



Employment, Investment, and Revenue in the Canadian App Economy

Prepared by

Information and Communications Technology Council



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Acknowledgement

We thank all of those involved directly or indirectly in contributing to our efforts, while acknowledging sole responsibility for errors of commission and omission. The data and information sources for this report include primary data collected through a cross-section of vehicles including key informant interviews, surveys, vacancy searches, and the social media. For benchmarking, the most up-to-date customized Labour Force Survey data published by Statistics Canada was used.

Special gratitude is expressed to all the app entrepreneurs who took their time to discuss with us in great detail the various opportunities and challenges facing Canada's app economy.

Thank you!

We hope the findings of this study will help them in their decision-making processes and also be used as departure point for future studies.

This report presents a timely review of the Canadian app economy and showcases that the app economy – a major part of Canada's digital economy – will play a major role in the economic landscape in the coming years. ICTC's sub-sector studies continue to demonstrate their value as a lens for critical and constructive thinking about some of the most fundamental opportunities and challenges in these spheres, and we are confident that these studies will remain as central as ever in key ICT discussions.

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Executive summary

Smartphone users in Canada will exceed 13 million before 2012 ends, increasing from 9.1 million at the end of 2011. There is a seemingly insatiable appetite for downloading and using mobile applications, or apps, that has created a huge opportunity for their development. The total number of new apps that get introduced is over 2,300 each day and over 70,000 each month.

It is the right time to recognize the various opportunities and challenges faced by the Canadian app economy. A detailed understanding of the Canadian app economy is critical and, consequently, ICTC responds with this rigorous snapshot of Canada's app ecosystem. This study explores:

- ▶ Various technical and non-technical occupations engaged in app creation and their composition and total direct employment in the app economy;
- ▶ The indirect and induced employment in the app economy labour market;
- ▶ The economics of app creation: The costs associated with developing apps, funding mechanisms of app enterprises, opportunities and challenges to funding app initiatives;
- ▶ The total expenditure on apps and related products and services by Canadians;
- ▶ The various avenues of revenue generation and the total revenue generated by the Canadian app-makers;
- ▶ The growth potential of the app economy and estimated job creation in this segment as a result of companies and developers looking to build new apps for the growing number of devices coming to market;
- ▶ Support and encouragement required to ensure that the Canadian app makers flourish and consolidate their position on the global stage; and
- ▶ Implications for policy makers with respect to talent, financing, and communications regulation.

Information for this ICTC study was gathered from desktop research, secondary data collected from Statistics Canada and Service Canada, and, crucially, primary data collected from key informant interviews and targeted survey of app-enterprises. Multiplier effects of the tangential and induced economic activities were also taken into account. These findings are in a position to be bolstered with jurisdiction-specific supplementary research, as ICTC continues to work with industry and regional partners.



In our findings to date, two-fifths (40%) of Canadian app-makers focus on developing service-related apps commissioned by a service company, with the remainder concentrating on original intellectual property (IP) apps and a combination of both service and IP apps. Basic ingredients of app development, regardless of whether they are created as IP or as part of a service contract, are: an original idea; demand-supply analysis; programming; interface/layout; promoting; and pricing.

App development related jobs include positions in start-up companies, in growing SMEs, and in large corporations. On the technical side, teams consist of concept creators, programmers, software engineers, user interface designers, and testers. The average salaries for technical employees range between \$35,000 and \$110,000, with the average being \$68,000. Non-technical functions range from marketing, sales, management, human resources, and administrative support. For every technical professional (55%) in the payroll of an app developing company, there is nearly another professional who is functioning in a non-technical role (45%).

It is estimated that there are 22,800 technical professionals among the *direct* employment of 41,300 in the Canadian app economy. They help the Canadian app ecosystem generate \$775 million per year in revenue. Generated revenues are estimated to reach \$1.19 billion in 2014 (▲54%) and \$2.2 billion in 2016 (▲184%).

A conservative multiplier of 1.25 is used in this study to estimate the breadth of the Canadian app economy. This implies that every 4 direct jobs in the app economy generate 1 job in the rest of the economy. Estimated 41,300 direct employments in the app economy generate another 10,400 indirect and induced jobs. The total app economy and related employment in Canada, therefore, is 51,700. The geographic composition of this employment is as follows: Ontario (47%), Quebec (22%), British Columbia (15%), the Prairies (11%), and the Atlantic region (5%).

Driven largely by strong global growth in accessing and consuming digital products and services through apps, the total app economy and related employment in Canada is estimated to grow by 51% to 78,000 by 2016. App enterprises will be looking for app-makers with leading-edge skills across platforms.

The costs associated with developing an app can range from \$5,000 to \$200,000 for service apps and \$10,000 to \$250,000 for IP apps. On average, an app that is not overly complicated costs \$20,000. Low cost is one of the main reasons why the app industry is largely organically funded. Two-thirds of the consulted companies confirmed that they commenced with self-financing, while the remaining third is split equally among companies that received endowments from family/angel investors, venture capitalists, or are public companies. Barriers to entry in the app space are low. The sector is ideally suited for early stage investment furnished by angel and venture capital, with opportunities abound for a quick return on investment. Still, members of the app economy have yet to see promising signs of access to capital. A third of the surveyed



enterprises are seeking funding to grow their operations and are finding it challenging. Despite these challenges, 41% of companies are forecasting strong growth, while the remaining 59% are expecting moderate growth.

The main sources of revenues stem from four sources, namely: app downloads; in-app purchases; advertisements; and subscriptions. 13 million smartphone users in Canada spend \$675 million annually on apps and related expenditures. This is estimated to grow to \$1.12 billion a year by 2014 (↑66%) and \$1.82 billion by 2016 (↑170%).

As mobile apps continue to become the preferred means to access and consume digital products and services, it is vital that app economy stakeholders ensure an enabling environment, a smooth path to progress, and opportunities for growth. Sound skills policy, an attractive investment climate, and collaboration among all stakeholders of skilled app workforce are all key ingredients of growth and for attracting investment, as well as for Canada to gain maximum benefits from workers' productivity gains. So what measures can be considered? ICTC will continue to hold dialogues with app economy stakeholders on the following issues:

Should supporting nascent enterprises be prioritized? In an environment of fiscal austerity, policymakers seek high probability returns. Supporting nascent enterprises that face low barriers to entry is key. Resource requirements are potentially low in the app development space. In comparison with capital-intensive industries, there is the strong potential for growth in jobs and revenues in the app development space for relatively low investments by public authorities. Low-risk measures that are conducive to nurturing entrepreneur and small- and medium-sized businesses can be beneficial to the app economy on a sustainable growth path.

Should necessary capital for small app enterprises be ensured? Ensuring app enterprises, particularly small ones, can adequately fund their activities is important. Providing stimulating financing measures to investors is likely to help SMEs overcome the difficulty they face in raising capital. Favourable general corporate income tax, and three-to-five-year tax holidays, among other measures could bolster growth in the app economy.

Should creating a job market-ready workforce be emphasized? Providing incentives to students and jobseekers in the form of targeted scholarships or reduced tuition in such academic majors as software engineering, software development, software technology, and interactive graphical design will like fast-track growth in in-demand skills. If corporate tax holidays or credits are tied to career development, app enterprises will likely have incentives and/or means to up-skill their developers.

Should integrating skilled foreign workers more effectively be prioritized? A more responsive immigration system is likely to improve addressing skills shortages and integrating skilled newcomers. Streamlining the process to improve one-to-one

matching with industry needs can be considered. Employability in Canada can be made a fast-tracking criterion in the selection process. Having a detailed understanding of global apps market, thus facilitating Canadian app-makers establish a strong foothold in this highly competitive environment, is vital. Recognizing and welcoming foreign product development talent can help in this regard.

Should collaboration with other sectors be prioritized? Increasing ties with all other economic sectors and sub-sectors can help increase reach and benefit from spill-over effects. Apps have already been introduced in various sectors enhancing productivity while lessening the reliance of capital expenditures. For instance, apps in the service sector can now maintain and track deliveries as is without having to enter data manually. Elsewhere, product managers are able to track product placements and pricing in grocery stores using their smartphones instead of a clipboard, evidence that apps contribute to economic growth in all sectors. Using apps in social media and networks is also helping push the Canadian media industry as a global leader.

Should awareness of global competition be raised? The same low barriers to entry that characterize the development of apps in Canada exist throughout the world. Measures to leverage existing competitive advantage will be helpful. For example, there is merit in targeting support in app development niches such as gamings, finance, e-health and digital media where Canada enjoys rich ecosystem clusters and a legacy of innovation and success.

1. INTRODUCTION

Blending corporate and personal functions with touch-screen ease-of-use, smartphones went from a high-end enterprise device to an everyday consumer product in a short few years. This has resulted in an explosion of development activity to take advantage of new possibilities smartphones offer. A smartphone today usually combines IP connectivity with multiple radios, GPS/A-GPS, and rich audio/video inputs/outputs. Combined with advances in cloud storage, computing and processing power, an entirely new field of mobile computing has emerged. To address the growing market demand, applications (or apps, discussed in detail in the next section) are being developed by app developers. They work on several smartphone platforms using standardized open software development kits (SDKs) to deliver their product on the global app economy via an aggregator (e.g. Apple's App store, Android Marketplace).

The consumer and business appetite for apps is evident from the billions of apps that have been downloaded for the more prominent platforms such as Android, iOS, Windows, and Blackberry. Nearly three million different apps have been developed to date, up from one million in 2011. These are proliferating even more rapidly in response to consumer and business uptake of tablets as developers create new apps for bigger screen sizes.

Apps are differentiated from traditional software distribution in part by their size and ease of distribution, as well as by price-points. Previously, software developers faced significant barriers to entry in the market, from getting their products onto retail shelves, to being granted access to development kits for major gaming platforms. The model for apps, in contrast, is significantly easier. Traditional barriers associated with sales channels are significantly reduced. Innovative, creative developers, leveraging new marketing tools such as social media, have been able to develop app "hits" in ways that would have been impossible in old models.

In the Canadian context, this represents a significant opportunity. App development implies that developers employ a spectrum of ICT and digital media skills. From low-value-added skills such as coding to very high-value-added activity such as interface design and "big data" visualization and analysis, development of successful apps helps generate significant labour market activity. The support provided by the pre-existing infrastructure has helped the app ecosystem thrive. Companies that are innovative in exploiting new avenues have been rewarded with large returns.

Against this promising backdrop, this paper begins with a brief overview of what apps are, how they are developed, and what the app economy consists of in section 2. The approach and methodology are outlined in section 3. The app economy labour market is estimated in section 4. The following section discusses the investment channels and mechanisms in mobile applications development in Canada. In section 6, the width and

breadth of the Canadian mobile applications economy is discussed in detail. In these sections where various aspects of the app economy are detailed, the Canadian landscape is discussed first, followed by the global state of affairs. Section 7 discusses potential policy approaches to stimulate the Canadian app economy. In a final section of the paper, the findings are summarised and concluded with discussion on the way forward.

2. BACKGROUND AND CONTEXT

2.1. Applications (apps)

Mobile apps (applications) or simply “apps”, as widely known today and the terminology used hereafter, are “relatively lightweight programs” (Mandel, 2012) developed and designed to run on mobile platforms (e.g. Android, iPhone) for small handheld devices such as smartphones, mobile phones, and personal digital assistants. Apps can come pre-loaded on the handheld device or can be downloaded by users from the online stores. The most popular smartphone platforms that support apps are Android, IOS, Blackberry, Windows Mobile, Symbian, Java ME, and Palm.

Games, services, social media, location services and instant messaging (IM) apps are some of the most popular, examples of apps. From the Weather Network app to quickly check the weather before heading out, to Angry Birds, a gaming application useful for killing idle time, apps are increasingly providing us with greater convenience and redefining our lives. Even the Olympic experience remains incomplete without the aid of apps. Data released by CTV suggests 1.1 million Canadians downloaded its application to follow the Olympics (CTV, 2012). From learning the alphabets to providing assistance in the case of an emergency, the versatility provided by the apps has users in all age groups that continue to increase at an express rate.

Apps allow us to simplify our daily lives. Mobile phones have been carrying applications long before the launch of smartphones. However, in an effort to gain a considerable market share via its revolutionary App store, Apple was responsible for promoting the term “apps.” With tag lines like “there’s an app for that,” Apple has been able to deliver a variety of apps useful for day-to-day life and thus remains the leader in the app industry. Google is second in line and has narrowed the gap significantly after a relatively late Android launch compared to the iPhone.

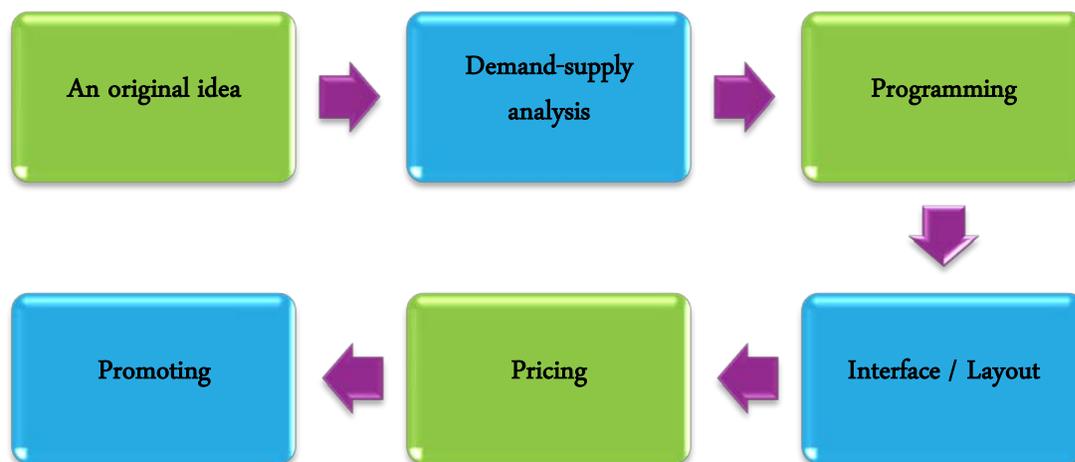
Applications evolve constantly to adapt to the sophistication provided by mobile platforms. This adaptability gives the users complete control over their mobile experiences, providing them with customizable options to best meet their respective needs for mobility, enterprise solutions, and convenience. With mobile-broadband subscriptions rising exponentially over the past five years, app users are expected to

utilize apps as the foremost means of accessing digital products and services (The International Telecommunication Union, 2011).

2.2. Developing apps

Long before smartphones were introduced, many apps (e.g. currency converters, calculators, mini browsers) were already running on mobile phones. These programs are smaller and require fewer resources to run. Often they are reduced versions of the original applications that run on computers.

Companies and developers employ a variety of approaches to develop applications. One approach is to come up with an original idea that solves a unique problem and go from there (an IP app). Another approach is to be commissioned by a service company to create an app that fits their needs (a service app). Most approaches, however, share the same ingredients of app development regardless of the order in which they are employed:



On the development side, the team consists of programmers, testers and concept and design creators. Management and sales staff at app development firms are also considered to be key contributors to the app economy.

2.3. The app economy

The unprecedented speed at which mobile phone sales have caught up to television and computer sales tells a lot about the recent dominance of wireless devices. Various technological innovations have pushed consumers to complement the wired devices with the wireless ones. As a result, the app economy emerged, which focuses primarily on developing and creating applications to meet the insatiable appetite of mobile consumers. Zynga's (2011) IPO describes the app economy:

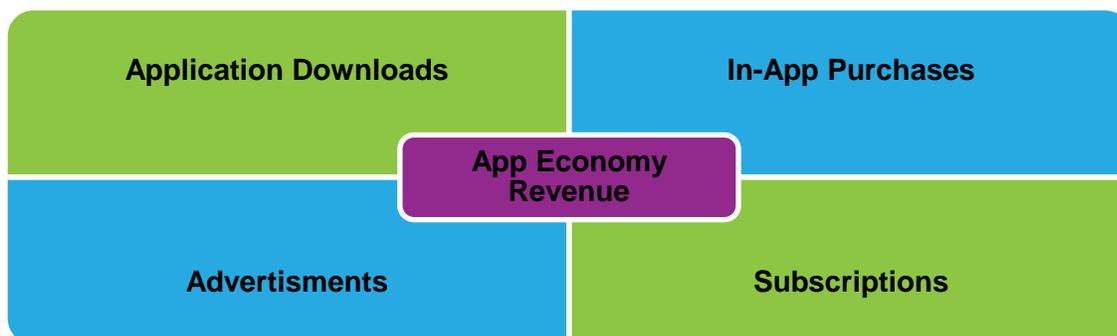
“In order to provide users with a wider range of engaging experiences, social networks and mobile operating systems have opened their platforms to developers, transforming the creation, distribution and consumption of digital content. We refer to this as the “App Economy.” In the App Economy, developers can create applications accessing unique features of the platforms, distribute applications digitally to a broad audience and regularly update existing applications.”

Despite the economic downturn, mobile phone services continued to grow on a global basis. The convenience and ease of mobile broadband allows users to use the internet wherever they please. As a result an array of new applications, services and devices have been developed and will be developed in the future to continuously improve the quality of life (Andes and Castro, 2010).

The number of global mobile-cellular subscriptions reached a record six billion in 2011 (ITU, 2011). Of these, approximately 1.2 billion (20%) users subscribe to mobile broadband/web services. Asia is the largest market, and saw a 45% annual growth rate over the last four years. During this period there were twice as many mobile-broadband users as fixed-broadband subscriptions.

Smartphone users in Canada will exceed 13 million before 2012 ends, increasing from 9.1 million at the end of 2011 (CWTA, 2012; ComScore, 2012). That represents an annual increase of 43%. Smartphone penetration is nearing half of all mobile users. Daily mobile content usage is growing more than 50% in several key content categories. Downloaded applications are used by 40.9% of total mobile audience compared to 84.2% of smartphone subscribers.

A major pillar of the app economy is the degree and ease of integration provided by the apps. This has given birth to a new field of economic activity that focuses solely on application development. Low barriers to entry have provided many entrepreneurs an opportunity to enter this market. The main sources of revenues stem from four sources, namely: app downloads; in-app purchases; advertisements; and subscriptions.



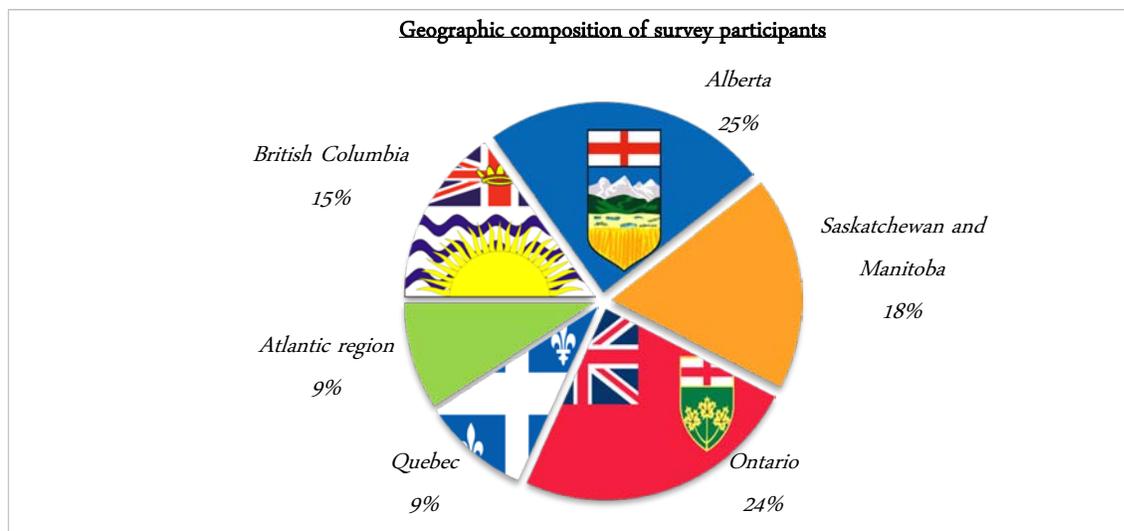
The insatiable appetite for downloading and using apps is naturally giving sensational rise to their development. While data with respect to apps and their development for all the mobile platforms is not available in equal detail, data on any one of the major platforms is indicative of the tremendous growth in apps development. New Windows apps are currently being added at the rate of 313 apps per day (All About Windows Phone, 2012). 27,000 Windows apps were added in the second quarter of 2012 alone at the rate of nearly 10,000 each month. And Windows is only one of the seven major operating platforms. At over 40,000, Android adds the highest number of apps each month, while iOS adds over 20,000. The total number of new apps that get introduced is over 2,300 each day and over 70,000 each month.

3. METHODOLOGY

This study got off the ground with a **desktop research** of directories and association memberships to ascertain a best-efforts list of companies in Canada engaged in mobile applications development.

Participants for **key informant interviews** were identified from the desktop research as well as from ICTC’s network. These interviews provided a first baseline of quantitative data, and were used to identify a survey base. These key informant interviews included consultations with key national and provincial association stakeholders.

Primary data regarding employment and revenue were collected through a **targeted survey** conducted online and via telephone. The following graph exhibits the geographic composition of the survey participants:



Source: ICTC app economy survey, 2012

Using the advertisements published on the [Job Bank](#) website, one of the largest web-based networks of job postings available to Canadians, wanted ads were identified for digital economy occupations that are looking for app-developing skills and related work experience. Vacancies posted on social media were also scanned, as [four out of five digital economy employers use this new avenue for recruitment](#). This vacancy analysis allowed us to generate a benchmark for the proportion of digital economy occupations that focus on app development.

Collected primary data was compared and contrasted against the Labour Force Survey (LFS) data released by Statistics Canada. The monthly LFS sample size is



approximately 54,000 households, resulting in the collection of labour market information for approximately 100,000 individuals. A comprehensive picture of the app economy using multiple lenses is thus presented to the readers of this study.

Economic activity in the app ecosystem is estimated by aggregating the annual operating budgets. Multiplier effects of the tangential and induced economic activities were also taken into account to size the app economy in Canada.

The analysis and preliminary findings were presented in a validation session to bring the research findings back to the stakeholders and evaluate the findings with their valuable inputs and closing thoughts. Feedback was collected, synthesized and incorporated in the study to ensure the validity of the findings, ensuring accurate capturing of stakeholder input to reflect current realities and prepare for future developments.

4. THE APP ECONOMY LABOUR MARKET

4.1. Canada

App-related jobs cover a wide range of opportunities and, as these jobs are gaining prominence, measuring the scope and contribution of these occupations in the Canadian economy is vital.

The app economy labour market includes positions in small start-up companies, in growing small and medium enterprises (SMEs), and in large corporations. Technical positions range from software engineers to programmers to user interface (UI) designers.

Total employment: **51,700**

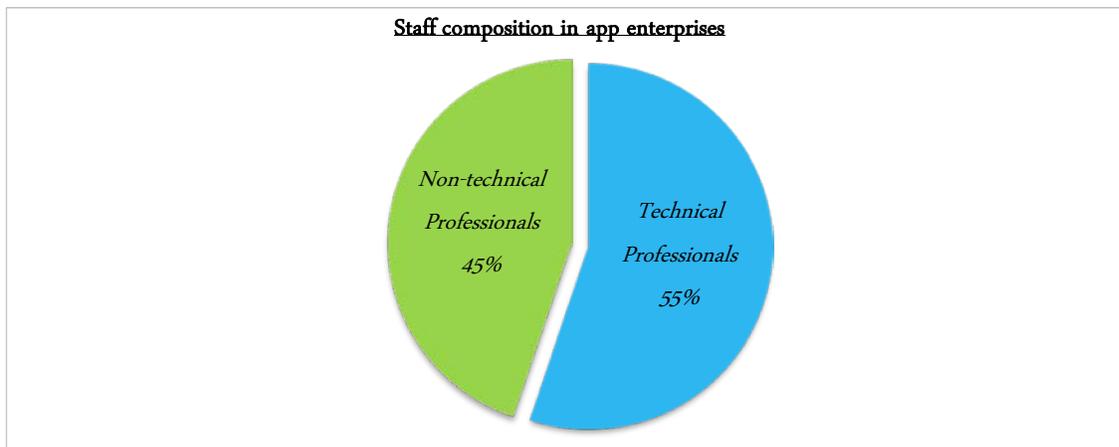
Technical professionals: **22,800**

Non-technical professionals: **18,500**

Total direct employment: **41,300**

Total indirect employment: **10,400**

The jobs in the app economy, however, are not limited to technical professionals only. There are many positions non-technical functions in an app-developing company as well. This is more so the case for companies that outgrew their initial take-off stage and embarked on a growth path. Non-technical functions range from marketing, sales, management, human resources, and administrative support. ICTC's consultation with Canadian companies engaged in mobile app development suggests that for every technical professional on the payroll of an app-developing company, there is nearly another professional who is responsible for promoting the apps through means of marketing or sales or is engaged in another related non-technical role.



Source: ICTC app economy survey, 2012

The evolving and expanding nature of mobile technology is dictating that a large range of skills are needed to succeed in the domain of app development. Mobile devices bridge the gap between the real world and the digital domain, making mixed-signal design (i.e., the ability to process both real and digital signals and transform them from one to the other) a basic requirement. At the epicentre of creating and generating revenue from an app are software engineers and app programmers who program and design the app, while UI designers make it user-friendly.

ICTC's latest [digital economy labour market report](#), analyzing data up to August 2012, shows that 133,000 computer programmers, 26,000 interactive media developers, 50,000 software engineers, 68,000 user support technicians, and 8,000 systems testing technicians are currently employed in Canada. Although not all of these 285,000 technical professionals are working in the mobile apps arena, many are. The job description and job title of these professionals obviously vary from company to company as well. Some of the sample job titles are:

- ☑ Computer programmers: application programmer; software developer; multimedia programmer; operating systems programmer; software programmer
- ☑ Interactive media developers: graphical user interface (GUI) designer; graphical user interface (GUI) developer; interactive media developer
- ☑ Software engineers: technical architect – software; telecommunications software engineer; telecommunications software specialist; applications engineer
- ☑ User support technicians: software installation technician; software technical support analyst; technical support supervisor

- ☑ Systems testing technicians: application tester; application testing technician; technician, application testing; technician, software testing

To determine the composition of professionals that are engaged in the app economy, job boards were thoroughly scanned for a three-month period. Job adverts that were specifically looking for skills and experience in developing apps were 8% of the total adverts in these occupations. These baselines suggest that 22,800 technical professionals, inclusive of developers and technical support staff, are involved in developing apps in Canada currently.

Using the above analysis, the app economy comprises of 55% technical roles and 45% of non-technical ones. The total *direct* employment in the app economy is estimated at 41,300.

In estimating the labour market, particularly one of the outputs which increasingly is impacting all spheres of life, it is a standard practice to use a multiplier. This allows estimating the spillover effects of the labour market of interest by approximating the combination of the direct, indirect, and induced employment.

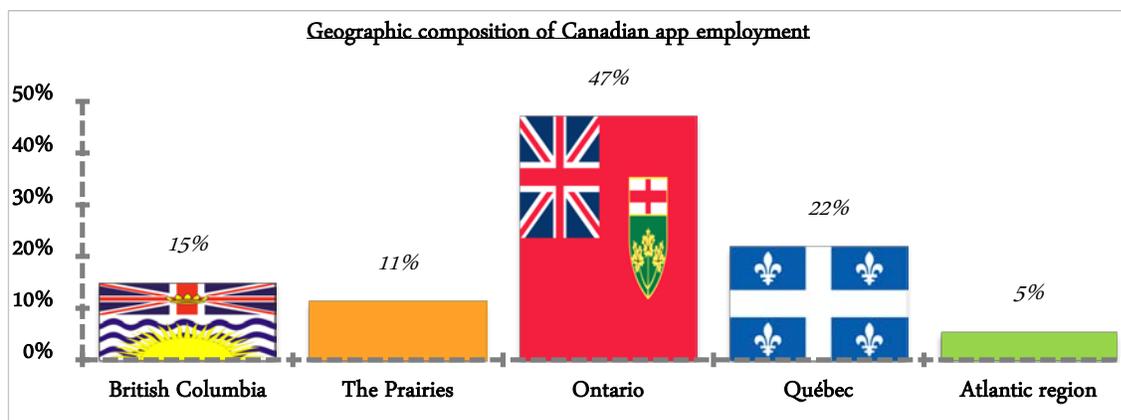
For clarity, beyond developing and selling apps (direct employment effects), the app economy also generates incremental employment in other sectors for those who process the information received via apps (indirect employment effects) and additional employment resulting from increased household spending resulting from rising incomes because of direct and indirect employments (induced employment effects).

That is where a multiplier becomes useful. A multiplier of two implies that for every direct job, there are two indirect and induced ones. An example with respect to the app economy would be a technically savvy worker who works in a health care environment and whose job is to download and process the information received from clients who are using health related apps to seek consultation. Higher earnings from these direct and indirect employments will be spent in the marketplace where additional salespersons will be required. This is an example of induced employment.

There is no fixed multiplier that is used across studies. Multipliers from one economy should not be extrapolated to another, either. In most cases, it is left to the discretion of the researchers. For example, a study that examined the Facebook labour market used a range between 2.4 and 3.4 (Hann, Viswanathan and Koh, 2011). In contrast, a study that examined the app economy labour market in the US used 1.5 (Mendel, 2012). In some other labour market studies, Atkinson et al. (2009) used 3.6 for the US, Katz et al. (2009) used 3.4 for the US, Katz et al. (2008) used 1.38 for Switzerland, Crandall et al. (2003) used 2.17 for the US, and Strategic Analysis Group (2003) used 3.4 for Canada.

A conservative multiplier of 1.25 is used in this study to estimate the breadth of the Canadian app economy. This implies that every four direct jobs in the app economy generate one job in the rest of the economy. This is, perhaps, erring on the side of caution and may need to be revised as the app economy expands further. 1.25 will, however, be used as the multiplier for now.

The estimated 41,300 direct employments in the app economy generate another 10,400 indirect and induced jobs. The total app economy and related employment in Canada, therefore, is 51,700. The geographic composition of this employment is as follows:

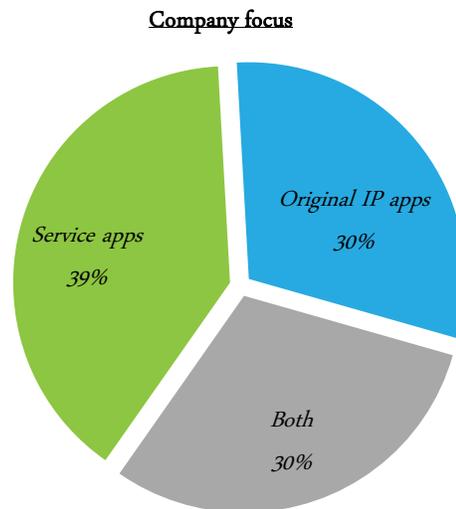


Source: ICTC app economy survey, 2012

Driven largely by strong global growth in accessing and consuming digital products and services through apps, the total app economy and related employment in Canada is estimated to grow by 51% from current levels to 78,000 by 2016. App enterprises will be looking for app-makers with leading-edge skills across platforms.

It is evident that the app economy jobs are spread out throughout the country. Most of the companies working in this sub-sector are small and medium enterprises (SMEs) employing 10 people or fewer. Despite the jobs being spread out across all the provinces, the labour market and app development hubs remain Toronto, Montreal and Vancouver.

Consultation with app developing companies shows that two-fifths (40%) of them focus on developing service related apps, with the remainder being split up between companies concentrating on IP and a combination of both service and IP apps.



Source: ICTC app economy survey, 2012

The average salaries for technical employees in the app economy range between \$35,000 and \$110,000, with the average annual gross salary being \$68,000.

4.2. Comparisons with the US app economy labour market

In studying the app economy labour market in the U.S., Mendel (2012) estimates that nearly 466,000 workers are involved in the U.S. app economy. He notes, however, that these may represent “jobs not lost” rather than net jobs gained. This alludes to the fact that most of these jobs are not filled by new entrants into the labour market, rather by workers that are switching their career focuses, for instance, an app developer who is developing apps today, having transitioned from developing computer software earlier. The degree to which direct employment is incremental to a hypothetical absence of smartphone platforms is likely to require further study.

5. INVESTMENTS IN MOBILE APPS DEVELOPMENT

5.1. Canada

Application developers can create apps for a number of platforms of which the most common are Android (Google), iOS (Apple), Blackberry (RIM) and Windows (Microsoft). The basic requirements to develop an application for any mobile

Cost of service apps: \$5,000 - \$200,000

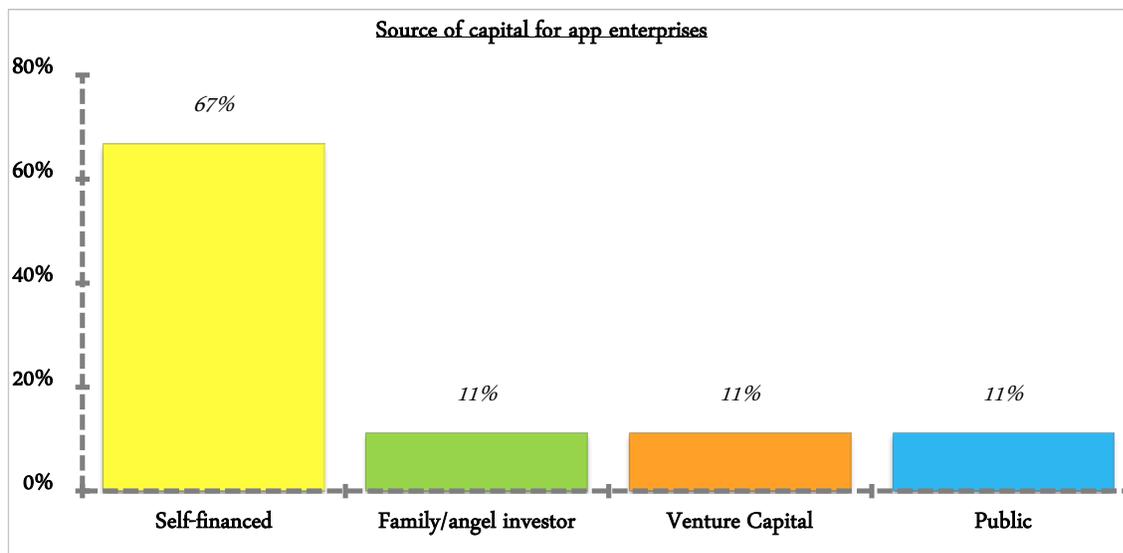
Cost of IP apps: \$10,000 - \$250,000

Average cost of apps: \$20,000

platform are having programming skills and access to a computer. Given these resources, one can develop and launch an application for any platform. The costs are not exorbitant to develop most apps and developers can sell it directly to platforms. These are two of the main reasons for many to engage in app development.

Consultation with Canadian companies involved in mobile app development reveals that the costs associated with developing an app can range from \$5,000 to \$200,000 for service apps and \$10,000 to \$250,000 for IP apps. On average, an app that is not overly complicated costs \$20,000.

Low cost is one of the main reasons why many companies proceed with self-financing, as opposed to seeking funds to initiate an enterprise. Two-thirds of the consulted companies confirmed that they commenced with self-financing, while the remaining third is split equally among companies that received endowments from family/angel investors, venture capitalists, or are public companies.

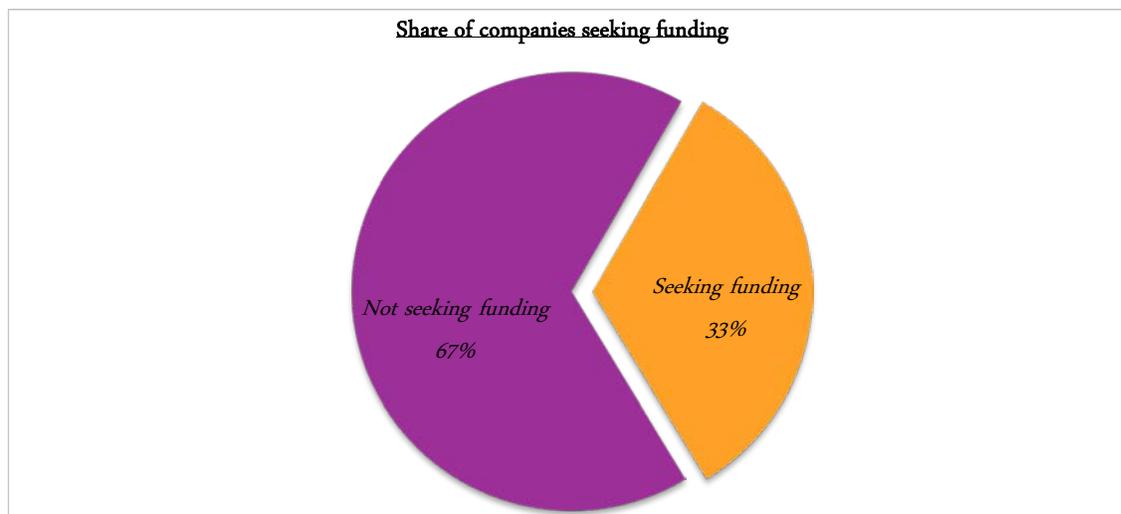


Source: ICTC app economy survey, 2012

Fuelled by the low cost and low barriers to entry, Canada is among four OECD countries – Germany, New Zealand, and the United Kingdom being the other three – that are the leaders in the creation of start-ups, with more than 10% of new businesses annually (OECD, 2007). In an effort to move onto the next level, many participants will seek capital to grow out of the infancy stage. Over 60,000 new apps are becoming available each month for entertainment, productivity, reference, communications, and countless other uses. The business models for creating apps are evolving too. It is evident that as marketing vehicles, one-off sales, or conduits to recurring revenue streams, apps have become a significant contributor to the digital economy. Investors ought to be responding to this opportunity. Barriers to entry in the app space are low,

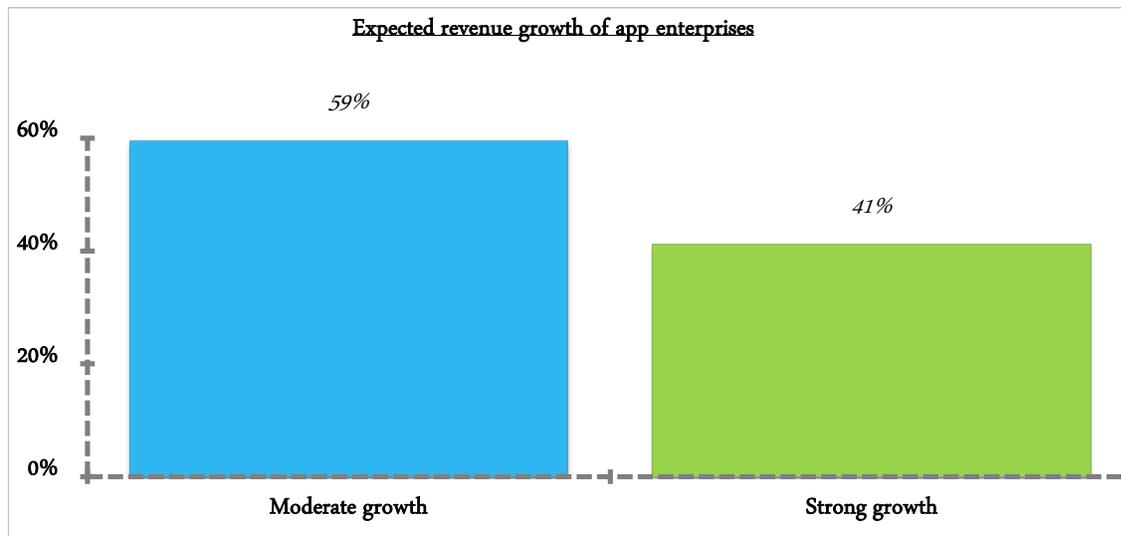
and the sector is ideally suited for early stage investment furnished by angel and venture capital, with opportunities abound for a quick return on investment. App development has generated over 50,000 jobs in Canada to date and is on course to create many times more.

In spite of these encouraging factors, app economy companies have yet to see signs of funding. A third of the surveyed participants revealed that they are seeking funding to grow their operations and are finding it challenging. The biggest challenge for SMEs is to showcase credibility with banks to access funding. They typically have small or no assets to pledge as collateral and thus are less likely to receive loans.



Source: ICTC app economy survey, 2012

Access-to-capital issues are pervasive across all manner of small enterprises and entrepreneurs, and bridging the gap from angel investment to venture capital is a persistent challenge. In the US, policy-makers have recognized the role that small companies play in the innovation cycle. The JOBS Act, recently passed, provides for reduced reporting and the potential to raise funds through crowdsourcing. Given the potential that the development of apps has to contribute significantly to employment in Canada and to GDP, policy-makers in Canada may be well-advised to explore an acceleration of measures to ensure firms here have the necessary capital to exploit new opportunities. At a recent digital economy conference, for instance, digital entrepreneur John Bitove suggested the creation of a new class of flow-through shares to help fund the development of apps. Any such discussion will require further research and analysis.



Source: ICTC app economy survey, 2012

Despite these challenges, survey findings suggest 41% of companies are forecasting strong growth, while the remaining 59% are expecting moderate growth.

5.2. Foreign Investment

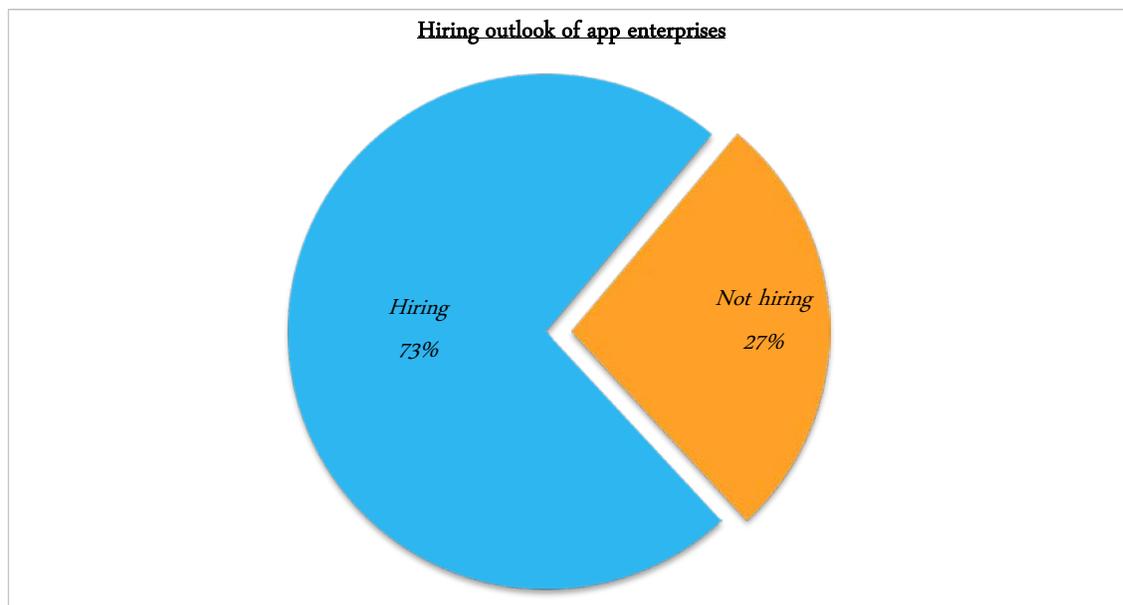
The Canadian mobile app economy continues to tread the growth path it has been on since its emergence in 2007. Despite the environment being extremely competitive to establish a foothold in the market, the app economy continues to attract players of all categories, be they developers, entrepreneurs, or investors. Although most entrepreneurs had to invest their own risk capital, the app economy has caught the interest of many investors with its capability of contributing to economic growth and creating jobs. Various success stories, like the one of OAK computing detailed below, are only helping boost their confidence.

OAK computing is a boutique software – including apps – development company founded in 2009 and managed by a team of three young technologists who believe in doing things the right way. They love building great technology solutions that merge exceptional design, well planned user interfaces, emerging technologies, current web standards, and established best practices together into one solid package. And they always do it with their clients’ needs and interest foremost in their mind.

In a span of four years, they developed 20 apps for the iOS platform and 15 for the Android platforms. Their aim is to always help customers achieve their immediate, long term and strategic objectives while helping them understand and appreciate the true potential of mobile technology.

Their innovative solutions have enabled their customers to develop newer business models, increase revenue and customer satisfaction, and reduce operational expenses while opening newer channels to reach untapped markets.

With 41% of the survey respondent enterprises expecting “strong growth” in the coming months, combined with 73% that plan to hire more full time app developers soon, it can be safe to assume the industry is on a growth path, an enviable position given the heightened uncertainty surrounding the global economic climate.



Source: ICTC app economy survey, 2012

Canadian technological firms have been on foreign venture capitalist radars for some time because not only do they boast desirable technical experience, but also have access to strong government funding for research and development, robust telecommunications infrastructure and world-leading post-secondary institutions.

Canada’s tax incentives in regards to innovation (scientific research and experimental development or SR&ED), are among the most generous in the world. When tax credits are factored in, \$100 R&D expenditure can be reduced to an after-tax cost of less than \$44 for a large enterprise and less than \$38 for a small enterprise (Invest Ontario, 2010). SR&ED cost the federal government \$3.6 billion in 2011. The definition of taxable Canadian property was narrowed to eliminate the need for tax reporting. Federal budget 2012 highlighted how this narrowing also eliminates complicated costs related to compliance regulation for a non-resident investor or firm. These incentives improve

Canadian businesses ability to attract foreign capital, including innovative high-growth companies that contribute to job creation and economic growth.

To strengthen Canada's position as a knowledge-based economy, the Government of Canada, in its 2012 budget, pledged \$400 million to help increase private sector investments in early-stage risk capital and to support the creation of large-scale venture capital funds led by the private sector. This will help foreign entities partner with strong local investors, a move that will encourage investment in the app economy.

Besides boasting a highly educated workforce and strong financial stability, Canada offers an inviting business environment in a sound economy. Add to that the advantage Canada gains through the North American Free Trade Agreement (NAFTA), providing investors access to various North American goods and services markets.

These incentives ensure that Canadian companies and multinational ones with Canadian operations have access to capital, and continue to attract foreign investments. Multinational corporations such as Ericsson, Motorola, Nokia and Siemens have set up R&D facilities in Canada to take advantage of these programs to cut innovation costs. These large companies' research and innovation infrastructures have contributed significantly to Canada's app economy, as developers continue to develop apps for various application platforms used in the mobile devices produced by these companies.

Presence of major handset manufacturers as well as network infrastructure providers allows regions such as British Columbia, Calgary, Kitchener-Waterloo, Toronto and Kanata to have a legacy and ongoing track record of developing hardware and software for cellular networks. While this landscape has constantly shifted, the expertise available in Canada related to wireless networking is significant. This legacy history of global wireless expertise is increasingly complemented by Canada's digital media expertise. Canada is a global leader in the development of games and digital film and television production. These are underpinned by world-leading schools such as Ryerson and Sheridan developing digital media and games talent, bolstered by strong software engineering schools such as Waterloo.

Mobile apps that are the subject of this paper will become increasingly sophisticated, with deep analytics of data performed in the cloud and increasingly resident on multiple, interconnected platforms. The intersection of digital media with hardware and software engineering creates a rich opportunity for enterprises of all sizes to participate, from large equipment vendors to freelance graphic designers.

6. THE MOBILE APP ECONOMY

6.1. Canada

In spite of being in its formative years with a majority of the participants having received no capital funding, the mobile app industry has blossomed. The constantly increasing demand for cellular and smartphones has assisted in growing the industry.

App developers can create service-related apps or deliver one that provides original intellectual property (IP). It is worth noting that the process involved in developing these

two types of apps varies significantly. Service related apps are easier to tackle of the two and require less creativity as most of the requirements are outlined by the service providers the apps are designed to support. The rewards to develop an original IP app, however, are superior to those of developing a service related one.

During the consultation phase of this study, ICTC met with enterprises ranging from one that just released its first app to one that creates over 100 apps a year. Production rate of apps relies on demand. On average, Canadian app enterprises develop nearly 10 apps a year. This number is expected to increase as many developers are targeting to double their production rate. That implies that the annual average would increase to developing 20 apps in a given year.

All Canadian smartphone users download at least one app to their mobile device (Xyologic, 2012). App users spend money on apps and related products and services through four avenues. Besides purchasing apps, users also spend in-app purchases. In-app purchases comprise consumers purchasing virtual goods as an app feature to unlock a level or proceed to the next stage. Revenue is also generated when users spend on shopping for goods and services that are advertised through apps. In-app advertising focuses on placing related advertisements in applications that are generally offered at no cost. And finally, revenue is also generated when consumers subscribe to a regular service in exchange for recurring payments.

Annual Canadian expenditure/revenue on

App download: **22%**

In-app purchase: **38%**

Advertisements: **21%**

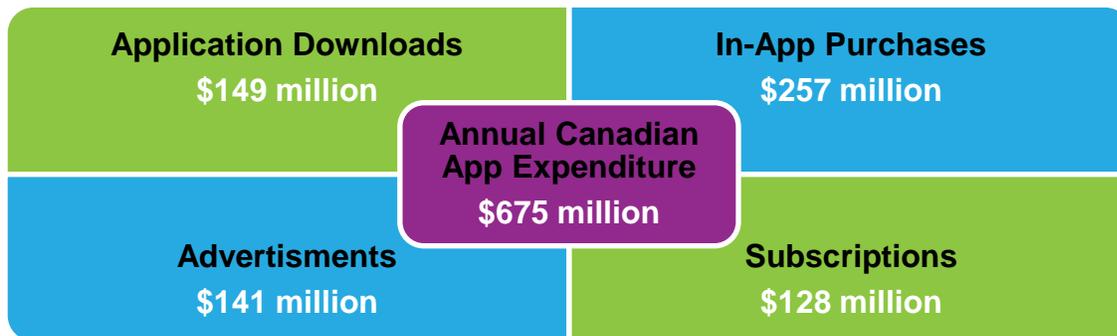
Subscriptions: **19%**

Total Canadian expenditure: **\$675 million**

Total Canadian revenue: **\$775 million**

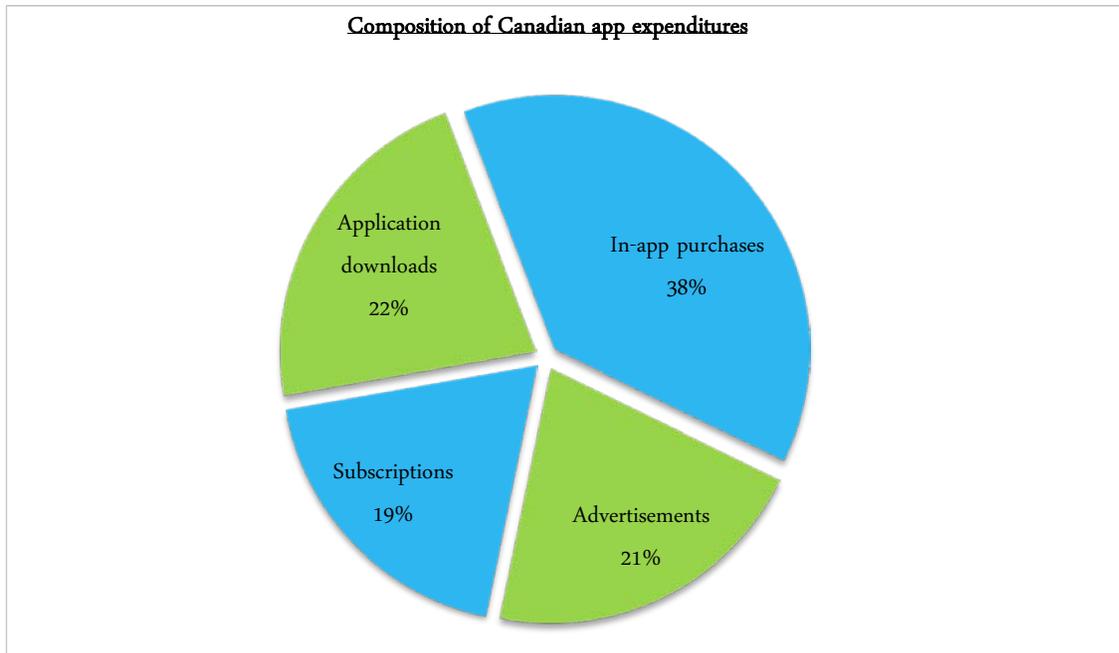
13 million smartphone users in Canada, on average, spend \$149 million to download paid apps in a given year. Approximately 7%, or \$10.5 million of this amount, is spent on new apps that are released in the recent past and the remaining \$138.5 million on other not-so-new apps.

Canadian app expenditures



Source: ICTC, 2012

Expenditure on downloading apps constitutes 22% of the total expenses on apps, easily bested by expenditure on in-app purchases that constitute 38% of the total expenses. Apps accommodate enhanced advertising features. As the smartphone penetration rate increases and more Canadians discard their cell phones for smartphones, application advertisement revenues experience spectacular growth (IAB Canada, 2010). Mobile app advertising revenues grew from \$12 million in 2008 to \$52 million in 2010 to \$136 million today in 2012. Revenues from advertising constitute 22% of the total revenues from apps. The remaining portion of the total expenses on apps – and by extension that of the total revenue generated in the app economy – comprises subscription expenditures (19%). In all, Canadian smartphone users spend on average \$675 million annually on apps and related expenditures.



Source: ICTC, 2012

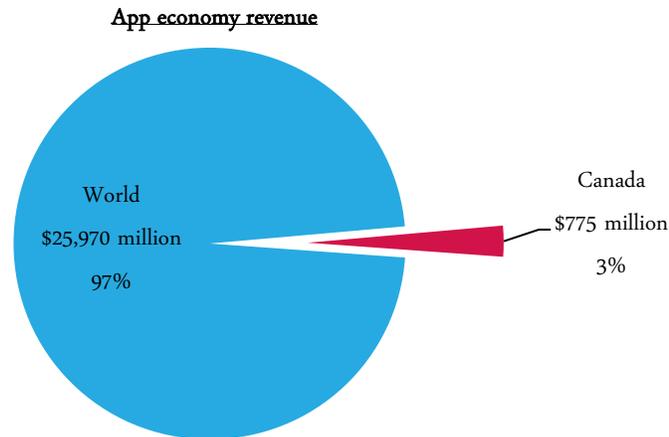
Obviously the total amount spent by Canadians on apps does not entirely go to Canadian apps enterprises. Similarly, a sizable share of the total revenue received by Canadian app-makers originates from app users in other countries that spend money on apps developed by Canadian developers.

80% of the app enterprises in Canada falls under the micro and small enterprises (total staff 10 or less) category. The estimated annual revenue generated by Canada's app economy is \$775 million. As the number of Canadian enterprises as well as worldwide smartphone and apps users increase, the app economy is expected to continue experiencing growth over the next several years. A detailed discussion on what the future holds in terms of Canadian app expenditures and revenues is found in section 7.6 The Path Ahead.

6.2. Comparisons with the global app economy

An estimated 1.2 billion global mobile broadband subscribers have downloaded 50 billion apps to date, inclusive of free and paid apps. Applying a similar download-to-expenditure ratio to Canada, it is estimated that global smartphone users spend \$25.97 billion annually on apps and other related expenditures. This estimate reconciles well with other comparable studies that estimate the app economy revenue to be increasing from \$5.2 billion in 2010 and \$15.1 billion in 2011 to \$58 billion in 2014 (Gartner, 2010).

Mobile app development and usage have become a common phenomenon. Australian smartphone users spend \$208 million, French users spend \$411 million, Korean users spend \$197 million, UK users spend \$432.7 million, and the US users spend a whopping \$2.04 billion annually on apps and related expenditures.



Source: ICTC, 2012

Of the total revenue of \$25.97 billion generated by the global app economy, Canadian apps enterprises are bringing in \$775 million, or 3%, of global revenue. The biggest player in the global app economy is the US. Some studies estimate the US app economy revenue – inclusive of app downloads, in-app revenues, sales of virtual goods, and sales of physical goods and services – to be reaching \$12 billion in 2015 (Rubinson, 2011).

7. REACHING THE NEXT LEVEL

The evolution of the Canadian app economy contributed significantly to the digital economy being a key driver of economic growth in Canada. The job growth in the app economy will continue strongly as enterprises look to capitalize on the opportunity being created by the growing number and variety of devices coming to market. There are a number of opportunities and challenges that the app economy stakeholders – workforce, enterprises, associations, and regulators – need to embrace and overcome.

7.1. Skills and productivity

Human capital is the most valuable resource of any enterprise, sub-sector, or country. The skills level and educational attainment of Canada's app economy workforce is significantly higher than the workforce of most of the other competing nations that are also vying for an increased share of app revenues. Canada needs policies and approaches to maintain its position ahead of the curve, as the growth of its app economy will be constrained if we do not emphasize on meeting the continuing strong demand for skills.

One reason the app economy is able to generate revenues at its current level is that our app professionals possess a strong mix of technical, interpersonal, and entrepreneurial skills. ICTC's extensive consultation with app economy stakeholders, however, reveals that skills requirements for high-skilled app-makers changes on a continuing basis, mainly as a result of new platforms, devices, and user preferences. Ensuring a steady supply of competent workers is critical as skills become substantially specialized. It is, thus, vital that market participants take all the necessary actions to provide the app workforce with the required tools and support to maintain its versatility.

Investing in skills to increase efficiency and productivity is the order of the day to produce high-value-added apps and related services. Empowering the workforce is vital for the competitiveness of this emerging segment of the economy, which is connected globally and has the ability and opportunity to access the global revenue pot. Strong Canadian skill policies will help Canada realize its aspiration to lead the global app economy.

The evolving app market has increased the need for developers to seek employees that match the skill set required. Besides pursuing programming skills in various handheld platform languages and embedded computing, employers are also looking for candidates to be equipped with effective communication and documentation skills, programming skills for web based developments and strong testing skills.

Enterprises require product development leaders with keen understanding of regional and global apps markets. Enterprises looking to move onto the next phase should

consider enrolling their technical and non-technical staff in training and mentorship programs that help uphold operations in the growth phase.

To help establish Canada as global leader in a highly competitive market, universities and colleges have started altering their curriculum to include courses that focus on application development as well. Some examples of relevant programs are:

- ▶ [BSc in Mathematics \(MICA - Mathematics Integrated with Computers and Applications\) \(Honours\)](#), Brock University, Ontario
- ▶ [BA in mathematics and statistics and computer applications](#), Concordia University, Québec
- ▶ [BSc in mathematics and statistics and computer applications](#), Concordia University, Québec
- ▶ [Certificate in Computer Programming Applications](#), Ryerson University, Ontario
- ▶ [BSc in Applications of Computer Science \(Minor\)](#), Western University (University of Western Ontario), Ontario
- ▶ [Mobile Application Development](#), Canadore College

Besides focusing on the required software programming skills, these programs are increasingly integrating skills such as project management and marketplace promotions into the curricula to help students launch their own companies. To enhance the effectiveness of these programs further, topics on spectrum requirements and regulatory frameworks also need to be gradually included in the programs.

7.2. Financing

In just over five years, Canada's app economy has managed to progress from a start-up phase to growth phase. The app enterprises – especially small- and medium-sized firms that have recently established operations – continue to face challenges related to raising capital. While large enterprises generally have adequate access to financing through their internal resources and credibility with banks, SMEs typically have great difficulty in securing financing. Lack of assets to pledge as collateral continues to be a deterrent to banks that more often than not embody a risk-averse nature. Besides providing them access to funding, it is important they are guided to establish themselves as a self-sustaining entity.

Survey respondents confirm that majority of the market participants established operations with their own capital and approximately a third of them are seeking funding to grow. With 73% of the respondents intending to increase hiring and 41% forecasting strong growth in the months ahead, access to available financing will play an important role in lifting growth higher.

7.3. Awareness raising

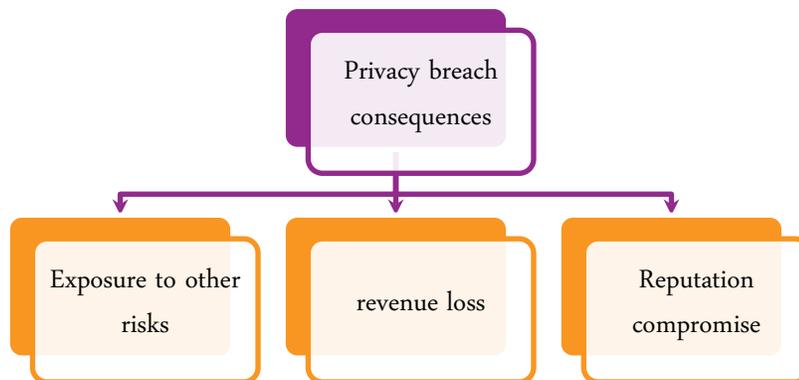
Apps enterprises that operate out of remote locations continue facing an uphill task to raise awareness in this highly competitive market. They also find it difficult to attend conferences and workshops intended to boost human capital and learn about current trends. Dynamic advertising that highlights the productivity and usefulness these apps offer will help boost awareness of their products and services and help them to be integrated into the mainstream app economy. Since most of these enterprises are start ups with limited hands on deck, employing marketing agencies to promote their products can be useful.

The widespread acceptance of the wireless era is proving to be a key contributor to Canada's app economy. With more consumers making the switch to a smartphone on a daily basis, the demand for apps is expected to drive growth in this economy to unexplored levels. Job growth in the app economy will continue strongly as a result of companies and developers looking to build new apps for the growing number and variety of devices coming to market. Service apps are playing an instrumental role in efficient bookkeeping, human resources management, maintenance tracking and service delivery areas. The employment growth will also come from enterprises increasing the use of various apps in their day-to-day management. The 'Suggested Steps to Progress' section below discusses this further.

Encouraging smartphone users to broaden their use of apps and technology in general, increase innovation in the workplace, promotion and investment in skills, research, and development can help the app economy grow even larger.

7.5 Privacy and security issues in the app economy

In many ways, and perhaps as a consequence of its impressive growth, the app economy has become a victim of its own success. The Canadian app economy remains in the crosshairs of hackers. Invasive attacks cause loss of revenues, damaged reputation, and exposure to other (e.g. legal) risks. The damages caused by breaches of privacy and security issues will get magnified if not adequately dealt with in the early stages.



If developers do not take measures to protect their apps from these attacks, the impact of hacking will hamper growth in the app-economy. It is thus imperative for app developers to adapt new methodologies that differ from traditional approaches to protect their apps from being attacked, especially after a recent study conducted by Arxan Technologies show more than 90% of top paid mobile apps have been hacked. Free-apps are also targeted by hackers, a sign that hacking remains pervasive across all groups and categories.

For instance, consider an app that sells for \$0.99 in an online store. Provided there exists a pirated version of the same app that can be downloaded for free, the app developer can lose millions in revenue – depending of course on the number of downloads – due to significant high volumes and potential large number of users. This financial threat leaves a possibility of worsening losses given the rapid growth of the app economy along with new applications and devices coming into the market at a brisk pace. Simply put, the more apps there are, the higher the potential losses, unless something is done to prevent it. If developers do not take adequate measure to stop or minimize the probability of these threats, the projected growth path for the app economy will face some limitations, especially after all risks are taken into account.

A recent study showed that mobile vulnerabilities nearly doubled in 2011, rising 93%. The Android OS was particularly targeted (Symantec, 2012). On a positive note, the report goes on to say that ten years of proliferation of mobile devices has not given rise to a corresponding rise in mobile threats on the same level as seen in PC malware.

The privacy issues cuts both ways in the sense that the app developers need to be protected from hackers, while there is a case for consumer protection from incorrigible app developers, as well. Preventing app-developers from accessing and gathering information from personal smartphones unbeknownst to users is also crucial.

Forcing developers to notify users, what data, if any, is being accessed would help raise awareness for everyday users. Policymakers, therefore, need to be strategizing to both



prevent invasive attacks on app-developers and app-developers accessing private information.

8. WHAT THE FUTURE HOLDS FOR CANADA'S APP ECONOMY

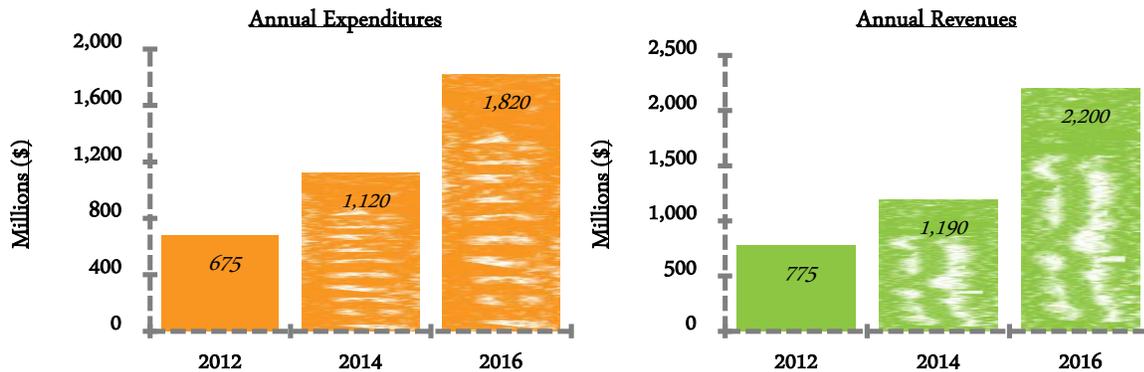
As the fastest growing consumer technology, mobile devices, particularly smartphones, will play a major role in our daily lives in the coming years. The phenomenal rate at which apps are being developed to help us with every facet of our lives makes it clear that the app economy is positioning itself for a bright future.

Smartphone penetration in Canada is nearing 50% currently at the end of 2012, increasing 45% since 2011, when the penetration rate was 33%. At this rate, all mobile phone users will be using smartphones by end 2014. Given the fast pace of adoption and new entrants into the smartphone ecosystem, maintaining this growth rate is not beyond the realm of possibility. To control for the current macroeconomic uncertainty and unforeseen risks, however, we consider a conservative growth rate of 20%. That is, the smartphone penetration rate will grow by 20% each year.

Considering the number of smartphone users, number of apps available in the major platforms, and increased usage of apps in daily lives and as enterprise solutions, Canadians are estimated to be expending \$1.12 billion a year on apps by 2014 (↑66%). At 20% growth in penetration rate, all Canadian mobile phone users will be using smartphones by end 2016. As a result of a 100% penetration rate, Canadian annual app-expenditures are estimated to be \$1.82 billion in 2016 (↑170%). Of that, \$400.5 million will be spent on application downloads and \$692 million on in-app purchases. Subscriptions will constitute \$346 million of the total app-expenditure, while another \$381.5 million will go towards purchases of goods and services through app-advertising.

Revenues, on the other hand, generated by the Canadian app enterprises, are estimated to reach \$1.19 billion in 2014 (↑54%) and \$2.2 billion in 2016 (↑184%).

Current and projected app economy expenditures and revenues



Source: ICTC, 2012

9. THE WAY FORWARD

As mobile apps continue to become the preferred means to access and consume digital products and services, it is vital that the app economy stakeholders ensure an enabling environment, a smooth path to progress, and opportunities for growth. These formative years are crucial in laying a strong foundation for sustained success. Sound skills policy, an attractive investment climate, and collaboration among all stakeholders of skilled app workforce are all key ingredients of growth and for attracting investment, as well as for Canada to gain maximum benefits from workers' productivity gains. The app economy employs a notable number of Canadian workers and targeted measures can create a better functioning app ecosystem to benefit from competition, strengthen the business environment, and improve efficiency.

So what measures can be considered? ICTC will continue to hold dialogues with app economy stakeholders on the following issues:

Should supporting nascent enterprises be prioritized? In an environment of fiscal austerity, policymakers seek high probability returns. Supporting nascent enterprises that face low barriers to entry is key. Resource requirements are potentially low in the app development space. In comparison with capital-intensive industries, there is the strong potential for growth in jobs and revenues in the app development space for relatively low investments by public authorities. Low-risk measures that are conducive to nurturing entrepreneur and small- and medium-sized businesses can be beneficial to the app economy on a sustainable growth path.

Should necessary capital for small app enterprises be ensured? Ensuring app enterprises, particularly small ones, can adequately fund their activities is important. Providing stimulating financing measures to investors is likely to help SMEs overcome the difficulty they face in raising capital. Favourable general corporate income tax, and three-to-five-year tax holidays, among other measures could bolster growth in the app economy.

Should creating a job market-ready workforce be emphasized? Providing incentives to students and jobseekers in the form of targeted scholarships or reduced tuition in such academic majors as software engineering, software development, software technology, and interactive graphical design will like fast-track growth in in-demand skills. If corporate tax holidays or credits are tied to career development, app enterprises will likely have incentives and/or means to up-skill their developers.

Should integrating skilled foreign workers more effectively be prioritized? A more responsive immigration system is likely to improve addressing skills shortages and integrating skilled newcomers. Streamlining the process to improve one-to-one matching with industry needs can be considered. Employability in Canada can be made a fast-tracking criterion in the selection process. Having a detailed understanding of global apps market, thus facilitating Canadian app-makers establish a strong foothold in this highly competitive environment, is vital. Recognizing and welcoming foreign product development talent can help in this regard.

Should collaboration with other sectors be prioritized? Increasing ties with all other economic sectors and sub-sectors can help increase reach and benefit from spill-over effects. Apps have already been introduced in various sectors enhancing productivity while lessening the reliance of capital expenditures. For instance, apps in the service sector can now maintain and track deliveries as is without having to enter data manually. Elsewhere, product managers are able to track product placements and pricing in grocery stores using their smartphones instead of a clipboard, evidence that apps contribute to economic growth in all sectors. Using apps in social media and networks is also helping push the Canadian media industry as a global leader.

Should awareness of global competition be raised? The same low barriers to entry that characterize the development of apps in Canada exist throughout the world. Measures to leverage existing competitive advantage will be helpful. For example, there is merit in targeting support in app development niches such as gamins, finance, e-health and digital media where Canada enjoys rich ecosystem clusters and a legacy of innovation and success.

10. CONCLUSIONS

Mobile apps are smaller programs developed to run on mobile platforms for small handheld devices. Apps allow us to simplify our daily lives by providing us with greater convenience. An estimated 1.2 billion global mobile broadband subscribers spend \$25.97 billion annually on apps and other related expenditures. 13 million Canadian smartphone users contribute \$675 million to that revenue. This is estimated to grow to \$1.12 billion a year by 2014 (↑66%) and \$1.82 billion by 2016 (↑170%). Canadian apps enterprises, on the other hand, are bringing in \$775 million, or 3%, of the global revenue. Generated revenues are estimated to reach \$1.19 billion in 2014 (↑54%) and \$2.2 billion in 2016 (↑184%).

Continued investments in the Canadian mobile applications development community are critical to ensure that they flourish and consolidate their position on the global stage. The app economy has some challenges, including finding investors and ensuring a sufficiently skilled talent supply to sustain future growth.

The Canadian app economy has been experiencing medium-term growth and is projected to grow considerably in the coming years. From the policy makers' perspective, it is imperative that the SMEs and the large corporations are both recognized for their respective contributions to these growths. Large corporations such as Google, Apple, Microsoft, and Research in Motion (RIM) play a major role as engines of the app economy platforms and spin-off activity that must be recognized and not allowed to diminish. These large corporations have paved the way for rapid mobile integration on a global scale.

Bibliography

- All About Windows Phone. 2012. http://allaboutwindowsphone.com/news/item/14960_100000_apps_published_to_Windo.php
- Andes, Scott M. and Daniel Castro. 2010. Opportunities and Innovations in the Mobile Broadband Economy
- Rubinson Partners. 2011. Appnation: How Big is the US App-Economy? Estimates and Forecasts 2011-2015
- Atkinson, R., Castro, D. and Ezell, S.J. 2009. The Digital Road to Recovery: A Stimulus Plan to Create Jobs, Boost Productivity and Revitalize America, Washington, DC, The Information Technology and Innovation Foundation.
- ComScore. 2012. 2012 Canada Digital Future in Focus.
- Crandall, R.W., Jackson, C.L. and Singer, H.J. 2003. The effect of ubiquitous broadband adoption on Investments, Jobs and the U.S. Economy. Washington, D.C.: Criterion Economics.
- CTVOlympics.ca. 2012
- Federal budget. 2012. <http://www.budget.gc.ca/2012/plan/anx2-eng.html>
- Gartner. 2010. Forecast: Mobile Application Stores, Worldwide, 2008-2014
- Hann, Il-Horn, S. Viswanathan and B. Koh. 2011. “The Facebook App Economy,” University of Maryland
- IAB Canada. 2010. Canadian Mobile Advertising Revenue
- Invest Ontario. 2010. <http://www.sse.gov.on.ca/medt/investinontario/Documents/English/infotech2pager.pdf>
- International Telecommunication Union (ITU). 2011. <http://www.itu.int/ITU-D/ict/facts/2011/material/ICTFactsFigures2011.pdf>
- Katz, R.L. 2009. La Contribución de las tecnologías de la información y las comunicaciones al desarrollo económico: propuestas de América Latina a los retos económicos actuales. Madrid, España: Ariel.

- Katz, R.L. and Suter, S. 2009. Estimating the economic impact of the broadband stimulus plan. Columbia Institute for Tele-Information Working Paper.
- Mandel, M. 2012, Where the Jobs Are: The App Economy. South Mountain Economics, LLC. Retrieved June 28, 2012 from <http://www.technet.org/wp-content/uploads/2012/02/TechNet-App-Economy-Jobs-Study.pdf>
- Organisation for Economic Co-operation and Development (OECD). 2007. Innovation and Growth, Policy brief.
- Strategic Networks Group 2003. Economic Impact Study of the South Dundas Township Fiber Network. Report prepared for the UK Department of Trade and Industry, Ontario, Canada.
- Symantec. 2012. Internet Security Threat Report, volume 17.
- Xyologic. 2012. App Downloads Reports: Canada June 2012
- Zynga. 2011. Prospectus. Retrieved June 28, 2012 from <http://sec.gov/Archives/edgar/data/1439404/000119312511341923/d198836ds1a.htm#toc>