C2iBRIDGE NEWSLETTER

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ONE-STOP SMART HOME SOLUTION FOR THE ELDERLY

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C2CAN is a collaborative platform between SFU VentureLabs®, China Canada Cleantech Innovation Centre (CCCIC), Tsinghua Holdings, and Hanhai Holdings. Its mission is to connect technology companies with the resources necessary to scale and succeed in China and Canada.

C2CAN supports the commercialization of Canadian and Chinese technology companies by linking Canadian and Chinese innovations, capital and markets. Its aim is to accelerate and commercialize innovative technologies that truly make our world a better place.

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FEATURE STORY

CANADA'S WEAKEST LINK IN THE DEEP TECH ECOSYSTEM

According to the latest Global Startup Ecosystem Report published by Startup Genome, nearly half (45%) of startups being created globally now are in Deep Tech sectors, such as AI, advanced manufacturing & robotics, biotechnology, blockchain, to name a few, twice the share they made up just a decade ago.

The new deep tech ecosystem

Deep tech is generally defined as a technology that is based on tangible engineering innovations or new scientific advancements and discoveries, and is usually back by patents. Based on a recent report by Boston Consulting Group(BCG), the aggregate annual global private investment in seven deep tech categories studied in its report soared by more than 20% year on year from 2015 through 2018, reaching nearly $18 billion.

With the onset of the fourth industrial revolution, some even suggest that we are at the beginning of a new tech cycle in which an "installation" phase is taking place where new technology infrastructures are again being constructed. In short, a new deep tech ecosystem is taking shape, with implications for all players involved, from startups, investors, companies all the way to governments.

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AVA SMART GARDEN

TABLE TO TABLE DINING AT HOME

For those who love to cook at home, finding fresh ingredients is usually key. The modern urban lifestyle and different climate conditions make it difficult to maintain an outdoor garden, AVA Technologies, a Vancouver-based maker of indoor smart gardens, hopes to change that by bringing food-growing directly onto the dining table.

“I used to work in food marketing and sales, when I met my co-founder who was a chef, we were both dissatisfied with the amount of food waste that goes into traditional grocery shopping and had wanted to grow food ourselves. But in Vancouver it is really dark and cold in the winter and we didn’t have the option to grow food all year round, so we started AVA,” says Valerie Song, CEO and co-founder of AVA Technologies.

A smart garden is a home accessory that is used to grow various vegetables, herbs and even flowers in soilless pots. It usually comprises of biodegradable plant capsules, LED lamps, humidifiers and wireless connectivity with various smart sensors. The sensors can take care of water, oxygen and other essential nutrients required by the plants.

According to Song, indoor food growing is a lot more efficient in terms of conserving energy and water in comparison to outdoor growing. The energy required is the same as a lightbulb and one can grow up to three or four times faster than outdoors with consistent lighting and water. Up to 98 percent of water can be conserved as the water used can be recycled, and ultimately one can also save on space.

There are already a few similar smart garden products on the market with the rising demand for indoor food growing, Song says AVA still stands out as their inbuilt camera and smart sensors enable the device to adjust automatically to what the plant needs whereas existing products usually have a timer that needs to be turned on and off.

“Right now in the industry, the light tends to stay the same throughout the whole growth cycle but that is not what the plant needs. Some plants might need more red at the beginning and more blue at the end, it is the intensity as well as the colour of the light, and our device can change that over time,” Song explains, “AVA’s plant pods were created with individualized ID codes. You can use our app to scan the code and the device will know if you are growing basil or lettuce and it then adjusts the lighting and watering for the plants.”

Song says a two-month nutrient life cycle is recommended for the plants and one can start harvesting as early as two weeks in for an herb such as basil. A 100 percent germination rate is guaranteed according to Song and if it fails, the pod packs will be replaced for free.

AVA has developed six different pot packs so far for a mix of 25 different herbs and plants. It is also launching microgreens and looking into other vegetables and fruits such as tomatoes and strawberries. It is also testing the possibility of growing fresh cuts of flowers as well as edible flowers, which many chefs like but are very expensive.

AVA took off after running a successful Indiegogo campaign in 2017 where it received USD 135,000 in sales in just over a month, the start-up has raised about USD two million up to date.

As a first-time female founder involving hardware, Song says it hasn't been an easy and smooth ride given the nature of the device.

"It looks easy on the outside but a lot is difficult, every time you design a new feature you have to test it, and it takes time. With traditional hardware, you can test it right there and if it doesn't work you just change it on the spot, but it takes two months to four months for us," Song says.

Despite the difficulties, AVA is finally delivering its first batch of products in January 2020 after three years of hard work.

ONE-STOP SMART HOME SOLUTION FOR THE ELDERLY

- TOCHTECH TECHNOLOGIES

Aging population is a global trend with the World Health Organization projecting that the proportion of the global population over 60 years old to nearly double to 22% by 2050 from 2015. In fact, 2018 already marked an epochal demographic turning point, where for the first time in recorded history there are more people over 65 than children younger than five.

How to care for the elderly in the best and most efficient manner is a growing problem waiting to be solved by technology. Tochtech Technologies, one of the first residents of Surrey's digital health hub, has come up with a one-stop customizable smart home solution Vericare for senior assisted living.

By installing non-camera and non-wearable based sensors in senior homes, Vericare collects and analyzes data using a machine-learning algorithm to build a profile of the senior's daily routine. From that it provides family members and caregivers updates on the senior's well-being or notifications on potential risky situations.

"The home sensor solution requires the lowest amount of effort from seniors. It takes about 15 mins to finish installation in a room. It is based on the idea that everyone has a routine and with the calculating method we developed with a professor from the University of Victoria, we can learn about someone's rhythm in a week or two. If there is an abnormality then there is a potential risk, and we can report that to family members and caregivers," says Jessica Yang, CEO and Co-founder of Tochtech Technologies.

Yang started the company with her Co-founder Wei Fang nearly four years ago in a garage, like a typical start-up story. With a passion for senior care and some government funding, they have grown their team to 10 people now and do everything in-house from design to 3D printing.

"Our first product was Smarturns, which was an intelligent stove knob that could automatically send a reminder to avoid irreversible consequences as we learned that unattended stove was the main source of house fires and we kept hearing horror stories of old people forgetting to turn off their stoves," Yang says.

As they gradually learned more and more about what the elderlies need working closely with home care professionals, they developed the Vericare system that can incorporate a suite of different products based on individual customer needs.

"After the motion sensors, we realized we needed a communication tool, so we made Tochie. The current home assistants on the market such as Echo or Alexa are mostly reactive but Tochie is

proactive. For example with Dementia patients, they might leave home and not be able to come back, but if Tochie can detect when the person is leaving and distract the patient with a family member's voice, then the problem is solved," Yang explains.

Best Buy, BIOS Medical, Boundless Assistive Technologies, Life Supply and many other online retailers have signed up as sellers of Tochie and Smarturns. The company is also planning to launch their new sleep sensor this year. The innovative sleep sensor is designed for sleep health management for patients and loved ones.

"We are combining hardware, software, AI, IoT and cloud computing for our Vericare system, and we can keep adding new products and services to be integrated into the system, and that is where our true value is," Wei Fang, CTO of Tochtech Technologies says.

Vericare deploys a subscription model that charges clients based on the customized package, which Hou thinks is much more economical to solve the senior care problem.

"This is a huge growing market, premium retirement homes cost about $8,000 a month, and we charge less than 100 dollars for a monthly subscription, but we can solve the problem at home rather than sending them to retirement homes," Fang adds.

Scarcer government and labour resources for social welfare in the future also mean that there likely just won't be enough elderly care facilities. According to Fang, for example, China already has a national 9064 policy for elderly care, which means 90 percent of the people will stay at home, six percent will be supported by the community and four percent will be sent to retirement homes.

The company has identified both Canada and China as its main markets and it has both a B2B and B2C business model to work with retirement home operators and developers, as well as directly with private homes.

The process hasn't been an easy ride for the team from product development to market penetration as older people are slower to adapt to new things but Yang says they derive a huge sense of achievement with their work. "We usually deal with senior care professionals, they all derive joy from taking care of the elders, if they are happy, we are happy, that is why we have been persistent."

Looking ahead, Tochtech hopes to partner up with more like-minded enterprises and investors to expand its suite of solutions to better serve the needs of the seniors.

BRINGING MOBILITY TO EVERYONE

- A & K ROBOTICS

A&K Robotics, established in Vancouver five years ago, has developed and is in the process of commercializing an AI-powered navigation system - Autonomous People Mover (APM) - for indoor vehicles, with the goal to bring mobility to everyone.

“The core technology is a brain that can turn anything with wheels to a self-driving car. We started with indoor environments as we identified an opportunity to make a big impact while others were focusing on autonomous vehicles on the streets. We wanted to enable mobility of goods and people in the very environments that people spend most of their time living and working,” says Matthew Anderson, Co-founder and CEO of A&K Robotics.

Initially funded with their own money from Co-founders Matthew Anderson and Jessica Yip, A&K Robotics has since grown to accommodate a team of more than 15 staff with subsequent seed investments and government research grants.

The company started with making cleaning robots and has been commercializing since 2018, with over 1,000 kilometers under their belt from their first fleet of robots. Now, they’re taking the technology launched and proven in the janitorial market and applying it to moving people.

In the medium term, Anderson says the company’s goal is to use its platform to solve the mobility problem for people who are in need of assistance.

“We would like to start with people with minor mobility issues, who can’t walk long distances; after that, we want to work with people with minor cognitive issues such as stroke survivors; thirdly we want to focus on people who are on wheelchairs full time - when they are getting fitted for their wheelchairs, they can just get the A&K modules added on; the fourth stage is an open-source stage, where the A&K platform can incorporate other specialized solutions developed by anyone from anywhere in the world. This is the stage we’re most excited about because at this stage it’s really about having the biggest impact possible on a global scale, and doing much more than any single company would be able to do on its own,” Anderson explains.

The global wheelchair market was valued at USD 2.3 billion in 2018 and is anticipated to grow at a CAGR of 7.6% till 2026 based on a market report by Grand View Research. According to the research, rising aging population globally and high prevalence of chronic disorders compared to other diseases are factors responsible for the increase in disability, which in turn is boosting demand for wheelchairs.

> “The core technology is a brain that can turn anything with wheels to a self-driving car.”

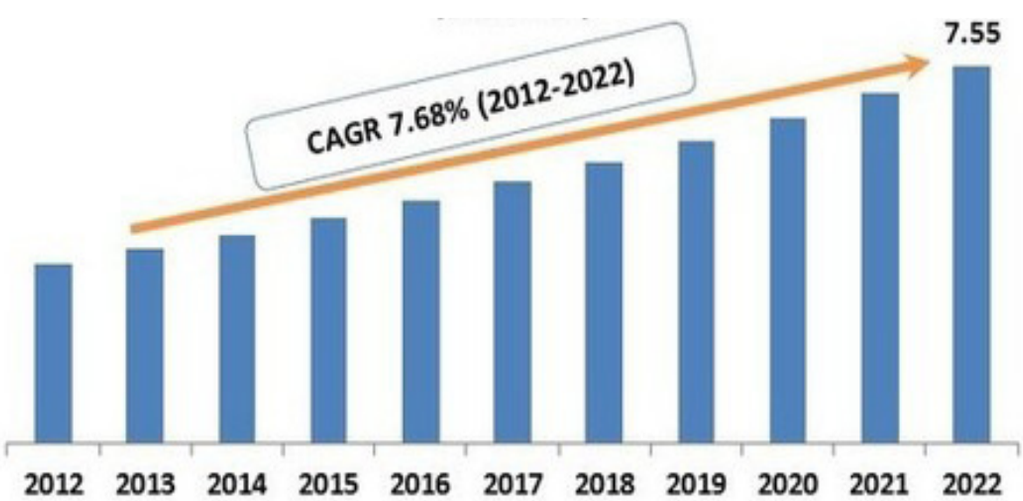
Over the long-term, Anderson says the company will be a part of the shift towards smart cities providing first and last mile transportation solutions.

"There are some gaps to fill in order to truly realize modern smart city plans, the most notable being the first and the last mile transportation problem. We would like to focus on micro-mobility issues to solve these challenges," Anderson adds.

The first and last mile problem is the first and last leg of urban travel that usually can't be covered by existing transportation solutions, such as coming off a subway and then looking to catch a taxi to get home, trying to get somewhere after parking the car or simply picking up groceries from a local store. Walking is not always the quickest or the most convenient way to get around.

The company is laying the groundwork for big plans in the future, it is currently conducting international trials and is preparing to commercialize their newest product release, the Autonomous People Mover (APM), in late 2020.

Personal Mobility Devices Market Size and Forecast 2012-2022 (USD Billion)



Source: Crystal Market Research

A SHORT PRIMER ON IP FROM AN EXPERT

As the pace of innovation accelerates with rapid advancements in multiple fields of technologies, business competition is increasingly a competition of inventions and ideas. Having a coherent IP strategy is crucial for a new venture's success, particularly for a high-tech start-up whose whole existence might be based on a new invention. Ling Wong, an intellectual property lawyer at Fasken in Vancouver, shares his expertise on how start-ups should go about thinking and managing their IPs.

To file or not to file

Wong explains that intellectual properties mostly include patents, trademarks, trade secrets, copyrights and industrial designs. The IP branches that are most relevant to tech start-ups are usually patents and trade secrets, and they are exclusive to each other.

According to the World Intellectual Property Organization(WIPO), a patent is an invention that is new, useful and inventive. It can be cutting-edge technology or it can be an improvement on products or processes. Patent protection applies in the country or region that issues the patent.

"With patents, what you are expected to do is basically sharing the technology with the world, that is why the government gives you a certain period of exclusivity, you are pushing the frontier of science so that others will be able to build upon it as well," Wong says, "trade secret on the other hand, you just have to keep it a secret, you don't share with the public."

Wong says that the benefit of a trade secret is that you don't have to go through the registration process and in theory it can last indefinitely such as KFC's secret fried chicken formula, however the moment a competitor patents something, you lose the right to use it and it could be stolen or made public by an insider.

"The technology industry moves so fast, if you are talking about traditional industry, three to five years is not the end of the world but for high tech in three years your tech might be obsolete. If you have a patent in place which a competitor is infringing, whether deliberately or accidentally, you can have the option to go against them," Wong says, explaining the benefit of having a patent.

Beyond protection against IP infringement, Wong says more commonly start-ups also get patents to attract collaborators and investors. "No one wants to get into an IP dispute, what a patent does do is give comfort to people who are backing these companies."

Despite the earlier the better when it comes to patent application, Wong says start-ups do tend to wait till a bit later when they have a proper prototype before applying, and it makes sense to do so.

"A patent covers your invention but you also want to make it cover your competitors' inventions, you don't want someone to change a small thing and make a new patent, that is part of the exercise that we go through with the inventor, how else can we do this," Wong says.

He adds that the patent application is a very detailed document, almost like "an IKEA instruction manual", where it sets out what the problem is, why your invention is better at solving this problem and at the end lays out what it is that you have protections for.

It usually takes a few months to prepare a patent application and costs around $7,000 to $10,000 according to Wong. Once the application is sent in, you get a date stamped and you are ahead of anyone who files the same invention after you.

A national patent examiner will decide if your application is deserving of the patent in time and once the registration is finished, you can enforce the right of protecting your patent, for up to 20 years. The length of the registration process varies across countries, in Canada it takes about 26 months based on statistics from WIPO.

Domestic or global

Because a patent is specific to one jurisdiction, companies also need to decide where they need the protections according to Wong, as competition is global and very few companies, particularly in the tech space, are limited to just domestic market.

"Where my commercial markets are, where my customers and my competitors are likely to be, those factors are what determine where you will file your patent," Wong says, "you can file in those specific countries, but the more common way is you can file a PCT application, which reserves the right for the patent to be converted to a national one later. You can then decide in time which market is more suitable, this can make a critical difference as the cost is deferred."

The Patent Cooperation Treaty (PCT), an international treaty administered by WIPO, allows applicants to seek patent protection for an invention simultaneously in a large number of countries by filing a single PCT international application. The granting of patents remains under the control of national and regional patent offices.

Wong shares that from his experience if a company needs protection in more than three countries, filing a PCT application makes more sense and if it is a core invention, PCT is definitely the far more common route for Canadian companies.

In fact, based on statistics provided by WIPO, applications filed abroad made up for more than 80 percent of the total for Canada (82.2%), Israel (90.3%) and Switzerland (80.3%), all are countries with strong innovations but small domestic markets.

Filing for a patent in a foreign jurisdiction is one thing, getting it enforced is another. Wong says the overarching theme in global IP development is to harmonize laws in all countries so the law is uniform.

Using China as an example, a country traditionally with a bad reputation in IP infringements, Wong clarifies that it was more a historical thing. In the last decade or so, IP law in China has gradually caught up with international standards and it is not very different to western countries now, however enforcement of these rights, particularly in small local areas, can still be challenging.

China's share of the world's total IP applications increased from 15% in 2008 to 46.4% in 2018, according to figures from WIPO, reflecting the fast changing landscape of global business and technology competition.

Last word of advice for start-ups

For tech start-ups with limited resources and a million things to do, Wong says many times they could overlook things that are really important such as IP while trying to focus on the product or the market.

"I think the first thing really is to keep IP in mind which is fundamental. When they go to their first round of financing, one of the top questions is like to be what is your IP position. They have to ask that question very early on internally. They need to address why they don't have IP, if they do have IP, they have to continuously assess what they can protect, those are the exercises we go through with our clients."

> "We talk about IP audits, it is the same as companies auditing their financials."

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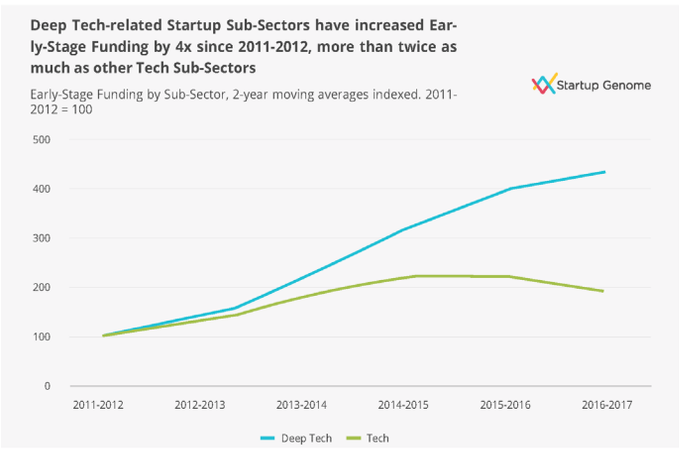
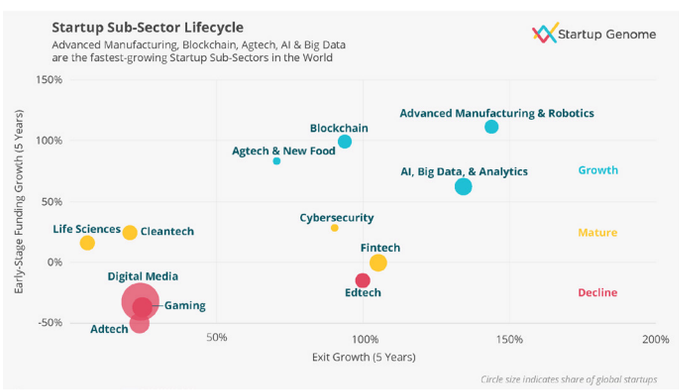


Source: Startup Genome



Source: Startup Genome

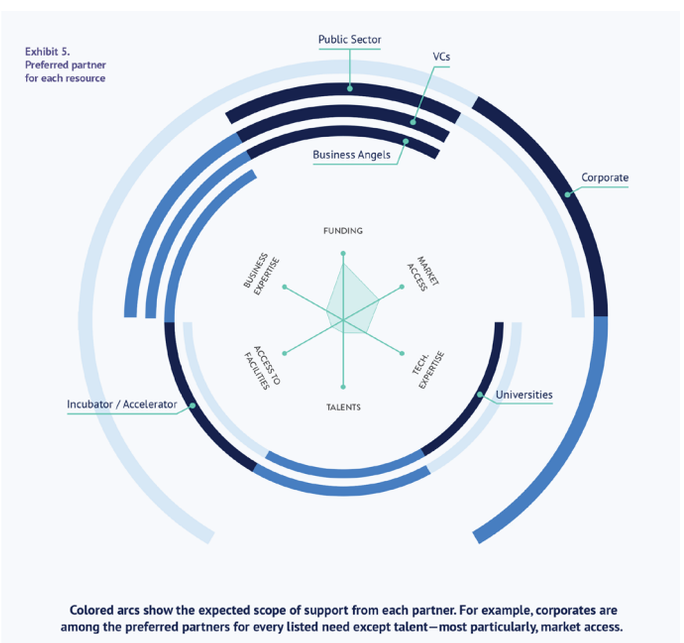
In the same report, BCG highlights three characteristics of deep tech start-ups - the potential for a big impact, the need for longer timescales, and higher levels of investment. It also identifies six key resources needed by deep tech start-ups: funding, market access, technical expertise, business expertise, access to facilities and talent.

Comparing Deep Tech to General Tech

FACTORS	DEEP TECH	GENERAL TECH
Idea	Scientific discovery or engineering innovation	Business innovation
Qualification	Typically Postgraduate, PhDs	Often self-educated programmer, new computer science graduates
Age of founders	Usually from 35 years old and above	Usually 20-25 years old
Gestation	Typically above 5 years	From months to a few years
Testing	Multiple in-depth trials	Rapid iteration on-the-go
Regulatory approval	Yes	Not necessary

Source: SGInnovate Insights

Given the demand for larger initial funding and longer gestation period for deep tech start-ups, the support of the surrounding ecosystem is of crucial importance for a start-up's success. The BCG report specifically emphasizes on the increasing active role played by corporate venture capital in the deep tech ecosystem. According to their findings, more corporations are now investing alongside traditional venture capitalists and become partners of deep-tech startups from early stages. In addition, according to BCG survey, 97% of deep-tech startups are interested in collaborating with corporate partners, in order to gain market access to further scale up the company.



Source: The Boston Consulting Group

Canada's weakest link

Thus the shortage of large corporations as partners to future start-ups appears to be Canada's weakest link in competing in the new global innovation economy, confirmed also by the findings from the Narwhal Project published by the Impact Centre at the University of Toronto last year.

The report states that a critical challenge in growing Canada's start-up ecosystem is to scale companies to a world-class size despite the

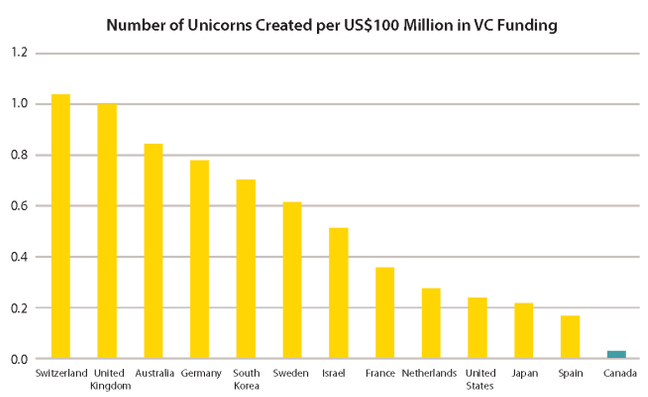
presence of funding and talents. In turn, without more sizable companies, new start-ups will be further limited in the resources and markets they can access to scale up, hence it becomes a vicious cycle. Moreover, as large multinational corporations increasingly play a bigger role in the deep tech ecosystem globally, Canada will be at an even more disadvantaged position despite its strength in scientific research and development.

Enterprises by business size (250 or more persons)

Country	Number of Large Companies	Population (in millions)	Number of Large Companies (per million population)
Germany	4408	82	53.8
Japan	3572	127	28.1
Australia	523	24	21.8
Italy	1236	59	20.9
France	1355	65	20.8
United Kingdom	1229	66	18.6
United States	5672	322	17.6
Spain	802	46	17.4
Canada	370	36	10.3

Source: OECD 2017 - Online

Source: The Narwhal Project



Source: The Narwhal Project

Since we can only live with the fact that Canada doesn't yet have a large domestic market, the Narwhal Project suggests that we will need to look outside and create world-class companies in global markets. The country has done it before with Blackberry for example and it can do it again with appropriate strategies both from the government and the start-up themselves.

One notable finding from the Narwhal Project indicates that Canadian companies tend to spend a lot less on M&S (marketing & sales) than for example US companies, they also have a smaller fraction of their employees dedicated to M&S.

The research shows that Canadian firms with US$50,000–US$2 million of funding have 24% of their employees engaged in M&S. Thus in the early stages of development, Canadian tech firms are likely to have a larger fraction of their workforce dedicated to R&D than to M&S. In comparison, leading American firms have 40% of their employees dedicated to M&S and firms that scale quickly to US$10 million in revenue spend, on average, 73% more on M&S than on R&D.

To be able to grow quickly in global markets is the biggest challenge that Canadian companies face to become world-class companies and it requires both more M&S spending and expertise based on the findings.

As the Narwhal Project concludes, "our success as an "Innovation Nation" will depend not only on our ability to come up with novel ideas or inventions but also on our ability to market and sell those ideas." In the global innovation economy, Canada needs more of the world and Canadian companies need more global visions before the world can realize it needs a lot more of Canada.

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