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**Working Paper**

## The digital economy: Insight from a special survey with IT service exporters

Bank of Canada Staff Discussion Paper, No. 2016-21

**Provided in Cooperation with:**

Bank of Canada, Ottawa

*Suggested Citation:* Dong, Wei; Fudurich, James; Suchanek, Lena (2016) : The digital economy: Insight from a special survey with IT service exporters, Bank of Canada Staff Discussion Paper, No. 2016-21, Bank of Canada, Ottawa,  
<https://doi.org/10.34989/sdp-2016-21>

This Version is available at:

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Staff Discussion Paper/Document d'analyse du personnel 2016-21

# The Digital Economy—Insight from a Special Survey with IT Service Exporters



by Wei Dong, James Fudurich and Lena Suchanek

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Bank of Canada Staff Discussion Paper 2016-21

November 2016

# **The Digital Economy—Insight from a Special Survey with IT Service Exporters**

by

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## **Acknowledgements**

We thank the Regional Analysis Division for its truly co-operative work in consulting with firms and associations to gather the information summarized in this paper. Laurent Martin, Eric Santor and Jing Yang provided excellent comments. We thank the anonymous firms and industry associations participating in our consultations for their time and interesting discussions. All remaining errors are our own.

## **Abstract**

Information technology (IT) is an increasingly integral part of everyday business and personal life reflecting the ongoing and accelerating digital transformation of the economy. In this paper, we present information gathered from a survey with export-oriented firms in the Canadian IT service industry and consultations with industry associations aimed at shedding light on this small but highly dynamic sector. Our main findings from this survey are: (i) IT service firms experience strong sales growth and tend to be very positive about their outlook, driven by the solid exports that comprise the majority of their sales; (ii) in this context, firms overwhelmingly view the weaker Canadian dollar as favourable, boosting their margins on foreign sales; (iii) because of the knowledge-intensive nature of the industry, firms report investing in human capital more than in physical capital. This often comes with strong employment and R&D investment intentions, although firms in some regions face difficulties in recruiting qualified staff. The survey results provide initial insight in the context of our broader agenda to better understand the implications of digitalization for the Canadian economy.

*Bank topics: Firm dynamics; Service sector*

*JEL codes: D22; L86; O33*

## **Résumé**

Les technologies de l'information (TI) font de plus en plus partie intégrante de nos activités professionnelles et personnelles, sous l'effet de la transformation numérique permanente et accélérée de l'économie. Dans cette étude, nous présentons l'information recueillie lors d'une enquête menée auprès d'entreprises à vocation exportatrice du secteur canadien des services TI ainsi que de consultations auprès d'associations industrielles dans le but de mieux cerner ce secteur, petit mais très dynamique. L'enquête nous a permis de faire les principaux constats suivants : 1) les entreprises de services TI connaissent une forte croissance des ventes et sont généralement très optimistes quant à leurs perspectives, portées par les exportations vigoureuses qui représentent la plus grande partie de leurs ventes; 2) dans ce contexte, une immense majorité des entreprises considèrent que le niveau plus bas du dollar canadien est avantageux, puisqu'il leur permet de dégager des marges bénéficiaires plus importantes sur les exportations; 3) compte tenu de la nature du secteur, qui dépend fortement du savoir, les entreprises déclarent investir davantage dans le capital humain que dans le capital physique. Cet état

de fait se traduit souvent par une ferme intention d'embaucher du personnel et d'investir dans la recherche-développement. Dans certaines régions, les entreprises ont toutefois de la difficulté à recruter du personnel qualifié. Cette enquête apporte de premiers enseignements dans le cadre du programme que nous nous sommes fixé en vue de mieux comprendre les implications de la numérisation pour l'économie canadienne.

*Sujets : Dynamique des entreprises; Secteur des services*

*Codes JEL : D22, L86, O33*

## Section 1: Introduction and Background

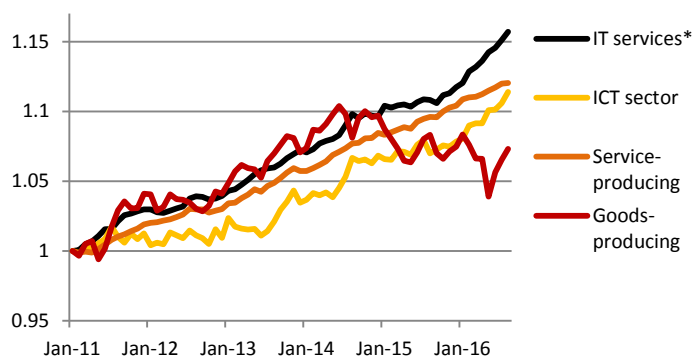
Rapid advances in digital technologies are affecting almost every aspect of the Canadian economy. The digital economy is becoming increasingly intertwined with sectors such as media (e.g., ad-supported content providers), banking (fin-tech), retail (e-commerce), energy, transportation (e.g., self-driving cars) and health (electronic records, digital health solutions), as well as entertainment and social interactions (social networks, online gaming, streaming services) (OECD 2015; Tapscott 2014). Digital networking and communication has led to the emergence of new business models and strategies and allows firms, consumers and governments alike to interact, communicate and seek information from everywhere. Solutions provided by information technology (IT) firms are an increasingly integral part of everyday business, including services such as cloud storage and big data analytics. In some cases, digital advances may even trigger the transformation of entire systems of production and management. While the Internet of Things<sup>1</sup> already connects billions of objects, smart devices and people today, it is expected to drive automation in countless fields, enabling machine-to-machine communication, machine learning and, ultimately, autonomous machines and systems.

Overall, Canada is well positioned to have a flourishing IT sector due notably to its highly educated workforce, favourable business climate and political stability. Tax incentives<sup>2</sup> also help to attract foreign investors and firms. Indeed, the sector has been doing well relative to other sectors and is expected to continue to do so, particularly in services: gross domestic product (GDP) growth of the IT service sector has outperformed GDP growth of service-producing industries overall (which, in turn, outperformed GDP growth of goods-producing industries) over the past two years (**Chart 1**). A recent surge in IT-related patents in Canada further points to the key role the sector plays in innovation (Di Battista et al. 2015). Yet, the Canadian IT sector as a whole is lagging countries such as the United States, Korea and Israel in terms of IT service exports, patents, value added of the sector in total value added, and expenditure on research and development (R&D), lacking the catalyst (such as a national strategy) to grow from a nation of small and medium-sized firms to large global players (OECD 2015).

In this context, the Bank of Canada conducted a special survey that targeted a subset of the IT sector: IT service exporters

**Chart 1: IT service sector outperforms services**

*GDP at basic prices, chained (2007) dollars, normalized to Jan 2011=1*



\*Note: IT services refers to the subsector of ICT targeted in the special survey. See table A1 in Appendix.

Source: Statistics Canada

Last observation: August 2016

<sup>1</sup> The Internet of Things refers to any smart device or object being connected to the Internet (e.g., biochips, smart thermostats, cars with built-in sensors), allowing the collection and exchange of data and remote control.

<sup>2</sup> For a comparison of tax incentives, see KPMG study by Ciaramitaro et al. (2014). Major programs include the Canadian Scientific Research and Experimental Development Tax Incentive Program (SRED or SR&ED) and various provincial programs such as the Québec Tax Credit for Salaries and Wages (R&D).

(ITSE). Staff in the Bank's five regional offices<sup>3</sup> consulted 44 firms and met with 5 industry associations to shed light on characteristics, trends, prospects, exports and challenges for firms in the sector.<sup>4</sup> Given the declining role of Canada's IT goods industries relative to the strong performance of its IT service sectors, the survey was limited to firms in service sectors.<sup>5</sup> Moreover, we targeted exporters only.<sup>6</sup> The target subsectors account for roughly 3.4 per cent in GDP and 1.5 per cent in exports, but come closer to 4.8 per cent in *service* GDP and 9 per cent in *service exports*.

The results paint a buoyant picture of a small but dynamic and highly innovative part of the Canadian economy as part of the so-called fourth industrial revolution.<sup>7</sup> In particular, firms reported robust past and future sales performance, which is driven by the solid growth of exports that comprise the majority of their sales. Firms attributed positive sales prospects to their own innovative service offerings and efforts against a backdrop of strong global demand for their services as key factors. Businesses overwhelmingly saw the weaker dollar as beneficial to their business, boosting their margins on foreign sales. To keep up with generally favourable demand conditions, many firms reported plans to increase their staff and to invest in R&D, though some find it difficult to find talent and qualified staff. Because of the knowledge-based nature of the industry, investment spending per se is limited in dollar terms; firms purchase equipment such as software and hardware to equip staff. This could mean that, as Canada moves further toward a service-based economy, aggregate investment in machinery and equipment (M&E) would be lower overall, because investment intensity in service industries such as IT is much lower, while investment in human capital could increase.

This survey is part of a broader research agenda to better understand service sector exports and the implications of digitalization for the Canadian economy. Services represent roughly 70 per cent of GDP and are evolving as Canadian firms are increasingly selling ideas and solutions. Moreover, drawing a clear line between goods and services is becoming more difficult as many services are becoming further intertwined with goods and are often sold in combination (Conference Board of Canada 2015). The survey opens up several avenues of further work on questions related to the measurement of GDP and

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<sup>3</sup> The Bank's regional offices are located in Halifax (representing Atlantic Canada), Montréal (Quebec), Toronto (Ontario), Calgary (the Prairies, Northwest Territories and Nunavut), and Vancouver (British Columbia and the Yukon).

<sup>4</sup> Survey respondents were typically the chief executive officer, president, chief financial officer, chief operating officer or treasurer. The survey was conducted from 1 August to 13 September, 2016. Of the 69 firms Bank staff attempted to contact, 25 were unavailable.

<sup>5</sup> Statistics Canada's definition of the information and communications technology (ICT) sector encompasses a number of North American Industry Classification (NAIC) codes in both the goods industries and the service industries. Our sample was selected from subsectors of two main *service* NAICS that are part of this definition, excluding telecommunications. See Table A1 in the Appendix and Statistics Canada (2014) for details.

<sup>6</sup> While this introduces a "sampling bias," it is likely small since firms in the targeted sectors have a very high propensity to export: Statistics Canada reports that about 86 per cent of ICT products were exported in 2014, and the Association Québécoise des Technologies states that 76 per cent of ICT small and medium-sized enterprises (SMEs) export (versus 21 per cent of SMEs in all industries). The rationale for focusing on exporters is to gain insight on service sector exports (Bank of Canada 2016b).

<sup>7</sup> The fourth industrial revolution, or Industry 4.0, refers to the current trend of automation and digitalization of the manufacturing sector, including technological advances in the Internet of Things, artificial intelligence, robotics, autonomous cars, 3-D printing, biotechnology, energy storage and quantum computing (Schwab 2016).



trade of services, as well as on the potential of digital technologies to transform other industries and change the entire economic landscape.

The remainder of the paper is structured as follows. Section 2 discusses some basic characteristics of the ITSE firms consulted in this survey. Section 3 presents findings from the survey including firms’ perspectives on sales activity, with a focus on export prospects and the role of the Canadian dollar, capacity pressures, investment and employment intentions, as well as financing conditions. Section 4 summarizes firms’ views on the future of the sector and their role in the digital transformation of the economy. Conclusions and areas of future work are provided in Section 5.

**Section 2: Some Basic Characteristics of ITSE Firms**

The Bank’s regional offices consulted with 44 firms. Although not a very large sample, it covers all regions in Canada and various firm sizes, company types and ownership structures. The distribution of firms consulted is reported in Table A1 in the Appendix. Discussions with five industry associations and information from public sources allowed us to complement and cross-check the findings from our consultations.

**The firms surveyed sell mostly software or services that use digital content**

Most often, firms sell to businesses or governments (Table 1). An example of products is software to track products along the supply chain, providing up-to-date information on shipments from vendors and deliveries to customers. Other types of software are designed to increase security against cyber threats, improve management of a company’s assets, automate data entry and provide other services to make businesses more efficient. A few sell software or solutions to the entertainment industry (e.g., video games and film industry).

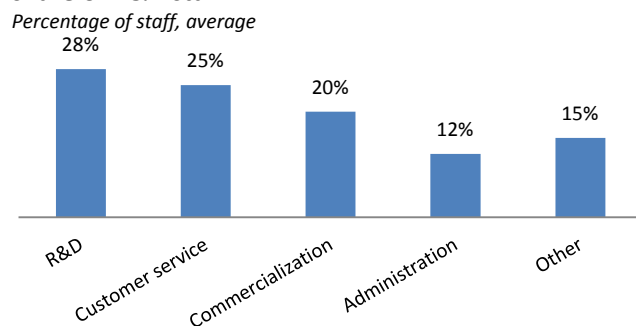
Firms that provide services using digital content range from marketing campaign strategists to online marketplaces and consulting firms using improved technology. Some sell solutions to manage online operations or reservation systems, to handle communications and administration, for business record keeping and for energy efficiency. Finally, a few firms provide specialized services to clients requiring expertise in niche areas, such as data analysis on specific hardware and engineering services.

**Table 1: ITSE firms sell mainly to businesses**

Main clients of ITSE firms (by major industry group, not mutually exclusive)	%
Consumers	7
<b>Businesses</b>	
Manufacturing	36
Finance and insurance	36
Retail and wholesale	39
Other	61
<b>Government</b>	
Healthcare	27
Education	20
Other	48
Internal	5

Firms' operations are highly oriented toward R&D and customer service (**Chart 2**). Firms reported their estimated distribution of staff into five categories: R&D, customer service, commercialization, administration and other. R&D has the largest average share of staff, at 28 per cent. This category was open to firm interpretation and included traditional activities such as developing new software and improving the firm's online platform, as well as customizing services or software for clients. There is also a sizable proportion of labour devoted to customer service, including, for example, training and customer support call lines. This suggests that a large proportion of the cost associated with a sale is incurred after the initial sale.

**Chart 2: ITSE firms generally have a large share of R&D staff**



### **The majority of surveyed firms have operations abroad, most often to facilitate sales**

Roughly two-thirds of surveyed firms reported having foreign affiliates, usually in the United States but also in Europe and emerging market economies. This is in line with economic statistics showing that many services are delivered to foreign customers through foreign affiliates rather than exported directly from Canadian operations: nearly half of Canadian foreign affiliate sales are services—a high share compared with about 16 per cent in exports. The majority of respondents cited the necessity to be close to the customer because it is easier to expand sales markets, manage sales service and collaborate with customers on product customization with local staff, as well as the advantage of being within the same time zone as the customer. It also helps to avoid regulatory issues associated with selling a product from Canada. Cultural differences, mentalities and language were also reasons to have a foreign office.

In most cases, such foreign operations are small and concentrated on sales. On average, respondents had around 80 per cent of their operations located in Canada. R&D including product development is typically done in Canada, but many firms leave some of the customization and technical work to be carried out on-site by foreign affiliates. Of the few firms with part of their R&D located abroad, most cited reasons such as tapping talent pools, low-cost well-educated talent or the lower cost of operation in more general terms.

## Section 3: Survey Results on Business Perspectives

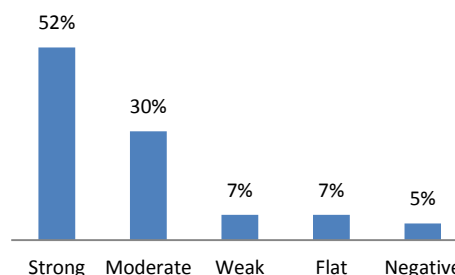
### 3.1 Business activity and the role of the weaker Canadian dollar

#### ITSE firms saw strong past sales growth

Over the past three years, most ITSE firms described their sales as strong or moderate (**Chart 3**). Twenty-three firms described their recent sales as “strong” and 13 described them as “moderate.” Many firms reported the percentage growth of their sales in the past and most of them were double-digit percentages. Several firms saw triple-digit sales growth, with sales having doubled or displayed explosive growth. Such strong sales performance is not limited to any specific region and is quite widespread across the country. Only three firms described their experience as “weak,” three described it as “flat” and two saw sales decline. When asked how they would describe their life cycle stage, most firms (66 per cent) deemed themselves to be in the growth stage.

**Chart 3: Firms saw strong sales growth over the past 3 years**

Percentage of firms

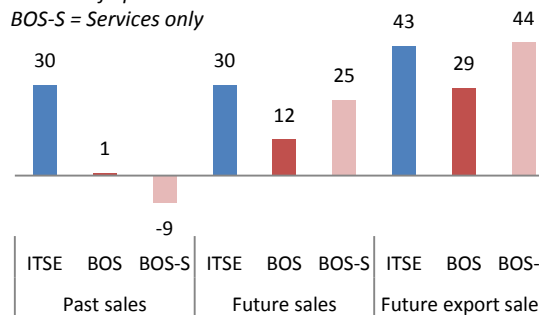


Solid past sales performance reflects trends in exports since ITSE firms are highly export-intensive. On average, they export 70 per cent of their products compared with 53 per cent for exporters in the Bank’s 2016 autumn *Business Outlook Survey* (BOS).<sup>8</sup> Most ITSE firms surveyed described entering export markets as easy and fast. In fact, many firms stated that they started exporting at the very beginning of business. Firms attributed the ease to begin exporting to the “niche” nature of their products, as well as to the ability to find foreign (mostly US) firms eager to adopt new technology early and with an open mind, in contrast with Canadian companies, which survey respondents perceive to be more risk-averse. Some firms also indicated that they started the business with a global focus since the Canadian market is too small. On the other hand, a few firms described their path to exporting being very difficult, mainly due to the highly competitive US markets.

Focusing on the last two years, the balance of opinion on past sales growth is significantly positive in the ITSE survey, indicating an acceleration in sales growth over the last 12 months (**Chart 4**, first panel). This is in clear contrast to the past sales balance of opinion from the BOS, which at near zero

**Chart 4: ITSE firms saw strong past sales and expect a further acceleration over the next 12 months**

Balance of opinion\*  
BOS-S = Services only



<sup>8</sup> The proportion of exports in sales of exporting firms participating in the BOS is roughly stable over time; over the 2015Q3–2016Q3 period, exports represented 49 per cent of BOS exporter sales.

reflects sales growing at the same rate over the past 24 months. More than half of the ITSE firms described their export sales to have been stronger than their Canadian sales over the past 12 months. Firms’ own efforts (ranging from marketing strategies to niche products and good reputations) are most often cited as factors driving the past and current export sales, together with improved foreign demand conditions. Eighty per cent of firms characterized the current environment for exports as favourable, 14 per cent deemed it neutral, while 7 per cent characterized it as unfavourable.

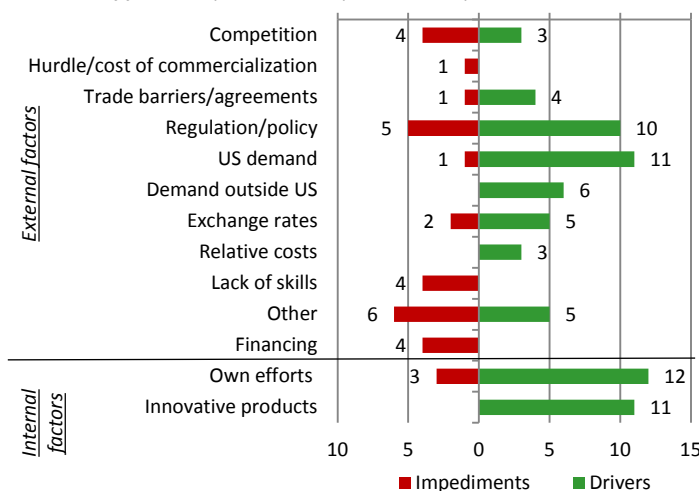
### Firms expect further acceleration in sales over the next 12 months

ITSE firms are optimistic that sales will accelerate over the next 12 months (**Chart 4**, second panel). Twenty-two firms (50 per cent) expect sales growth to be even faster than over the past 12 months, 13 firms expect sales growth to remain steady, while 9 firms expect growth to slow. Two firms are expecting a decline in sales because of the decreasing discretionary budget of oil and gas companies. Export growth is generally expected to accelerate (**Chart 4**, third panel) and to be stronger than domestic sales growth over the next 12 months. Twenty-six firms (59 per cent) expect export growth to outpace domestic sales and 15 firms (34 per cent) expect export and domestic sales to grow at a similar pace. It is interesting to note that an important proportion of “exports” represents, in fact, *intra-firm* exports (i.e., sales from the subsidiary or affiliate to its parent or vice versa).

Comparing the balance of opinion on future sales growth across surveys, positive sales perspectives are more prominent in the ITSE survey than in the BOS, but sales indicators are more similar when compared with service firms in the BOS.<sup>9</sup>

Many firms indicated their own efforts (12 firms) and new/innovative products (11 firms) to be important factors in supporting export sales growth expectations (**Chart 5**, green bars). Eleven firms indicated that US demand conditions support future export sales expectations and six firms also see foreign demand conditions outside the United States as supportive. A number of firms (10) reported that government policies also support firms’ future export outlook, such as the Quebec tax credit for salaries and wages (R&D). The exchange rate has a relatively small impact on firms’ outlook for export volume, and a much larger impact on their revenues and margins. We discuss this in more detail in the next subsection.

**Chart 5: Factors impeding and driving performance of future export volumes**  
*Number of firms (respondents can provide multiple answers)*



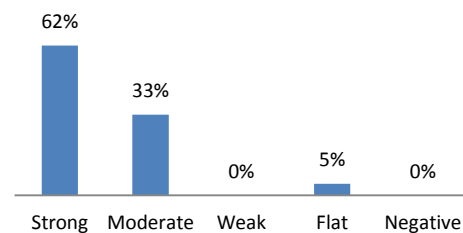
<sup>9</sup> Indeed, recent publications of the BOS, including the autumn survey (Bank of Canada 2016a), have highlighted the relatively more positive outlook among firms in the service industries (compared with goods-producing firms).

Generally, firms identified fewer impediments than drivers to their export outlook (**Chart 5**, red bars). A number of firms reported financing being an issue, alluding to challenges because of limited support from Canadian banks to accompany domestic companies going global (see next section for details). Some firms also mentioned the difficulty in attracting and retaining talent as a factor holding back their export performance.

Over the next three years, most firms (62 per cent) expect export sales growth to be strong, 33 per cent expect export growth to be moderate and 5 per cent expect it to be flat. Many firms expect strong export growth from new products launching, easily scalable technology and fruitful outcomes from R&D efforts (**Chart 6**).

**Chart 6: Most ITSE firms expect export sales to be strong or moderate over the next 3 years**

*Percentage of firms*



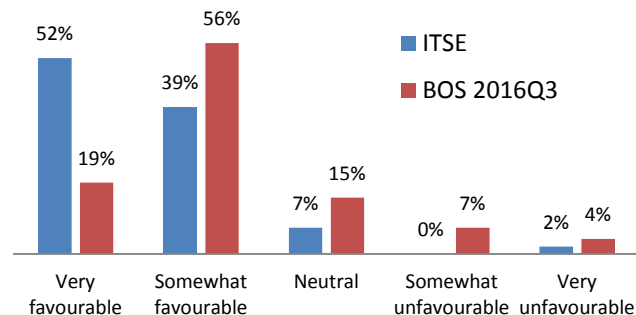
### The weaker Canadian dollar boosts margins and profits but has a relatively small impact on export volumes

ITSE firms overwhelmingly view the exchange rate environment as favourable, even more so than BOS firms (**Chart 7**). Over half of the firms (52 per cent) deem it as very favourable, while 39 per cent view it as somewhat favourable. The majority of firms cited improved margins from their foreign sales, as their cost bases are largely in Canadian dollars while they price their exports in US dollars. The lower Canadian dollar has had a relatively small impact on firms' outlook for export volumes, as only five firms had lowered or considered lowering their US-dollar prices in response to the weaker Canadian dollar and expected a boost to their export sales

volumes or competitiveness as a result. Some firms mentioned the lower Canadian dollar had put some upward pressure on salaries as they compete with the United States to attract and retain talent. This view was mirrored in discussions with one industry association, which stated that rising labour costs are offsetting some of the benefits from the lower currency, in part because of the influx of large foreign multinational firms offering real wages 50 to 70 per cent above the local prevailing wage rate. The lower dollar (as well as lower worker turnover<sup>10</sup>) implies that it is about 50 to 60 per cent cheaper for a company to set up here and hire Canadian workers relative to Silicon Valley.

**Chart 7: ITSE firms overwhelmingly view the exchange rate environment as favourable**

*Percentage of firms*



Over half of the ITSE firms reported the lower Canadian dollar has had an impact on their actions, including investing more in R&D, hiring more in Canada (or avoiding hiring in the United States),

<sup>10</sup> One industry association referred to the lower churn rate for workers, which averages three to four years in its respective region, compared with 12 months in the United States.

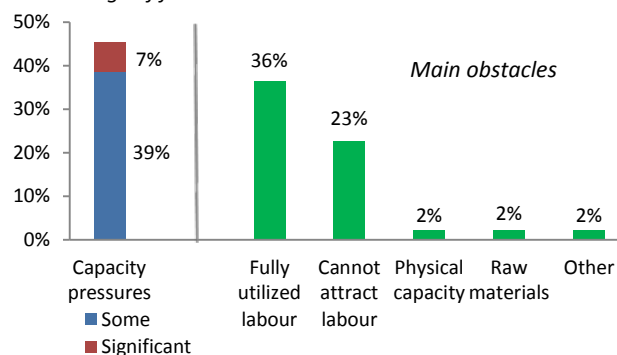
switching to Canadian suppliers, and seeking more US businesses. Yet one industry association noted that while the lower Canadian dollar has been positive for most firms, growth is generally sought in the United States regardless of the exchange rate. Firms’ business plans are based on a stable or appreciating exchange rate, as 27 firms reported that their planning assumption is for the exchange rate to remain roughly unchanged, whereas 5 firms are basing their plans on a higher exchange rate in the range of 81 to 87 cents. Ten firms responded with “don’t know.”

### 3.2 Capacity pressures, investment and employment, and financing

#### Many firms face capacity pressures that relate almost entirely to labour

Nearly half of the firms cited difficulties responding to an unexpected increase in demand, with 7 per cent citing significant difficulties (**Chart 8**), in line with strong growth in the industry. Capacity pressures are thus somewhat higher than in the recent BOS (with 38% citing difficulties) and above BOS historical average of 42 per cent. Pressures are also much higher than the historical average for BOS *service* sector firms (36 per cent).

**Chart 8: Nearly half of firms would have difficulty responding to an unanticipated increase in demand**  
Percentage of firms



Firms almost unanimously referred to labour as the key factor that would restrict their

ability to respond to an unexpected increase in demand, whereas the concept of physical capacity has little relevance in their context. Respondents most often responded that their staff are maxed out, and to increase volume, firms would need to hire support and sales staff, programmers, developers and computer engineers (**Chart 8**, green bars). But recruitment is a challenge for about one-quarter of firms, particularly in regions where clusters in the industry create competition among firms for young and mobile workers, leading to turnover due to “poaching.” Several firms mentioned that qualified and senior talent was particularly hard to find. On-the-job training that needs to occur before a firm can fully benefit from new hires also takes time and thus creates a lag before a firm can respond to an unanticipated increase in demand.

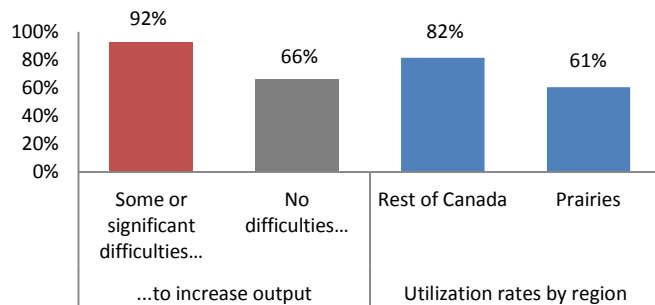
Yet, a slight majority of firms reported that they would have no difficulty responding to an increase in demand, with nearly one-quarter stating the nature of their product makes it easy to scale up. Some even reported being able to sell multiple times as much, since in those cases it is just a matter of software being sold several more times—sales of software do not have a limit.

Firms in regions hit by the oil price shock nearly unanimously reported that they would have no difficulties to increase sales, as labour is readily available in the context of layoffs in energy-related industries. Some firms have put in place some type of strategy to access labour as needed—for instance,

they partner with a bigger company in the industry or use their global footprint strategically to get work done in their operations in other countries.

Firms were also asked an alternative question on capacity pressures, which has been shown to be a simple way to estimate capacity utilization rates for non-manufacturing firms.<sup>11</sup> About 80 per cent of respondents reported that they could increase output with current resources to a certain degree, after which most often they would need to hire more staff. The reported possible percentage increase in output can be translated into capacity utilization rates. Not surprisingly, capacity utilization is highest among firms reporting some or significant difficulties responding to an unexpected increase in demand (**Chart 9**). Capacity utilization rates are lowest in regions hit by the oil price shock.

**Chart 9: Capacity utilization rate is lower for firms reporting no difficulties and for firms in the Prairies**  
Percent of capacity



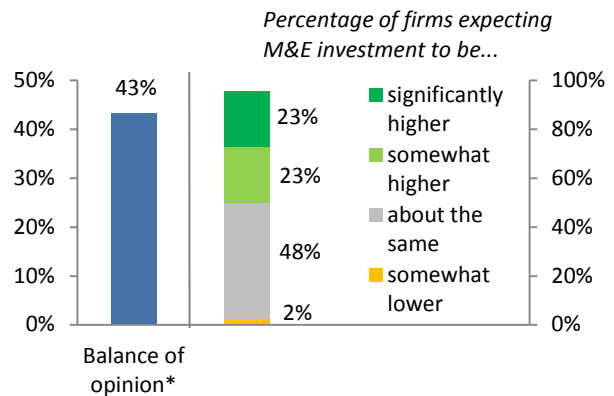
Notes: Rates are based on new survey question; see text and footnote. PR results are based on a small sample (7 firms).

**While the scale of M&E investment is limited, firms invest heavily in R&D**

The balance of opinion on M&E investment intentions is high (**Chart 10**), and significantly higher than in the autumn BOS (18 per cent). Nearly half of respondents (20 firms) reported planning higher, (often significantly) investment expenditures. Twenty-one firms anticipated similar amounts, and only one firm planned to cut.

That said, the scale of investments is, almost universally, small. Because of the nature of the industry, firms rarely invest in machinery, and literally all respondents referred to the purchase of equipment. In the majority of cases, firms invest in computers and software. In that sense, investment spending is highly related to employment plans: as

**Chart 10: Strong investment intentions are focused on IT equipment**



\*Percentage of firms expecting higher investment minus the percentage expecting lower investment

<sup>11</sup> It has been argued that for many service firms, the concept of capacity utilization is inappropriate because it has a strong connotation with a production process involving mainly equipment and material and necessitates a fairly clear notion of a company's full capacity. In addition to the question on capacity pressures, we asked: "If the demand addressed to your firm expanded, could you increase your volume of activity sustainably with your present resources? (yes/no) If so, by how much? (answer in per cent)." The capacity utilization rate (CU) can then easily be inferred with the formula  $CU \text{ (in per cent)} = 100 / (1 + \text{percentage of increase} / 100)$ . For details, see Gayer (2013).

firms expand, they hire more and purchase the necessary equipment (e.g., a desk and a computer) for new employees. Several also referred to expenditures on servers, while a few noted that rather than having their own server, they rent space with cloud providers (in which case the investment expenditure is replaced with an operating cost). Many firms explicitly said that their investment expenditure is small, limited or even non-pertinent.

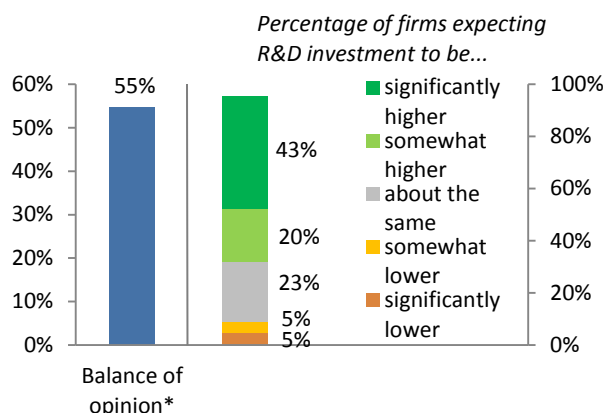
A large majority of firms surveyed reported investing in R&D (**Chart 11**), more firms than those reporting meaningful investments in M&E. Again, the balance of opinion is strongly positive and higher than recorded in the short history of this question in the BOS, with firms most often citing new product development or upgrades of existing products. Nearly half of firms indicated increasing R&D significantly. In most cases, firms referred to additional staff or refocusing of time allocated for R&D, rather than R&D intermediate expenditures.<sup>12</sup>

R&D pertains, in most of the cases, to product development. For instance, respondents referred to work on new products they are planning to bring to market in the near term, or upgrading existing or early stage products. A few also mentioned investing time of their workforce to adapt solutions to new markets. For some, the purpose of R&D is to help shift the focus of their operations in the context of a new strategy. Examples include moving toward cloud computing, overinvestment to tap new opportunities, integrating solutions with social media, and increasing original content creation. In the context of our discussion with firms about R&D, several referred to the importance of tax credits, often as an incentive to increase R&D investment. In many cases, firms join R&D efforts with other firms or universities. Many firms hold their own patents (or trade secrets).

### Firms are hiring to meet buoyant growth expectations and develop new products

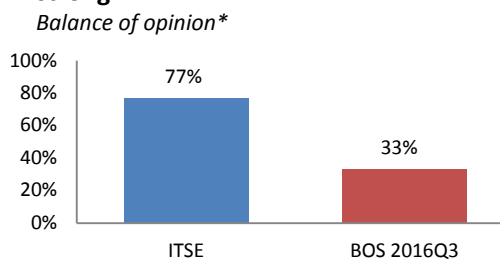
The balance of opinion on employment intentions is exceptionally strong (**Chart 12**), as not a single firm expected to reduce staff and three-quarters of firms planned to add to their headcount. Most often, firms

**Chart 11: Solid investment intentions in R&D focus on product development**



\*Percentage of firms expecting higher investment minus the percentage expecting lower investment

**Chart 12: Employment intentions are strong**



\*Percentage of firms expecting higher levels of employment minus the percentage expecting lower levels

<sup>12</sup> Statistics Canada splits R&D expenditures into intermediate expenditures (materials, machinery, equipment and buildings required for the scientific process) and investments (salaries, wages, etc. that will create value in the future).



referred to growth as the driver—for instance, to accommodate growth or meet aggressive sales targets. In this context, double-digit percentage increases were not uncommon among the responses. Several cited the need to recruit talent for R&D, consistent with overall strong R&D investment intentions. A few also planned to expand their sales and marketing staff.

About one-quarter of firms did not plan to change the level of staff, most of them headquartered in regions where firms reported spare capacity. For some, limited growth prospects, or the ability to grow sales without new workers were reasons for not planning to add to headcount. Others referred to the need to run lean or abundant spare capacity.

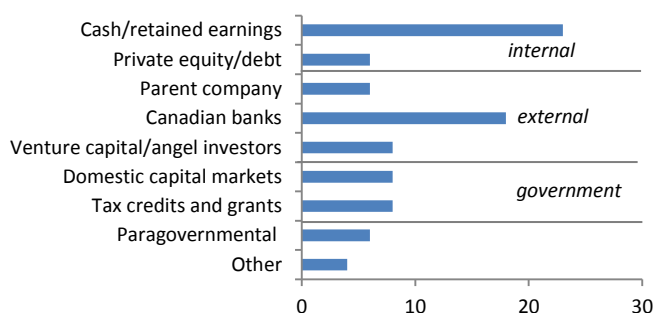
### While financing through cash and loans is easy for most, many find credit difficult to obtain

Solid growth in the industry is also reflected in firms' ability to fund themselves *internally*. The most important source of financing is cash (**Chart 13**), as more than half of firms stated that their strong cash flow and retained earnings allow them to (partially) finance their operations. This proportion is substantially higher than for BOS firms. A number of firms are moreover (fully) financed by their parent companies or rely on private equity or debt from shareholders and owners.

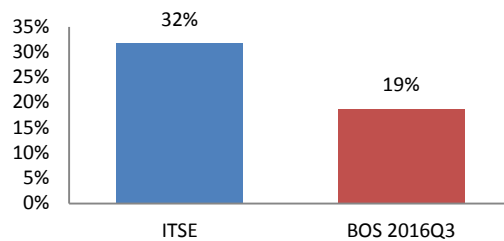
Domestic banks are the main *external* source of financing, as is the case for BOS firms. Most respondents have a line of credit, while large players rely on syndicated loans. Whereas several publicly traded firms have access to domestic capital markets, younger firms refer to venture capital, including angel investors. Finally, government tax credits and grants are an important source of financing, while a few firms receive support from governmental institutions such as Export Development Canada and the Business Development Bank of Canada. Start-ups initially often have to rely on personal/family loans for financing.

Yet many firms find credit hard to obtain, limiting their expansion and R&D plans. One-third of firms reported having difficulty in obtaining credit (**Chart 14**), which is significantly more than for firms encountered in the BOS (20%). Firms most often referred to the nature of their industry: since IT firms have limited physical assets and thus collateral, firms view financial institutions as being less inclined to lend to them. Some judged that financial institutions simply have an aversion toward the sector as a whole and are thus unwilling to extend loans to those firms. A few also referred to their early growth stage, in which risk capital investors have very ambitious growth expectations, putting the firm under tremendous pressure to perform.

**Chart 13: Firms mainly use cash and bank loans**  
Number of citations (respondents can provide multiple answers)



**Chart 14: Somewhat more ITSE firms find credit hard to obtain than BOS firms**  
Percentage of firms



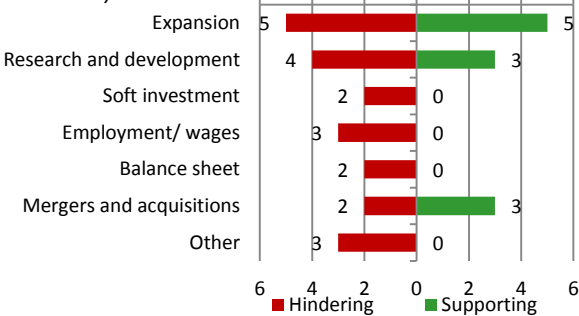
In half of the cases, difficulty in accessing credit is an impediment to firms' decisions (**Chart 15**, red bars). For instance, firms saw their expansion plans or R&D objectives limited or slowed down by the insufficient availability of finance.

The other two-thirds of respondents found credit easy to obtain. Some firms reported being financed through the parent company, while others benefit from access to domestic or US capital markets. A few firms reported this affecting their actions or perspectives (**Chart 15**, green bars): easy access to finance may support or allow more rapid expansion plans or growth through their acquisition strategy.

Finally, for several firms, the fact that credit is easy to obtain had no impact on their actions or plans. This is often the case if the growth strategy is simply independent of financing conditions or because firms that are fully financed do not require loans to expand, for instance.

**Chart 15: Credit conditions have an overall negative impact on firm decisions**

*Number of citations (respondents can provide multiple answers)*



## Section 4: The Digitized Economy Going Forward—Views from ITSE Firms

Beyond being asked about perspectives for their own businesses, firms in the ITSE survey were also asked about their views for the industry as a whole and the role the IT sector is playing in the digital transformation of the economy.

### Firms see important growth potential in areas such as cloud computing and big data

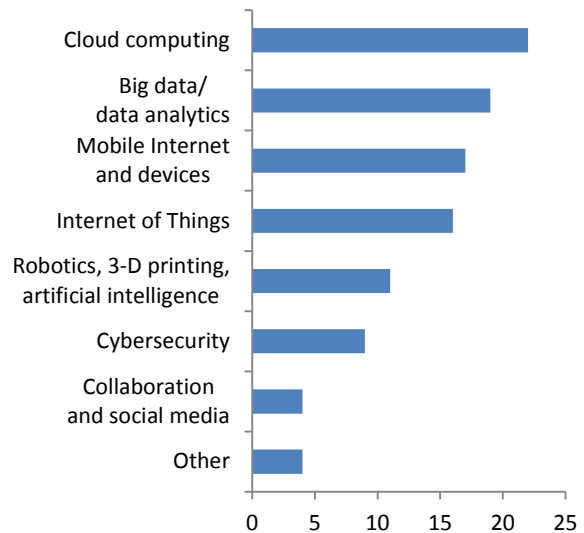
When asked which technologies or areas of the industry have the biggest growth potential going forward, roughly half of respondents expected growth to be fastest in cloud computing, as more and more firms (outside their industry) get rid of storing data on their own and start storing big data sets on cloud servers (**Chart 16**). As part of a growing trend of outsourcing professional services, cloud computing also enables firms to shift other internal IT services (such as data storage, security and analysis) to third-party providers. In the words of one respondent, “cloud computing is becoming mainstream.”

The second most often cited area of growth was big data, although some noted a shift in focus on personalization and relevancy, or, a possible new tendency toward “small data” to treat more detailed information rather than masses of statistics. Some did not share the enthusiasm about big data and expected growth to be stable as it is now a standard service.

Several saw the Internet of Things and mobile Internet use as an important area of growth. Robotics, artificial intelligence and 3-D printing were seen to be at an early stage only, although with the potential for growth and to “truly redefine the world in the future.” Firms also pointed to several industries’ growing need for cybersecurity, e.g., in the financial or governmental sectors, or to safely store big data. Views on collaborative tools (e.g., Skype) and social media (e.g., Facebook) diverged: some judged that growth has already happened and technologies are now standard in everyday life, while others still saw a lot of potential in new applications. Others expected further growth in enterprise resource planning (ERP) systems where businesses and public institutions consolidate their accounting, human resources, payroll and procurement systems under one solution. A few firms mentioned areas such as face/voice/habit recognition as well as biotech.

**Chart 16: Firms see fastest growth in areas such as cloud computing and big data**

*Number of citations (respondents can provide multiple answers)*



## **Although the digital transformation in Canada is viewed as slow, firms also think it has significant potential**

Many respondents viewed Canada as slow and lagging the United States in terms of the adoption of technology. Canadian firms, such as those in manufacturing and retail, have been slow to adapt and invest in digital tools and solutions. The financial sector has yet to open its doors to technological transformation, especially in Canada (where businesses are viewed as more risk-averse by the firms surveyed). Younger firms and those with young staff, and those getting the most of mileage out of technology adoption were seen to be more likely to invest in IT. Some also noted that governments are slow to adopt new technologies and should be a leading example by implementing new IT solutions offered by Canadian firms (such as is the case in the United States), helping firms to establish their reputation. Firms felt that US business culture is, in general, more open to try out and adopt new digital solutions and judged that this, together with more “outside-the-box thinking,” helps to explain Canada’s productivity gap with the United States.

Yet the digital transformation of the economy was viewed as having significant potential, by making firms and their management more efficient, and operations faster and cheaper. Firms view the digital economy as the next industrial revolution with profound effects on the economy over the coming decade—in particular with its impact on business management. For instance, the trend toward cloud-based computing and storage can allow firms to be more flexible and more efficient. Digital delivery allows selling and purchasing around the world, dismantling borders and giving even small niche firms access to foreign markets. Nevertheless, much has yet to be done to transform the way businesses are managed and organized, with new IT solutions bringing opportunities to cut costs.

Firms viewed their role as being drivers toward the technological/digital transformation of the Canadian economy. Most often, IT service firms saw themselves as enabling businesses to become more efficient, allowing firms to optimize their processes, enable faster decision making, use more efficient planning and management systems and benefit from secure communication. Respondents view themselves as “problem solvers” to various elements such as logistics and software implementation, data analysis and storage on the cloud, and efficient supply chain and resource management. Several firms saw their role in accompanying businesses in their digital transformation, for example by helping their clients to outsource IT to other third-party services, to enable e-commerce, to test new applications and to protect their information.

Some also believed that the disruptive nature of the transformation, i.e., through automation, will eliminate or destroy jobs. For instance, self-driving cars should hugely impact the automotive and related industries, while the sharing economy (e.g., Uber, Airbnb, etc.) will continue to disrupt markets more frequently. Several firms referred to the fact that advances in technology will also imply that fewer people are needed to produce more in a context where businesses are pushing to increase efficiency and reduce costs to remain competitive. “Middlemen” and mid-skilled types of jobs could be eliminated. The trend toward cloud computing and outsourcing of IT services could imply that businesses need less

IT staff because they are less dependent on hardware. Some foresee a shift in the traditional workforce toward more jobs in services, while others see structural unemployment to be higher as a result.

### **Firms point out challenges for the IT sector**

A number of firms saw challenges and called for more supportive governments. While R&D grants and tax credits are vital to many firms, some were worried about reductions in the generosity of the tax incentives in place. Others claimed that governments and institutions are either slow to put up and implement technology strategies or that the latter are poorly focused and lack coordination. One industry association called for a cohesive national strategy (something akin to France's "French Tech" push) and for governments to do more to market Canada's firms abroad and attract more foreign investment. Respondents saw the lack of such public initiatives as a danger to Canadian competitiveness and claimed that Canadian talent is already being lured away by companies that set up in more competitive tax jurisdictions.

Some respondents called for more support to commercialize products internationally, lamenting the lack of support to service-exporting firms in Canada. Firms often fail to grow beyond a certain threshold because of a lack of knowledge of commercialization and marketing, particularly in foreign markets. Firms called for governments to provide more help—beyond tax credits to boost R&D—to accompany firms to go global. Foreign sales often require firm maturity, patience and liquidity, as it may take up to two years from the first contact to the contract signed, during which time the firm incurs costs for travelling, etc.<sup>13</sup>

Access to talent was also often cited as a challenge, as universities are failing to keep up with the demand for engineers and computer scientists. One industry association claimed that governments are (too) busy attracting foreign investment in the IT sector by lauding its talent pool, but that domestic and foreign firms then have to compete for the same resources. Moreover, many of the best and brightest are being enticed to go work in Silicon Valley. The shortage of skilled labour becomes all the more important because non-IT firms increasingly require IT staff as they shift to digital—firms in other sectors now hire *more than half* of the IT skills in the labour market. Increased immigration is seen as part of the solution.

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<sup>13</sup> In this context, EDC's Accounts Receivable Insurance (trade credit insurance) was seen as helpful and used heavily by IT exporters.

## Section 5: Conclusion and Areas of Future Work

Consultations with firms in the IT service industry shed light on a small but dynamic and highly innovative part of the Canadian service economy. The digital transformation impacts almost all sectors and is therefore important to our understanding of changes in the Canadian economy. The results suggest that the outlook for IT firms is solidly positive, with all forward-looking indicators of activity being stronger than for BOS firms in general. While the small sample of the survey does not allow us to make general conclusions or draw definitive policy implications, we propose some takeaways and suggest areas that require further reflection and work, as the digital economy may change our perception of traditional (GDP and trade) data and measurement and involve structural changes as other sectors adjust to the digital transformation.

### **The digital transformation raises questions about how we measure GDP, trade and productivity**

Advances in technology may not be accounted for in measures of GDP, or even *reduce* GDP at market prices in some cases. GDP measures the market value of all final goods and services produced—if a product is not bought and sold, it is not captured in GDP. As a result, technological progress such as quality changes, free services and open-source software may not be well captured in our present measurement (Varian 2016). In some cases, this implies that “intelligent technology” will reduce GDP, e.g., trends toward ad-supported content providers, digital photography and integrated GPS.<sup>14</sup> Similarly, intangible assets, as well as the sharing economy,<sup>15</sup> are increasingly important yet not part of official GDP figures (Brynjolfsson and McAfee 2014).<sup>16</sup> The US Bureau of Economic Analysis has tried to address these issues by creating experimental R&D satellite accounts that track some of these categories of intangible assets (Aizcorbe et al. 2009).

The vast advantages of the Internet may also not be well measured in either GDP or productivity, e.g., it allows small companies to compete in a global market place (termed “micromultinational” by Varian [2011]), increases transparency for consumers and saves time. Yet a recent study by Syverson (2016) finds that there is little evidence for the hypothesis of mismeasurement of productivity because of product improvement such as digital technologies.

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<sup>14</sup> If a content provider abandons a pay-per-view revenue model to adopt an ad-supported model, measured revenue and GDP would be lower. Similarly, while the estimated amount of photos taken increased *by a factor of 20* from 2000 to 2015, cost of photos fell dramatically as one no longer needs to pay for film and developing—an immense increase in productivity we fail to measure. Lastly, the reduced need of GPS because smartphones now incorporate such systems reduces GDP (fewer sales of GPS).

<sup>15</sup> For instance, in 2013, 416,000 visitors booked accommodation through Airbnb in New York, generating economic activity worth US\$632 million, i.e., *more than the hotel industry* (Airbnb 2014; OECD 2015).

<sup>16</sup> User-generated content, for example, involves unmeasured labour creating an unmeasured asset that is consumed in unmeasured ways to create unmeasured consumer surplus. Other examples include digital music and streaming (iTunes, Spotify, etc.) replacing music on physical media: while usage has skyrocketed, revenues from sale of music have declined dramatically, pointing to yet another gap in the measurement.

Moreover, it is generally harder to measure service exports, as they do not physically cross borders and are not recorded in customs data. Statistics Canada classifies the quality of its services trade data as “acceptable,” while acknowledging that there are measurement issues associated with the intangible nature of services (Statistics Canada 2012). Existing statistics rely on a host of sources, including surveys of large known service exporters. However, survey coverage of enterprises with lower levels of services trade is limited. ITSE firms (and surveys of associations, etc.) provide anecdotal evidence that small and large players alike have a high propensity to export. Further work is needed to determine whether our data and models fully capture the importance of trade in services.

Finally, respondents mentioned the recent trend toward software as a service (SaaS) away from typical license use models, which impacts economists’ notion of “investment.” The move toward SaaS means that the upfront cost to implement or try new software is much lower, implying that more companies can afford and adopt new IT solutions, potentially accelerating the technology transformation. From an economist’s point of view, this may have implications for how we measure investment. Investment in IT such as software is considered an “investment in M&E” (in national accounts). But firms consider SaaS a current expenditure accounted for as a cost instead (in financial accounting).

### **The digital transformation poses challenges for the “old economy” and has implications for GDP growth and productivity**

The disruptive nature of the digital economy implies (sometimes existential) challenges for traditional industries. A recent survey across the corporate world found that 52 per cent of executives experienced significant disruption in their industries over the past three years brought on by new digital technologies (Dell Technologies 2016). Forty-five per cent of respondents admit they may become obsolete within five years. Losers in the digital transformation include traditional retailers (competition from e-commerce giants such as Amazon and Alibaba), media firms (less conventional advertising), financial services (competition from fin-tech), hospitality and transportation industries (due to sharing economy competitors such as Airbnb and Uber). Yet a recent OECD study finds that, even if about 9 per cent of jobs in OECD countries are automatable, automation and digitalization are unlikely to destroy large numbers of jobs, as the transition is rather slow and allows or forces workers (particularly unskilled workers) to adjust to changing technology (Arntz 2016).

Moreover, as Canada moves toward a knowledge- and service-based economy, aggregate investment in M&E may be lower. Results from the ITSE survey suggest that investment is mostly limited to small-scale expenditures such as IT equipment. Similar conclusions hold for BOS service firms more generally—the investment intensity in service industries such as the IT sector is simply much lower. Indeed, the ratio of capital and repair expenditures to GDP is about 31 per cent for goods-producing industries, and only 13 per cent for service-producing industries. As the service sector grows (from 65 per cent in 1997 to 70 per cent in 2015), it is simple arithmetic that investment in M&E should be lower as a share of GDP. On the flip side, more investment in human capital may be needed, implying a shift from physical to “organic” capital.

The slow (comparatively to the United States) adoption of IT in other sectors of Canada's economy could also pose a challenge for productivity growth. According to a recent survey, Canadian companies are "digital laggards" when compared with their international peers, ranking 13th out of 16 countries (Dell Corporation 2016). Research has shown that IT adoption is a determinant of productivity growth (Syverson 2010; Cardona et al. 2013). Moreover, insufficient talent or talent mismatches could potentially restrain growth of potential GDP. The International Data Corporation estimates that inadequate digital skills reduce an organization's total productivity by 21.3 per cent (Webster 2012).

Finally, firm creation is relatively high in IT, which should play into our estimation of potential GDP growth. The high-tech sector (and the ICT segment of high-tech) is an important contributor to entrepreneurship in the United States, being 23 per cent more likely (and ICT 48 per cent more likely) than the private sector as a whole to witness a new business formation (Hathaway 2013). Job creation is robust and in fact offsets job losses from early-stage business failures. This is in sharp contrast to young firms across the entire private sector where net job losses resulting from the high rate of early-stage failures are substantial. Similar analysis for Canada could improve our understanding of firm creation and thus potential GDP, though firm creation data for the IT sector are not readily available.



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## Appendix

### Tables

**Table A1: Information and communications technology (ICT) sector definition (Statistics Canada vs. ITSE survey) by NAICs**

	Statistics Canada	ITSE Survey
Goods	3341 (computer and peripheral equipment manufacturing)	
	3342 (communications equipment manufacturing)	
	3343 (audio and video equipment manufacturing)	
	3344 (semiconductor and other electronic component manufacturing)	
	3346 (manufacturing and reproducing magnetic and optical media)	
Services	4173 (computer and communications equipment supplies and merchant wholesalers)	
	5112 (software publishing)	5112 (software publishing)
	517 (telecommunications)	
	518 (data processing, hosting and related services)	518 (data processing, hosting and related services)
		51913 (Internet publishing and broadcasting, and web search portals)
		54142 (industrial design services)
		54143 (graphic design services)
	5415 (computer systems design and related services)	5415 (computer system design and related services)
8112 (electronic and precision equipment repair and maintenance)	5416 (management, scientific and technical consulting services)	
<b>*% of GDP</b>	<b>4.3</b>	<b>3.4</b>

*\*Approximations based on GDP at closest level of disaggregation possible*

**Table A2: Firm summary statistics (44 firms)**

Distribution by region	# of firms	%
British Columbia & Yukon	8	18
Prairies	7	16
Ontario	10	23
Quebec	12	27
Atlantic	7	16
Distribution by firm size (# of employees)		
Less than 100	17	39
100 to 500	20	45
Greater than 500	7	16
Distribution by company type		
Canadian subsidiary of multinational	8	18
Canadian headquartered	36	82
Distribution by firm ownership		
Privately held	31	70
Publicly traded	13	30