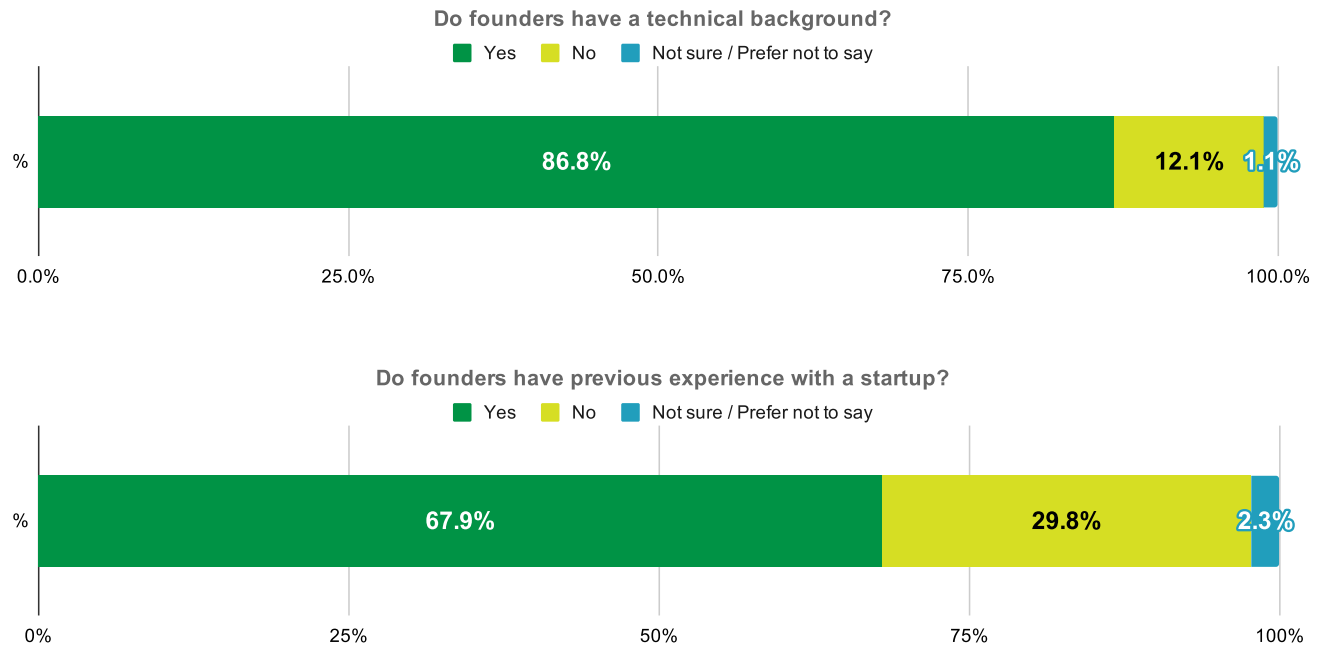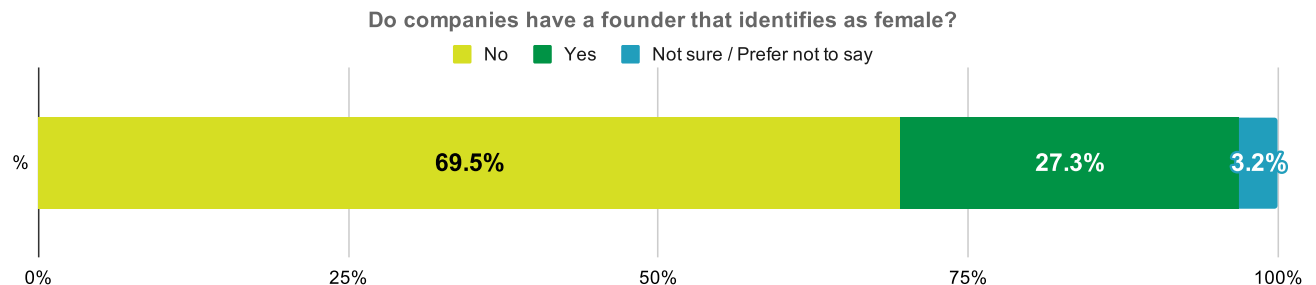27% of Survey Respondents have at least one female founder, which is materially the same as the 2018 study. We note that this is 11.4 percentage points higher than the share of women majority owners of Small Medium Enterprises in Canada (15.6%), according to a recent Women Entrepreneurship Knowledge Hub report.[3]

Additionally, an End of Year Diversity report by Crunchbase found that 20% (7 percentage points below our findings for Alberta) of global startups have at least one female founder.

- Furthermore, Survey Respondents with at least one female founder are more likely to have been established over the last 2 years (26% of companies with at least one female founder compared to 18% of companies with no female founder)

Figure 10: Founders' Female Representation

Do companies have a founder that identifies as female?

■ No ■ Yes ■ Not sure / Prefer not to say

%	69.5% 27.3% 3.2%

0%   25%   50%   75%   100%

3 https://wekh.ca/the-state-of-womens-entrepreneurship-in-canada-2020/

3.3 Employees

The most common company size is between 1 and 4 employees (33% of all Surveyed Companies, a decrease of 7 percentage points from 2018) and almost three quarters (74%) of Surveyed Companies have less than 25 employees. Compared to the 2018 Study, there has been a significant increase in the share of companies with 25 to 49 employees (13% in 2021 vs. 6% in 2018).

Survey Respondents with 1-4 employees tend to have:

- Been founded in the last three years (45%)
- Raised less than $US500k since their establishment (68%)
- Obtained less than $500k (CAD) in annual revenue in previous fiscal year (80%)
- Have founders with a technical background (92%)
- Have founders with previous experience (78%)
- Have at least one founder that self identifies as female (34%)

Survey respondents with 5-49 employees tend to:

- Have raised more than US$1M in funding to date
- Be in the scaling or establishing phases (73% of these companies are in one of these phases)
- Have annual revenue in their last fiscal year of between $500k - $10 million (55%)

Survey Respondents with 50-99 employees tend to have:

- Been founded before 2007 (50%)
- Raised more than US$5M since their establishment (41%)
- More than US$10 million in annual revenue (41%)

Figure 11: Company Size
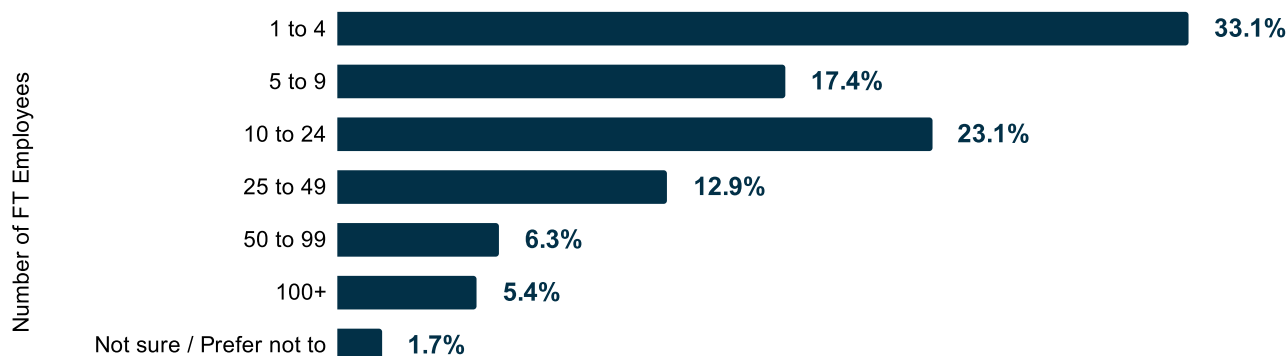
23% of Survey Respondents have 41% or more employees who self-identify as females.

Figure 12 shows the breakdown of the Surveyed Companies by the percentage of their employees that self-identify as female. In the figure, each bar shows the percentage of companies with a given share of employees who self-identify as female. For example, 15.5% of Surveyed Companies have between 41% and 50% of such employees.

Figure 12: Share of Employees who Self-Identify as Female
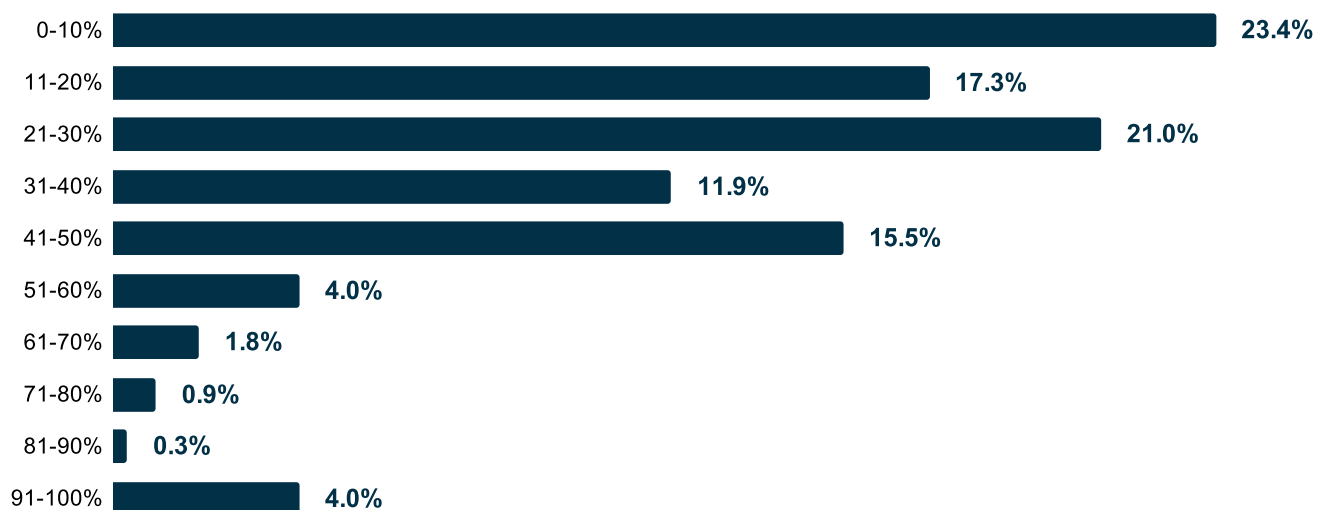
Share	Percentage
0-10%	23.4%
11-20%	17.3%
21-30%	21.0%
31-40%	11.9%
41-50%	15.5%
51-60%	4.0%
61-70%	1.8%
71-80%	0.9%
81-90%	0.3%
91-100%	4.0%

4 Operations

4.1 Overview

This section summarizes operational characteristics of the Survey Respondents.

Half of companies were founded between 2015 and 2020, with 7% of them in 2019 and 14% in 2020.

Survey Respondents that achieved profitability within 2 years have relatively more female founders, compared to overall companies, with 35% of them having at least one founder that identifies as female.

29% of Survey Respondents are in the Validation Phase, 51% are working on Scaling and 12% are Establishing their product.

72% of Survey Respondents identify business-to-business (B2B) as their primary business model.

67% of Survey Respondents utilize Software in their product or service offering, while almost 40% rely on Artificial Intelligence or Machine Learning.

65% of companies consider themselves startups.

4.2 Company Characteristics

65% of Survey Respondents are startups, while half of all
Survey Respondents were founded between 2015-2021.
Among mature companies, 56% were founded before 2005.

Figure 13: Share of Startup Companies

Is Company a Startup?

■ Yes   ■ No   ■ Not sure / Prefer not to say

65%	30%	5%

0%   25%   50%   75%   100%

Figure 14: Founding Year

Year	%
2005 or earlier	21.3%
2006-2011	17.0%
2012-2016	25.9%
2017	6.9%
2018	8.9%
2019	6.6%
2020	13.5%
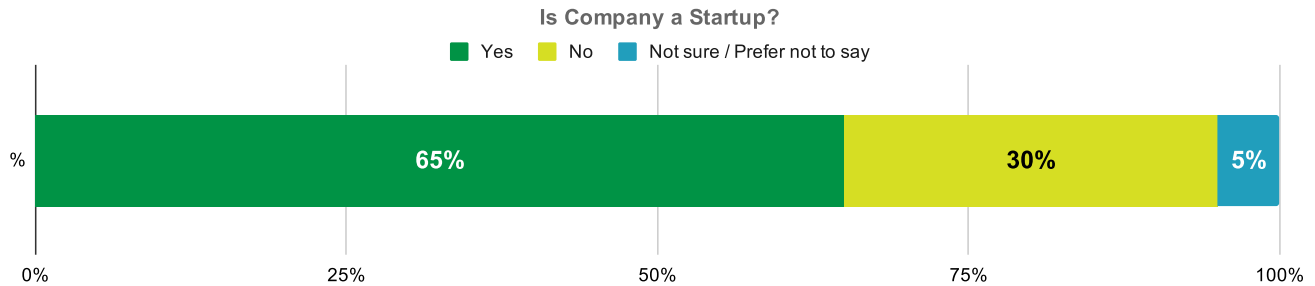
64.2% of companies were founded in 2016 or earlier
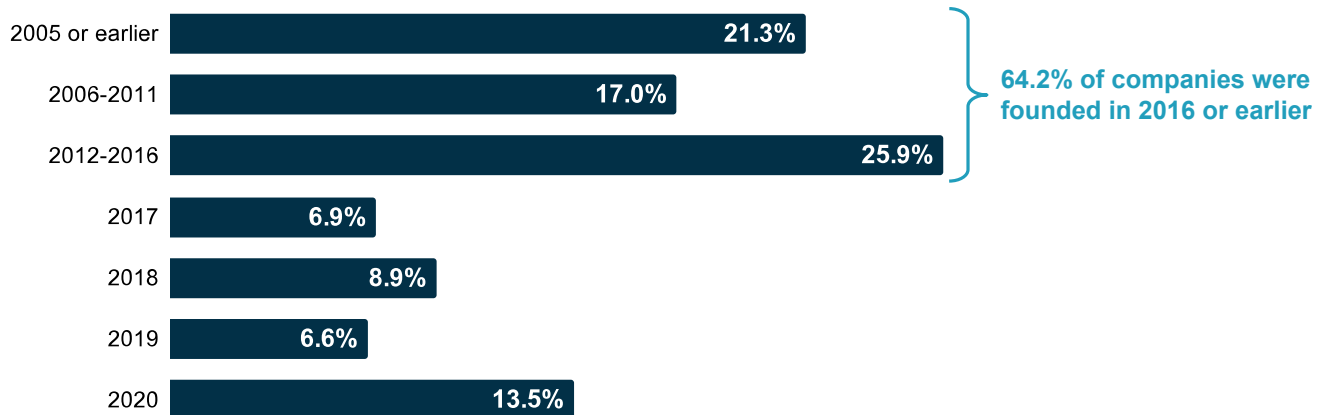
Survey Respondents are concentrated in Calgary (62%)
and Edmonton (35%). Compared to the 2018 survey results,
a greater proportion of companies are headquartered
in Calgary (+7 percentage points), and there are less in
Edmonton (-6 percentage points).

Figure 15: Headquarter Locations

Other AB
3.7%

Edmonton Region
34.6%

34.6%

61.7%

Calgary Region
61.7%
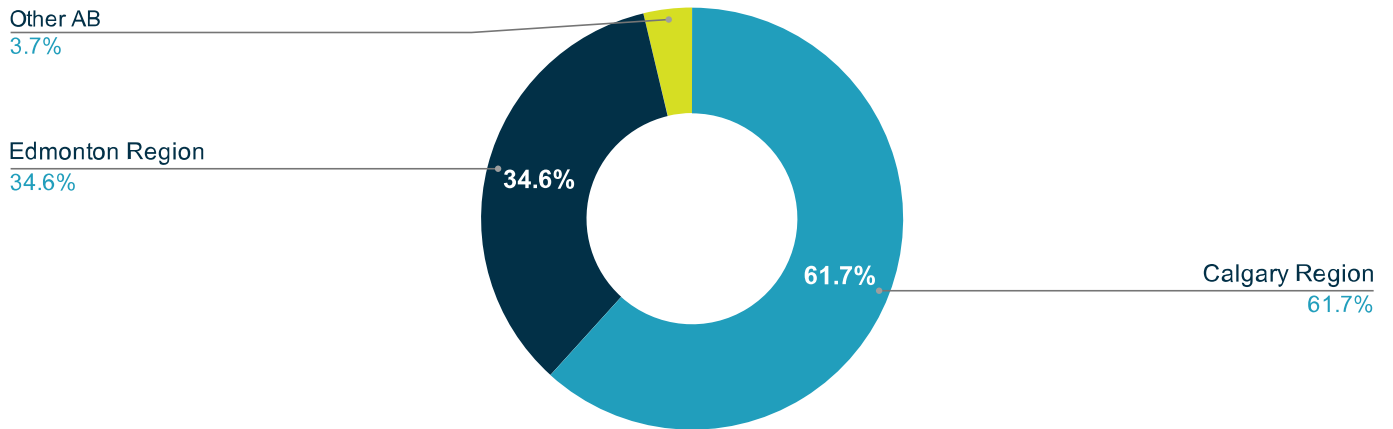
18% of Survey Respondents are spun-off of academic research. These companies tend to:

- Be located proportionately more in Edmonton (44%)
- Produce an innovative physical product (44%)
- Have founders with a technical background (94%)

Figure 16: Spin-Offs of Academic Research

■ Yes ■ No ■ Not sure / Prefer not to say

% | 18% | 80% | 2%

0%   25%   50%   75%   100%
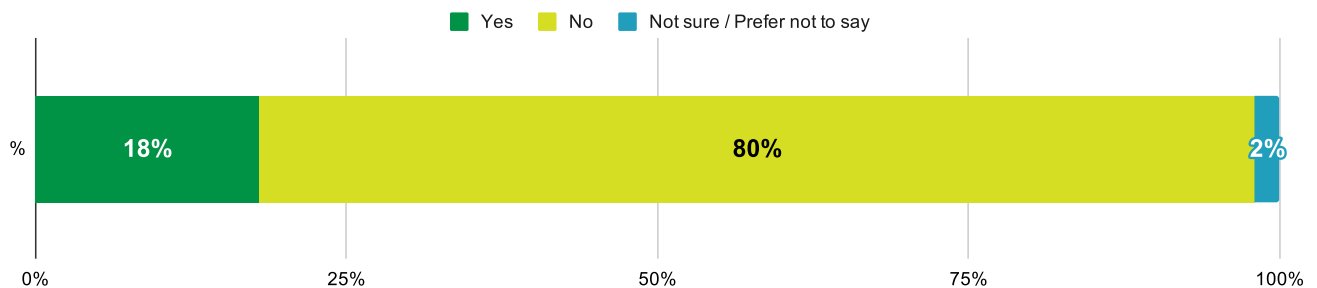
79% of Survey Respondents report not being involved in any transactions, such as mergers or acquisitions in the past 24 months. Of those that have been involved in transactions, 47% report being the acquirer and 38% report being the target of an acquisition.[4]

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4 Note that these transactions exclude fundraising.

The majority of Survey Respondents build their own product or service (54%) or combine outsourcing with building its own product (39%). Only 6% of Survey Respondents exclusively outsource the product or service development.

Survey Respondents that exclusively outsource development tend to have:

• 1-4 employees (71%)
• Annual revenue in the most recent fiscal year of less than $500k (CAD), including being pre-revenue (85%)

Survey Respondents that exclusively build their products in-house tend to have

• Between 10-100 employees (54%)
• More than $1 million in revenue (CAD) (51%)

Figure 17: Product Building and Outsourcing

Who develops the product?

Outsourcing
6.0%

Not sure / Prefer not to say
1.1%

A mix of both
38.6%

38.6%

Building our own product in-house
54.3%

54.3%
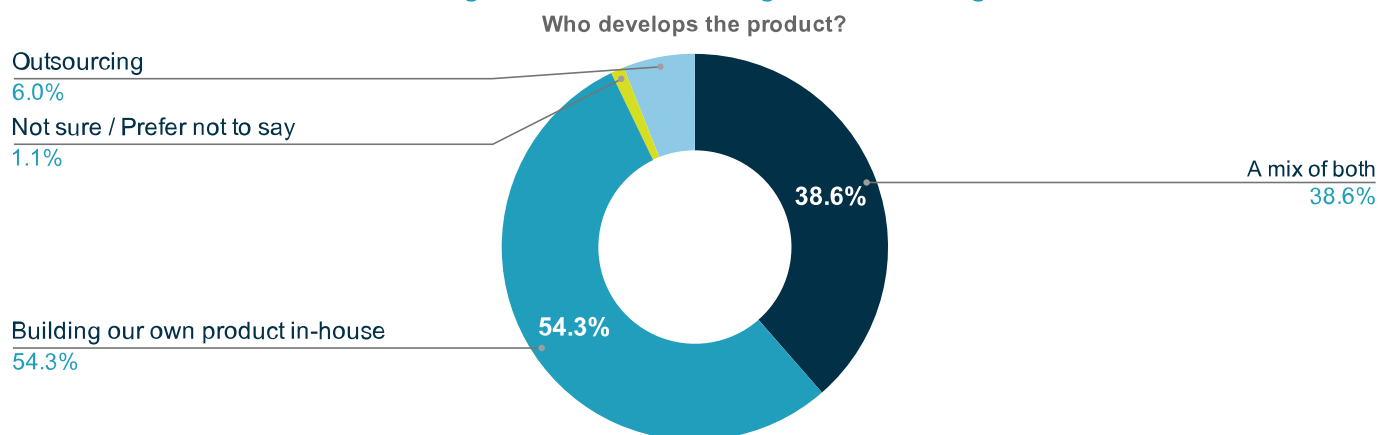
4.3 Products and Services Offered

Company's products or services have a number of potential impacts on consumers, with ultimate outcomes and benefits of business productivity (68%) and cost savings (66%) the most common impacts. This year, we adapted our methodology to include Environmental, Social and Governance (ESG) impacts which startups strived to deliver in their product or service offerings, with 39% Survey Respondents having an Environmental Benefit, 45% having a Social Benefit, and 17.5% having a Governance Benefit.

Figure 18: Impact of Company's Product

Impact	Percentage
Business Productivity	67.5%
Cost Savings	66.4%
ESG Impact - Social benefits	44.8%
ESG Impact - Environmental benefits	39.1%
ESG Impact - Governance benefits	17.5%
Other	13.8%
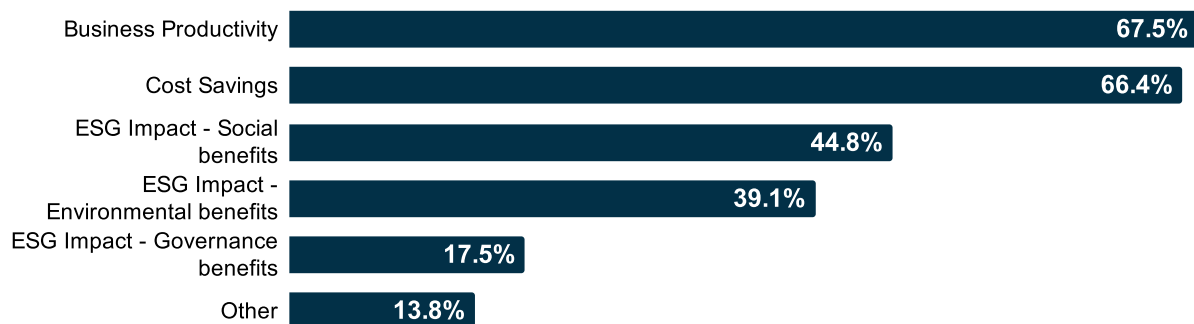
Impacts add up to more than 100% as company products may have multiple impacts.

60% of Survey Respondents develop either an innovative service (31%) or physical product (21%), with a further 29% developing a combination of the two.

Figure 19: Product or Service Developed

Other Innovation
4.3%

An existing product or service made or delivered in a new way
15.2%

15.2%

30.7%

Innovative Service
30.7%

Combination of an innovative physical product and service
29.0%

29.0%

20.7%

Innovative Physical Product
20.7%
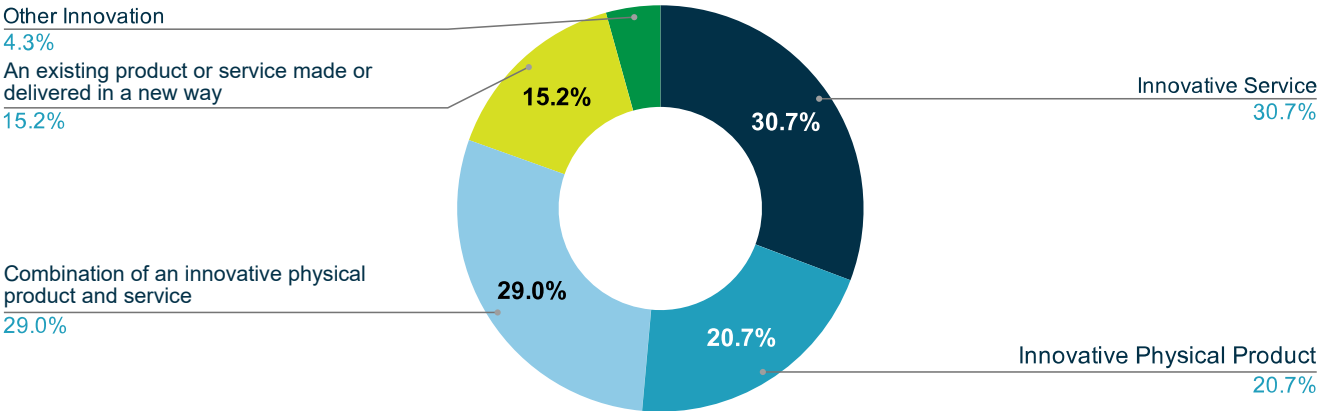
67% of Survey Respondents are utilizing Software in their product or service offering and further 36% are relying on Artificial Intelligence or Machine Learning. Big data is utilized by 27% of all Survey Respondents and hardware by 25%.

Figure 20: Technology Utilized in Company's Offering

Digital Innovation	35%
Physical Innovation	20%
Innovation in Business/ Product Design	23%
Hybrid/Other	9%
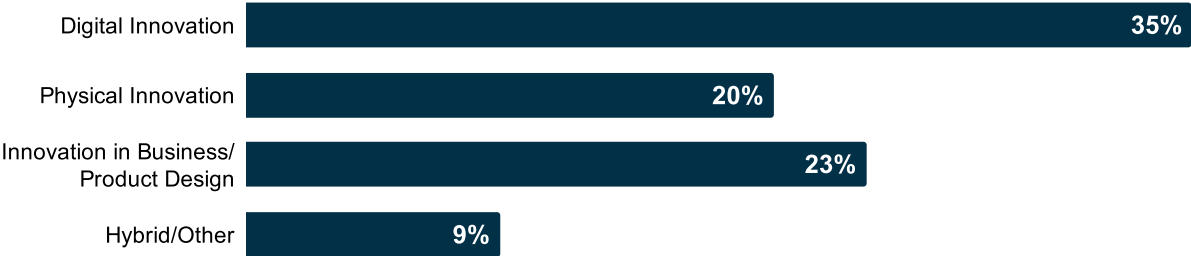
Figure 21: Breakdown of Digital Innovation Technology Utilized in Company's Offering

- Software: 66.8%
- AI/ML: 36.4%
- Big Data: 26.6%
- Blockchain: 4.3%
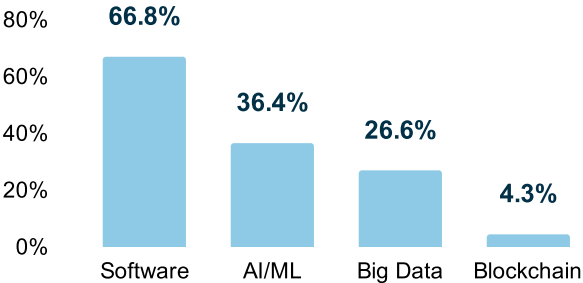
Adds up to more than 100% as companies may utilize more than one technology

Figure 22: Breakdown of Physical Innovation Technology Utilized in Company's Offering

- Hardware: 25.2%
- Chemistry/ Biology: 14.3%
- Materials: 12.0%
- Medical Devices: 11.2%

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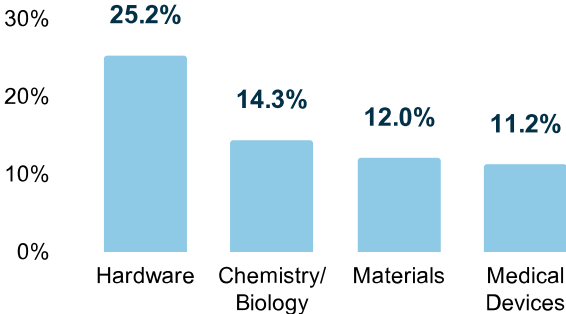
This year, the framework for classifying startup development phases developed by Startup Commons was used. Over half of Survey Respondents are Scaling with almost 30% in the Validating stage and 12% in the Establishing stage.[5] Refer to the glossary for the definition of each stage.

Figure 23: Product or Service Development Stage

Stage	Percentage
-2 Ideating	0.3%
-1 Concepting	3.4%
0 Committing	3.7%
1 Validating	28.6%
2 Scaling	50.9%
3 Establishing	11.7%
Other	1.4%
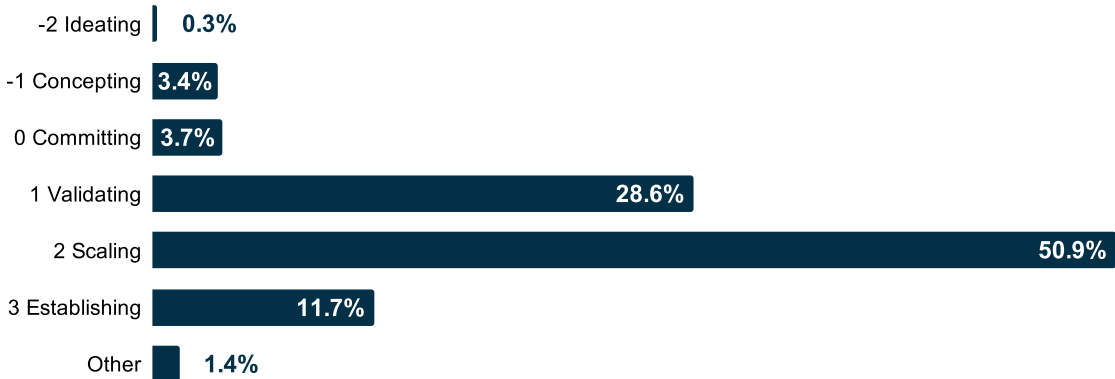
There is a positive relationship between the development stage of a product and the amount of funding raised to date: more advanced companies in terms of their product development tend to have accumulated more funding.

A similar trend is visible when looking at revenues in the last fiscal year: 71% of Survey Respondents in the Establishing Stage and 47% of Survey Respondents in the Scaling Stage had revenues of greater than $1 million.

Figure 24: Product Development Stage by Amount of Funding Raised

Stage	Less than 500k in Funding	More than $1M in Funding
-2 Ideating	100.0%	0.0%
-1 Concepting	100.0%	0.0%
0 Committing	53.8%	15.4%
1 Validating	52.0%	36.0%
2 Scaling	34.8%	48.3%
3 Establishing	24.4%	41.5%
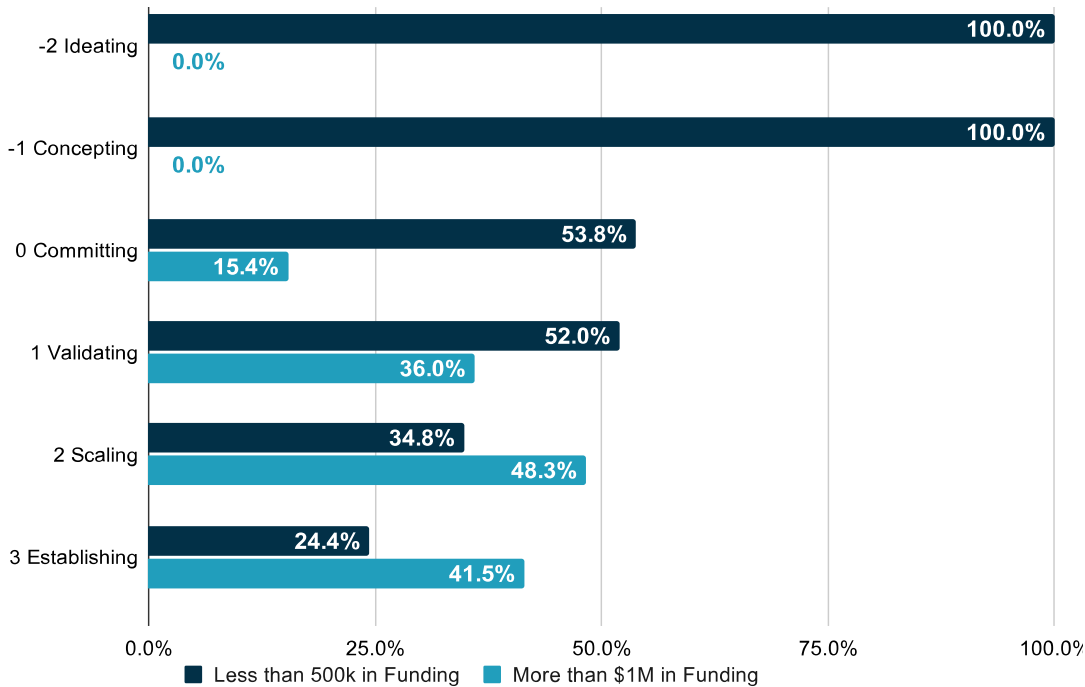
For example: 100% of companies in the Ideating phase have less than $US500k in funding and of companies in the scaling phase, 34.8% have less than $US500k in funding and 48.3% have more than $US1M in funding

5 https://www.startupcommons.org/startup-development-phases.html

Business-to-business (B2B) is the most common business model, with 72% of Survey Respondents using that business model. A higher share of companies offers their product or services to individual consumers (41%), compared to 38%

in 2018. Just over a quarter of Survey Respondents use the business-to-government (B2G) model, a 16 percentage point decrease compared to 2018, in which 39% of Survey Respondents use B2G.

Figure 25: Company's Business Model

Business Model	Percentage
B2B	71.6%
Two Sided (B2B and B2C)	24.1%
B2G	23.2%
B2C	16.9%

Does not add up to 100% as companies may use multiple business models.

Customers which Survey Respondents sell to are distributed primarily across the following industries: professional and other services (34%), followed up by other industrials (23%) and energy and mining (15%).[6]

- 55% of surveyed companies selling to the Health, Wellness, and Medical industry have not been profitable yet

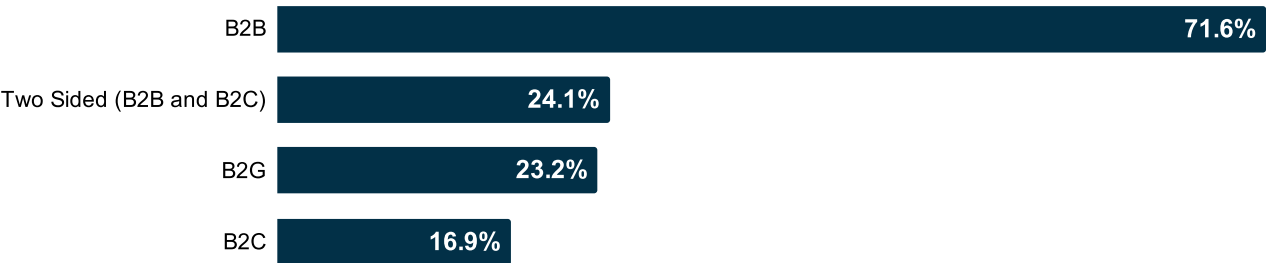- 62% of surveyed companies selling to the Energy and Mining industry have either not been profitable yet, or it took more than five years to become so

- 61% of surveyed companies selling to the Other Industrials industry have either not been profitable yet, or it took more than five years to become so

Figure 26: Target Customer Markets / Industries

Industry	Percentage
Health, Wellness, and Medical	8.3%
Agriculture, Food & Bio Resources	7.6%
Energy and Mining	15.2%
Other Industrials	22.6%
Information and Media	12.0%
Professional and Other Services	34.2%
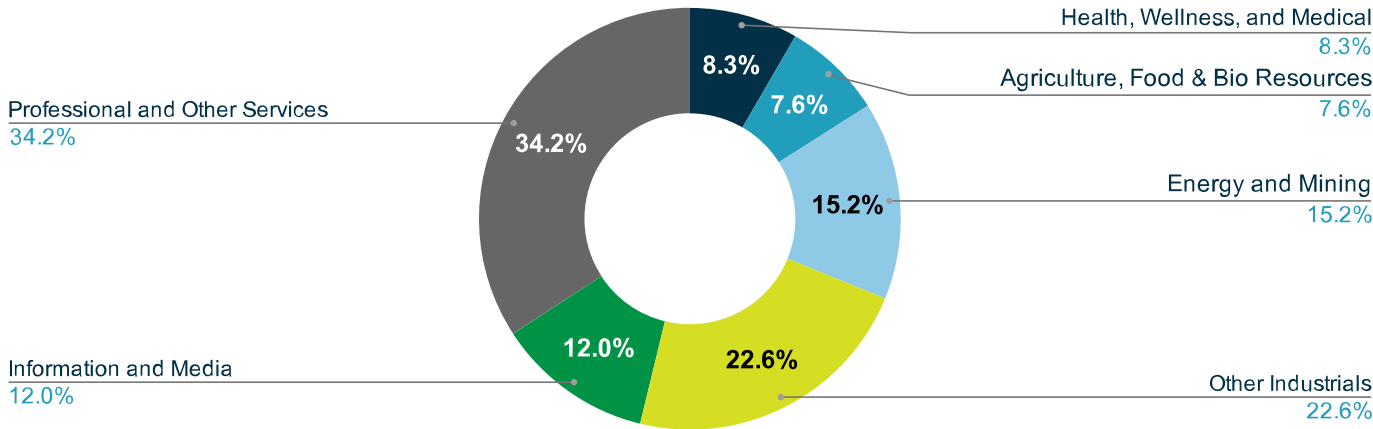
6 It should be noted that the above chart is not necessarily the percentages of Survey Respondents selling to each industry, but the percentage of total responses that each industry received. For example, the professional and other services industry is made up of various sub-industries, the most prominent five being technical and scientific services, financial services, public administration, management, and insurance and if more than one of those was selected by the respondent, then it would be counted as multiple responses for the overall professional and other services industry. Therefore, the graph above illustrates the percentage that each industry is sold to, as a proportion of total responses.

4.4 Exports

59% of Survey Respondents export their products, with 22% of companies exporting more than $1M. The USA is the most common location for exports (60%) while other popular jurisdictions include Europe (30%) and Asia (23%).

Figure 27: Value of Exports

41.4%	No exports
10.1%	<$100K
11.8%	$100K to $500K
5.9%	$500K to $1M
14.2%	$1M to $5M
7.4%	$5M+
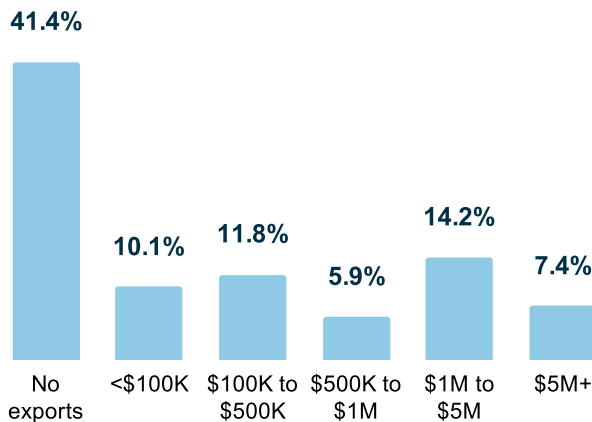
Figure 28: Location of Exports

60.3%	USA
32.9%	No Exports
29.2%	Europe
29.2%	Other/Not Sure
23.3%	Asia
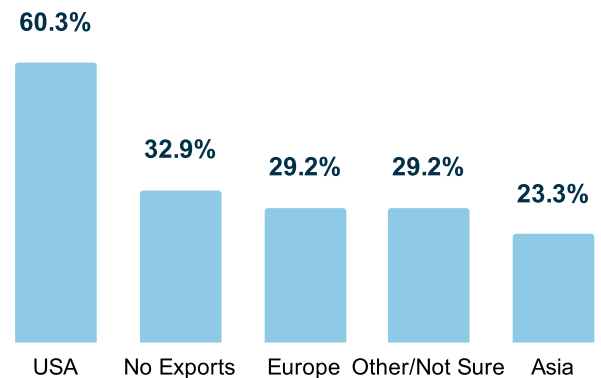
4.5 Challenges and Opportunities

Almost 60% of Survey Respondents indicated the Lack of Access to Capital / Funding as the biggest immediate challenge they are facing. 57% of the companies that selected this have been founded since 2015, and 83% of companies founded in 2021 selected Lack of Access to Capital / Funding as their biggest challenge. Compared to 2018, a lower proportion of companies have identified Access to Capital / Funding as one of the biggest challenges - in 2018, this challenge was identified by 63% of companies (5 percentage points higher than in 2021).

Market access (i.e. reaching customers and scaling sales) was identified as an immediate challenge by 45% of Survey Respondents.

Access to talent, including developing, acquiring and retaining teams remains a challenge, particularly in the case of sales (39%) and technical (36%) talent.

- There is some correlation between the challenges companies are facing and the amount they have raised: 55% of companies that cited Access to Capital / Funding as their biggest challenge have raised less than US$1M in funding to date.

Figure 29: Biggest Challenges Faced

Challenge	Percentage
Access to Capital / Funding	58.3%
Market Access	44.9%
Sales Team	38.9%
Technical Team	36.0%
Management Team	20.3%
Achieving Profitability	17.7%
Achieving Product - Market Fit	16.0%
Competition / New or Exisitng Market Entrants	10.9%
Other	6.3%
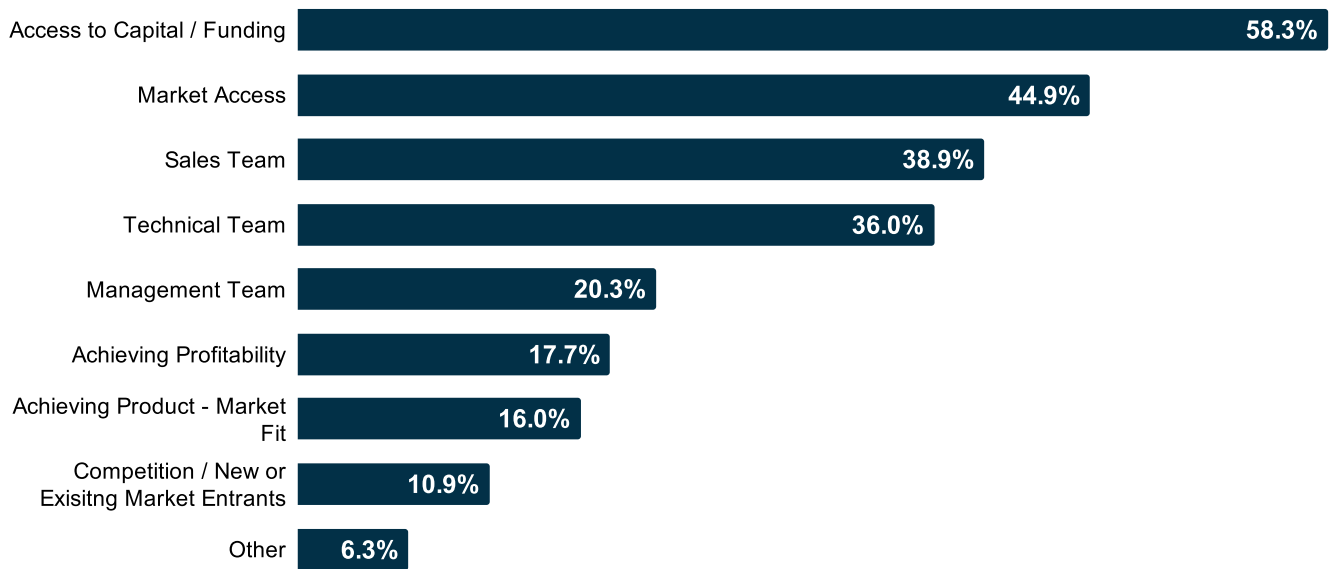
Accelerator programs were not heavily attended, with only 36% of Survey Respondents having participated in such a program. This is however an 8% increase from the 2018 study.

While the majority of Survey Respondents have not attended an accelerator program, 50% of the respondents claim they would participate if there was a program for their sector.

Figure 30: Accelerator Program Past Participation

Yes | No | Not Sure

Yes	No	Not Sure
36%	63%	1%
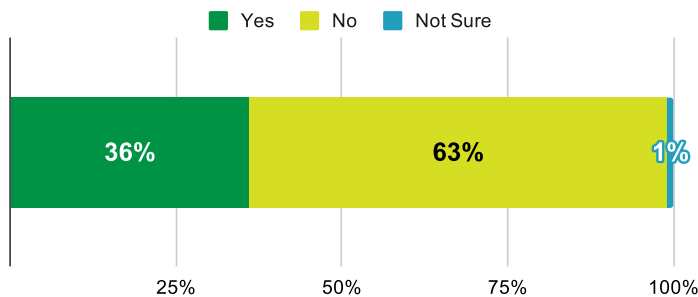
Figure 31: Interest in Potential Accelerator Programs
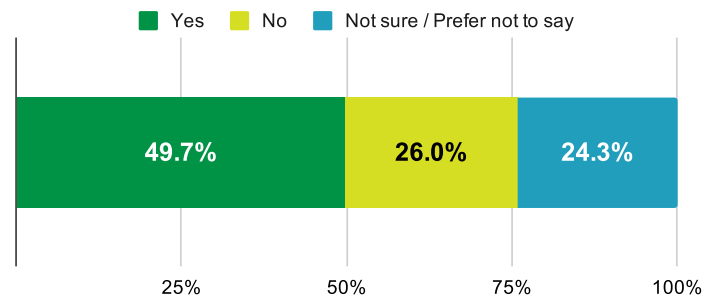
Yes | No | Not sure / Prefer not to say

Yes	No	Not sure / Prefer not to say
49.7%	26.0%	24.3%

5 The Resources

5.1 Overview

This section highlights revenues, profitability and funding characteristics of the the Survey Respondents

22% of Survey Respondents are in the pre-revenue phase, and 31% of companies had between $1M and $9.9M in revenue in their most recent fiscal year.

40% of Survey Respondents have achieved profitability, including 17% in the last two years. Moreover, 38% of Survey Respondents have revenues of more than $1M in their most recent fiscal year.

58% of Survey Respondents are currently seeking funding, a decrease from the 2018 study, in which 70% of companies were seeking funding.

Over 57% of the Survey Respondents have undergone one or more rounds of fundraising, and over 16% of companies have gone through more than three rounds.

43% of Survey Respondents have received at least $US1M in funding to date, an increase of 6 percentage points from the 2018 study.

53% of companies sourced their funding from Calgary, while the other key funding sources are Edmonton (32% of companies) and Canadian provinces outside of Alberta (34% of companies).

43% of Survey Respondents have achieved profitability, including 17% in the last two years.

- Survey Respondents that have yet to achieve profitability tend to have 1-4 employees (67%)
- Survey Respondents that achieved profitability within 2 years have a higher incidence of female founders, with 35% of them having at least one founder that identifies as

female. Of the companies that did not achieve profitability or took longer than 3 years to achieve profitability, only 26% had at least one female founder.

- 81% of companies founded in the last 2 years have not achieved profitability yet, compared to 21% of companies that were founded before 2014

Figure 32: Years to Profitability

Category	Percentage
It has not been profitable yet	50.1%
Less than 2 years	17.3%
2 to 4 years	8.9%
More than 4 years	17.3%
Not sure / Prefer not to say	6.3%
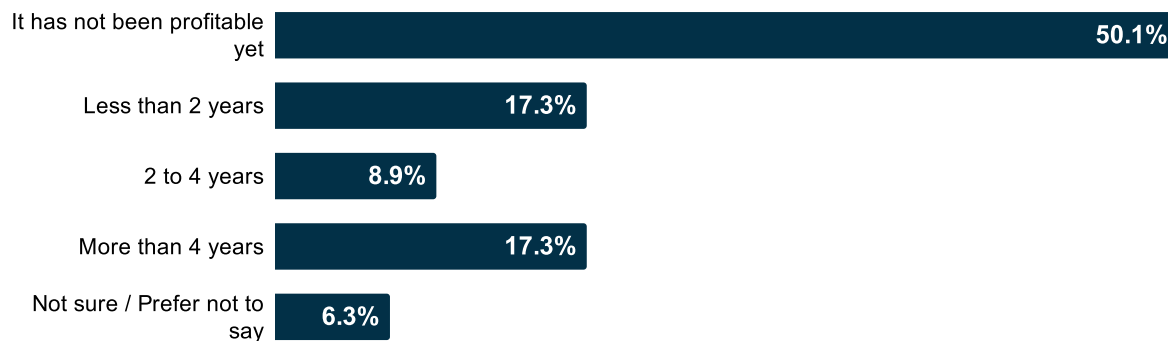
38% of Survey Respondents have revenues of more than $1M in their most recent fiscal year, representing a 15 percentage point increase from the 2018 study. Among these companies, 85% are in the Scaling or Establishing development phase.

Further insights into the data suggest that companies that achieve profitability within a relatively short period of time tend to raise less funding than companies that take a longer time to achieve profitability, as demonstrated below.

- 72% of surveyed companies that became profitable in less than one year have less than $US500k in funding to date, 41% of which have raised no funding at all.
- 64% of surveyed companies that have raised more than US$50M in funding to date have either not yet been profitable, or took more than five years to achieve profitability.

- Survey Respondents with revenues of greater than $15M tend to be:
  - Located in Calgary (80%)
  - Not classified as startups (95%)
  - Not a spin off of academic research (100%)
  - Founded before 2008 (90%)
- In comparison to the 2018 report:
  - Percentage of companies with less than $100K in revenue decreased by 8 percentage points (was 19% in 2018)
  - Percentage of companies with between $500k-$1M in revenue decreased by 6 percentage points (was 12% in 2018)
  - Percentage of companies with revenues of more than $1M increased by 15 percentage points (was 23% in 2018)

Figure 33: Annual Revenue in Most Recent Fiscal Year ($CAD) (and change relative to 2018)

Category	Percentage	Change
Pre-revenue	21.6%	(-2 pts)
<$100K	10.8%	(-8 pts)
$100K to $500K	15.7%	(no change)
$500K to $1M	5.8%	(-6 pts)
$1M to $9.9M	30.9%	(+6 pts)
$10M to $14.9M	1.5%	
$15M+	5.8%	
Not sure / Prefer not to say	7.9%	(+2 pts)
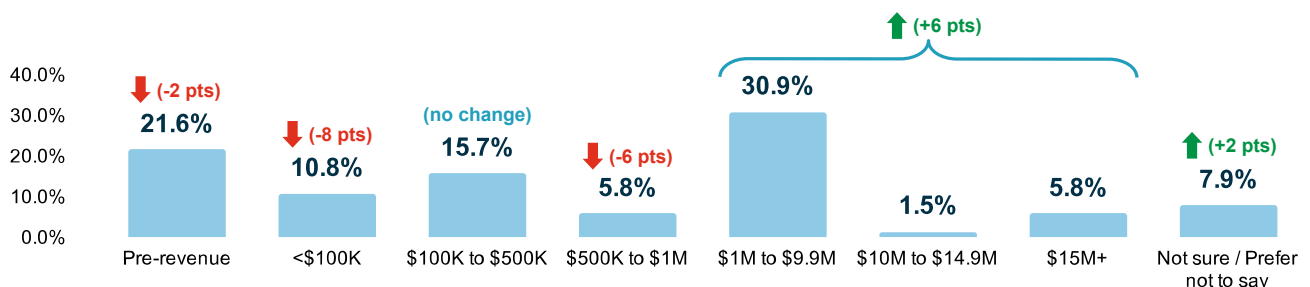
5.2 Funding Stage

Over 57% of the Survey Respondents have undergone one or more rounds of fundraising, and over 16% of Survey Respondents have gone through more than three rounds.

Figure 34: Rounds of fundraising

Not sure / Prefer not to say
8.0%

3+
16.4%

2
18.1%

8.0%

16.4%

34.8%

18.1%

22.7%

0
34.8%

1
22.7%
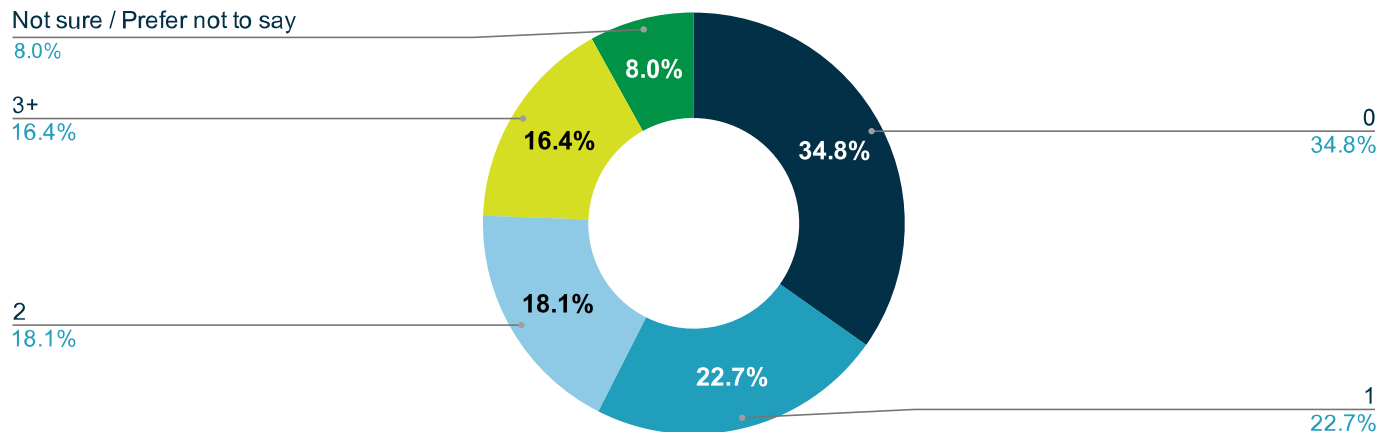
Seed stage is the most common round of funding achieved by Survey Respondents (25% of them), followed by pre-seed stage at 18%. Almost a quarter of Survey Respondents have raised a Series A or later stage of financing. More mature funding rounds were achieved by 13% of Survey Respondents.[7]

84% of Survey Respondents that have completed a seed round have a founder with previous experience in establishing a startup and 87% have a founder with a technical background.

Figure 35: Stage of Last Round of Funding (and change relative to 2018)

Stage	Percent	Change
Pre-Seed	17.8%	▼ (-11 pts)
Seed	25.1%	(no change)
Series A	7.9%	▲ (+1 pt)
Series B	2.6%	▲ (+2.6 pts)
Series C	0.6%	▲ (+0.6 pt)
Beyond Series C	1.7%	(no change)
Not Applicable	28.9%	▲ (+2 pts)
Not sure/prefer not to say	11.4%	▼ (-2 pts)
Other	4.1%	(no data in 2018)
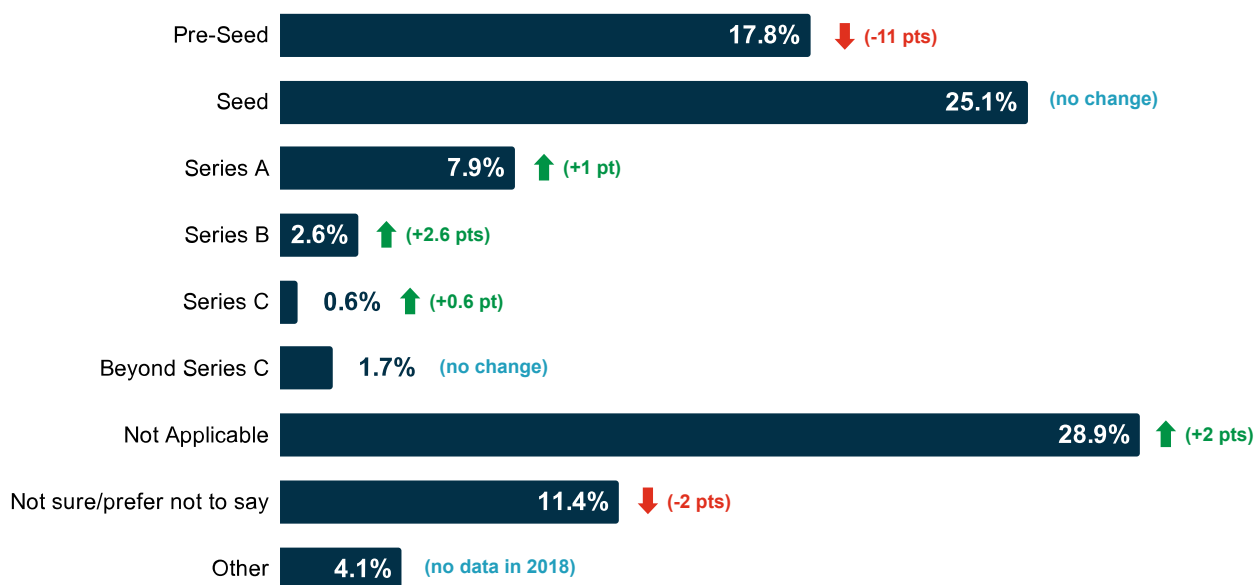
7 Mature funding rounds include Series A, B, C and beyond. Refer to https://corporatefinanceinstitute.com/resources/knowledge/trading-investing/ for an explanation of each Series.

5.3 Fundraising

Of the Surveyed Respondents 71% were able to obtain some funding in the past, while almost 60% of Surveyed Respondents are currently seeking funding or additional funding.

Figure 36: Companies Currently Seeking Funding

Legend: ■ Yes ■ No ■ Not sure / Prefer not to say

| 58.2% | 34.4% | 7.4% |
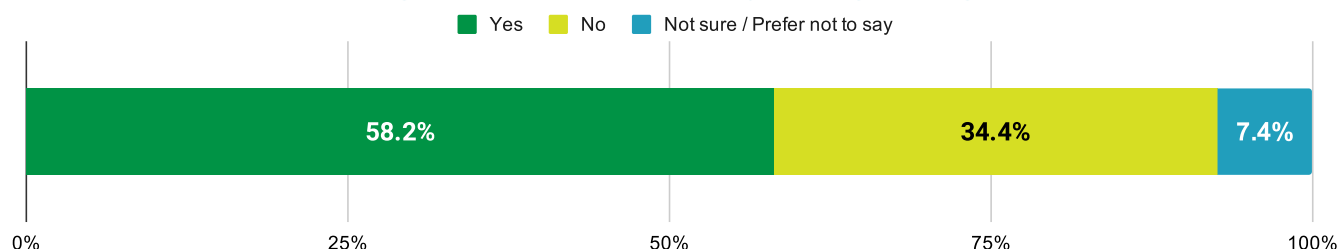
43% of Survey Respondents have raised more than US$1M to date, an increase of 6 percentage points from the 2018 study.

Survey Respondents that received some funding to date tend have the following characteristics:

- 48% of companies that have between $US500k and $US1M in funding have at least one female founder
- 83% of companies that have raised more than $US15M in funding are located in Calgary
    - Of these companies, 67% of them were founded before 2009
- 85% of companies that have raised between $US5M-$US15M in funding have a founder with previous experience
- 85% of companies that have raised between $US5M-$US30M in funding have a founder with a technical background

Edmonton, Calgary, and the rest of Alberta all have a more even distribution of total funding raised. Surveyed Respondents that target certain industries are more likely to have raised no funding to date:

- Insurance (44% have raised no funding)
- Software publishing (41%)
- Communications (39%)
- Real Estate (33%)
- Arts and Entertainment (36%)

Figure 37: Total Funding to Date ($USD)

None	Less than $100k	$100k - $499k	$500k - $999k	$1M - $4.9M	$5M - $14.9M	$15M - $29.9M	$30M - $49.9M	$50M or more	Not sure / Prefer not to say
23.5%	6.0%	14.8%	7.5%	24.1%	9.9%	4.2%	1.2%	3.3%	5.4%
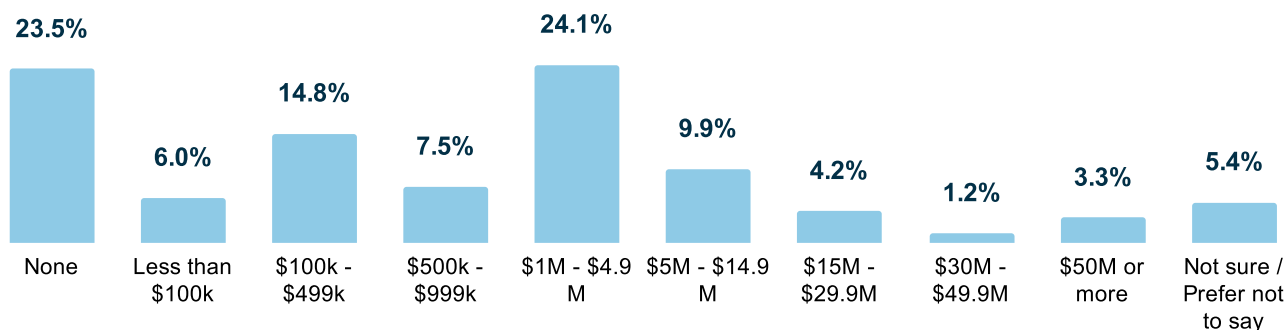
Almost a quarter of all Surveyed Respondents stated that they were unsuccessful in their attempts to fundraise over the last two years.

Figure 38: Companies with Unsuccessful Fundraising Over the Past Two Years

Legend: ■ Yes ■ No ■ Not sure / Prefer not to say

22.6%	67.2%	10.3%

0%   25%   50%   75%   100%
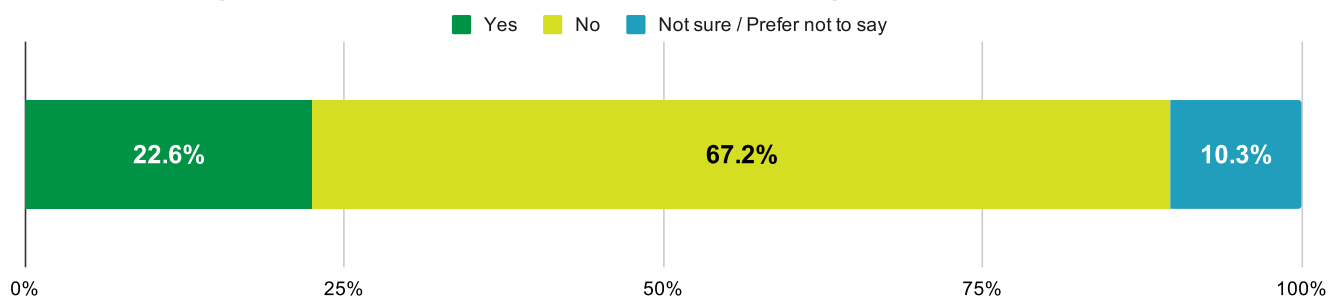
Of those Survey Respondents that were able to fundraise in the last 2 years (67%), there is a similar breakdown in the funding raised in the most recent year and the funding raised to date, which is likely due to the fact that over 50% of Survey Respondents have only undergone one fundraising round.

Figure 39: Funding Raised ($US) in Most Recent Round

Category	Percent
None	26.9%
Less than $100k	8.9%
$100k - $499k	15.8%
$500k - $999k	9.2%
$1M - $4.9M	20.9%
$5M - $14.9M	5.1%
$15M - $29.9M	2.5%
$30M - $49.9M	0.6%
$50M or more	1.6%
Not sure / Prefer not to say	8.5%

30.7% of Alberta companies have raised between $1M and $50M
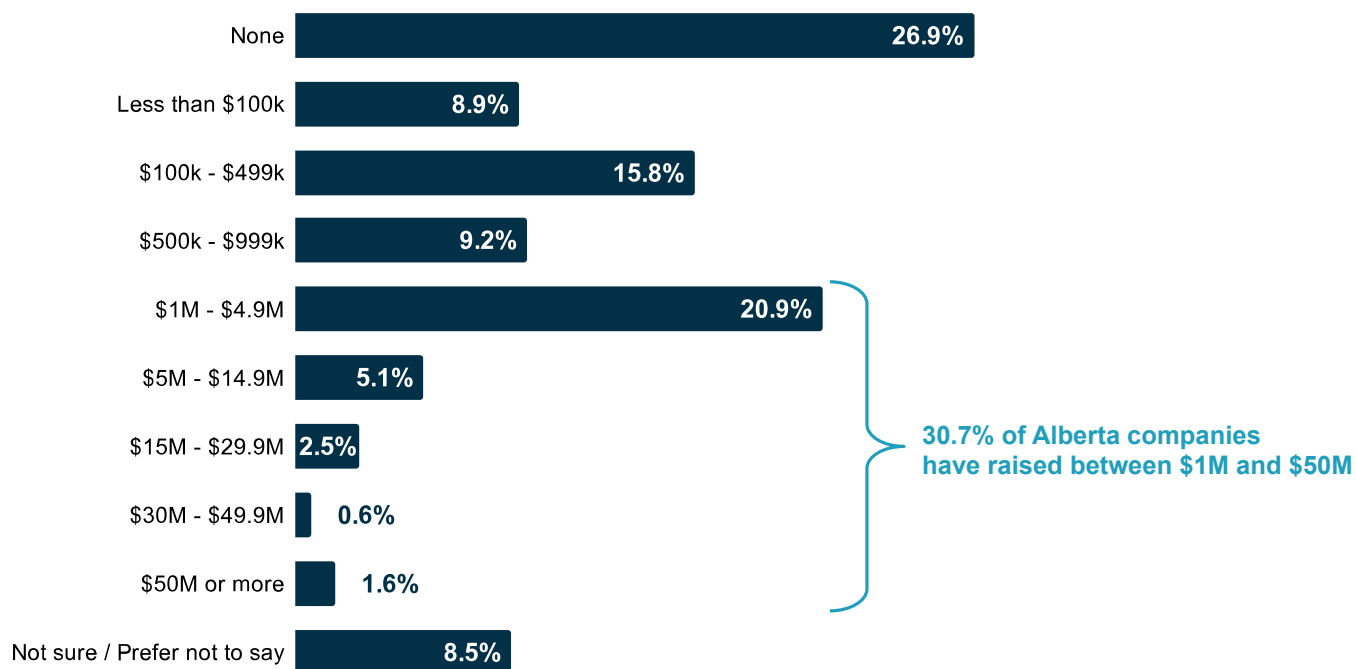
Additionally, 46% of Survey Respondents found that it took 6 months or less to close their most recent round of fundraising and less than one in ten Survey Respondents had their most recent fundraising event last more than a year.

Figure 40: Time to Close the Most Recent Round of Fundraising

Not sure / Prefer not to say
30.0%

30.0%

Less than 3 months
25.8%

25.8%

4 to 6 months
20.0%

20.0%

6 to 12 months
15.5%

15.5%

More than 12 months
8.7%

8.7%
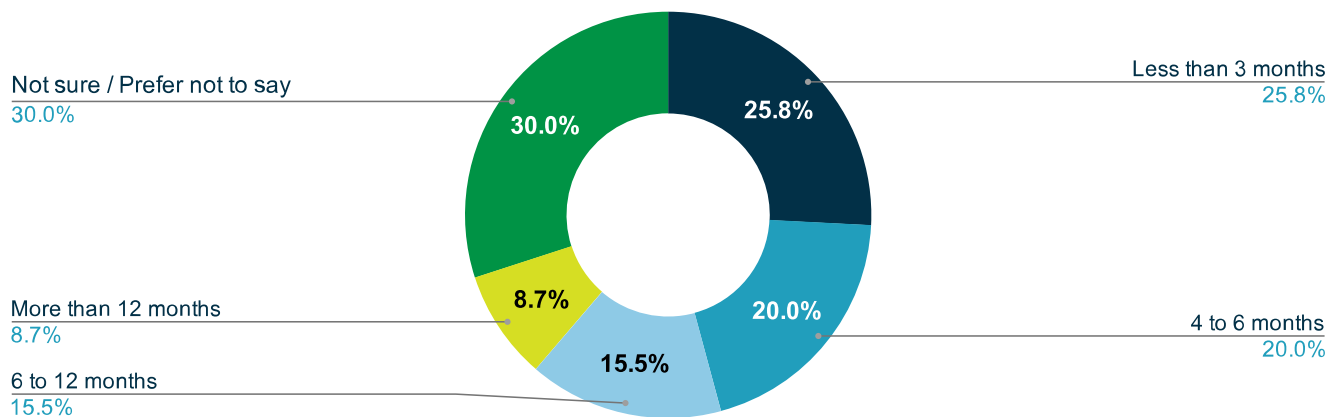
31% of Survey Respondents raised more than US$1M in their most recent round and 48% are intending to raise more than US$1M in their next round of fundraising. 59% of the companies that raised over US$1M in their most recent round did so in either the 2nd or 3rd round of fundraising.

Figure 41: Intended Fundraising ($US) in Next Round

Category	Percentage
None	20.3%
Less than $100k	0.9%
$100k - $499k	9.2%
$500k - $999k	8.9%
$1M - $4.9M	24.3%
$5M - $14.9M	16.6%
$15M - $29.9M	4.0%
$30M - $49.9M	1.2%
$50M or more	2.2%
Not sure / Prefer not to say	12.3%
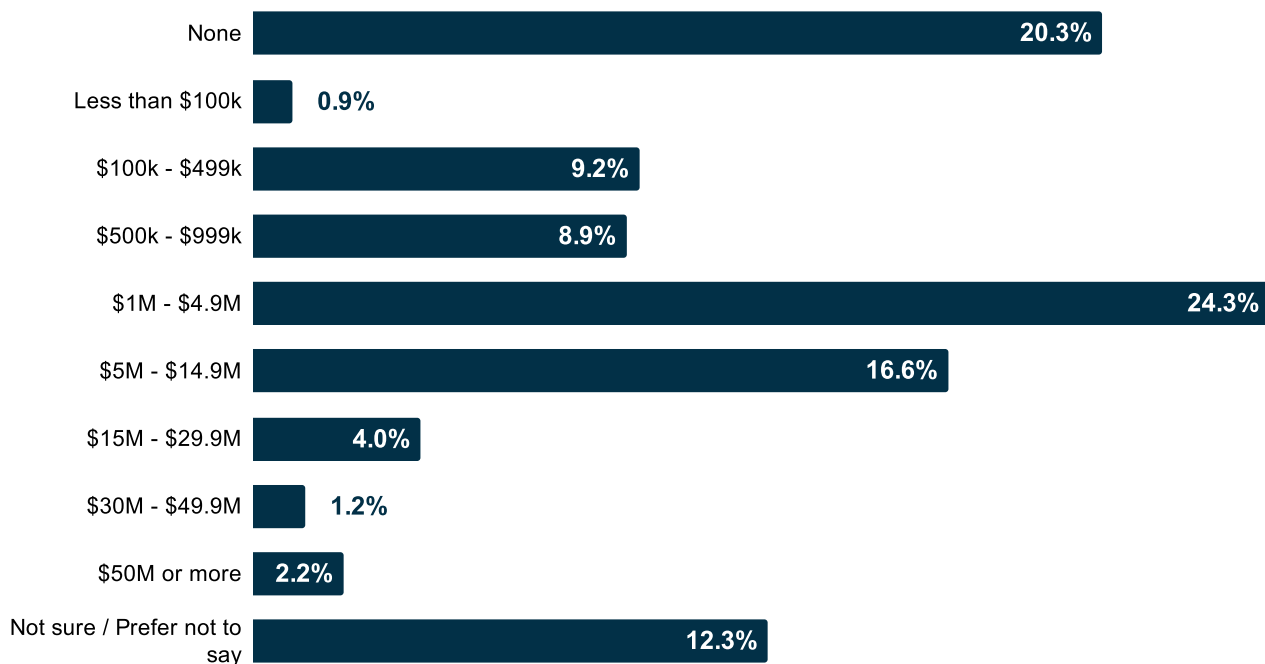
69% Survey Respondents indicated personal savings as a source of funding, followed by government grants and credits (55%), friends and family (40%), and angel investors / family offices (40%).

- This is a similar breakdown to 2018, with personal savings (-5 percentage points from 2018), government grants / credits (-1 percentage point), and friends and family (-7 percentage point) as the top three in both years
- The percentage of companies citing venture capital investors as a funding source has increased by 6 percentage points from 2018, while those citing angel investors / family offices has decreased by 3 percentage points
- Venture capital investors account for 24% of funding sources compared to 40% of Survey Respondents raising funding from angel investors.

Figure 42: Funding Sources

Funding Source	Percentage
Personal Savings	69.1%
Government Grants / Credits	55.2%
Friends and Family	40.5%
Angel Investors / Family Offices	40.2%
Venture Capital Investors	23.7%
Banks	23.1%
Other	14.7%
Not Sure / Prefer not to say	4.0%
Crowdfunding	1.7%
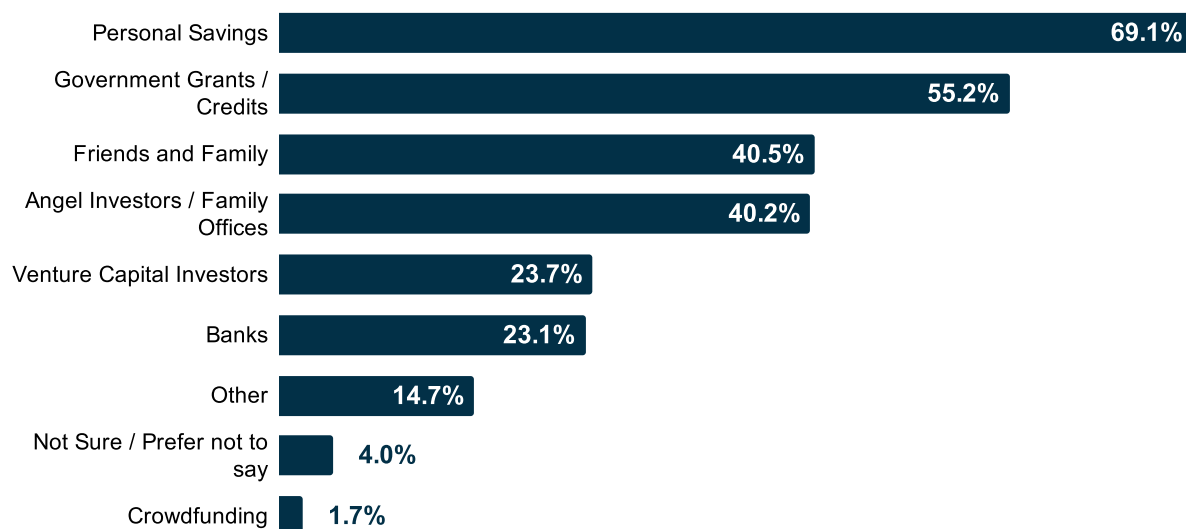
Adds to more than 100% as companies may have multiple funding sources. Note that the funding sources do not necessarily represent the amount of funding coming from each source, only the popularity of funding sources.

53% of companies accessed their funding from Calgary funding sources, while the other funding sources are based in Edmonton (32% of companies) and Canadian provinces outside of Alberta (34% of companies). This is similar to 2018, where Calgary-based funding was sourced by 50% of companies, while Edmonton-based was sourced by 31% of them.

Figure 43: Location of Funding Sources
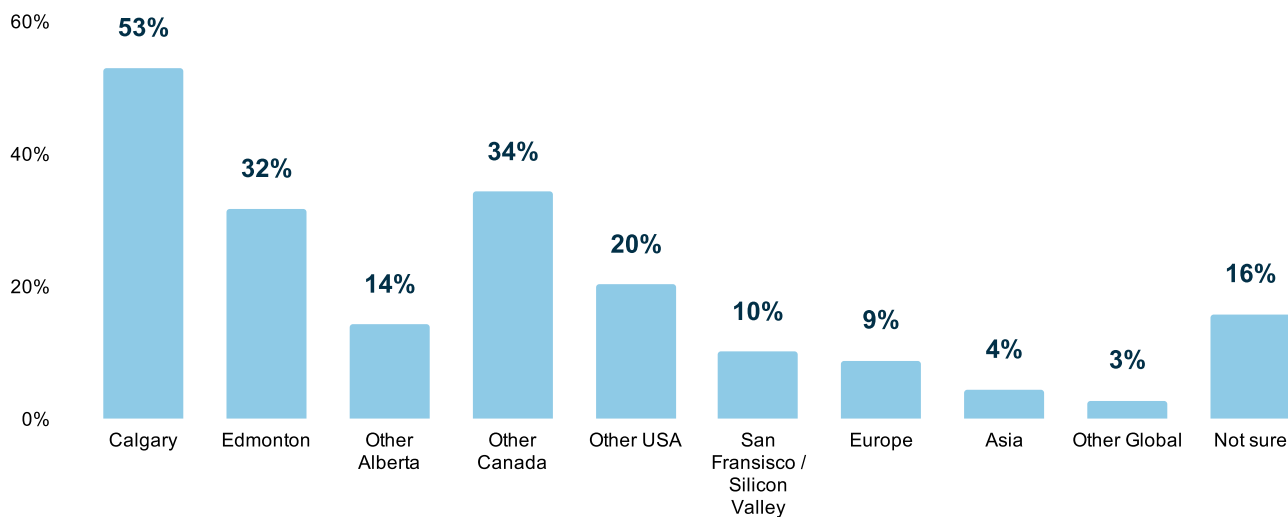
Adds to more than 100% as companies may have multiple funding sources

Financing options are diverse, with equity used by 47% of Survey Respondents, grants by 23%, debt by 20% and hybrids combinations noted by 15% of Survey Respondents.

Figure 44: Types of Financing Options Used in Fundraising
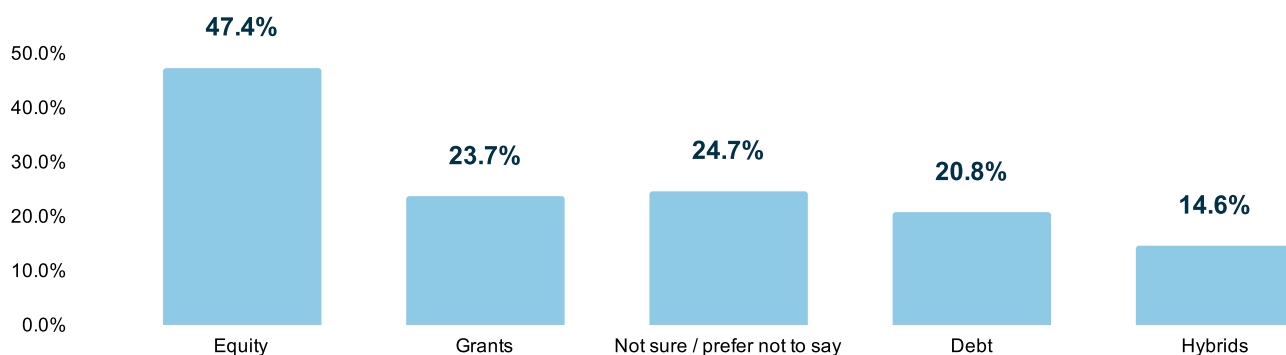
Appendix A

Glossary of Terms

Throughout this report, a number of key terms are used for which the following definitions should be assumed.

Key terms

2021 Study
Study of the technology and life and health science industries in Alberta for 2021.

Deal Flow Study
The Deal Flow Study has been providing stakeholders with a shared understanding of the strengths, challenges and make-up of the technology and innovation industries across sectors and regions in Alberta. It provides the leading yardstick for measuring the health, growth, and composition of the Alberta technology sector.

ESG
Environmental, Social, and Governance - refers to the three central factors in measuring the sustainability and societal impact of an enterprise or an investment.

Identified Companies
Technology companies which were found to be operating in Alberta in 2021.

NAICS
North American Industry Classification System used for industry classification of companies.[8]

Survey Respondents
Companies that completed the survey.

Startup Phases

Startup Development Phases
A framework for classifying startup development phases developed by Startup Commons.[9]

Ideating
Companies with entrepreneurial ambition and / or potential scalable product or service ideas for a big enough target market.

Concepting
Companies defining mission and vision with initial strategy and key milestones for next few years on how to get there.

Committing
Companies with committed, skills balanced co-founding team with shared vision, values and attitude.

Validating
Companies iterating and testing assumptions for validated solutions to demonstrate initial user growth and / or revenue.

Scaling
Companies that focus on KPI based measurable growth in users, customers and revenues and / or market transaction and market share in a big or fast growing target market.

Establishing
Companies that achieved great growth that can be expected to continue.

Funding Rounds & Sources of Funding

Angel
Investment by an individual in a company from their individual funds and not using funds raised from other people.

Crowdfunding
Financing received from a crowdfunding platform through which individuals have provided non-equity funding in exchange for companies' products, generally before they have been released to the market.

Pre-seed and / or Seed
When any investor type provides the initial financing for a new enterprise that is in the earliest stages of developing.

Venture Capital
Form of private equity and a type of financing that investors provide to startup companies and small businesses that are believed to have long-term growth potential.

Other Funding Types

Convertible note
A form of short-term debt that converts into equity, typically in conjunction with a future financing round; in effect, the investor would be loaning money to a start-up and instead of a return in the form of principal plus interest, the investor would receive equity in the company.

Debt
Borrowed money with repayment expectations. Usually from banks.

Equity
Ownership stake in a company, usually in exchange for investment.

Grants
Usually financial support from government and government funded agencies and typically does not include the recipient company giving up equity.

8 https://www23.statcan.gc.ca/imdb/p3VD.pl?Function=getVD&TVD=1181553

9 https://www.startupcommons.org/startup-development-phases.html

Hybrids
Combination of multiple funding types.

Sectors & Verticals

Agriculture, Food & Bio-resources
This sector comprises establishments primarily engaged in growing crops, raising animals, harvesting timber, harvesting fish and other animals from their natural habitats and providing related support activities.

Analytics / Big Data
Companies providing a product or service where the core technology handles data that is too large for traditional database systems, usually due to data volume, data velocity, or data variety.

Artificial Intelligence / Machine Learning
Companies developing technologies that enable computers to autonomously learn, deduce and act, through utilization of large data sets.

Business Model
To whom the product or technology is delivered or sold to. Business Models include: B2B (business-to-business), B2C (business-to-consumer), Two-sided platforms (both B2B and B2C simultaneously), and B2G (business-to-government).

Business Productivity
Software products aiming to increase business productivity and efficiency.

Customer Industries / Verticals
The industry which the tech product or service is marketed to or focused upon.

Enabling Technology / Innovation
The technology utilized in the product offering (Innovation categories include: digital / soft tech, physical / hard tech, innovation in the business or product model, hybrid, other).

Energy and Mining
This sector comprises establishments primarily engaged in extracting naturally occurring minerals. These can be solids, such as coal and ores; liquids, such as crude petroleum; and gases, such as natural gas.

Health, Wellness and Medical
This sector comprises establishments primarily engaged in providing health care by diagnosis and treatment, providing residential care for medical and social reasons, and providing social assistance.

I.T. (Information Technology)
Computer hardware / software & services, Internet software & services, eCommerce.

Impacts
Outcomes of the technology (including ESG Outcomes (environmental, social, governance), business productivity and cost savings).

Information & Media
This sector comprises establishments primarily engaged in producing and distributing (except by wholesale and retail methods) information and cultural products, as well as operating facilities or providing services to meet the cultural, entertainment and recreational interests of their patrons.

Medical Device
Health / Medical focused mechanical or electronic equipment.

Other industrials
This sector comprises establishments engaged in construction, transportation, warehousing, manufacturing, infrastructure, wholesale trade and non-energy utilities.

Pharmaceuticals
Compound manufactured for use as a drug to diagnose, cure, treat or prevent disease.

Professional and Other Services
This sector comprises establishments primarily engaged in activities in which human capital is the major input. These establishments make available the knowledge and skills of their employees, often on an assignment basis. The individual industries of this sector are defined on the basis of the particular expertise and training of the service provider and include financial services, education, legal services, management, food services, retail trade and others.

Appendix B

Detailed Approach & Methodology

In 2021 Alberta Enterprise augmented the Deal Flow Study methodology to uncover a more well-rounded view of the innovation ecosystem in Alberta. Technology companies included in the Study were segmented based on the Customer Industry or Vertical their technology product or service is marketed to or focused upon. The North American Industry Classification System (NAICS) was used to map these categories to ensure broader comparability.

To understand the specific enabling technology(s) being leveraged by companies in their product offering, companies selected the enabling technologies across digital / soft tech or physical / hard tech, innovation in the business or product model, hybrid, or other. Furthermore, to better understand who the technology company sold or delivered their product or technology to we sorted technology company by business model, including: B2B (business-to-business), B2C (business-to-consumer), Two-sided platforms (both B2B and B2C simultaneously), and B2G (business-to-government).

To ascertain the specific impacts targeted, we segmented Alberta technology companies by the outcomes of their technology. Outcomes included ESG Outcomes (environmental, social, governance), business productivity and cost savings, enhancing our ability to account for CleanTech companies and beyond. This framework allowed us to more accurately classify companies who target multiple customer industries and leverage multiple technologies. The present methodology will provide more in-depth findings on the tech companies and their unique attributes across verticals, stages, and other dimensions.

Stage 1 - Scoping and criteria development

The first stage of the 2021 Study involved scoping the project and developing a new classification scheme for the identified technology companies. For the purpose of this study, the North American Industry Classification System (NAICS) was used to classify the identified companies' industry of operation. NAICS is used by national statistical agencies, including Statistics Canada, in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the economies. Unlike in the previous Alberta Deal Flow Studies which relied on customized classification schemes, NAICS classification was used for the 2021 Study to allow for better comparison and benchmarking of the technology industry in Alberta.

In addition to developing new classification schemes for the identified companies, the technology industry was updated for the purpose of the 2021 Study to include software, hardware, equipment, devices, chemicals, health or life science products or services, and any product or service offerings that require development and / or research (but not including value added resellers, integrators, distributors and resellers of high technology products manufactured by others).

Stage 2 - Criteria and mapping

In the second stage of the 2021 Study, a master list of candidate technology companies was compiled. The purpose of the Deal Flow Study is to track not only startups, but rather technology companies more generally. Therefore, technology companies of all ages and stages are included, including startups and more mature companies. To this end, a variety of databases available to PwC were utilized, in addition to company listings provided by Alberta Enterprise.

The databases were scanned and filtered according to a number of company attributes, namely:

- Location of the company's headquarters
- Product or technology offering
- Company's primary NAICS industry
- Ownership status (publicly traded vs. privately held)

Stage 3 - Company screening and verification

PwC verified companies relevant to the 2021 Study (and eliminated those that were not) according to the following attributes, which were agreed upon with Alberta Enterprise:

- Headquartered in Alberta
- Privately held
- Produced a tech based product or service
- Industry classification that does not include retailers, wholesalers, resellers and distributors.

The companies identified in the first stage were paired down to include only those that were still operating as of the end of 2021. This was achieved through the verification of the operating status of the companies' websites, obtained either through a scan of the various databases or through secondary internet search. These final verified companies are referred to in this report as the "Identified Companies".

The verification phase of the research was intended to be a census of all existing Alberta-based tech companies which meet the verification criteria, however some companies may have been missed.

Stage 4 - Detailed survey of sample companies

The last stage of the study was an in-depth survey of Alberta's tech sector. To this end, an online questionnaire was distributed to companies that meet the verification criteria.

The purpose of the survey was to dive deeper into the unique attributes, including:

a. Further segmentation, including age and business model

b. Operations data, including product offering stage, challenges, revenues and exports

c. Funding sources, including funds raised and rounds of funding undertaken

d. Employee characteristics, including gender and minority status of founder and employees

The survey was hosted by PwC and was open to participants from February 1, 2021 to February 19, 2021. In total, 350 qualified companies completed the online survey, representing approximately 12% of the identified companies. The companies that completed the survey are referred to as "Survey Respondents".

In addition to inquiring about the unique attributes of companies, the survey also gave the respondents an opportunity to provide comments or suggestions to improve government policy for the technology sector. In total 121 Survey Respondents provided such commentary.

It should be noted that the survey phase was intended to be a representative subset of the universe of tech companies identified in the verification stage. However, it is possible that companies motivated to answer the survey may have different characteristics than those that did not participate. For example, 30% of the companies identified in the initial identification were based in Edmonton. However, 34.6% of the companies that answered the survey indicated their headquarters location to be Edmonton. This suggests some bias in the survey responses.

Some Alberta technology companies that participated in the survey were not originally included in the list of verified companies.[10] These companies were subsequently added

to the final list. In addition, some companies taking the survey indicated that they did not belong to the technology sector. These companies' responses were not considered in the survey results analysis.

Unless otherwise noted, all dollar amounts in this report are expressed in Canadian currency. Percentages presented in this report are rounded for simplicity.

Data collection overview

Data used to compile the list of technology companies was collected from four categories of data sources:

1. Previous year's Master Lists - companies included in the previous Alberta Tech Deal Flows Studies were scanned and verified according to the set of relevant criteria.

2. Additional private and publicly available datasets containing technology companies were provided by Alberta Enterprise and Western Economic Diversification Canada.[11] These companies were sourced from Alberta company ecosystem stakeholders lists, Alberta Enterprise Venture Capital Portfolio Funds, as well as from service providers and ecosystem partners.

3. PwC utilized a number of company databases including Capital IQ, DB Hoovers, Crunchbase, CB Insights and Pitchbook to identify relevant companies.

4. PwC's internal databases were also used to identify the relevant companies

Data collection and verification was conducted between November 2021 and January 2021. Therefore, the final list of companies represents the technology companies that were operational as of the end of 2021 and the beginning of 2021.

Industry classifications used by various data sources varied considerably. As part of this study, PwC assigned a unique North American Industry Classification System (NAICS) code to each identified and verified company based on the nature of the company's product or service offering. It should be noted that many of the identified companies operate across multiple industries. Consequently, the assigned industry, which was selected based on the most appropriate characterization of the companies' operations, may not fully represent an individual company's industry classification.

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10 There were 39 such companies.
11 Company listings provided by WD were from publicly available sources.

Appendix C

Study Considerations

The conclusions expressed and information presented in this report rely on the following major assumptions, in particular completeness, reliability, and accuracy of external sources used in this report.

It should be noted that significant deviations from the above listed major assumptions may result in a significant change to our analysis.

Data limitations: PwC has relied on the information provided by a number of external sources. PwC has relied upon the completeness, accuracy, and fair presentation of all information and data obtained from Alberta Enterprise as well as from other sources, which were not audited or otherwise verified. The findings in this report are conditional upon such completeness, accuracy, and fair presentation, which have not been verified independently by PwC. Accordingly, PwC provides no opinion, attestation or other form of assurance with respect to the results of this study.

Receipt of new data or facts: PwC reserves the right at its discretion to withdraw or make revisions to this report should PwC receive additional data or be made aware of facts existing at the date of the report that were not known to us when PwC prepared this report. The findings are as of March 2, 2021 and PwC is under no obligation to advise any person of any change or matter brought to its attention after such date, which would affect our findings.

This report and related analysis must be considered as a whole: Selecting only portions of the analysis or the factors considered by us, without considering all factors and analysis together, could create a misleading view of our findings. The preparation of our analysis is a complex process and is not necessarily susceptible to partial analysis or summary description. Any attempt to do so could lead to undue emphasis on any particular factor or analysis.

Companies mapping and verification: Qualified companies may have been missed in the study if those companies were not appearing in any tech databases or not referred to by the participating ecosystem partners. In addition, some companies may have been misclassified as technology based on the various descriptions of their product or service offerings. For example, some companies may offer technology based services, however technology may not be their primary offering and consequently such companies may not classify themselves as fulfilling the verification criteria.

Factors behind a significant increase in the number of identified companies in 2021 relative to 2018: The following factors are proposed as potential explanations for the increase in the number of companies observed in the 2021 Study:

- Use of different data sources: PwC has relied on all databases used for the purpose of the 2018 study, however other databases such as Capital IQ, DB Hoovers, Crunchbase, CB Insights, Pitchbook were also used, as well as PwC's proprietary data.
- Broader industry classification: the industry classification used in the 2021 study was based on the NAICS classification and includes almost every sector of the economy. The industry classification used in 2018 and previous years was more focused on technology-specific industries. The broader industry classification has likely resulted in a larger number of companies captured in 2021 compared to the previous years.
- Certain products and services offerings that were identified as technology based in 2021 might not have been categorized as such in 2018 and previous years.

Because of the above factors, it is not possible to provide the number of technology based companies operating in Alberta in 2021 according to the methodology and criteria used in previous years' methodologies.

Of the 1,238 Identified Companies in 2018, 940 were included in 2021.[12] The remaining 298 companies were determined as either not operational (approximately 45) or otherwise not fulfilling the validation criteria (approximately 245).

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12 As noted in the table, there were 1,238 companies included in the 2018 study, however an additional 43 companies were identified during the online survey phase. We did not verify which of the 43 companies were included in the 2021 list due to unavailability of the companies' names.

Appendix D

List of Sources Used

The following is a list of data sources that were used to identify the companies subject to this study.

- Alberta Enterprise Venture Capital Portfolio Fund Data
- Start Alberta Deal Flow Platform
- Previous Alberta Tech Deal Flow Study Masterlists (2016 and 2018)
- Western Economic Diversification Canada company listings
- External databases:
    - Capital IQ
    - DB Hoovers
    - Crunchbase
    - CB Insights
    - Pitchbook
- PwC internal listing of technology companies operating in Alberta

Appendix D

Detailed Results

Alberta's Technology Sector Overview

Companies by industry

Table 1: Number and percentage of identified companies by summary industry classification

Industry	Share	Number
Information & Media	29%	899
Other industrials	23%	698
Professional and other services	20%	625
Health, Wellness and Medical	14%	442
Energy and Mining	11%	326
Agriculture, Food & Bio-resources	3%	93
Total	**100%**	**3083**

Table 2: Number and percentage of identified companies by detailed industry classification

NAICS - Summary	NAICS - Detailed	Number of Companies	Percentage with industry
Information & Media	Software publishing	653	73%
	Data processing, hosting, and related services	148	17%
	Internet broadcasting and web search portals	42	5%
	Communications	22	2%
	Arts and Entertainment	15	2%
	Publishing	11	1%
	Media	6	1%
	Broadcasting	1	0%
	Sub-total	**899**	
Other Industrials	Manufacturing	566	81%
	Non-energy utilities	44	6%
	Internet and Telecommunications Infrastructure	41	6%
	Construction	26	4%
	Transportation	14	2%
	Infrastructure	7	1%
	Sub-total	**690**	
Professional and other services	Management	205	33%
	Technical and scientific services	191	31%

NAICS - Summary	NAICS - Detailed	Number of Companies	Percentage with industry
	Other services	109	17%
	Education	49	8%
	Financial services	32	5%
	Waste management	17	3%
	Real estate	13	2%
	Insurance	7	1%
	Legal	2	0%
	Sub-total	**625**	
	Hospitals and health care delivery	128	29%
	Health IT and analytics	77	17%
	Pharmaceuticals	68	15%
Health, Wellness and Medical	Medical devices	63	14%
	Medical devices - diagnostics	48	11%
	Natural and conventional health and wellness goods and services	32	7%
	Medical devices – therapeutics	27	6%
	Sub-total	**443**	
	Conventional and alternative energy extraction	292	90%
Energy and Mining	Supply and transmission	32	10%
	Mining	1	0.3%
	Sub-total	**326**	
	Agriculture	84	87%
Agriculture, Food & Bio-resources	Food processing and manufacturing	10	11%
	Forestry	2	2%
	Sub-total	**93**	

Companies by region

Table 3: Number and percentage of identified companies by headquarters location

City	Percentage of Total	No. of Companies
Calgary	58%	1776
Edmonton	30%	918
Red Deer	1%	39
Lethbridge	1%	32
Sherwood Park	1%	21
Other	10%	297
Total	**100%**	**3083**

Table 4: Number of identified companies by industry classification and headquarters location

Industry	Calgary Region		Edmonton Region		Rest of Alberta	
	#	%	#	%	#	%
Information & Media	512	28.8%	271	29.5%	115	26.9%
Other industrials	402	22.6%	206	22.4%	90	23.1%
Professional and other services	360	20.3%	187	20.4%	78	20.1%
Health, Wellness and Medical	249	14.0%	135	14.7%	59	15.2%
Energy and Mining	196	11%	97	10.6%	33	8.5%
Agriculture, Food & Bio-resources	57	3.2%	22	2.4%	14	3.6%
Total	**1,776**	**100%**	**918**	**100%**	**389**	**100%**

Companies over time

Table 5: Number of identified companies by year and headquarters location

	2021		2018		2016		2012	
	#	%	#	%	#	%	#	%
Calgary	1776	57%	767	62%	847	62%	547	59%
Edmonton	918	30%	394	32%	460	34%	332	36%
Other AB	389	13%	77	6%	66	5%	48	5%
Total	**3,083**	**100%**	**1,238**	**100%**	**1,373**	**100%**	**927**	**100%**

Table 6: Number of identified companies by year and industry classification

2021		2018	
Industry	**Number of companies**	**Industry**	**Number of companies**
Information & Media	898	Telecom	23
		ICT	471
		Sub-total	**494**
Other industrials	698	Consumer Products	54
		Electronics	42
		Hardware	11
		Industrial / Material Tech	114
		Sub-total	**221**
Professional and other services	625	Financial Services	28
		Tourism	2
		Sub-total	**30**
Health, Wellness and Medical	443	Life Sciences	157
Energy and Mining	326	Clean Tech	130
		Energy Tech	126
		Mining	2
		Sub-total	**258**
Agriculture, Food & Bio-resources	93	Agriculture	24
Total:	**3,083**	**Total:**	**1,184**[13]

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13 Does not add up to 1,238 as some companies from the 2018 studies were not assigned an industry classification.

Detailed Survey Responses

Section I - Segmentation

	Total	Location			Year founded		
		Calgary	Edmonton	Other	2019-2021	2014-2018	<2014
Q1: Where is your company headquartered?							
Calgary Region	62%				60%	57%	66%
Edmonton Region	35%				34%	41%	30%
Q2: In what year was your company founded?							
2019-2021	21%	19%	20%	31%			
2014-2018	31%	29%	37%	1%			
<2014	48%	52%	43%	54%			
Q3: Is your company developing:							
An innovative physical product	31%	18%	25%	15%	21%	19%	21%
An innovative service	21%	32%	29%	23%	37%	35%	25%
A combination of the two	29%	27%	29%	46%	23%	32%	29%
Existing product or service made or delivered in a new way	15%	16%	14%	15%	19%	8%	18%
Other	4%	7%	3%	0%	0%	6%	7%
Q4: Please indicate the technology utilized in your company's offering. Please select all that apply.							
Digital innovation: Software	67%						
Digital innovation: AI / ML	36%						
Digital innovation: Big data	27%						
Physical innovation: Hardware	25%						
Innovation in how a product is designed	25%						
Innovation in how a business is structured	20%						
Physical innovation: Chemistry / Biology	14%						
Physical innovation: Materials	12%						
Other	5%						
Q5: Please indicate your company's business model. Please select all that apply.							
Business-to-Business (B2B)	72%						
Business-to-Consumer (B2C)	17%						
Two-sided platforms (both B2B and B2C simultaneously)	24%						
Business-to-Government (B2G)	23%						

	Total	Location			Year founded		
		Calgary	Edmonton	Other	2019-2021	2014-2018	<2014
Q6: Please indicate the outcome of your company's product or technology on consumers. Please select all that apply.							
Cost savings	66%						
Business productivity	68%						
ESG impact - Governance benefits	18%						
ESG impact - Social benefits	45%						
ESG impact - Environmental benefits	39%						
Q7: Which industries do you sell your product(s) or service(s) to? Please select all that apply.							
Health, Wellness and Medical	8%						
Energy and Mining	15%						
Agriculture, Food & Bio-resources	8%						
Other industrials	23%						
Information & Media	12%						
Professional and other services	34%						
Q8: Does your company operate in the Health or Life Science sector?							
Yes	35%	32%	40%	25%	53%	34%	27%
No	65%	68%	60%	75%	47%	66%	73%

Section II - Company Data

	Total	Location			Year founded		
		Calgary	Edmonton	Other	2019-2021	2014-2018	<2014
Q9: Has your company been involved in transactions, such as acquisitions or mergers, in the last 24 months? Please select all that apply.							
Acquisition - Target	8%						
Acquisition - Acquirer	10%						
Merger	3.1%						
None	79%						
Other	2%						

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	Total	Location			Year founded		
		Calgary	Edmonton	Other	2019-2021	2014-2018	<2014

Q10: What are the biggest immediate challenges your company is facing? Please select all that apply.

	Total	Calgary	Edmonton	Other	2019-2021	2014-2018	<2014
Sales team - Developing / Acquiring / Retaining talent	39%						
Technical team - Developing / Acquiring / Retaining talent	36%						
Management team - Developing / Acquiring / Retaining talent	20%						
Technical team - Developing / Acquiring / Retaining talent	36%						
Access to capital / Funding	58%						
Achieving product - Market fit (i.e. a product which meets your market's demand)	16%						
Market access (i.e. reaching customers and scaling sales)	45%						
Competition / New or Existing Market Entrants	11%						
Achieving profitability	18%						
Other	6%						

Q11: Would you classify your company as a start-up?

	Total	Calgary	Edmonton	Other	2019-2021	2014-2018	<2014
Yes	65%	64%	69%	50%	100%	85%	38%
No	30%	31%	28%	42%	0%	11%	55%
Other	5%	6%	2%	8%	0%	4%	7%

Q12: Was your company originally a spinoff from academic research?

	Total	Calgary	Edmonton	Other	2019-2021	2014-2018	<2014
Yes	18%	15%	23%	33%	30%	22%	11%
No	80%	83%	76%	58%	69%	76%	87%
Other	2%	2%	1%	8%	1%	2%	2%

Q13: Which of the following best represents the stage of your company's main product offering (as based on the Startup Commons Development Phases)?

	Total	Calgary	Edmonton	Other	2019-2021	2014-2018	<2014
(-2) Ideating	0%	0%	0%	0%	0%	1%	0%
(-1) Concepting	3%	5%	1%	0%	7%	0%	4%
(0) Committing	4%	2%	6%	8%	10%	4%	1%
(1) Validating	29%	24%	36%	38%	59%%	31%	14%
(2) Scaling	51%	56%	45%	31%	23%	59%	58%
(3) Establishing	12%	11%	12%	15%	1%	6%	20%
Not sure / Prefer not to say	1%	1%	1%	8%	0%	0%	3%

	Total	Calgary	Edmonton	Other	2019-2021	2014-2018	<2014
			Location			**Year founded**	

Q14: Are you building your product on your own or outsourcing?

	Total	Calgary	Edmonton	Other	2019-2021	2014-2018	<2014
Building our own product in-house	54%	53%	57%	54%	46%	46%	62%
Outsourcing	6%	8%	2%	0%	4%	12%	3%
A mix of both	39%	38%	40%	46%	50%	39%	34%
Not sure / Prefer not to say	1%	1%	1%	0%	0%	3%	1%

Q15: What was your company's annual revenue (in $CAD) in the most recent fiscal year?

	Total	Calgary	Edmonton	Other	2019-2021	2014-2018	<2014
Pre-revenue	22%	19%	26%	17%	60%	21%	5%
<$100K	11%	11%	10%	8%	20%	17%	3%
$100K to $500k	16%	16%	13%	33%	13%	29%	8%
$500K to $1M	6%	7%	3%	8%	1%	5%	8%
$1M to $9.9M	31%	31%	32%	17%	1%	22%	49%
$10M to $14.9M	2%	1%	2%	0%	0%	0%	3%
$15M+	6%	8%	3%	0%	0%	0%	12%
Other	8%	6%	10%	17%	4%	6%	11%

Q16: How long has it taken for your company to achieve profitability (i.e. positive EBITDA)?

	Total	Calgary	Edmonton	Other	2019-2021	2014-2018	<2014
It has not been profitable yet	50%	51%	49%	50%	81%	75%	21%
Less than one year	11%	11%	11%	25%	10%	8%	14%
One to two years	6%	5%	8%	8%	3%	7%	7%
Two to three years	6%	5%	8%	0%	0%	3%	10%
Three to four years	3%	4%	3%	0%	0%	3%	5%
Four to five years	5%	6%	4%	0%	0%	2%	10%
More than five years	12%	13%	11%	17%	1%	0%	24%
Other	6%	7%	7%	0%	4%	3%	10%

	Total	Location			Year founded		
		Calgary	Edmonton	Other	2019-2021	2014-2018	<2014
Q17: Please indicate the most recent annual value (in $CAD) of your company's international exports.							
No exports	41%	42%	42%	33%	83%	44%	23%
<$100K	10%	8%	12%	17%	7%	13%	9%
$100K to $500K	12%	15%	6%	8%	1%	17%	13%
$500K to $1M	6%	4%	10%	8%	0%	9%	6%
$1M to $5M	14%	14%	15%	17%	0%	10%	23%
$5M+	7%	9%	5%	0%	1%	0%	15%
Other	9%	8%	10%	17%	7%	8%	11%
Q18: What are the destinations of your company's international exports? Please select all that apply							
No exports	33%						
USA	60%						
Europe	29%						
Asia	23%						
Other regions	29%						
Q19: If an early stage accelerator program had been / was available in your sector would you be interested in participating?							
Yes	50%	49%	50%	50%	70%	47%	43%
No	26%	27%	25%	8%	14%	32%	27%
Other	24%	23%	24%	42%	16%	21%	30%

Section III - Fundraising

	Total	Location			Year founded		
		Calgary	Edmonton	Other	2019-2021	2014-2018	<2014
Q20: Is your company currently seeking funding?							
Yes	58%	59%	57%	54%	77%	69%	44%
No	34%	33%	37%	38%	22%	27%	44%
Other	7%	8%	6%	8%	1%	5%	12%

	Total	Location			Year founded		
		Calgary	Edmonton	Other	2019-2021	2014-2018	<2014

Q21: How much funding ($USD) has your company raised to date?							
None	24%	21%	29%	8%	27%	15%	28%
Less than $100k	6%	5%	8%	8%	13%	5%	4%
$100k - $499k	15$	17%	11%	25%	36%	10%	8%
$500k - $999k	8%	7%	9%	0%	6%	16%	3%
$1M - $4.9M	24%	23%	26%	25%	13%	33%	22%
$5M - $14.9M	10%	11%	9%	8%	3%	11%	12%
$15M - $29.9M	4%	5%	3%	0%	0%	4%	7%
$30M - $49.9M	1%	1%	1%	0%	0%	2%	1%
$50M or more	3%	5%	1%	0%	1%	1%	6%
Other	5%	5%	4%	25%	1%	4%	8%

Q22: Which of the following are funding sources to your company? Please select all that apply.	
Personal savings	69%
Angel Investors / Family Offices	40%
Venture Capital Investors	23.7%
Friends and Family	41%
Crowdfunding	2%
Government Grants / Credits	55%
Banks	23%
Other	15%

Q23: How many rounds of fundraising did your company go through?							
0	35%	32%	41%	25%	49%	21%	38%
1	23%	18%	27%	58%	37%	27%	14%
2	18%	21%	14%	8%	10%	32%	13%
3	6%	9%	2%	0%	0%	7%	8%
4	4%	4%	3%	0%	0%	3%	6%
5+	6%	8%	2%	8%	0%	3%	11%
Other	8%	8%	9%	0%	4%	6%	10%

	Total	Location			Year founded		
		Calgary	Edmonton	Other	2019-2021	2014-2018	<2014
Q24: What was the stage of the last round of funding your company raised?							
Pre-seed	18%	18%	18%	15%	37%	16%	11%
Seed	25%	28%	21%	23%	19%	43%	16%
Series A	8%	10%	5%	8%	3%	11%	8%
Series B	3%	3%	1%	8%	0%	1%	5%
Series C	1%	0%	1%	0%	0%	1%	1%
Beyond Series C	2%	3%	0%	0%	0%	0%	4%
Not applicable	29%	26%	34%	23%	30%	19%	34%
Other	16%	32%	43%	23%	10%	10%	22%
Q25: How much funding ($USD) was raised in your company's most recent round of fundraising?							
None	27%	25%	33%	9%	32%	19%	31%
Less than $100k	9%	9%	10%	0%	21%	5%	6%
$100k - $499k	16%	13%	18%	45%	27%	17%	9%
$500k - $999k	9%	11%	6%	9%	5%	12%	9%
$1M - $4.9M	21%	23%	18%	9%	8%	30%	21%
$5M - $14.9M	5%	6%	5%	0%	2%	7%	6%
$15M - $29.9M	3%	4%	1%	0%	0%	1%	5%
$30M - $49.9M	1%	1%	0%	0%	0%	1%	1%
$50M or more	2%	2%	2%	0%	0%	1%	3%
Other	9%	8%	7%	0%	6%	8%	10%
Q26: From what type of financing options did this fundraising come from? Please select all that apply.							
Equity	47%						
Debt	21%						
Grants	24%						
Hybrids (i.e. convertible notes etc.)	15%						
Other	25%						

	Total	Location			Year founded		
		Calgary	Edmonton	Other	2019-2021	2014-2018	<2014
Q27: How long did it take you to close your most recent round of fundraising?							
Less than 3 months	26%	28%	21%	33%	36%	23%	22%
4 to 6 months	20%	17%	26%	17%	20%	30%	13%
6 to 12 months	16%	17%	13%	8%	8%	17%	18%
More than 12 months	9%	9%	8%	0%	2%	11%	11%
Not sure / Prefer not to say	30%	28%	32%	42%	35%	19%	36%
Q28: Have you attempted to fundraise over the past two years but were unsuccessful?							
Yes	23%	25%	19%	25%	23%	23%	23%
No	67%	63%	75%	67%	70%	72%	63%
Other	10%	12%	6%	8%	7%	6%	15%
Q29: How much funding ($USD) does your company intend to raise in your next round of fundraising?							
None	20%	21%	20%	17%	11%	6%	35%
Less than $100k	1%	1%	1%	0%	1%	0%	1%
$100k - $499k	9%	10%	7%	8%	16%	10%	6%
$500k - $999k	9%	8%	9%	17%	21%	8%	4%
$1M - $4.9M	24%	22%	27%	33%	29%	29%	19%
$5M - $14.9M	17%	20%	13%	0%	13%	24%	13%
$15M - $29.9M	4%	3%	5%	8%	1%	7%	3%
$30M - $49.9M	1%	0%	3%	0%	0%	2%	1%
$50M or more	2%	3%	0%	0%	1%	2%	3%
Other	12%	10%	15%	17%	6%	13%	15%
$50M or more	2%	3%	0%	0%	1%	2%	3%
Other	12%	10%	15%	17%	6%	13%	15%

		Location			Year founded		
	Total	**Calgary**	**Edmonton**	**Other**	**2019-2021**	**2014-2018**	**<2014**
Q30: Where have your funders been located? Please select all that apply.							
In the Calgary region	53%						
In the Edmonton region	32%						
In another part of Alberta	14%						
In another part of Canada	34%						
In San Francisco / Silicon Valley	10%						
In other parts of the USA	20%						
In Europe	9%						
In Asia	4%						
In another part of the world	3%						
Other	16%						

		Location			Year founded		
	Total	**Calgary**	**Edmonton**	**Other**	**2019-2021**	**2014-2018**	**<2014**
Q31: How many full-time employees are in your company?							
1-4	33%	31%	36%	46%	61%	25%	20%
5-9	17%	15%	21%	31%	24%	20%	12%
10-24	23%	27%	18%	8%	4%	31%	26%
25-49	13%	12%	15%	8%	1%	8%	21%
50-99	6%	7%	4%	8%	0%	2%	12%
100-199	3%	2%	3%	0%	0%	2%	4%
200+	3%	4%	1%	0%	1%	1%	5%
Other	2%	1%	2%	0%	7%	0%	1%
Q32-33: Approximately what percent of your employees self-identify as:							
Male							
Female							

	Total	Location			Year founded		
		Calgary	Edmonton	Other	2019-2021	2014-2018	<2014
Q34: How many founders started your company?							
1	22%	19%	26%	42%	16%	17%	28%
2	41%	44%	36%	42%	36%	42%	44%
3	22%	22%	23%	8%	27%	25%	18%
4	9%	8%	10%	8%	16%	10%	5%
5+	5%	5%	5%	0%	6%	6%	4%
Other	1%	1%	1%	0%	0%	1%	2%
Q35-39: Does your company have at least one founder who:							
Self-identifies as a female?	27%	27%	30%	15%	36%	30%	22%
Self-identifies as a visible minority?	48%	30%	34%	15%	39%	36%	23%
Self-identifies as an Indigenous person?	4%	2%	6%	9%	7%	4%	2%
Has a technical background in your industry?	87%	86%	88%	100%	89%	84%	88%
Previous experience in a startup?	68%	72%	62%	54%	77%	75%	59%
Q40: What is the current average age of your company's founders?							
Less than 20 years	1%	0%	1%	8%	1%	0%	1%
20 to 30 years	5%	4%	7%	15%	16%	5%	1%
31 to 40 years	28%	27%	31%	15%	40%	44%	12%
41 to 50 years	30%	29%	31%	38%	24%	31%	33%
51 to 60 years	21%	25%	16%	8%	16%	13%	28%
61 to 70 years	10%	11%	10%	8%	1%	6%	17%
Other	5%	5%	5%	0%	1%	2%	8%

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