# Taking Ontario Mobile

Research-based recommendations for how mobile technologies are part of the financially responsible solution to providing better access to services for Ontarians


Ontario College of Art and Design University

Sara Diamond, Ph. D.

Vera Roberts, Ph. D.

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## Principal Investigators

Sara Diamond, Ph. D.
Vera Roberts, Ph. D.

Ontario College of Art and Design University (OCAD University)
Toronto, Ontario Canada

## Primary Researchers

Bruce Cater, Ph. D.
Barbara Crow, Ph. D.
Pat Draper
Nabil Harfoush, Ph. D.
Sam Ladner, Ph. D.
Rhonda McEwen, Ph. D.
Catherine Middleton, Ph. D.
Michael O'Farrell
Katherine Osterlund, Ph. D.
Iva Parisi
Avi Pollock
Sam Punnett
Tom Purves
Howard Rosen
Gary Schwartz
Gary Woodill, Ed. D.

## Research Team

Peter Chen
Iwona Gwozdz
Juan Morales
Vince Manzerolle
Hilary Roche
Jutta Treviranus
Kathleen Webb

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## Letter from President Dr. Sara Diamond: Why Take Ontario Mobile?

The *Taking Ontario Mobile* report was prompted by a transformation that is occurring at a global scale—the exponential adoption of mobile technologies, networks and content—and by the need to understand the potential opportunities and challenges this change may bring to Ontario. OCAD University initiated this project because of our belief that mobility is a burning platform that Ontario can, should and must build on. The recent *2020 Media Futures*[1] report found that in a world where mobile penetration is at approximately 74 per cent according to the Global System for Mobile Communications Association (GSMA), there are no evident counter-trends that could stall or reverse the movement toward portability and mobility. More than half of the world's population owns a mobile telephone, and there are 5.9 billion mobile subscribers worldwide.

*Taking Ontario Mobile* is unprecedented in its scope—addressing needs, potentials and capabilities. Our methodology is unique: we have engaged with strategic foresight and scenario development, undertaken surveys and interviews, and carried out extensive secondary research—we combine quantitative and qualitative methods. Our research team includes private-sector experts and academics, and we have consulted closely with ministries across the Ontario public sector. The report builds on the work of the Mobile Experience Innovation Centre (MEIC) that OCADU initiated in 2007, which is now a multi-sector non-profit. MEIC was created in response to the concern that Canada, despite the strength of companies such as Research In Motion and the history of wireless engineering with Nortel, was falling far behind other jurisdictions in its overall adoption of mobility and invention of mobile content, services and experiences. *Taking Ontario Mobile* allows us an opportunity to assess where Ontario stands as a province in 2012.

We define "mobility" as the capacity to move seamlessly through work, leisure and personal life wherever one is located because of four fundamental characteristics of mobile technology: 1) 24/7 ubiquitous connectivity; 2) intense personalization, which allows information to be delivered based on individual needs and preferences; 3) heightened access to social networks and media; and 4) context and location specificity, which combines the features of the Internet with the ability to take location into account. Mobility redefines the individual as part of a network that links data, technologies, content, context and other users and systems to create a profoundly new way of being in the world.
OCAD University's interest in mobility is reinforced by the crucial role that design plays in creating processes, systems and products in the mobile sector. Successes in the mobile industry are the results of battles for excellent design—design that understands and responds to its users. Apple has dominated markets because of its capacity to trumpet design excellence and to continually invent new delivery systems that respond to users' needs, such as iTunes. Joseph Crump, the executive creative director

[1] Greg VanAlstyne, "2020 Media Futures," in *2020 Media Futures*, ed. Greg VanAlstyne (Toronto: OCADU, 2011).

of Razorfish/Microsoft, described the iPhone victory thus: "Usability—once fetishized—is now merely the price of entry. . . . The bar is getting raised every day for the way an object or an experience looks or feels; its tone of voice, its personality." [2] The failure to place design first and foremost can be seen as the Achilles heel of other companies in the mobile space. In the creation and deployment of tools and systems, it is important to build technology interfaces that offer extreme ease of use as well as personalization.

As generations around the world grow up "untethered" [3] and as more adults join mobile culture, the conditions of intimacy, connectivity and individuation are transformed: the device becomes an interface for private and public services. Yet mobility can be invasive. The constant interruption of mobile communications is now an accepted part of social and business activity, and the voices of personal mobile dialogue (despite the dominance of text messaging and email) remain part of our environment. Mobile marketing and advertising now interrupt the flow of mobile communication. At the same time, mobility is solitary. We are familiar with the sight of individuals looking down at their mobile devices ("praying") while they thumb anxiously through their email, with social context fading into the background—what Sherry Turkle calls being "alone together." [4] This is a disconnected connectedness characterized by multitasking, or the ability to "keep in touch with a lot of people who we also keep at bay." [5] Attitudes toward risk are also shifting with secure-payment systems, online ad tracking, social networks, more exposed personal data, location-based services and information disclosure. These transformations require us to address policy issues such as privacy and consumer protection. [6]

Yet new mobile devices afford new possibilities. Tablets, for example, add additional capacity for collaboration through increased screen size, while context- and location-based applications allow the melding of the virtual and physical worlds in learning applications and entertainment that gather groups of players and learners. Social media is a growth market that facilitates collaborative work, engagement for isolated individuals and support for preventative health measures. When well designed, mobile devices and mobility can act as gateways and creative centres.

I am optimistic about Ontario's ability to succeed in meeting the mobile challenge. As you will read in the report, cost has often been described as an inhibiting factor in Canada. As the winners of multiple spectrum auctions come on stream, pricing is expected to drop as coverage extends throughout the

[2] Joseph Crump, "the new! improved! black box: Four questions that should keep creative people up at night," *2008 Digital Outlook Report* (2008).

[3] Sherry Turkle, *Alone Together: Why We Expect More from Technology and More from Each Other* (New York: Basic Books, Perseus Books Group, 2011).

[4] Ibid., 14.

[5] Ibid., 14.

[6] Services such as Foursquare, Facebook Places and Gowalla provide exact data about where users are located, as well as information about their social contexts and activities.

province. One might predict that a more open environment will have a stimulating effect on mobile development. In addition, the adoption of mobility as a requirement for doing business in many sectors continues to expand the base of those engaged in mobility. The global take-up of mobility and the expansion of the smartphone market represent a growth business for the many Ontario companies developing applications for mobile devices, including productivity applications, utility applications, data services, games and applications that accompany or complement existing media and information franchises. To take advantage of our capacity, we need to build local markets that can retain and strengthen companies; we also need to ensure that our own residents benefit from the innovation produced in Ontario yet currently primarily sold abroad, such as m-health and m-education applications.

Ontario is a province with significant mobility resources in our human capital, knowledge economy resources, industrial bench strength, social infrastructure and global networks. These strengths have direct bearing on the matter of this report, which explores how to engage mobility in order to better realize the full potential of all of Ontario's residents, bring significant increases in productivity, create and retain jobs in the knowledge industries, allow inclusion and engagement, and build on Ontario's extant leadership in the broad cast of mobile industries.

Even in times of economic duress, the failure to modernize by changing technology and systems, building infrastructure and developing capabilities in research, education and industrial impact could lead to significant future gaps in competitiveness. The international shift toward the adoption of mobile lifestyles and policy initiatives warrants our attention.[7] After all, we face a global economic challenge and a world in which mobility sits at the crossroads of business capacity. We believe success is only possible through the collaborative efforts of industry, government and public sectors such as healthcare, education and post-secondary education (PSE). In imagining an action plan, we understand that government must seek new sources of revenue and constrain expenditures. Ontario will need to balance its plans to curtail its use of traditional instruments such as tax incentives against the need to intensify public/private industry collaboration and retain and attract industry in order to ensure an enhanced tax base and job creation in strategic sectors.

Ontario has a unique window in which it can position itself as a centre of excellence for mobility. There is a legacy of leading technological development, a collaborative spirit between the private sector, government, public institutions and academia, and a diverse user base that possesses the attributes necessary to be a successful "mobile" market. We are an ideal test bed for applications: Ontario includes one of the largest metropolitan areas in North America, the seat of the Government of Canada, and remote, rural and Aboriginal communities. The quality of life and economic well-being of Ontario residents can be radically transformed over the next decade with the possibilities that mobile technologies, networks and applications offer.

[7] See Taking Ontario Mobile Appendix: Jurisdiction Analysis and International Policy Environment: Consumer Protection Policies for Cell Phone and Internet Use

# Executive Summary

Taking Ontario Mobile examines the benefits of mobile technologies for Ontarians as they work, learn, play, shop, seek care and interact with others. The report considers the disruptive nature of technologies and provides guidance and support for implementing mobile solutions, in order to enhance services for Ontarians as well as to improve their access to them. We have extrapolated from the province's capacity and potential and the desires of Ontarians we surveyed to create a comprehensive vision for a mobile Ontario. Our recommendations suggest the possibilities of enhanced access to services, heightened productivity, increased social inclusion and the creation of jobs. We address current challenges and propose an action plan, accompanied by a road map that provides three-month, six-month, one-year, three-year and five-year deliverables against which to benchmark. Given the potential for mobility to provide low-cost services across many government ministries, a mobility plan for Ontario needs to include the vast majority of the province's residents. At the same time, Ontario cannot wait for 100 per cent coverage or ubiquitous broadband before beginning to move toward mobile capacity.

The Taking Ontario Mobile report provides the following tools:

- A discussion of five sectors that intersect with multiple aspects of Ontarians' lives: Lifelong Learning (pg. 4), Health (pg. 28) and Government Services (pg. 46) are essential to the quality of life and productivity of the province's citizens. We also investigate mobile Entertainment (pg. 84) in recognition of the strength of cultural industries in Ontario, and look at the potential and challenges of adopting mobile Commerce (pg. 66), given the importance of Ontario's financial industries.
- An analysis of challenges and recommendations for these sectors;
- A discussion of the difference mobility would make in the lives of Ontario residents by providing increased productivity, jobs, inclusion and engagement.
- An examination of which of Ontario's private, public and post-secondary sectors have the capacity to act.
- An outline of the forms that mobile inclusion—economic and social—may take and an understanding of the barriers to mobile inclusion (pg. 112). The principle of inclusion articulates the mobile resident as a democratic citizen as well as a consumer, and the sector strategies that we propose can be approached within an inclusive design framework. We also address accessibility, suggesting that technical solutions be flexible in their functional specifications. Content and interface design are presented in a way that enables personalization, and designs are not produced for an ideal user or a fixed set of abilities or disabilities.
- An analysis of Ontario's mobile industry and its support systems based on a jurisdiction review that examines the capacity of our mobile sector (pg. 128). We look at the regulation, services and use characteristics of other jurisdictions selected because they possess comparable demographics or are rapidly growing or inspirational mobile markets. This review results in a set of recommendations for building industry capacity.
- An analysis of resident and sector surveys regarding mobile use, attitudes, perceived needs and future plans based on our primary research, providing a context for action (pg. 162).
- A note on the threats posed if Ontario does not adopt a clear mobile action plan (pg. 186).
- An action plan with recommendations presented as 10 themes that emerged from our analysis of

sector activity, survey data, interviews and discussions with experts (pg 190).
- A road map that offers immediate and long-term actions, including "quick wins." (pg. 218)
- A series of 10 scenarios that describe how residents from across Ontario will be affected by the growth of mobile services (pg. 236). These scenarios show the impact of mobile on varied demographics, be these families, private- and public-sector workers, students, the elderly or the disabled. We have developed the scenarios and mapped them against the respective areas of Ontario—including urban, regional, rural and remote communities—in order to show the breadth of effect.
- A set of appendices that describe the research team and provide background research, extended information and other resources (pg. 268).

## Ontario's Current Challenges

We table Taking Ontario Mobile during a time when Ontario faces grand challenges: a significant deficit of $16 billion and a projected slow recovery, at about two per cent per year; only 2.7 per cent growth; six per cent annual inflation in healthcare and post-secondary education (PSE); and a 7.7 per cent unemployment rate. [8] Government is focused on developing a strategy to reduce the deficit in a balanced, strategic way that sustains or even improves quality and will allow Ontario to excel in the future; for these reasons, government has designated education, PSE and health as sectors that must be protected. However, to meet government's deficit-reduction targets, enhanced productivity will be of fundamental importance—not only in these two domains, but across the public sector. [9]

Arguments throughout this document indicate ways that mobility can help to address the quality and productivity challenges that Ontario faces. The following are just some examples developed through the pages of this report:

### Productivity

- Public services can be delivered in a more cost-effective and efficient manner, combined with efficient just-in-time service delivery. Sectors such as healthcare and PSE can find efficiencies through mobile applications.

[8] Commission on the Reform of Ontario's Public Services, "Public Services for Ontarians: A Path to Sustainability and Excellence," ed. Don Drummond (Ontario: Ontario, Ministry of Finance, 2012).

[9] The *Public Service for Ontarians: A Path to Sustainability and Excellence* report commissioned by the Dalton McGuinty government stresses that the "bottom line should be delivering effective services to citizens, not preserving the institutional status quo." Ibid.

## Education

- The use of mobile devices and experiences can lead to increased flexibility and engagement in learning, and encourage high school completion.
- Mobile delivery outside of the bricks-and-mortar campus can lead to efficiencies in the use of capital resources in the PSE sector.
- Location-based and context-aware educational opportunities developed with Aboriginal organizations can engage and retain learners in their own communities and ensure that they develop the skills needed for employment.

## Healthcare

- Mobility can help to provide home services for the growing population of seniors through effective monitoring and mobile healthcare support.
- Mobility can be an important lever to enable the movement of medical support from acute care to chronic care, home care and prevention.

## Labour-Force Demand

- M-learning is a core tool to ensure that the Ontario workforce remains competitive, as it helps workers continually adapt to change, provides a valuable tool for reskilling and just-in-time learning, and allows employees to adjust to changing labour-force demands.

## Job Creation and Retention

- The mobile industries are part of a strong economic sector that will continue to expand as mobility becomes even more ubiquitous.
- M-commerce and other extended infrastructure will lead to new kinds of jobs in the knowledge economy across many industries. M-commerce can complement Ontario's strong financial industries.
- Ontario needs to diversify the market for its goods and services. The mobile industry has global relevance: some players have global reach, and others are capable of competing in the global marketplace. Demand in China, India and Brazil for mobile technologies, applications and content is strong.
- As Ontario builds mining and industry capacity in the North, mobile infrastructure will ensure the integration of communities and the effective delivery of services and up-to-the-minute production techniques and efficiency.
- Ontario and Canada are world leaders in medical research—mobile applications of these discoveries could provide us with significant new industries.

## Understanding Ontarians—A User-centric Approach

As part of Taking Ontario Mobile, we undertook the following research to assist us in developing an understanding of what Ontario residents want from mobility:

- An online survey of Ontario residents, conducted in order to gauge interest in and ability to access mobile technologies and services.
- An online survey of employees in industrial and non-profit sectors, conducted in order to understand how mobile technology is being used by the labour force in a variety of industries.
- A survey of Ontario industries, conducted in order to understand their current and planned use of mobile technologies.
- Interviews with leaders in the mobile sector, potential users of mobility and key policymakers.
- Interviews with Aboriginal and rural Ontarians, undertaken by Copernicus Research and sLab in order to determine these individuals' mobile needs and strategies.
- A jurisdiction comparison, undertaken by the Toronto Regional Research Alliance (TRRA) in order to understand the relative development of and potential for mobile services in Ontario.[10]
- Surveys and secondary research, undertaken by the Mobile Experience Innovation Centre as part of its 2012 research into the Ontario/GTA mobile content, services and applications industry. This Mobile Innovation Survey Report, for the Ontario Media Development Corporation, is excerpted in this report and also available in full as a companion to this report.[11]

## Sector Analysis

The sector analysis focuses on five sectors that exemplify a range of services and content for Ontario residents: 1) lifelong learning; 2) health; 3) government; 4) commerce; and 5) entertainment. Each analysis considers how the sector fits into the worlds of mobile Ontarians as well as how mobility serves goals of increased productivity, job retention and improved services within that sector. Each analysis also considers challenges and develops an action plan to take in order to move the sector toward mobility. We organize each strategic theme into three key actors: government, industry and academia.

[11] MEIC, "Mobile Innovation: Mobile Content, Services, and Applications Industry 2012," ed. Kathleen Webb (Toronto: Mobile Experience Innovation Centre, 2012).

We follow our five-sector analysis with a discussion of mobile inclusion that is relevant to all sectors.

## Learning in a Mobile Ontario

### DEFINITION

While mobile learning (m-learning) is correctly perceived as part of overall electronic learning (e-learning) implementation, mobile enables unique opportunities for learners to engage with others and their environment in novel ways by enhancing their interaction with subject material, providing new skills and appearing to influence completion of both specific learning outcomes and graduation.[12] Mobile learning brings unique affordances to learners, including mobility, ubiquity, accessibility, context sensitivity and personalization.

### OPPORTUNITY

Learning in a mobile Ontario:

- Affords quality.
- Affords efficiencies.
- Integrates new groups of learners.
- Improves student retention.
- Supports experiential learning, mentorship and year-round and self-paced learning.
- Facilitates student credit transfer.
- Is well suited to workplace-skills development.
- Provides opportunities for the e-learning and educational publishing industries.

The unique affordances of mobile devices—mobility, ubiquity, connectivity, interconnectivity and context sensitivity—empower mobile individuals, whether they are engaged in K–12 education, post-secondary education or lifelong learning. It is these qualities that propel m-learning beyond standard computer-mediated learning.

### K–12

Ontario already has in place an e-learning mandate that is working toward a connected Ontario for every student with a variety of portals and tutoring, mostly for students at intermediate levels. However, school boards will need to set up loan programs to provide mobile devices for those students who cannot bring their own to school, and will also need to provide ubiquitous Wi-Fi throughout the schools in their jurisdictions. Support that allows student learners and teachers to fully integrate mobility into

[12] A secondary school principal at our round-table discussion indicated that preliminary data from his school's m-learning program indicates that students are more engaged. It is expected that this engagement will translate into higher graduation rates as the school's m-learning program matures.

curriculum will be needed, as will the teaching of "netiquette"—the appropriate use of online technology in a learning environment.

### PSE

Universities and colleges have increasingly placed a greater emphasis on the quality of learning and the adoption of strategies that encourage student engagement. Almost all analysts and institutions agree that system change must drive toward more flexibility, a focus on distributed learning and increased mobility. E-learning and m-learning will be fundamental means to:

- Allow students to move between institutions with learning resources in the cloud and on their devices.
- Help students pace their educations more effectively and condense their time to completion.
- Enable experiential learning through enriched work placement and service-learning experiences supervised by mentors or faculty in a remote location.

As learning becomes less formalized and accreditation becomes available from outside traditional catchment areas, post-secondary institutions should look to mobile technologies as a means to extend catchment area and to become more inclusive as well as accessible. Through m-learning-management systems and e-services, Ontario students can acquire a post-secondary education while maintaining the economic benefits of living with parents or in affordable locations, and, in the same way, students from other provinces or countries may find and Ontario-based education becomes more feasible.

While enrollment in PSEs is expected to increase in the next 10 years, enrollment is expected to return to 2003–06 levels by 2024.[13] M-learning enables post-secondary institutions to respond to fluctuations in enrollment without exerting pressure on capital resources or requiring investments in physical infrastructure that will be underused when enrollment levels decrease.

### RESKILLING AND LIFELONG LEARNING

We live in a mobile society experiencing increasing globalization. Global sourcing and global labour mean that employees can train anywhere in the world. [14] In many jobs, the workforce is also mobile and not fixed to a specific place, or workers increasingly work from home or from "third-party spaces"—not the office. Young people, sometimes called the "always on" generation, expect that mobile communications will also be part of their work lives. There are thus many business drivers that will propel m-learning forward at the corporate and large-organization level. The widespread deployment

[13] Rick Miner, "People without jobs, jobs without people. Ontario's Labour Market Future," (Toronto: Miner Management Consultants, 2010).

[14] Adapted from Gary Woodill, *The Mobile Learning Edge* (New York: McGraw-Hill, 2010).

of mobile computing means that an infrastructure for m-learning is already in place. Some of the specific benefits of mobile lifelong learning are as follows:

- Mobility provides speedier just-in-time training that responds to an environment of hyper-competition in which companies are often constrained to do more with fewer people. Mobile devices enable workers to train during commuting time.
- In many larger organizations, there is a demand for greater access to and integration of information, data management and communications, all delivered in real time and in context, whenever possible.
- Mobility provides an excellent means through which to offer courses to update compliance with government regulations or industry standards.
- Mobile communications, including m-learning, are in great demand in specific industries, including healthcare, natural-resources monitoring, agriculture, emergency services, government inspections, retail and transportation.

For these reasons, managers in large organizations are aware that m-learning is on the rise, and are at the stage of formulating their own mobile learning strategies.

## Health in a Mobile Ontario

### DEFINITION

Mobile health (m-health) refers to the use of mobile information and communications technology (ICT)—most commonly, mobile communication devices, such as mobile phones and personal digital assistants (PDAs)—across wired and wireless networks to provide health services and information to medical and public-health workers, as well as to patients and healthy residents of Ontario. M-health further refers to wireless devices such as glucometers, cardiograms and blood-pressure cuffs, which transmit information wirelessly. M-health takes advantage of the 24/7 connectivity, intensive personalization, communication and social media qualities, and context and location awareness of mobility. The ubiquity of mobile devices in both the developed and developing world presents the opportunity to improve health outcomes by delivering innovative medical and health services to the farthest reaches of the globe using ICT. [15]

[15] mHealth Alliance, "Mobilizing Innovation for Global Health: Frequently Asked Questions," mHealth Alliance, http://www.mhealthalliance.org/about/frequently-asked-questions.

## OPPORTUNITY

Health in a mobile Ontario:

- Is patient-centric, providing new opportunities for the self-management of health.
- Provides enhanced access, productivity, inclusion and job creation.
- Affects all areas of care, including preventative care, chronic care, remote care, acute care and community care.
- Makes medical care and information convenient and accessible for physicians and/or patients, thus allowing clinical management decisions to be made more quickly.
- Keeps patients out of hospitals and in appropriate care settings in part through enabling the monitoring of chronic conditions outside of the clinical environment.
- Integrates electronic records and effective billing methods at each point of service.
- Allocates resources to those with appropriate skills in real time.
- Uses ICT for system coordination, access to records and data gathering, leading to accountability.
- Facilitates easy information access through multiple sources, including mobile telephones.
- Blends base funding and payment by activity (for example, micropayments through m-commerce adoption). [16]
- Assists in collecting community and clinical health data, and delivering healthcare information to practitioners, researchers and patients.
- Allows the monitoring of remote patients' vital signs in real time.
- Uses mobile telemedicine to directly provide care. [17]
- Allows healthcare professionals to engage in lifelong learning.
- Increases access to healthcare and health-related information (with special value for hard-to-reach populations). [18]

For practitioners, m-health provides a practical, real-time mechanism with which to keep and share records, record medications and make decisions about the course of care.

[16] Commission on the Reform of Ontario's Public Services, "Public Services for Ontarians: A Path to Sustainability and Excellence."ed. Don Drummond (Toronto: Ontario Ministry of Finance, 2012), 13–15.

[17] Panagiotis. Germanakos, Constantinos Mourlas, and George Samaras, "A Mobile Agent Approach for Ubiquitous and Personalized eHealth Information Systems" (paper presented at the 'Personalization for e-Health' of the 10th International Conference on User Modeling, Edinburgh, 24 - 30 July 2005 2005).

[18] The developing world has identified the following strengths of m-health, which resonate with challenges in the developed world: improving physicians' ability to diagnose and track diseases; providing timelier, more actionable public-health information; involving patients in care, and expanding health workers' access to ongoing medical education and training. See Vital Wave Consulting, "mHealth for Development. The opportunity of Mobile Technology for Healthcare in the Developing World," (2009). http://www.unfoundation.org/what-we-do/legacy-of-impact/technology/mhealth-for-development.html.

Devices that help to routinely collect and/or send information may encourage patients to take "ownership" of their health, and could promote early interventions that reduce the need for costly critical-care approaches. Pilot projects that use mobile technology in this way are already underway in Ontario, for example: the Bant app for youth with diabetes, the Re-ACT program for seniors who want to be in a community setting, and the virtual ward for surgery aftercare at Women's College Hospital.

### TRANSITION FROM ACUTE CARE TO CHRONIC CARE

Mobility is particularly suited to chronic care, in that it:

- Provides mechanisms for the ongoing monitoring of patients.
- Provides the capacity to communicate alerts to patients, caregivers and health practitioners as needed.
- Enables more individuals to move out from acute/on-site care facilities.
- Creates productivity gains, as practitioners in chronic-care settings are able to care for more patients.

M-health also facilitates a distribution of labour within an integrated system in which "nurses, nurse practitioners, personal support workers and other staff members can apply their full range of skills." [19] Expertise can be available as a remote resource that healthcare workers can access as needed.

ABI Research estimates that 15 million wireless m-health devices and sensors will be in place by end of 2012. A plan that can integrate the outputs of these devices this with formal health care system data would ensure the ongoing relevance of the public system as more users begin to rely on informal sources for self-monitoring, prevention and communication about health issues. There is a need to ensure that health data is secure and private, especially in informal settings where privacy regulations may not be in place.

Mobile healthcare as a service and an industry may be stimulated through specific actions on the part of stakeholders. These solutions may be part of a broader action plan to support the infrastructure for and the privacy of mobile activity. An m-health solution must include strategies for interoperability, a clear regulatory framework for privacy and security, and a focus on preventative and remote care. Initiatives to enable remote care may also require new payment models and definitions of fees and services in order to encourage practitioners to adopt remote and mobile care solutions.

[19] As described in Rain Rannu, Siim Saksing, and Triin Mahlakõiv, "Mobile Government: 2010 and Beyond," (Mobi Solutions Ltd., 2010).

## Government in a Mobile Ontario

### DEFINITION

Mobile government (m-government) brings mobility—the integration of individuals, networks, institutions and devices—to the provision of government services, processes and public-sector activities, allowing individuals and systems to interact efficiently with government, and for government to provide first-rate, timely services.[20] M-government applications can be seen as tools for streamlining administration and the flow of information at all levels of government.[21]

M-government is especially suited to provincial and municipal government initiatives because of the greater frequency with which citizens interact with these services, and because of their regional focus. The Organisation for Economic Co-operation and Development (OECD) and International Telecommunication Union (ITU) note that m-government provides better service quality, efficiency and scalability, and helps to reduce costs. [22] Some national initiatives go beyond m-government toward a broader notion of a "ubiquitous network society." In this model, it is not a particular technology or setting that acts as the focus, but a general condition of ubiquitous connectivity that sits at the heart of governance itself.

While what constitutes an "m-government" action plan is still somewhat undefined, there are a plethora of global examples that suggest m-government will gain coherence and direction in the very near future. In particular, national strategies outlined in Scandinavia, Korea, Japan and India offer clear models worth examining in closer detail, and, in some cases, emulating.

### OPPORTUNITY

Government in a mobile Ontario:

- Provides many cost-saving opportunities for government as well as for the citizen (e. g. , automatic data gathering, using SMS).

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[20] There are many definitions of what constitutes "good" governance, but, in the context of m-government, Johan Hellstrom defines it as "characterised by participation, the rule of law, effectiveness and efficiency, transparency (built on the free flow of information), responsiveness, consensus orientation, equity, accountability, and strategic vision." Similarly, Kuscu et al. assert that m-government offers at least four important areas of governance: 1) instant information release; 2) mobile transactions; 3) faster information exchange; and 4) increased feedback and participation.

[21] Johan Hellstrom, "Mobile phones for good governance: Challenges and way forward," in *World Bank Workshop on Mobile Innovations for Social and Economic Transformation: From Pilots to Scalle-up Implementation* (Washington D.C.: The World Bank, 2009).

[22] OECD/International Telecommunications Union, "M-Government: Mobile Technologies for Responsive Governments and Connected Societies," (2011).

- Closely aligns efficiency and improved service with cost savings through the reorganization of work process through m-government.
- Allows better management by providing sophisticated monitoring tools to ensure that services are delivered in the most efficient manner possible, helping government to manage allocated financial and human resources.
- Speeds up information flow to enable time saving and speedier data transfer, supporting more efficient decision-making.
- Enables government workers to access data at service sites through context- and location-aware mobility so that they can undertake tasks more efficiently. The same is true for government clients.
- Offers public services via mobile phone, which are available to a greater number of people than those offered on the Internet, as mobile penetration begins to exceed fixed Internet penetration.
- Provides a way to reach residents who are not willing to buy more expensive tethered personal computers, but who do have mobile phones.
- Improves access to services for individuals in remote areas who do not have wired access but do have wireless connectivity.[23]
- Offers public announcements via mobile phone, which are accessible everywhere, at all times. This is especially important in case of urgent messages and crisis communication.
- Allows information to reach the preferred addressee at any time through one specific device, because the mobile device is designed for a single user.
- Uses mobile interfaces that can be highly personalized and meet Accessibility for Ontarians with Disabilities Act (AODA) standards of accessibility.
- Provides an open data resource that provides means for residents to engage with all manner of public information in order to affect decision-making.
- Allows engaged citizens can to monitor and report problems such as infrastructure breakdowns. Mobility makes it possible to create bottom-up participation, and ultimately to enhance citizen empowerment.

While connectivity is clearly still an issue in Ontario—especially in rural, remote and Native communities—m-government may have a role to play in improving connectivity for residents who have access to mobile services but not to broadband.

Ontario can develop a plan to integrate mobile services by moving from physical to mobile services (without an e-service stage) as part of its efficiency planning. The adoption of mobile technology by civil servants should lead to faster response times and a more efficient deployment of resources. As well, it will allow personnel to work both from home and on location, streamlining the use of office space and reducing costs of capital and infrastructure. A consolidated plan for replacing face-to-face

[23] Rain Rannu, Siim Saksing, and Triin Mahlakoiv, "Mobile Government: 2010 and Beyond. White paper," ed. Bernadett Koteles (Mobi Solutions Ltd., 2010). 7, 21, 99.

service with mobile capacity (automated as appropriate) should be part of the government's plans as it considers the *Public Service for Ontarians: A Path to Sustainability* report. *Taking Ontario Mobile* further emphasizes the value and efficiency that mobile technologies can bring to healthcare productivity, education and post-secondary education. Ontario, working closely with the private sector, needs to ensure that residents can access mobile services. In particular, location-based and context-aware services as well as simple information provision and m-commerce applications could provide significant savings.

## Commerce and Finance in a Mobile Ontario

### DEFINITION

Mobile commerce (m-commerce) refers to a secure and flexible system that allows consumers to make just-in-time payments remotely or at the point of sale by using a device. M-commerce is any transaction "involving the transfer of ownership or rights to use goods and services, which is initiated and/or completed by using mobile access to computer-mediated networks with the help of an electronic device."[24] These practices are also referred to as mobile finance, which encompasses traditional banking and financial-service institutions (such as credit- and debit-card companies) and beyond. Consumers, in many cases, are already using their phone as a mobile wallet when purchasing applications (apps). In order to move outside of the existing bill-to-phone relationship, consumers tether[25] their phones to an existing payment method—one that mimics the kind of payment method traditionally found in the wallet.

### OPPORTUNITY

Commerce and finance in a mobile Ontario:

- Empowers the consumer by shifting the information-retrieval and power equation from the store to the shopper.
- Deepens customer engagement.
- Enhances customer service.
- Creates persistent relationships with customers.
- Links sales, marketing and fulfillment between virtual and physical channels.
- Is personal, because the mobile wallet is tied to individual identities and social personalities.
- Solves a derivative problem for brands: how to effectively monetize and complete commerce transactions within cyberspace.

[24] Stephan Buse Rajnish Tiwari, "The Mobile Commerce Prospects: A strategic analysis of opportunities in the banking sector " (Hamburg: Research Project Mobile Commerce, Institute of Technology & Innovation Management .Hamburg University of Technology, 2007).

[25] Melanie Pinola, "What is Tethering?,"

- Transforms the in-store retail experience, allowing price comparison and mobile check out.
- Creates opportunities to continue building Ontario's successful financial industries.
- Creates opportunities for design-based and skilled jobs in retail as sales-force jobs are replaced by mobile transactions.

### DISRUPTION AND OPPORTUNITIES FOR NEW PLAYERS

M-commerce influences the productivity of consumers, merchants and retailers. One of the greatest challenges for businesses is to understand how to use mobile solutions within their business models. The face of m-commerce is still undeveloped, and the area is ripe for design, creating opportunities for the traditional finance sector and for new players. At times, m-commerce bypasses not only the banking industry but also traditional distribution partners like retailers and resellers, as mobile operators, retailers and online brands move into the high-margin financial service market.

For some businesses—particularly manufacturers, online brands, start-ups and developers—the mobile channel represents a new way to reach customers more directly, anywhere and anytime. Over the past few years, near field communication (NFC) has emerged as the favoured solution for connecting phones to transactions at points of purchase. [26]

About 90 per cent of Canadian banks have their headquarters in Ontario. Canada's banks have a long history of leading banking innovation and should be able to rise to the challenge of m-commerce. Canada has the highest rates of electronic-payment usage through debit and credit cards, and the highest rates of online banking usage. Moreover, Ontario was the first region in North America to invest in chip-card technology.[27] Ontario banks can continue this type of leadership with m-payments.

The mobile wallet is an important actor in the future labour market. Ontario's retail outlets will need to adopt m-commerce strategies if they are to survive in a competitive world in which global commerce has moved onto the mobile platform. Canadian businesses have lagged behind those in jurisdictions like the US in making use of the web and e-commerce, and we cannot afford to repeat this with m-commerce. When Ontario consumers reach into the cloud to make purchases, [28] they are using the commerce storefront of American companies such as Amazon and Yahoo. A proactive position by Ontario stakeholders will enable Ontario and Canada to avoid American control of m-commerce, which

[26] NFC is a machine-to-machine short-range wireless connectivity payment system that sits on top of the same tagging technology that is used to track household pets and make unpaid-for items set off store alarms. We call this radio-frequency identification (RFID), and it can be used to enable a two-way communication channel for multiple services.

[27] Economy Watch, "Canada Credit Cards," Stanley St Labs., http://www.economywatch.com/canada-credit-cards/.

[28] Cloud computing is the delivery of computing as a service rather than a product, whereby shared resources, software and information are provided to computers and other devices over a network.

would avoid loss of jobs and revenueas well as exposure of Canadian data to another country's scrutiny.

Mobile marketing in Canada is projected to grow from less than $50 million last year to more than $1.5 billion cumulatively over the next five years. With Ontario and the greater Toronto Area being prime drivers of marketing activity in Canada, it is essential to embrace the opportunities this will afford to grow the creative and technical skills necessary to help brands and individuals benefit from the efficiencies and effectiveness of mobile marketing and its twin, m-commerce. At the same time, the mobile sector needs to ensure rigorous security and privacy standards for its customers.

## Entertainment in a Mobile Ontario

### DEFINITION

Audiences are actively searching platforms like the Internet and mobile for content, and consumers are spending an increasing amount of their time with non-traditional screens.[29] Mobile entertainment (m-entertainment) refers to the experience of consuming media through mobile platforms that may or may not rely on the user's current location to bring further context to the presented media. Mobile media provides the user with the "ultra-media" capability of accessing media of any kind, anytime and anywhere. This trend is described as "SoLoMo": social, local and mobile. Mobile moves the potential for media consumption into locales that until recently either didn't exist or were reserved for other kinds of media; in essence, mobile is the unfixed web married to sensors, data and computer processing. For example, commuters now use screened devices at times they may have previously reserved for listening to the radio or reading newspapers. The result is that people are spending more time engaged with media entertainment; hence, revenue growth in the media sector is primarily from new sources.

There are many kinds of mobile experiences, such as the delivery of non-interactive media (where the device is used as a media player), standalone, locally interactive apps (where the device is used like a computing device) and interactive mobile apps that often rely on connecting to networks and other devices. An important shift with the emergence of HTML5 will be the movement of some m-entertainment directly onto the mobile Internet. We are also seeing the aggregation of apps to enable search and brand recognition.

### OPPORTUNITY

Entertainment in a mobile Ontario:

- Provides new opportunities to build Ontario's already powerful entertainment industries through

[29] Jacob Neilsen, "Transmedia Design for 3 Screens - Make That 5," http://www.useit.com/alertbox/3-screens-transmedia.html.

adding multiple consumption channels and screen time, thus bringing new revenue streams and business models.
- Can extend Ontario's wider cultural and tourism industries to international markets.
- Acts as an extension channel for traditional media.
- Is a gateway for accessing international markets.
- Is designed with attention to two form factors: visual acuity and flexibility, thereby broadening appeal across generations.[30]
- Leverages the "app" software and app-store model, which has required Ontario producers to build relationships with platform buyers and distributors. [31]
- Builds on the emergence of HTML5, which will see the movement of some m-entertainment directly onto the mobile Internet.
- Enables search and brand recognition through the aggregation of apps.

Ontario faces the transition to mobile media with strong resources. The province has a robust and multidimensional creative-industry sector[32] that ranks third in employment and is among the world's strongest in revenue generation.[33] Creative industry GDP is now larger than Ontario's energy industry, is approaching 70% of the auto manufacturing sector and surpasses those of agriculture, forestry and

[30] Suzanne Stein, "2020 Media Futures Trends Package," (Toronto: OCAD University & sLab, Super Ordinary Lab, Changeist, 2010).

[31] The app software model is clearly working: ABI research shows that more than 18 billion apps had been downloaded in the Apple marketplace by October 2011, and more than 10 billion had been downloaded in the Android marketplace by December of the same year. Larry Johnson, Samantha Adams, and Michele Cummins, "The NMC Horizon Report: 2012 Higher Education Edition," (Austin, Texas2012).

[32] "The creative industries in Ontario generate $12.2 billion in GDP for Ontario's economy annually and are number one in Canada by GDP." Ministry of Tourism Culture and Sport, "Ontario's Entertainment and Creative Cluster: A Framework for Growth," (Toronto2010).The Ontario Ministry of Tourism and Culture provides a comprehensive overview of Ontario's creative industries, which include significant resources to produce m-entertainment (including core arts and cultural workers such as those in film and television, supporting industries such as design, and wider creative industries such as software development) and opportunities for the application of mobile content across many industries, including publishing and fashion. See the forthcoming report by Kathleen Webb et al., *Mobile Innovation: Ontario's Growing Mobile Content, Services, and Application Industry.* Toronto: Mobile Experience Innovation Centre, 2012. Also of value is *Ontario's Creative Cluster Study* (2009), http://www.mtc.gov.on.ca/en/publications/Creative_Cluster_Study.pdf.

[33] Charles Davies proposes that the total aggregate revenues of the screen-based segments of the Ontario media industry were $6.2 billion in 2006–07, of which around $4.5 billion was from the Toronto region. He provides an excellent analysis of strengths and weaknesses of the cluster in,Charles Davis, "The Toronto Media Cluster: between culture and commerce," in *Media Clusters : Spatial Agglomeration and Content Capabilities.*, ed. Charles Karlsson and Robert G. Picard (Cheltenham, UK; Northampton, MA, USA: Edward Elgar Pub, 2011).

mining sectors combined.[34] The final report by the Toronto-region Consortium on New Media, Creative, and Entertainment R&D (CONCERT)[35] shows that Ontario has a history of quality production and breadth across cultural sectors, especially within screen-based industries. The overall Canadian sector, with its base in Ontario, represents a faster growth number than the Canadian economy: despite the recent recession, 1.1 million Canadians are "estimated to owe their jobs (directly or indirectly) to creative industries." [36] Between 1999 and 2007the Ontario sector grew at a rate of 38.3 per cent—well over the 17 per cent overall growth of jobs in Ontario.[37] Federal regulations, federal and provincial funding policies that favour Canadian firms and economic-support mechanisms from both federal and provincial programs have played an instrumental role in the sustainability of these industries.[38]

Innovation in the digital-media sector requires responsive market intelligence, strategic foresight, fast prototyping (agile development) and usability, as well as an entity able to take risks in order to propel the consortium of companies forward.[39] Development is no longer staged—testing of new products needs to happen in the marketplace as others come on-stream.

To further understand the needs and potential of mobile creative industries, we refer readers to the in-depth analysis of the mobile industries developed by the Mobile Experience Innovation Centre and presented in its Mobile Innovation: Ontario's Growing Mobile Content, Services, and Applications Industry 2012 report which provides in-depth analysis of the needs of the m-entertainment industries in Ontario. [40]

## Inclusion and Access in a Mobile Ontario

### DEFINITION

Ensuring inclusion is in the interests of industry, the public sector and government. The ability to access and make use of ICT should be viewed as "digital capital" that conveys advantages and opportunities similar to those that result from access to more traditional forms of economic capital. [41] Inclusion

[34] Ministry of Tourism Culture and Sport, "Ontario's Entertainment and Creative Cluster: A Framework for Growth.", 4

[35] Consortium on New Media, "Creative and Entertainment R&D in the Toronto Region," ed. Luigi Ferrara (Toronto2008).

[36] Ministry of Tourism Culture and Sport, "Ontario's Entertainment and Creative Cluster: A Framework for Growth.", 5

[37] Ibid.

[38] Scott Earl McKinnon, "From Cultural Nationalism to Regional Development: Examining the Growing Role of Canada's Provincial Cultural Agencies in the Support of the Nation's Cultural Industries During the Era of Globalization" (Ryerson, 2008).This report underscores the importance of provincial intervention in maintaining a healthy industry.

[39] MEIC, "Digital Economy/Digital Society: A Submission by OCAD University," Government of Canada, http://www.ic.gc.ca/eic/site/028.nsf/eng/00330.html.

[40] MEIC, "Mobile Innovation: Mobile Content, Services, and Applications Industry 2012."

refers to the removal of barriers to mobile access experienced by residents of Ontario due to socioeconomic factors, lack of mobile infrastructure and unmet functional needs (e. g. , a screen magnifier for users with low vision). Seniors (65+), Ontarians with disabilities, Aboriginal people, immigrants, and rural- and low-income residents are often underrepresented in the mobile market. Providing access enables full participation in social, academic and economic spheres. Barriers due to markets, costs and functions mean that the groups most likely to be excluded from the rapidly evolving mobile marketplace are the same groups that would disproportionately benefit from the increased access to public services, economic inclusion, jobs and productivity that these new technologies will offer.

### OPPORTUNITY

Mobile inclusion is possible if government, industry and the not-for-profit sector work together to address these issues:

- Statistical analyses show that absolute cost is the foremost barrier to computer and wireless phone usage.[42] Canada still has the world's most expensive data tariffs, which, according to user surveys, inhibit full mobility.
- For many rural and remote communities, reliable cellular service is unavailable. Respondents told us that future mobile-infrastructure development is a critical issue for populations outside major urban centres.
- Aboriginal communities in remote areas often have multiple barriers to accessing mobile technologies such as economic, infrastructure and language. Barriers to accessing mobile technology for Aboriginal people may extend to those who live off reserves in rural or urban areas where, even if coverage is available, tariffs are prohibitive.
- Mobility is closely linked to independence for people with disabilities. In 2026, the majority of people with disabilities will be 65 years of age or older—some 3.05 million people."[43]

Access and inclusion is the cornerstone of a comprehensive mobile Ontario action plan and requires that cost barriers, geographic barriers, functional barriers (such as technology and interface design) and cultural barriers be addressed, and initiative taken to remove them.

[41] Michael .J. Stern, Alison.E. Adams, and Shaun Elsasser, "Digital Inequality and Place: The Effects of Technological Diffusion on Internet Proficiency and Usage across Rural, Suburban, and Urban Counties," *Sociological Inquiry* 79, no. 4 (2009).

[42] Menzie D. Chinn and Robert Fairlie, "The Determinants of the Global Digital Divide: A Cross-Country Analysis of Computer and Internet Penetration," in *Working Paper Series* (National Bureau of Economic Research, 2004).

[43] Toronto District School Board, "Facts and Statistics," http://www.tdsb.on.ca/_site/viewitem.asp?siteid=15&menuid=8564&pageid=7492.

## Ontario's Mobile Capacity and Assets

Taking stock of Ontario's mobile ecosystem reveals a great depth of resources and capacity that, if deployed in a comprehensive manner, could provide the backbone for a mobile Ontario action plan. The term "mobile ecosystem" refers to interrelated spheres comprising the production, distribution, consumption and regulation of mobility. Ontario has a substantial network of mobile-related creators, researchers, innovators and manufacturers, who develop a range of services, including network components, infrastructure, handsets, software and applications. With the requisite regulatory approach and broad inclusion goals, this capacity will make it more plausible to coordinate a successful Ontario mobile action plan.

Ontario and Canada have already made significant investments in building Ontario's mobile leadership through investment in research, the training of highly qualified personnel, and infrastructure. Many large, globally successful mobile companies in each component of the mobile ecosystem are headquartered in Ontario. Ontario has important ICT clusters like the Greater Toronto Area (the GTA and the "Golden Horseshoe"), Kitchener-Waterloo-Guelph (the "Technology Triangle") and Ottawa Valley ("Silicon Valley North"). These developers cross many sectors, from education to preventative health and healthcare to marketing to entertainment to sustainability. However, the wavering of Research In Motion (RIM)—the former giant in mobile handsets and services—opens up important questions around the leadership and health of Ontario's mobile capacity.

Ontario is primarily served by three national telecommunications providers—Rogers, Bell and TELUS—but also has a number of regional carriers. As is the case in all of the jurisdictions we examined, market share in Ontario is dominated by a few big players in mobile Internet service provision. Rogers, Bell and TELUS control 97 per cent of the market, with shares of 47 per cent, 30 per cent and 20 per cent, respectively. Countries with only a few players achieve strong competition through effective regulation, price monitoring and self-regulation by industry.

Ontario boasts design programs and curricula at the university and college levels that support mobile development and graduate creative talent. Five of the top-10 institutions for mobile research in the country are located in Ontario: University of Waterloo, University of Ottawa, University of Toronto, Carleton University and Queen's University. [44] Ontario's colleges train mobile developers.

As well as possessing a capacity in wireless engineering, platform and application development,

[44] USNews, "World's Best Universities: Subject Rankings," U.S.News & World Report LP, http://www.usnews.com/education/worlds-best-universities/articles/2010/09/21/worlds-best-universities-engineering-and-it.

Ontario is a leader in three significant emerging technology movements:

1. The "Internet of Things" (IoT), which is an emerging concept that is in the process of being recognized by analysts as "the next big thing"; it is an array of connected everyday devices (such as appliances) that may be controlled or may send data through digital networks.
2. The "maker" movement of do-it-yourself technology tinkerers who work on ideas, experimentation and pre-commercial prototypes.
3. Augmented reality, which is a live view of the world that is enhanced by computer-generated media such as sound, images or GPS data.

## What Ontario Residents and Experts in the Field Told Us

Our survey respondents reflected the growing interest and use of mobile technology that was identified in our expert interviews and in other jurisdictions. In our sample,

- 99 per cent of respondents reported using some form of mobile technology, and
- 77 per cent owned a cell phone.

Respondents indicated that mobile technology has a great importance, and showed a strong interest in accessing more services through mobile technologies (78 per cent) and learning about how mobile technologies can augment or replace common tasks (74 per cent). High cost as a barrier to access and perceived lack of competition between carriers were common themes in our discussions and interviews with experts. This concern is reflected by our survey respondents: 83 per cent indicate that they feel overcharged for their service-delivery option. Of our respondents,

- 83 per cent were interested in using mobile devices to carry non-sensitive information like loyalty cards, and
- 40 per cent wanted to have sensitive information such as identification and credit cards on a mobile device.

We found that industries currently use mobile for customer-service applications, media delivery, marketing and internal productivity. Industry respondents led us to conclude that:

- Large companies prioritize productivity gains, while small and medium enterprises (SMEs) are more interested in the innovation that mobility can bring to their products. Industries have seen the advent of mobile technologies and believe that their trade associations are aware of the importance of the "mobile turn."
- The vast majority believed that consumers want more mobile services, and that providers know they needed to provide these services to remain current.
- Mobility is used for these tasks: advertising, archiving, payment, desktop replacement, on-the-go document preparation, GPS mapping and directions, technical documentation, location-based

information, 24/7 customer relationship management (CRM), product development, market research, product marketing, social networking, marketing, and voice and email content.
- The most common use of mobile technology reported by our respondents was voice and email contact with employees (75 per cent), followed by social networking (41 per cent).
- Less significant uses such as "on-the-go document preparation" and "payment mechanism" indicate trends for the future, as mobile becomes ubiquitous.
- Companies are concerned about the cost of going mobile in Ontario and issues of security and talent procurement.

The relatively low rates for uses of mobile technology outside of communication suggest that there is still a great deal of room to educate consumers, companies and the non-profit sector about the potential of mobile services, as well as to develop and implement mobile services across all sectors. Non-mobile industries require opportunities to interact with mobile developers.

## Risks to Ontario in Failing to Adopt Mobility

This report establishes that we live in a world in which mobility is driving the modernization of the developing and advancing worlds. Mobility is shaping the experiences and expectations of residents across the province. Ontario has built significant infrastructure to excel in the mobile world, but needs to act now with comprehensive policies and an action plan.

Failing to act now will disadvantage Ontario in numerous ways. To name just a few: affordability issues will mean a widening gap of disadvantage for those who cannot afford mobile access, private-sector businesses will miss out on economic opportunities, financial-services organizations will lag behind their global counterparts, government services like healthcare will miss out on significant efficiencies of operation and quality of care, and students will miss out on skills they will need to compete effectively in a competitive, technology-infused world.

## Action Plan for a Mobile Ontario

We developed our call to action for a mobile Ontario using the following resources: 1) best practices derived from our review of jurisdictions with comparative challenges and resources; 2) analysis of current Ontario government priorities, initiatives and policy; 3) analysis of federal initiatives regarding spectrum and regulation; 4) extensive secondary research concerning key sectors, as well as infrastructure, technology, social impact, culture and economy in the context of mobility; 5) data collection and analysis of the needs, capacities and plans of Ontario residents, industries and public entities; and 6) foresight work that derived best-case scenarios for mobility.

In developing a call to action, we addressed opportunities for: industry (either as a whole or in critical sectors); public and non-profit entities (academia, healthcare sector) and government. Some proposals require action on the part of one entity, while many others require collaboration. In moving forward

toward a mobile Ontario, government would do well to convene a voluntary advisory council that can assist in implementing the proposed action plan.

Throughout our research a number of recurring themes emerged, such as:

- The need to facilitate affordable access to mobile broadband and devices for Ontario residents.
- The value of a comprehensive regional mobile policy, as exists in other jurisdictions.
- The importance of secure services and privacy protection in a form that encourages mobile take-up by creating confidence, and enables private-sector development while protecting residents.

Other elements of our action plan focus on the potential of the five specific sectors we analyzed. Finally we provide a series of aspirational proposals that aim to:

- Build mobile capacity in Ontario's non-mobile sectors in order to ensure the Ontario economy is competitive.
- Ensure job development and the retention of a mobile industry in Ontario.
- Provide means for citizen engagement and inclusion.

The action plan and a timetable for their implementation are found on page 190 of this report. The chart below provides a schematic of each theme.

| Theme | Description |
|---|---|
| One | The Need for an Ontario Mobile Policy |
| Two | A Mobile Ontario Requires Ubiquity, Accessibility, Quality Infrastructure and Affordability |
| Three | Creating Confidence in Mobile Services: Privacy, Security and Consumer Protection |
| Four | Increased Quality, Accessibility and Productivity in the Delivery of Healthcare |
| Five | Increased Quality, Accessibility and Productivity in the Delivery of K–12 Education |
| Six | Increased Quality, Accessibility and Productivity in the Provision of Post-Secondary Education |
| Seven | Increased Productivity and Quality in the Provision of Government Services |
| Eight | Increased Productivity, Accessibility and Quality across Ontario's Non-Mobile Industries |
| Nine | Job Development and Retention to Build a Strong Mobile Business Sector |
| Ten | Citizen Engagement and Inclusion |

We have identified actions that can be implemented immediately and that do not necessarily need new budget or long investment-analysis cycles. These actions are not inextricably linked, and all combine to add merit to the overall goal of making Ontario a centre of mobile excellence.

We further believe there would be distinct advantage in bringing together a common brand–a mobile Ontario initiative–under which all of the actions could be moderated. There would be synergies and efficiencies, especially where collaborations are needed across parties such as industry, academia and government.

We have identified a number of high-priority "quick wins" that will give momentum and credence to the overall ambition of taking Ontario mobile, which will require a balanced commitment across the private sector, all levels of government and academia.

**Figure 01:** High-Impact Actions

| Action | Timeline | Proposed Owner |
|---|---|---|
| Creation of brand "Ontario" as a centre of mobile excellence | Winter 2013 | MEDI & Ministry of Tourism, Culture and Sport |
| Government to recognize mobile-health solutions that promote prevention | Apr. 2013-Oct. 2013 | Ministry of health |
| Support mobile-learning projects as part of MTCU Innovation Fund | Dec. 2012- Mar. 2013 | Ministry of Training Colleges and Universities |
| Create plan to use mobility to increase responsiveness and productivity of government services | Oct 2013–Oct 2014 | Ministry of Government Services |
| Promotional awareness campaign of m-commerce benefits to non-mobile | Dec 2012–Mar 2013 | Ministry of Economic Development and Innovation |
| Government to establish voluntary advisory council to offer advice , coordinate action and align programs to make Ontario a centre of excellence for mobile | Fall 2012–2014 | Ministry of Economic Development and Innovation |
| Initiate m-commerce task force across industry and government for privacy and security | Fall 2012 | Ministry of Consumer Services |
| Commission study to assess impacts of mobile learning in K–12 and PSE | Dec 2012–2013 | MTCU and Ministry of Education |
| Investigate potential of ORION as network option | Fall 2012–Summer 2013 | ORION |

**Figure 01:** High-Impact Actions (Cont.)

| Action | Timeline | Proposed Owner |
|---|---|---|
| PSE to direct research efforts into mobile industries | Winter 2013–Fall 2015 | Universities and Colleges |
| Academia to collaborate with industry to develop experiential-learning programs | Winter 2013–Fall 2015 | Universities and Colleges |
| Enhance training for app developers | Fall 2012–2014 | MEIC |
| Industry to collaborate with health-sector subject-matter experts to create standards, services and applications | Oct 2012–Mar 2014 | Mobile Industries and Ministry of Education |
| Industry to build consortium with publishers, e-learning sector and teachers to migrate Ontario-appropriate content to mobile platforms | Dec 2012–Oct 2013 | MEIC, School Boards & Ministry of Education |
| Industry to collaborate with PSE subject-matter experts to develop and disseminate applications | Dec 2012–Mar 2014 | MEIC, COU & Colleges Ontario |
| Industry to collaborate with government to develop and test productivity tools | Mar 2013–Oct 2014 | MEIC & Ministry of Finance |
| Finance sector to collaborate with government to incentivize angel investment | Winter 2013–2014 | MEDI |
| Government to work with commercial developers on “mobile alert system” | Mar 2013–Oct 2013 | Ministry of Community Safety and Correctional Services |
| Mobile industries to establish consortium approach through associations to fast-track mobile and application adoption in non-mobile industries | Fall 2012–Fall 2014 | MEIC with MEDI |

# Taking Ontario Mobile

## Full Report

The *Taking Ontario Mobile* report was prompted by a transformation that is occurring at a global scale: the exponential adoption of mobile technologies, networks and content and the need to understand the potential opportunities and challenges that this change may bring to Ontario. We define "mobility" as the capacity to move seamlessly through work, leisure and personal life wherever one is located because of four fundamental characteristics of mobile technology: 1) 24/7 ubiquitous connectivity; 2) intense personalization, which allows information to be delivered based on individual needs and preferences; 3) heightened access to social networks and media; and 4) context and location specificity, which combines the features of the Internet with the ability to take location into account. Mobility redefines the individual as part of a network that links data, technologies, content, context and other users and systems to create a profoundly new way of being in the world. Because of these factors, design plays a crucial role in creating processes, systems and products in the mobile sector. Successes in the mobile industry are the results of battles for excellent design—design that understands and responds to its users.

The scope of the *Taking Ontario Mobile* report is necessarily wide. It acts as a call to action and a starting point that will encourage others to initiate further in-depth studies into more specific areas of "mobile." Our goal was to consider the range of activities engaged in by Ontarians and to highlight how mobile technologies enhance or could enhance their experiences. We focus on sectors that represent learning, content production, commerce, governance and services in order to show how these kinds of activities can go mobile. This report is broadly divided into three sections: 1) we provide an analysis of key sectors and make recommendations for taking Ontario mobile; 2) we provide an overview of Ontario's ability to go mobile, focusing on research and industry capacity and situating Ontario's level of mobility relative to other jurisdictions, and we make a set of recommendations that would bring us in line with best practices; and 3) we situate this overview in an overall analysis of how Ontario residents use mobility and imagine its use in the near future, based on our primary research.

Our regional analysis occurs within a booming mobile environment. Growth in mobile adoption is led by China and India, which now account for more than 30 per cent of world subscriptions.[45] In Western Europe, Japan, Singapore and Hong Kong, mobile penetration has already exceeded 100 per cent—with multiple cell phones per subscriber—and global penetration is predicted to achieve 95 per cent by 2013.In Finland, for example, mobile phones have a penetration of 128.7 per cent, and in the United Kingdom penetration is 121.9 per cent.[46] In the developing world, mobility has allowed vast

[45] mobithinking, "PART A: Mobile subscribers; global mobile handset and smartphone market share; world's top five operators," http://mobithinking.com/mobile-marketing-tools/latest-mobile-stats#phone-shipments.

[46] International Telecommunication Union, "World Telecommunication/ICT Indicators Database," (Geneva: International Telecommunication Union, 2010).

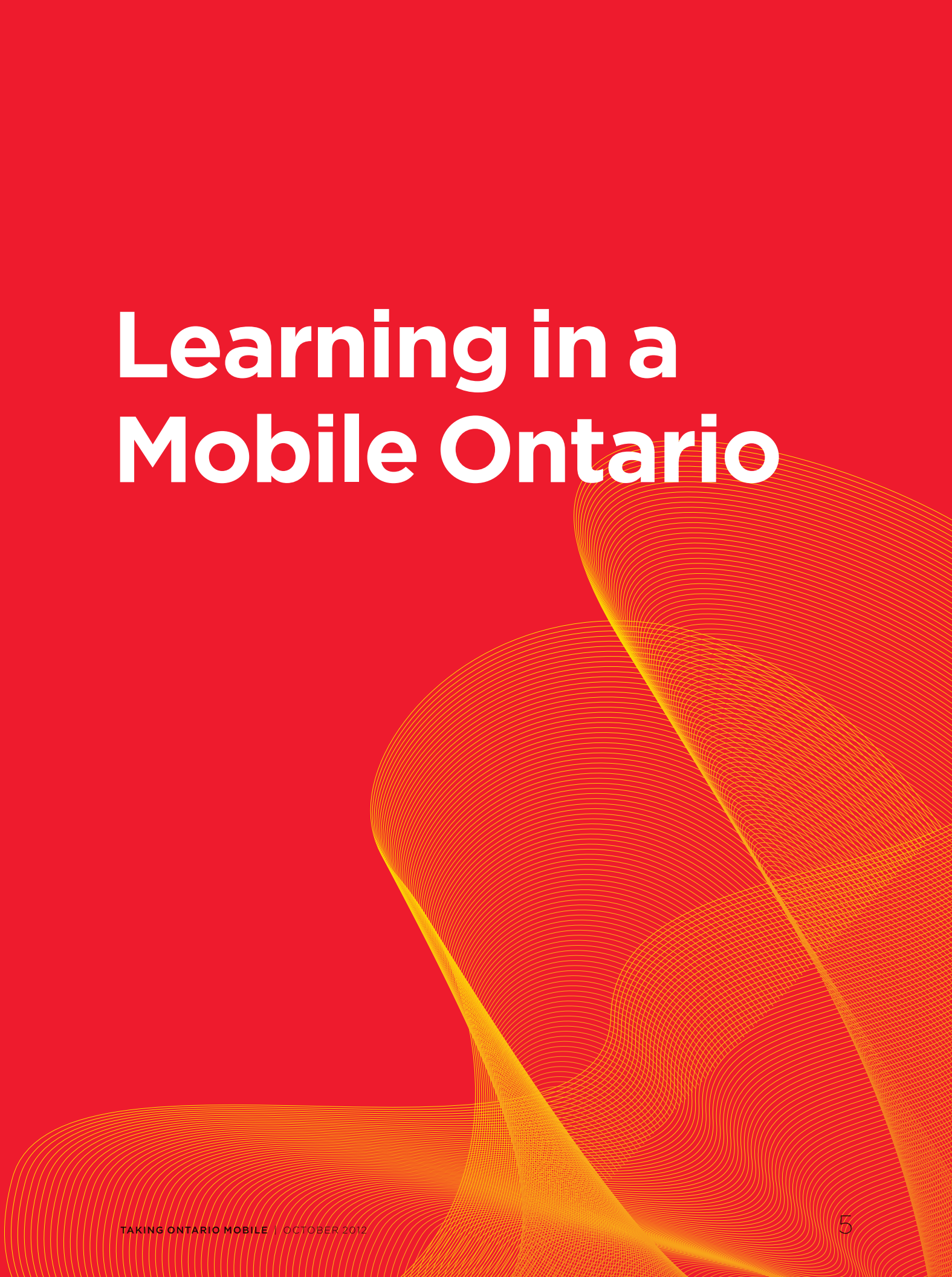
populations to leap from a lack of global connectivity and access to digital content and transactions to full engagement with the global economy. Mobile telephone ownership rates amount to 127.45 per cent in Brazil, 122.9 per cent in the United Kingdom and 154.5 per cent in Russia, which shows that many individuals in these countries have more than one device or SIM card.[47] The report *The Future of Internet III*[48] predicted that mobility will become the Internet gateway due to the relative affordability of devices, their portability and the rollout of networks.

We provide an action plan to "take Ontario mobile." We end with a series of scenarios that allow the reader to imagine an Ontario that makes the most of mobility.

[47] Wikipedia Contributors, "List of countries by number of mobile phones in use," http://en.wikipedia.org/wiki/List_of_countries_by_number_of_mobile_phones_in_use#References.

[48] Janna. Q. & Rainie Anderson, Lee, "The Future of the Internet III," Pew Internet & American Life Project, http://www.pewinternet.org/Reports/2008/The-Future-of-the-Internet-III.aspx., accessed July, 2014.

# Learning in a Mobile Ontario



## Challenges

- Recognizing the importance of education to global competitiveness, the province has set increased graduation-rate targets for both high school[49] and post-secondary[50] students in Ontario: 85 per cent and 70 per cent, respectively.
- At the same time, the province is further tasked with stretching the education dollar without compromising the promise of housing "the best publicly funded education in the world." [51]
- Learners' mobility, engagement with technology and expectations of the learning environment have changed pressures on institutions and systems.
- Unmanaged uses of mobile devices in classrooms (texting, phone calls, photographing, social media, mobile gaming) create disruptions in attention and engagement. Mobile phones can encourage a lack of concentration and focus.
- There is a need for expanded credential options, year-round learning and increased mobility in an experiential environment to ensure a qualified and competitive labour force.
- The increase in high school graduates and initiatives to encourage post-secondary attainment place capital pressures on the post-secondary education (PSE) environment.
- Changing demographics over the next 12 years require institutions to respond more efficiently to fluctuations in cohort size as well as in subject-area demand.
- There is a need for the workforce to update and adapt skills in a just-in-time manner, in situ and in context.

[49] See http://www.edu.gov.on.ca/eng/gettingResultsGrad.html for graduation-rate targets for secondary school.

[50] See http://www.tcu.gov.on.ca/eng/about/annualreport/ for current college and university graduation rates.

[51] Ontario Ministry of Education, "Results-Based Plan 2011/12," Queen's Press of Ontario, http://www.edu.gov.on.ca/eng/about/annualreport/#1.

We make the argument in this section that mobile learning (m-learning):

- Affords quality.
- Affords efficiencies.
- Integrates new groups of learners.
- Improves student retention.
- Supports experiential learning, mentorship and year-round and self-paced learning.
- Facilitates student credit transfer.
- Is well-suited to workplace-skills development.
- Provides opportunities for the e-learning and educational publishing industries.

Students need to master numeracy, literacy and media literacy as well as the capacity to learn continually in order to gain employment and compete successfully in a complex global economy with local nuances and values. Technical proficiency with contemporary digital tools (including mobile devices and applications) is also important. Such learning is only possible when an affordable, accessible mobile infrastructure is in place.

Technologies are capable of producing new social relations and have significant disruptive impacts. As David Lewkowich states, "forces of influence in both pedagogical and technological relations work multifariously: as both constraints on and endowments through relations of power, and in always more than one direction; subjective relations that create subjects, but that also endow these subjects with power." [52]

Few technologies have as powerful an impact in shifting social relationships and power as mobile devices. These are pervasive—increasing numbers of children and youth own a mobile phone or other device, and, unlike other technologies, mobiles are carried on the body 24/7 and are highly personalized.[53] An American study by Pew entitled *Teens, Cell Phones and Texting: Text Messaging Becomes Centrepiece Communication* found that 64 per cent of teens with cell phones said they had texted in class, and 43 per cent said they texted in class at least once a day. [54]

Unmanaged mobility can be disruptive. Teachers report gaps in attention and engagement when students text message, answer calls, snap and exchange photographs and play mobile games uncon-

[52] David Lewkowich, "Technology and Curriculum: Shadows and Machines," *McGill Journal of Education* 47, no. 1 (2012)., 31

[53] Kathryn Zickuhr, "Generations and their gadgets," *Pew Internet and American Life Project*, no. Journal Article (2011).

[54] Ibid., p.4

[55] Ethan Pendleton, "The Disadvantages of Mobile Phones in Schools and the Effects on the Learning Proces of Students," eHow, http://www.ehow.co.uk/info_8712620_disadvantages-effects-learning-process-students.html.

strained by mobile etiquette.[55] Others may cheat or share answers, engage in illegal activities or begin rumours or threats that escalate due to the instantaneous nature of mobile communication. [56] Schools have responded by banning mobile devices from the classroom. This philosophy suggests that "students should be monitored by school officials, campus police and teachers to make sure that the use of cell phones in class is minimized. Parents should make their children aware of the fact that cell phone use in schools is prohibited and not proper behavior."[57] Banning mobile devices has met with lukewarm success. The Pew study showed that "65% of cell-owning teens at schools that completely ban phones bring their phones to school every day and 58% of cell-owning teens at schools that ban phones have sent a text message during class." [58]

This report proposes a different approach—one that thoughtfully integrates mobility into "deeper" learning, through which learners master core academic content, critical thinking skills, collaborative work skills, excellent communication and self-paced learning. [59]

In this scenario, mobility complements contemporary scholarship promoting the "flipped classroom"—a place of collaboration and engagement: "with teacher-created videos and interactive lessons, instruction that used to occur in class is now accessed at home, in advance of class. Class becomes the place to work through problems, advance concepts, and engage in collaborative learning." [60] Elliott Soloway, who studies mobile phone use in Detroit classrooms, has stated, "To use them effectively, you need a learning-management system, a curricular rationale, evidence of the best practices." [61]

The unique affordances of mobile devices empower mobile individuals, whether engaged in K–12, post-secondary education or lifelong learning:

[56] Catherine Henderson, "The Impact of Cell Phones on Educaitonal Institutions," eHow, http://www.ehow.com/about_5476783_impact-cell-phones-educational-institutions.html., http://www.ehow.com/about_5476783_impact-cell-phones-educational-institutions.html.

[57] Ibid.

[58] Amanda Lenhardt, "Teens, Cell Phones and Texting: Messaging Becomes Centrepiece Communication," Pew Research, http://pewresearch.org/pubs/1572/teens-cell-phones-text-messages.

[59] The Hewlett Foundation adopted this new focus after months of research and analysis, including more than 100 interviews with top thinkers in the fields of education, business, and public policy. See http://www.hewlett.org/programs/education-program/deeper-learning.

[60] Jackie Gerstein to User Generated Education, 2011, http://usergeneratededucation.wordpress.com/2011/06/13/the-flipped-classroom-model-a-full-picture/.

[61] Kathleen Kennedy Manzo, "Making the Case for Mobile Computing," Educaiton Week, Digital Directions 2, no. 4 (2009), 1. available online at http://www.edweek.org/dd/articles/2009/06/29/04neccmobile.h02.html.

- *Mobility:* Learners can take a mobile
vice anywhere, be it different locatic
within the classroom, other learning
spaces outside of the classroom, or t
homes.
- *Ubiquity:* Mobile devices such as fea
ture phones, smartphones, tablets ar
portable game consoles (e. g. , Ninte
DS, which also acts as a communicat
and Internet device) are increasingly
common.
- *Connectivity:* Mobile devices enable
learners to access information from
networked locations (e. g. , using loc
area networks, Wi-Fi, 3G connection
all times. "Learning at the point of n
means that students can ask for info
tion from an expert or get advice fro
mentor or one of their peers at the t
that support is most relevant to then
- *Interconnectivity:* Learners have bro
opportunities to share and collabora
through the global reach of social ne
working and through digital commur
cations mediated by the Internet.
- *Context sensitivity:* Mobile devices a
learning applications use GPS, Bluet
and Wi-Fi to enable learning that is
relevant to the individual's time, env
ronment and location (e. g. , informa
about a historical site). Mobile learn
ing can be "learning in context" in t
students can supplement real-world
experiences with additional useful
information. This is described as "sc

The *Public Services for Ontarians* report sets five goals for post-secondary education in Ontario: "it must educate a growing share of the population; help equalize economic and social outcomes; provide an important component of lifelong learning; be an engine of innovation; and deliver quality education efficiently." Mobility can address each of these challenges. It can: reach learners where they are located, helping to integrate Aboriginal students and those outside of urban centres as well as supporting part-time working students; provide students with the skills required to function in a global, mobile world, helping to equalize economic and social outcomes; facilitate constant skills development; play an important role in future applications and innovations where Ontario has existing capacity; help to coordinate and centralize resources while simultaneously personalizing them; take pressure off of capital resources; and ensure that quality learning is delivered to learners with greater efficiency.

The report argues that post-secondary institutions must focus on the quality of the teaching and learning environment, "devote more resources to experience-based learning such as internships, allow for more independent study, develop problem-based learning and increase study abroad." A coordinated use of mobility will be important in realizing these goals, allowing students to learn off-campus while engaged with on-campus resources and faculty. [62]

[62] Don Drummond, "Commission on the Reform of Ontario's Public Services Public Services for Ontarians: A Path to Sustainability and Excellence," (Ontario: Ontario Ministry of Finance, 2012).

cially situated learning" [63] that takes place in "the course of activity, in appropriate and meaningful contexts." [64]

- *Personalization:* Mobile devices are personal and learners can configure learning preferences and access needs assessments, inclusive design or other personal profiles that allow digital information to be delivered based on individual needs and preferences (e. g. , a child who cannot yet read may have all text read aloud using text-to-voice settings). John Traxler suggests that "mobile learning offers a perspective that differs dramatically from personalized conventional e-learning in that it supports learning that recognizes the context and history of each individual learner and delivers learning to the learner when and where they want it." [65] What is more, it can offer "authentic learning" that involves real-world problems and projects that are relevant and interesting to the learner. [66]

## 2.1 Global Competitiveness

The report *People without Jobs, Jobs without People* [67] indicates the importance of ensuring that Ontario trains skilled workers who are able to meet the requirements of our changing economy: "it is concluded that by 2031 we will need 77 per cent of our workforce to have post-secondary credentials (apprenticeship, university, college, and industry, professional)"—a rise from the current figure of 60 per cent. [68] The Council of Ontario Universities' data underscores the role that PSE plays in maintaining success within the labour force of today and tomorrow:

> Even during the most challenging economic times, in the midst of the 2008 recession, 91.7 per cent of students who completed their undergraduate degrees at universities across the province were able to find a job within six months, and 93.8 per cent were able to do so within two years. . . . Jobs grew by 28 per cent for those with a university degree from 2004 to 2010, 17 per cent for those with a college credential, and four per cent for those with a high school diploma. [69]

[63] Randy Bass, "New Media Technologies and the Scholarship of Teaching and Learning: A Brief Introduction to this Issue of Academic Commons," (2009), http://academiccommons.org/commons/essay/introduction-issue.

[64] John Traxler, "Current State of Mobile Learning," ed. Mohamed ally, Mobile Learning: Transforming the Delivery of Educaiton and Training (Edmonton, AB: Athabasca University Press, 2009), http://www.aupress.ca/index.php/books/120155., 18.

[65] Ibid.

[66] Ibid.

[67] Miner, "People without jobs, jobs without people. Ontario's Labour Market Future." http://www.collegesontario.org/research/research_reports/people-without-jobs-jobs-without-people-final.pdf.

[68] Ibid., 1.

[69] Universities Council of Ontario, "Strong rise in number of university applications and applicants across Ontario," Council of Ontario Universities, http://www.cou.on.ca/news/media-releases/cou/strong-rise-in-number-of-university-applications-a.aspx.

*People without Jobs, Jobs without People* notes that the gap in labour-force demand and supply could be dramatic: "By 2021, for example, the medium growth assumption yields a workforce deficit of some 600,000. By 2026, this rises to 800,000, and by 2031 it passes the one million mark." [70] The majority of population growth will be due to an aging population, as well as a growing number of immigrants and Aboriginal people. Strategies to mobilize skilled immigrant labour and to ensure the entry of underrepresented groups such as Aboriginal people, women and disabled individuals into appropriate training and jobs are important elements of a holistic talent-creation initiative, and respond to the reality painted by the *People without Jobs* report, the recent *Public Services for Ontarians* report and the *Strengthening Ontario's Centres of Creativity, Innovation and Knowledge* [71] discussion paper.

Mobile learning technology builds labour force capability through:

- Mechanisms that allow students to take less time to complete their educations and to spend less money through access to 24/7 and mobile off-site learning.
- Learning in context, better supporting the success rate of Aboriginal students who wish to remain in their communities, as well as personalizing learning for other historically marginalized groups.
- Retraining with just-in time and location-based programs that encourage problem-based learning.
- An increasingly familiar access method for recent immigrants, many of whom come to Ontario from countries with high rates of mobile penetration. [72]
- Intensified mentorship and immediate feedback to facilitate learning and completion.

## 2.2 Quality Learning: Changing the Way that We Learn

The digital era has forever transformed the way that we learn. According to the 2020 Media Futures Report, learners who have access to mobile and digital media have changed too:

> Text alone will not hold the attention of today's school children who are digital natives. Google, blogs, social media and collaborative knowledge management means that they can also easily search and access any information . . . the amount of information available outside the classroom today is

[70] Rick Miner, "People without jobs, jobs without people. Ontario's Labour Market Future." (Toronto: Miner Management Consultants, 2010), 6.

[71] A discussion paper prepared by the Ministry of Training, Colleges and Universities on the innovation needed to make Ontario's university and college system stronger (June 2012).

[72] "In 2008, the number of temporary residents in Ontario was 240,264—40.8% of all temporary residents in Canada. In 2008, 44.9% of immigrants to Canada were destined for Ontario (110,895). Ontario's share of immigrant arrivals, however, has been declining annually since its high point in 2001 (59.3%)." Ontario Ministry of Citizenship and Immigration, "Ontario immigration key facts: Preliminary 2010 data," ed. Ontario Ministry of Citizenship and Immigration (Toronto: Queen's Printer, 2010)., p. 2.

> greater by an order of magnitude compared to what was available just 10 years ago. [73]

The skills that are needed have shifted, requiring the ability to research, digest large quantities of information and form sound judgments. Michael Wesch underscores both the disruption and possibility that the combined impacts of data, the Internet and mobility bring: "If we fail to address the crisis of significance, the technologies will only magnify the problem by allowing students to tune out more easily and completely." [74]

Blended learning facilitates such media literacy for technology-savvy users. The combination of using computers to teach while also having a teacher or facilitator involved is known as "blended learning." This method leverages students' comfort level with new technologies while giving teachers the role of ensuring that the information students are receiving is sound and well understood. In an article for TV Ontario (TVO), Rochelle Strauss notes,

> Familiarity with technology is not the same as critical literacy, so there are opportunities here for everyone in the classroom—teachers and students alike—to be both instructors and learners. This reversal of the traditional teacher-student relationship may be uncomfortable for educators, but it's an opportunity to democratize the classroom through the sharing of expertise and experience. [75]

There remains a place in K–12 for the "three Rs" (reading, writing and arithmetic) in primary education. The educators we interviewed predicted a shift in assessment tools in many subjects from "what do you know?" to "how do you know?" [76] Instead of measuring learning in absolute terms—e. g., whether a student has memorized a concept/fact or not—m-learning fits well with outcomes-based assessment that evaluates students' abilities to solve problems, be innovative and creative, and apply information appropriately when needed. John Traxler describes this as "Finding information rather than possessing it or knowing it becomes the defining characteristic of learning generally and of mobile learning especially." [77]

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[73] 2020 Media Futures, "What will our media and entertainment be like by 2020? Education 2.0," 2020 Media Futures, http://2020mediafutures.ca/Education+2.0.

[74] Bass, "New Media Technologies and the Scholarship of Teaching and Learning: A Brief Introduction to this Issue of Academic Commons".

[75] Rochelle Strauss, "Digital Literacy," TVO, http://tvoparents.tvo.org/article/digital-literacy.

[76] We conducted two round-table discussions to cover a range of learning and education topics. Attendees included mobile educational content developers, school administrators, teachers, PSE instructors, representatives of the Ontario College and University Faculty Associations and representatives from government.

[77] John Traxler, "Defining, Discussing and Evaluating Mobile Learning: the moving finger writes and having writ . . . . ," *The International Review of Research in Open and Distance Learning* 8, no. 2 (2007).5.

Formal learning has become more personal and individualized as a result of digital technologies. What is so attractive about the new digital technologies is that they capture each student's "voice" on an individual basis, as well as allowing sharing of personal ideas and thoughts. Strauss goes on to state that "integrating resources that reflect the reality of students' Web experiences—and not just specifically designed 'educational' materials and environments—allows teachers to maintain the relevance of the classroom experience to the real world and students' lives." [78]

As an added benefit of m-learning, through texting and file-sharing, students can now connect at any time with other students, leading to feelings of engagement and inclusivity as well as a sense of in-the-moment learning. [79] Mobile learners can also be creators of learning materials for others through crowdsourcing and peer-to-peer sharing. In a comparative UK study, students testify to the benefits they accrue from m-learning, such as: the ability to share of ideas and build knowledge; opportunities for autonomy and independence; and the ability to revisit learning outside of the classroom. There appears to be some evidence that high or medium device use and higher than predicted attainment can correlate. [80] Longitudinal studies undertaken by the Research Center for Educational Technology at Kent State University in Ohio reinforce the power of these qualities, demonstrating that handheld devices in the classroom can "improve students' motivation, engagement, conceptual understanding, and problem-solving skills." [81]

## 2.3 Access to Mobile-Learning Opportunities for K–12

Ontario already has in place an e-learning mandate that is working toward a connected Ontario for every student with a variety of portals and tutoring, mostly for students at intermediate levels. An action plan for m-learning, however, is more than a small-screen version of existing web services, as students need to move between resources and curriculum. The full deployment of m-learning outside the classroom encourages curiosity and integration with the larger community and its contemporary issues and culture. [82] Acknowledging the external dimension of mobile learning, the American Federal Communications Commission (FCC) is launching a pilot program that supports off-campus

[78] Rochelle Strauss, "Digital Literacy," TVO, http://tvoparents.tvo.org/article/digital-literacy.

[79] A secondary school principal at our round-table discussion stated that preliminary data from his school's m-learning program indicates that students are more engaged. It is expected that this engagement will translate into higher graduation rates as the school's mobile learning program matures.

[80] Angela McFarlane and Pat Triggs, "Researching mobile learning: January to September 2008 (final report)," *British Educational Communications and TEchnology Agency (BECTA)* (2009), http://dera.ioe.ac.uk/1472/.

[81] Manzo, "Making the Case for Mobile Computing".

[82] Mark van Hooft to School Stuff, 2011, http://sch00lstuff.blogspot.ca/2011/04/putting-mobile-back-into-mobile.html.

wireless internet connectivity for m-learning devices.[83] Engaging with mobile technologies in the classroom is a learning experience for teachers as well as for students. [84] Teachers' facility and confidence with devices as well as device and content reliability affect their willingness to engage with m-learning. [85]

In Ontario, a significant number of pilot projects across 47 school boards and the provincial schools branch will soon use m-learning technology and blended-learning approaches in their classrooms as part of "Teaching and Learning in a Digital World" a joint initiative by the Ministry of Education and the Council of Ontario Directors of Education (CODE). [86]

As part of this joint initiative, a variety of pilot projects [87] have connected rural and remote schools to the Internet using a variety of systems such as fixed high-speed wireless connections to wide area networks (WANs), satellites and virtual private networks (VPNs). Even higher speeds will be achieved by new broadband networks, such as the Eastern Ontario Regional Network, now under construction, which is expected to improve high-speed Internet access for more than one million residents of Eastern Ontario. [88]

Ramap Island: A Virtual World/SMS Learning Project:

Without leaving the classroom, students visited Ramapo Islands a secure 3-D world on the web site Teen Second Life that is only open to students from the school district age 13 and over, their teachers and a few screened adults. At Ramapo Islands, students created an avatar that resembled their physical identity and then altered them to resemble their sense of the media's generic image of beauty, finally, students worked together to create "media-perfect" avatars of the opposite gender. Throughout each exercise, the students silently conversed about body image using the site's SMS text messaging feature. Their teacher noted that "students who wouldn't normally even talk in class shared some personal stories and feelings in Teen Second Life." After the mobile exercise, the improved student engagement continued and comfort levels and depth of inquiry seemed greater in follow-up face-to-face discussions. These levels of engagement are difficult to establish in the traditional classroom where students feel more emotionally vulnerable. [89]

[83] Ibid.

[84] For a broad analysis of pedagogical possibilities (e.g., narrow, teacher-led, constructivist and open settings), Norbert Pachler et al., *Mobile learning : structures, agency, practices* (New York: Springer, 2010).

[85] Angela McFarlane and Pat Triggs, "Researching Mobile Learning: January to September 2008" (2009), http://www.becta.org.uk.

[86] Ministry of Education, "Teaching and Learning in a Digital World," (Toronto: Ministry of Education, 2011).

[87] "Ontario's E-Learning Strategy," Queen's Printer for Ontario, http://www.edu.gov.on.ca/elearning/connectivity01.html.

[88] See www.eorn.ca for more information.

[89] Suzie Boss, "Avatars Teach Teens About Self-Image," Edutopia, http://www.edutopia.org/avatars.

While many students today have a presence online through their mobile phones, and students who can bring their own mobile devices will help boards reduce the cost of moving toward m-learning, not all families are equal in terms of the kinds of mobile devices they can purchase, hence school boards must:

- Work in collaboration with service providers to set up loan programs to provide mobile devices for those students who cannot bring their own to school, in order to ensure that no students are left behind for economic reasons.
- Provide ubiquitous Wi-Fi throughout the schools in their jurisdictions. The presence of cloud-based resources can facilitate anytime, any-place learning. While some boards have access to high-speed bandwidth that can be used to provide Wi-Fi within their schools, many boards in rural and Northern areas don't have good connectivity, as 3G-level bandwidth is too expensive.

## 2.4 Quality Learning and Mobility in PSE

Universities have increasingly placed a greater emphasis on the quality of learning and the adoption of strategies that encourage student engagement. Engagement is measured regularly through National Survey of Student Engagement (NSSE) scores as well as through surveys that rank universities, whether by *Maclean's* or the *Globe and Mail*. The recent "Three New Campuses for Ontario" symposium was the site of debate about the future of PSE in Ontario. Speakers argued that learning needs to be designed from the perspective of students and their needs. Minister Glen Murray has introduced a broad-ranging consultation aimed at encouraging innovation and productivity in PSE. Almost all analysts and institutions agree that system change must drive toward: more flexibility; a focus on distributed and experiential learning; the integration of technology-enabled learning; and increased mobility. Online learning and mobile learning will be a fundamental means to:

- Allow students to move between institutions with learning resources in the cloud and on their devices. [90]
- Pace education more flexibly and when appropriate condense time to completion by intensifying learning through mobile affordances (online, 24/7, collaborative learning).
- Enable experiential learning through enriched work placement, service-learning experiences and mentorship.

Like K–12 learners, PSE learners are changing. Research the Strategic Foresight Laboratory (SLab) conducted for OCAD University [91] as part of its strategic planning initiative in 2011–12 underscored

[90] Christine Arnold, "The Student Mobility Challenge" (paper presented at the Three New Campuses for Ontario: A Symposium on Options, Challenges, and Possibilities, Toronto, Feb 7 2012).

[91] Lenore Richards et al., *Horizon Scan, Leading in the Age of Imagination* (Toronto: Slab, 2011).

the disintermediation that is beginning to occur within PSE as individuals seek training outside of traditional credentialing, and as degrees become available through an international market that defies traditional jurisdictional boundaries and relies on the Internet. This view is echoed in the top 10 meta-trends in education identified at the NMC Horizon Project Retreat and in key trends from *NMC Horizon Report > 2012 Higher Ed Edition*: [92]

> There is a rise in informal learning as individual needs are redefining schools, universities, and training. Traditional authority is increasingly being challenged, not only politically and socially, but also in academia—and worldwide. As a result, credibility, validity, and control are all notions that are no longer givens when so much learning takes place outside school systems. [93]

Adaptability and an international presence online will be necessary in order for institutions to remain competitive. Ontario's strong PSE institutions provide a basis for successful adaptation. Mobile and e-learning can allow institutions with defined catchment areas to offer programs for learners around the world. The points below provide further motivation for Ontario institutions wishing to enter these markets:

- The research from the 2020 Media Futures strategic foresight initiative led by OCADU and Canada's media industries indicated that the global market for e-learning had reached an estimated USD$27 billion in 2009 and is expected to double by 2014, suggesting a trend in which the sage-on-the-stage model is shifting to "one-to-one and collaborative models of teaching and learning."[94]
- In jurisdictions such as India, Africa or Central China, m-learning is already integrated into both K–12 and PSE, as a means to address the scale of change and populations that require learning. Institutions and programs in the developing and emerging worlds are jumping over traditional e-learning onto mobile platforms and methods, taking advantage of the lower cost of mobile platforms such as tablet computers. [95] Other institutions could provide content and expertise.

Research by Maxim Jean-Louis detailed in his report *Engagement Process for an Ontario Online Institute* indicates that Ontario is the leader in Canada for PSE online education, and that e-learning and m-learning are closely intertwined. In his survey of experts in the field, the need to leverage Ontario's e-learning competency into mobility was repeated: "If you want to lead, focus on mobile learning." [96]

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[92] Johnson, Adams, and Cummins, "The NMC Horizon Report: 2012 Higher Education Edition." 4–6.

[93] NMC New Media Consortium, "A Communiqué from the Horizon Project Retreat," The New Media Consortium, http://www.nmc.org/pdf/2012-Horizon-Project-Retreat-Communique.pdf.

[94] VanAlstyne, "2020 Media Futures."Toronto: Strategic Futures Innovation Lab), http://2020mediafutures.ca/.

[95] Ibid.

[96] Maxim Jean-Louis, "Engagement Process for an Ontario Online Institute," (Toronto, Ontario: Minister of Training, Colleges and Universities, 2011)., 46.

Pursuing these changes will not only enhance learner engagement and efficiency but will situate Ontario institutions within existing transformations in educational delivery at the global level.

While mandatory laptop programs are present at a number of post-secondary institutions (such as the University of Ontario Institute of Technology and OCADU), and some successful pilots are current, it was the opinion of our PSE round-table participants that universities and colleges are behind the K–12 school system in terms of speed of adoption of m-learning. There are a number of steps that are necessary as PSE institutions modernize. These institutions must:

- Develop small group tutorials over lecture formats for courses that enable the use of mobile.
- Develop new methods of assessment and evaluation for team success that better suit access to information of connected learners, as well as enhanced collaboration opportunities.
- Develop programs of study that have flexible timing for completion.
- Develop technical support centres for student-owned devices.

Post-secondary institutions differ from the school system in that professors have the academic freedom to teach the way they wish; they also retain intellectual property rights to their own courses and publications. Incentives for change, professional development and support systems for faculty are thus needed. PSE institutions will need to develop training and technical support for faculty in the use of m-learning, assist with mobile curriculum development through Teaching and Learning centres and subsidize infrastructure and devices.

### 2.4.1 Efficiencies in PSE: Capital, M-commerce, Communication

There is the need to serve the enrollment growth that is projected for the next 10 years, yet governments and institutions run a risk if they invest in infrastructure that will go unused in the future. Demographic shifts suggest that there will be periods of decline in the size of cohorts moving into PSE. PSE enrollment by individuals 17–29 in Ontario is projected to decline to near 2003–06 levels around 2024. This fluctuation requires a PSE system that is adaptable and privileges virtual infrastructure and blended learning, e-learning and m-learning as much as bricks-and-mortar learning. M-learning can prove to be a significant asset in this changing context, as it allows adaptability. At the same time, mobility can take pressure off of currently taxed capital resources.

Although there will be some upfront investments in building mobile-ready systems, there are many efficiencies to be gained:

- Savings in staff time and productivity as students are able to complete all administrative and research interactions with the institution via mobile devices.
- Improved student safety through mobile alerts.
- Improved delivery of communications to students (e. g. , information about closures, schedule changes, room changes).

- Adoption of flexible and affordable technologies that amalgamate the affordances of digital tools with ubiquitous access to information (e. g. , researching, collaborating, media production, publishing).

### 2.4.2 Retention

Retaining students through their K–12 education remains an Ontario policy priority. According to the Canadian Council on Learning's report *Cost Estimates of Dropping Out of High School in Canada*,[97] nearly a third of students did not complete their high school educations in 2003–04. Students who drop out:

- Can expect an income loss of more than $100,000 over their lifetimes, compared to individuals with a high school diploma (and no PSE).
- Represent 42.7 per cent of welfare recipients resulting in assistance costs of $969 million/year.
- Are disproportionally represented in prison populations with crime costs of $350 million, and as users of other social supports and income assistance.
- Have a lower quality of life because there are strong associations between education and health across a range of illnesses (e. g. , cancer, diabetes). Nationally, annual health costs are $23.8 billion.
- Combining morbidity and mortality costs, there is an estimated cost to the student who drops out of more than $8,000 per year. [98]
- Create a loss of $10.3 billion and a tax-revenue loss of $378 million.

The Ontario government has set an 85 per cent high school graduation rate target. From 2003–04 to 2009–10, the high school graduation rate has increased by 13 percentage points, from 68 to 81 per cent.[99] To reach this objective, the Ontario government has undertaken a series of initiatives through the Elementary To Secondary School Transition Program,[100] which helps students succeed in high school. All of these measures [101] can be enhanced by the capacities of m-learning technology (detailed

[97] Olena Hankivsky, "Cost Estimates of Dropping Out of High School in Canada," (Burnaby: Simon Fraser Univesity, 2008).

[98] Ontario Ministry of Education, "Student Success/Learning to 18," Queen's Printer for Ontario, http://www.edu.gov.on.ca/eng/teachers/studentsuccess/strategy.html.

[99] Ontario Ministry of Education, "Ontario's Graduation Rate," Queen's Printer for Ontario, http://www.edu.gov.on.ca/eng/gettingResultsGrad.html.

[100] For more information, see http://www.edu.gov.on.ca/eng/teachers/studentsuccess/transition.html.

[101] Program measures include: individual profiles, customized timetables and other programs; the creation of a specialist high-skills major opportunity that allows students to focus on career opportunities; the expansion of cooperative education; e-learning that allows students to learn online and aggregates teacher resources across Ontario; and the introduction of dual credits, which allow students to achieve high school completion as well as apprenticeship, college or university credits.

earlier):

- Retention also requires ensuring that Aboriginal students receive high-quality education, and providing well-structured support for students with disabilities. [102]
- Ontario's Re-engagement (12 and 12+) Initiative encourages school boards to contact students who are within reach of graduation but have either left school or have not been attending, and to subsequently re-engage these students in their studies so that they complete their Ontario Secondary School Diplomas (OSSDs). Funding is provided to school boards to support programs for these students once they return. Mobility could add the benefits of social media and mentorship.

The positive effects of m-learning and blended learning on retention of at-risk students is evidenced by Rachel Cobcroft, who notes that studies indicated that students who used mobile learning in primary and secondary school were more engaged, had better learning outcomes and had better voluntary attendance; this finding was also true for students identified as at risk for not continuing their schooling.[105] An m-learning program in the UK targeting similar unengaged learners found positive outcomes. In this example, researchers report the case of a homeless student:

At Georgia Gwynett University, a non-competitive admission university in the United States, professors and instructors were provided with mobile phones and/or phone plans with no conditions on use except that their numbers be published on the syllabus. The result of this program is that Georgia Gwynett has a sophomore retention rate that is double that of other non-competitive admission universities and on par with competitive-admission universities.

Faculty contacted for a report by *Inside Higher Ed* [104] indicated that the demands of responding to phone calls and texts were reasonable. In student engagement studies by the university, students report "feeling that faculty care about and are accessible to them."

The authors of the *NMC Horizon 2012*: Higher Education Edition report [103] point to a mobile approach that focuses on the advantage of campus and alternative learning locations:

"We are beginning to see developments in online learning that offer different affordances than physical campuses, including opportunities for increased collaboration while equipping students with stronger digital skills. Hybrid models, when designed and implemented successfully, enable students to travel to campus for some activities, while using the network for others, taking advantage of the best of both environments."

[102] Drummond, "Commission on the Reform of Ontario's Public Services Public Services for Ontarians: A Path to Sustainability and Excellence."notes the importance of sustaining these initiatives.

[103] Johnson, Adams, and Cummins, "The NMC Horizon Report: 2012 Higher Education Edition."

[104] Steve Kolowich, "Can You Hear Me Now?," Inside Higher Ed, http://www.insidehighered.com/news/2010/08/19/cellphones#ixzz1mDkbjwPK.

[105] Rachel Cobcroft et al., "Mobile Learning Literature Review," (Technical Report DIT-03-009, Informatica e Telecomunicazioni, University of Trento., 2003).

> One mentor has been working with a homeless young adult who regularly truanted while at school and subsequently left school without any qualifications. The mentor reports that as a result of participation in the m-learning project, her client has not only developed a greater confidence in his current reading and writing abilities, but he has also been inspired to seek help to improve his mathematical skills from the local Adult Basic Education Centre. [106]

Post-secondary retention models underscore the importance of interaction with faculty, individualization based on student goals, and interpersonal interaction based on evaluation. Retention is enhanced by a sense of community and by opportunities to have co-curricular experiences such as service learning. [107] Mobility can enhance students' experiences at every point along their paths, including student services, advising and acculturation. For example, the UK CloudBank project is a mobile- and web-based crowd-sourced information system that helps international students further their knowledge and understanding of local UK language and culture. The system enables students to collect, annotate and tag interesting or puzzling language- and culture-related content found in everyday life. [108] Studies of mobile use between faculty and students show increased bonding and a significant increase in "student extrinsic motivation" without adding performance pressures. [109] Mobility leverages personalization, informal support structures, advisement and mentorship, collaboration, and social media interaction, and offers strong support for those undertaking fieldwork, service learning or internships. Hence mobility can claim an indirect positive relation to retention.

Data on the direct effects of mobile technology on post-secondary retention and graduation rates is thin, in part because post-secondary institutions have not fully adopted these technologies. However, those who are more educated earn higher wages, work longer, pay more taxes, experience less unemployment, adapt better to changing technology, and have better health and life expectancies. Estimates for the social return of college and university training are in the range of seven to 10 per cent. [110] The significance of this figure justifies investments in m-learning because of the mounting evidence that it

[106] Jill Attewell &Tamatha Webster, " Engaging and supporting mobile learners. Mobile learning anytime everywhere." (paper presented at the MLEARN 2004, UK, 2004).

[107] There are multiple data sources that support this point. See: Joanna C. Dunlap and Patrick R. Lowenthal, "Defeating the Kobayashi Maru: Supporting Student Retention by Balancing the Needs of the Many and the One," *Educause Quarterly* 33, no. 4 (2010).; Raymond Hicks and Nava Lerer, ""NSSE and Retention: Does integration affect the probability of leaving?"," in *Northeast Association for Institutional Research 30th Annual Conference* (Newport, Rhode Island 2003).and Campus Compact, "How Can Engaged Campuses Improve Student Success in College?," (2008), http://www.compact.org/wp-content/uploads/resources/downloads/Retention_Research_Brief.pdf.

[108] van Hooft Title of Weblog.

[109] Pei-Luen Patrick Rau, Qin Gao, and Li-Mei Wu, "Using mobile communication technology in high school education: Motivation, pressure, and learning performance," Comput. Educ. 50, no. 1 (2008)., 1–22.

has a positive impact on student engagement. This in turn is known to increase post-secondary retention and graduation rates. Mobile will allow the significant social benefits of education to be realized for a larger fraction of Ontario's population.

### 2.4.3 Reskilling and Lifelong Learning

The benefits of lifelong learning and reskilling have been articulated earlier in this chapter, but formal m-learning for the corporate, non-profit and government sectors is at an early stage in Ontario. However, many workers in Ontario have already started to use their mobile devices for informal learning, without waiting for formal implementation of m-learning in their organizations. For example, our research indicated that self-training was the most significant use of mobile tools by workers in the healthcare sector. A proven benefit of m-learning is the ability to serve remote communities or workplaces where there are limited educational resources. [111]

We live in a mobile society experiencing increasing globalization. Global sourcing and global labour mean that the employees can train anywhere in the world. [112] Hence, there are many business drivers that will propel m-learning forward at the corporate and large-organization level; in many jobs, the workforce is also mobile and not fixed to a specific place, or workers increasingly work from home or from "third-party spaces"—not the office. Young people, sometimes called the "always on" generation, expect that mobile communications will also be part of their work lives. The widespread deployment of mobile computing means that an infrastructure for m-learning is already in place. Some of the specific benefits of mobile lifelong learning are as follows:

- Mobility provides speedier just-in-time training that responds to an environment of hyper-competition in which companies are often constrained to do more with fewer people.
- Mobile devices enable workers to train during commuting time.
- In many larger organizations, there is a demand for greater access to and integration of information, data management and communications, all delivered in real time and in context, whenever possible.

[110] W. Craig Riddell, *Impact of Education on Economic and Social Outcomes An Overview of Recent Advances in Economics,* ([S.l.]: Canadian Policy Research Networks, 2006), http://myaccess.library.utoronto.ca/login?url=http://site.ebrary.com/lib/utoronto/Top?id=10131071.

[111] "A major benefit of using wireless mobile technology is to reach people who live in remote locations where there are no schools, teachers, or libraries. Mobile technology can be used to deliver instruction and information to these remote regions without having people leave their geographic areas." Mohamed Ally et al., Mobile learning transforming the delivery of education and training, (Edmonton: AU Press, 2009), http://www.aupress.ca/index.php/books/120155.

[112] Adapted from Woodill, *The Mobile Learning Edge.*

- Mobility is an excellent means to offer courses to update compliance with government regulations or industry standards.
- Mobile communications, including m-learning, are in great demand in specific industries, including healthcare, natural-resources monitoring, agriculture, emergency services, government inspections, retail and transportation.

For these reasons, managers in large organizations are aware that m-learning is on the rise, and are at the stage of formulating their own m-learning strategies.

### 2.4.4 Job Creation: Educational-Application Developers

**Current m-learning opportunities**

- Use of micro-blogging and text messaging as educational tools: Learners can text questions and receive answers almost instantly, or share information with their peers.
- Research programs that use mobile devices for data collection and aggregation of results: Such programs can be used for tracking trends or crowdsourcing data collection in a wide variety of ways.
- Personal media productions: As mobile phones and tablets are improved, they are rapidly becoming high-definition audio- and video-production devices. More and more learners are using their devices to document their own worlds, or to produce creative products that can be shared with others. Educational "point-of-view" (POV) applications allow for continuous scanning and recording of learners' experiences.
- Performance support or coaching: Mobile devices allow users to retrieve information at a moment's notice in order to support the task they are doing. Live mentoring is possible through the use of mobile phones.
- Social learning through networking: Peer-to-peer teaching and learning is now possible with a number of educational applications. Informal learning through sharing and collaboration takes place all the time using mobile devices.
- Collaboration, cooperation and collective behaviour: Mobile devices are now being used to coordinate large numbers of users to take action. Many educational uses of this ability will be developed in the near future.
- With their growing number of features (e. g. , large screen, motion sensors, cameras, processing power, portability), tablets give traction to other educational technologies—from facilitating the real-time data mining needed to support learning analytics to offering a plethora of game-based learning apps. What makes tablets so powerful is that students already use these or very similar devices outside the classroom to download apps, connect.

**Future m-learning opportunities**

- Coding of the environment with educational tags: Technologies such as Quick Response (QR) codes (Figure 3) or radio-frequency identification (RFID) tags can be used to label any object or location in the environment with information that can be retrieved with a mobile device.
- Augmented-reality educational applications: As a location is viewed through the lens of a camera on a mobile device, textual information or computer-generated objects can be added into the scene being viewed. Augmented-reality learning games can be developed that use the "real environment" supplemented with additional information to play the game.
- Virtual-learning worlds on mobile devices: Mobile learning games are being created for both entertainment and educational purposes. Bridging programs between mobile devices and virtual worlds have been developed that allow participation in those worlds while the learner is mobile.
- Location-based educational applications: Using GPS, most mobile phones know the location of a user, as well as the direction in which the camera of the phone is being pointed. A variety of location-based educational programs can be developed using this information.
- Responsive learning environments and smart objects: Large-scale objects such as billboards or the sides of buildings can be used to engage with and elicit responses from passersby using mobile technology. These experiences can be engrossing and/or educational if they are supported by real-time data and regular information and functionality updates.
- Haptic applications: The movement of mobile devices, recognition of gestures, and simulations using force feedback (in which the interface responds to physical pressure) are being built into applications that can have educational value. Newer sensor arrays and "body area networks" (BANs) allow mobile learning to be an experience based on physical interactions.

Ontario has a thriving e-learning industry that provides materials for K–12, PSE, corporate training and the general public. [113] In 2011, the Canadian eLearning Enterprise Alliance (CeLEA) identified 136 Ontario companies out of a total of 388 firms building e-learning in Canada (35 per cent). [114] Ontario is the home of many leading educational technology companies such as Desire2Learn, Redwood E-

[113] Data is provided by the mobile asset map developed by the Toronto Regional Research Alliance for this report, and bt Maxim Jean-Louis's *Engagement Process for an Ontario Online Institute*.

[114] Canadian eLearning Enterprise Alliance, "Canadian eLearning Directory," http://www.celea-aceel.ca/Canadian_eLearning_Directory.

Learning, Metrix and Edcetra. While m-learning is on the rise, there are only a few Ontario companies that are currently ready to offer m-learning products and services. Ontario is in the process of developing capabilities in the design and development of mobile learning, and the industry for mobile learning is being developed according to the business plans of vendors and publishers, rather than as a result of government policy. M-learning is a "hot topic" at e-learning conferences in both the United States and Canada, and those Ontario companies in the field are frequent exhibitors and presenters.

As K–12, PSE and corporate/lifelong learning move inevitably toward increased mobility, there is an imperative for content that is relevant to the Ontario context. The combinations of new platforms and potential applications should be a powerful driver for new content and technology. [115]

## 2.5 Action Plan

The section that follows proposes as series of strategies that will enhance Ontario residents' access to mobile lifelong learning.

### 2.5.1 Access

★ The challenges involved in developing comprehensive mobile learning are parallel to challenges in overall mobile inclusion. Barriers include: issues with patents and copyright; the high cost of data plans for mobile devices in Canada (compared with others jurisdictions); and the difficulties of reaching rural and Northern areas of Ontario with high-speed broadband. While it is not sensible to delay m-learning strategies until they can be deployed uniformly across Ontario, it is imperative that any action plan include steps to identify and mitigate connectivity weaknesses in the province.

### 2.5.2 Kindergarten–Grade 12

The following strategies will facilitate the integration of mobility into K–12 education in Ontario:

#### PUBLIC/PRIVATE COLLABORATION

★ Through a consortium, infrastructure providers, school boards and the Province of Ontario could create a cost-sharing mechanism to ensure that students have access to devices that support m-learning.

[115] Adapted from Woodill, *The Mobile Learning Edge*.

★ Infrastructure and device providers will benefit by building loyalty among younger consumers, and can build new businesses that provide educational services and content in alliance with the strong educational content industries.

#### SCHOOL BOARDS

★ School boards can create support for positive m-learning policies and leadership through multi-year projects that allow the growth of mobile learning in each school. Budgets can reduce the number of laptop and desktop computers that are purchased and increase the purchasing of mobile devices.
★ Technical support and best practices must be provided to enable educators to use these technologies easily and effectively and to reflect the excellence of Ontario education.
★ Working in collaboration with service providers, school boards will need to set up loan programs to provide mobile devices for those students who cannot bring their own to school, in order to ensure that no students are left behind for economic reasons.

#### GOVERNMENT

★ Ontario can continue to encourage the integration of m-learning skills and outcomes within Ontario learning objectives by providing school boards with the tools to create and implement curriculum.
★ Boards should be guided in policies related to safe wireless exposure [116] by Health Canada guidelines. [117]

### 2.5.3 Post-secondary Education (PSE)

Post-secondary institutions would benefit by moving in parallel with the K–12 school system in adopting m-learning opportunities; this will effectively manage incoming students' expectations of m-learning. In order to facilitate m-learning, post-secondary institutions can:

★ Builda PSE consortium through university and college associations to develop m-learning materials and infrastructure. One strategy would be the creation of an online-learning portal that prioritize online and mobile content and facilitate collaboration and support for the creation of that content as well as for student mobility between institutions and sectors in accessing the content.

[116] See http://www.hc-sc.gc.ca/ahc-asc/media/ftr-ati/_2010/2010_142-eng.php.

[117] Exposure to wireless signals is becoming an increasingly contentious issue, and the Ontario English Catholic Teachers Association took a formal stand against Wi-Fi in schools in February 2012.OECT Health and Safety Committee, "A position regarding the use of Non-Ionizing Electromagnetic Radiation, including WiFi, in the workplace " (2012).

- Support faculty in mobile curriculum development, undertake research into mobile pedagogy and its impacts, develop an international marketing mechanism.
- Integrate mobile technologies and learning support into experiential learning opportunities and mentorship.
- Adopt mobile platforms for student-facing operations such as fee payment and for internal operations to create productivity gains.
- Commission Higher Education Quality Council of Ontario (HEQCO) to undertake a rigorous, longitudinal Ontario-wide study regarding the effects of m-learning on student retention, including the retention of students in rural, Northern and Aboriginal communities.
- Continue to build m-learning environments and study the impact on space use and student productivity.

### 2.5.4 Private Sector

The adoption of m-learning is a core element in productivity enhancement for Ontario companies, allowing them to ensure that their labour force is competitive in a rapidly changing global context. In Ontario, the beginnings of an m-learning industry are starting to appear.

The following actions would accelerate the adoption of m-learning:

- Through an aggregate approach of industry associations, create an opportunity for Ontario firms to develop methods of converting e-learning materials into content that will run well on mobile devices.
- Higher education textbook publishers should develop mobile electronic versions of their major textbooks—which could include interactive simulations, instance evaluative feedback and online activities.
- At the industry level, service providers and the mobile industry could join with universities and colleges to provide funding for special programs to produce mobile materials at the post-secondary level.
- Offer a major prize for innovations, or one or more prizes or fellowships for innovative projects in m-learning.

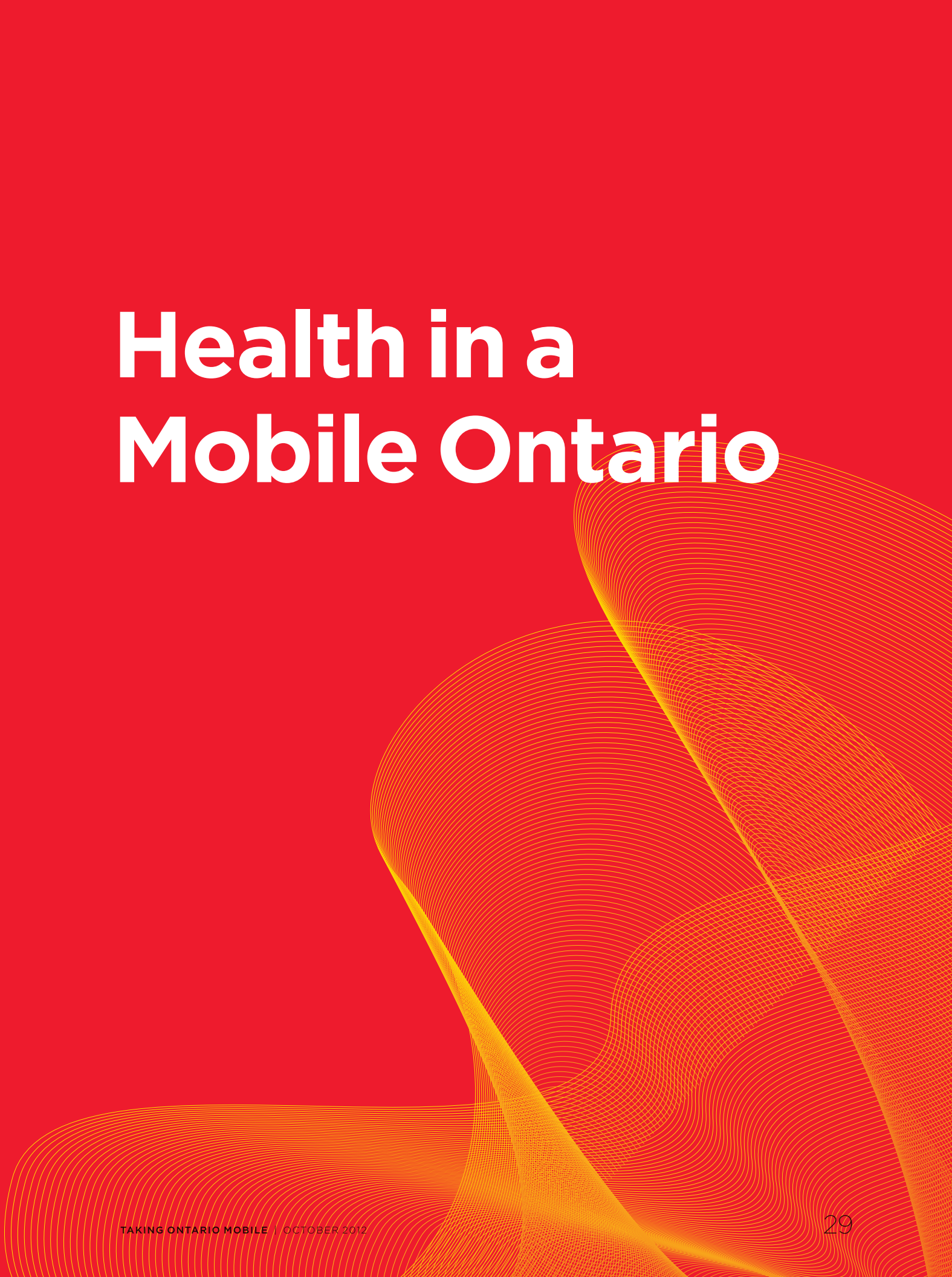
### 2.5.5 Government

The Government of Ontario establishes policy and funding priorities that can help to drive m-learning adoption:

- The government could respond to PSE m-learning initiatives by further supporting e-learning and m-learning through strategic mandate agreements that include e-learning and m-learning. This approach would provide support for internships and place-based learning.
- The Ontario government can encourage the adoption of m-learning through its procurement of

- m-learning applications for its own retraining purposes, hence encouraging competition and the production of new innovative products by Ontario vendors of learning materials.
- ★ The Ministry of Training, Colleges and Universities could create an experimental fund for m-learning, one that would support programs to pilot curricula focused on new learning approaches and learning outcomes.
- ★ The province could divert a portion of its planned investment in physical infrastructure to virtual infrastructure. It could broker public-private partnerships to support mobile learning infrastructure.

# Health in a Mobile Ontario



## Challenges

Healthcare in Ontario accounts for almost 42 per cent of the provincial budget, and this amount is expected to increase as the population continues to age. [118] There is a need to curb healthcare costs without compromising service.

- Health funding needs to move from acute care to chronic and community care.
- Healthcare spending ultimately needs to focus on prevention. A dollar spent on prevention is amortized many times over an individual's lifetime.
- The education of health professionals does not prepare them for a technology-enabled world.
- Regulatory policies and best-practice guidelines are needed to inspire confidence in and promote the use of mobile applications within the public health system.
- Protocols are needed for accessing and sharing informal health data as well as for integrating it into health data such as medical records, requiring systems design and a clear policy regarding data security and privacy.
- There are currently 17,000 health-related apps on the major app stores, with 74 per cent adhering to paid business models. [119] As more Ontario residents make use of these applications, a payment model is needed when care involves a doctor.
- There are a series of significant data-related concerns with the fast-developing mobile health market. For example, Ontario residents are generating and will generate significant amounts of personal data already available wireless devices. Where is this data going? Who is managing it? Who owns it? Who controls it?
- The Ontario mobile health industry cannot compete easily because other jurisdictions around the world provide specific industry incentives to encourage the development of mobile health applications; these include Business Link in the UK [120] and incentive changes across the United States that have resulted from the US Health Reform Act. [121]
- Despite Canada's industry leadership in the development of new medical devices and applications, the slow and tedious process of adopting these devices into health institutions has severely limited the potential these technologies offer the Canadian economy[122] and Ontario residents.
- The potential of mobile health applications will only be realized when the healthcare system (including government policymakers) engages the new technology and begins to apply it to their own objectives.

[118] Martin Regg Cohn, "Ontario review calls for deep cuts; Balanced books impossible without austerity, adviser's long-awaited report warns," *Toronto Star* 2012.

We make the argument in this section that mobile health (m-health):

- Is patient-centric, providing new opportunities for self-management of health.
- Provides enhanced access, productivity, inclusion and job creation.
- Affects all areas of care, including preventative care, chronic care, remote care, acute care and community care.
- Keeps patients out of hospital and in appropriate care settings.
- Integrates electronic records and effective billing methods at each point of service.
- Allocates resources to those with appropriate skills in real time.
- Uses information technology for system coordination, access to records and data gathering, leading to accountability.
- Facilitates easy information access through multiple sources, including the use of mobile telephones.
- Blends base funding and payment by activity, for example micropayments through m-commerce adoption. [123]
- Makes medical care and information convenient and accessible for the physician and/or the patient, thus allowing immediate clinical management decisions to be made more quickly.
- Enables the monitoring of chronic conditions outside of the clinical environment.
- Assists in collecting community and clinical health data, and delivering healthcare information to practitioners, researchers and patients.
- Allows the monitoring of remote patients' vital signs in real time.
- Directly provides care (via mobile telemedicine). [124]
- Allows healthcare professionals to engage in lifelong learning.
- Increases access to healthcare and health-related information (with special value for hard-to-reach populations). [125]

[119] research2guidance, "Mobile Health Market Report 2010-2015," (research2guidance, 2010).

[120] Business Link, "Tax advantages for those starting up in business," Crown, http://www.businesslink.gov.uk/bdotg/action/staticpage?page=Copyright&r.i=1073791420&r.l1=1073858808&r.l2=1086692188&r.l3=1073948907&r.s=f&r.t=RESOURCES.

[121] The Commonwealth Fund, "The New Wave of Innovation: How the Health Care System Is Reforming," *Columbia Journalism Review*, no. Supplement to the Nov/Dec 2011 issue of the Columbia Journalism Review (2011).

[122] Anne Snowdon, Jeremy Shell, and K. Kellie Leitch, "Innovation Takes Leadership: Opportunities & Challenges for Canada's Health Care System," in *The Ivey Centre for Health Innovation and Leadership* (Ontario: The Ivey Centre for Health Innovation and Leadership, 2010).

[123] Drummond, "Commission on the Reform of Ontario's Public Services Public Services for Ontarians: A Path to Sustainability and Excellence."13–15.

[124] Germanakos, Mourlas, and Samaras, "A Mobile Agent Approach for Ubiquitous and Personalized eHealth Information Systems."

M-health refers to the use of mobile information and communications technology (ICT)—most commonly, mobile communication devices, such as mobile phones and personal digital assistants (PDAs)—across wired and wireless networks to provide health services and information to medical and public-health workers as well as patients and healthy residents of Ontario. M-health further refers to wireless devices such as glucometers, cardiograms and blood-pressure cuffs, which transmit information wirelessly. M-health takes advantage of the 24/7 connectivity, intensive personalization, communication and social media qualities, and context and location awareness of mobility. The ubiquity of mobile devices in both the developed and developing world presents the opportunity to improve health outcomes by delivering innovative medical and health services to the farthest reaches of the globe using ICT. [126]

There has been a significant shift in the way that Ontario residents perceive their relationships to healthcare, and mobility plays into this change. In our review of existing literature—not only articles from published, peer-reviewed articles but also a variety of insights from interviews, round-tables, analogue and digital literature, blogs, tweets, vlogs and SlideShare presentations—we found a consensus forming around the idea that the use of mobile technology to perform easy, secure transfers of data, provide health information and facilitate business and government interactions will create a healthcare economy that is fundamentally mobile-based. Eric Holman sums up this cultural shift toward mobile health as being driven by three key factors:

- First, the proliferation of smartphones (iPhone, Blackberry) and the media attention paid to them has brought the concept of a cell phone as a personal computer into the mainstream.
- Second, the number of people becoming more familiar with data functions (primarily text messaging) on their personal mobile devices is increasing. According to the International Association for the Wireless Telecommunications Industry, CTIA, wireless-data non-voice revenue accounted for 20 per cent of all US wireless-service revenues during the first half of 2008, up from 10 per cent just two years ago. [127]
- The third factor affecting public perception is commercial uptake of mobile marketing, which

[125] The developing world has identified the following strengths of m-health, which resonate with challenges in the developed world: improving physicians' ability to diagnose and track diseases; providing timelier, more actionable public-health information; involving patients in care; and expanding access to ongoing medical education and training for health workers. See Vital Wave Consulting, "mHealth for Development. The opportunity of Mobile Technology for Healthcare in the Developing World." http://www.unfoundation.org/what-we-do/legacy-of-impact/technology/mhealth-for-development.html.

[126] mHealth Alliance, "Mobilizing Innovation for Global Health: Frequently Asked Questions", http://www.mhealthalliance.org/about/frequently-asked-questions.

[127] Dylan McGrath, "CTIA: U.S. wireless data revenue up 40% year-to-year," (2008), http://www.eetimes.com/electronics-news/4078881/CTIA-U-S-wireless-data-revenue-up-40-year-to-year.

has encouraged messaging innovation in addition to acclimating users to third-party communications. [128]

The adoption of m-health requires the integration of human factors as well as technology factors. Technological capacity is not a sufficient motivation for the adoption of m-health; however, where mobile technology improves patient care or enables physicians to optimize their ability to provide care, the case for m-health is much more compelling. While evidence is mounting in favour of m-health, there is room for ongoing study to determine the most effective uses of mobile technology in healthcare as well as understand areas where m-health may not be as effective as other approaches. As suggested by Alastair van Heerden, Mark Tomlinson and Leslie Swartz, the field of m-health would benefit from "a synchronized, strategic global research agenda that is focused more heavily on evaluating the evidence for, and the impact and cost-effectiveness of, m-health services." [129] These researchers suggest seven steps [130] to fulfil an m-health research agenda, and these steps may provide guidance to the province to effectively plan for the move to m-health services.

## 3.1 Efficiencies within the Healthcare System

In "Therapy or Surgery?" a 2011 lecture given at the C. D. Howe Institute, Don Drummond identified the measures needed to attack the spiralling costs of healthcare while sustaining an excellent system. These are:

- A shift in focus from acute care to chronic care and prevention.
- A greater emphasis on health promotion.
- System reorganization to make the system more patient-centric and more responsive to growing chronic care needs.
- Payment methods to hospitals and physicians that incent quality care, efficiency and greater use of information. [131]

[128] Eric Holmen, "TXTING4HEALTH: The Role of the Mobile Channel in the Health Care Industry and in the Sphere of Public Health," *Social Marketing Quarterly* 15(2009).

[129] Alastair van Heerden, Mark Tomlinson, and Leslie Swartz, "Point of care in your pocket: a research agenda for the field of m-health," *Bulletin of the World Health Organization* 90, no. 5 (2012).

[130] These are: 1) development of an evidence base; 2) interoperability with existing e-health systems; 3) adoption of standards already present in e-health; 4) participatory approach; 5) promotion of equity in health; 6) a plan for sustainability; and 7) a focus on health, not on the technology.

[131] Don Drummond, "Therapy or Surgery?A Prescription for Canada'sHealth System," (Toronto: C.D.Howe Institute, 2011).

For practitioners, m-health provides a practical, real-time mechanism with which to keep and share records, record medications and make decisions about the course of care. These activities can occur between providers, between providers and systems (in instances involving record management or prescriptions) and between providers and patients. The following sections discuss the means for mobility to impact transformation within the healthcare system.

### 3.1.1 Enabling Individual Responsibility for Wellbeing

M-health management is not only a demand push (by providers suggesting its use) but a demand pull by consumers/patients (this pull market is already underway). When healthcare goes mobile, distance and location can fade into the background and individuals can become empowered directors of their healthcare. [132] Our survey of Ontario residents indicated that 78 per cent of respondents would like more services available via mobile devices, and 84 per cent of respondents believe that access to mobile technologies and services will be very important to them in the next five years.

The informal use of m-health applications is readily apparent from a review of commercial apps, for example apps to help individuals to lose weight.

Self-care aligns well with the increased use of mobile technology for self-monitoring and significant savings. [135] For example, researchers estimate that if five factors related to heart disease are reduced to targeted levels, the incidence of ischaemic heart disease (reduced blood supply to the heart) in Canada would decrease by 452,000 cases by 2020, resulting in a cost savings of $76.4 billion by 2020, and an additional $10 billion annually. [136]

Healthcare is the Ontario government's single biggest spending program. In 2010–11, the province spent $44.8 billion on health—40.3 per cent of its total spending on programs. In 2010–11, operation of hospitals accounted for about 35 per cent of provincial healthcare spending, and doctors and practitioners, about 27 per cent; almost eight per cent each went to prescription drugs and long-term care, and another six per cent to community care. The remaining 17 per cent financed everything else.

The transformation of the Ontario healthcare system has been systematically addressed in *Public Service for Ontarians*. The thrust of the recommendations is that "Reform must shift the system from one built mainly for acute care to one built mainly for chronic care. Quality of care and efficiency are essential. Better care delivered smoothly and briskly will benefit patients and providers alike; it will also save money. Quality and efficiency go hand in hand." [133] Moving to chronic care and education is of critical importance: "Today, the key health issues are increasingly shifting [from acute] to chronic care questions, in good part because the population is aging, but also because some lifestyle problems such as obesity are creating particular health conditions." [134] The report links well-being and health to factors outside of the healthcare system, such as levels of education and income. *Public Service for Ontarians* continues by stating that "The ideal health system would emphasize the prevention of poor health. It would be patient-centric and would feature co-ordination along the complete continuum of care that a patient might need. Primary care would be the main point of contact, but there would be much less emphasis on treating patients in hospitals." [134] Mobility will facilitate these goals.

Devices that routinely help to collect and/or send information may encourage patients to take "ownership" of their health, and could promote early interventions that reduce the need for costly critical-care approaches. Mobile technology such as SMS have been shown to be effective in promoting behaviour change in patients, resulting in increased adherence to treatment and decisions to seek medical care. [137] Healthcare practitioners in Ontario are among those helping to deploy mobility to better support patient empowerment through research experiments. Dr. John Semple, for example, is investigating mobile technology as a way to monitor patients in the 30 days after surgery, thus preventing hospital readmission. In this pilot study at Women's College Hospital, patients are provided with a smartphone and are asked to take pictures of their incision and send these to the surgeon at regular intervals. The patients may also send information about pain levels or other symptoms if they have concerns about their healing processes. The surgeon is able to review and assess the images, and to make decisions about appropriate care. In fact, while on a research trip in Nepal, Dr. Semple was able to use this mobile system to diagnose and put at ease one patient in Toronto. [138]

Hospitalizations in Canada for diabetes per 100,000 people are above the Organisation for Economic Co-operation and Development (OECD) average [139] and "only 32 percent of diabetics reported receiving all four recommended tests in 2007." [140] Diabetes care is a field that has seen successful experiments using m-health in care for teenagers, [141] marginalized communities and older diabetes

[132] Carleen Hawn, "Take Two Aspirin And Tweet Me In The Morning: How Twitter, Facebook, And Other Social Media Are Reshaping Health Care," *Health Affairs* 28, no. 2 (2009): 361–68.

[133] Drummond, "Therapy or Surgery? A Prescription for Canada'sHealth System." Toronto: C.D.Howe Institute, 2011.

[134] Drummond, "Commission on the Reform of Ontario's Public Services Public Services for Ontarians: A Path to Sustainability and Excellence."12–13.

[135] This theme runs through Don Drummond's recommendations in both the "Therapy or Surgery?" lecture and the *Public Service for Ontarians* report.; another example is ;Jeni Williams, "the value of mobile apps in health care," *hfm (Healthcare Financial Management)* 66, no. 6 (2012).

[136] Sabrina Browarski, Carole Stonebridge, and Louis Theriault, "The Canadian Heart Health Strategy: Risk Factors and Future Cost Implications," (Ottawa: Conference Board of Canada, 2010).

[137] Harsha Thirumurthy and Richard T Lester, "M-health for health behaviour change in resource-limited settings: applications to HIV care and beyond," *Bulletin of the World Health Organization* 90, no. 5 (2012).

[138] Lisa Priest, "Wirelessly enabling the long-distance house call," *Globe and Mail*, Jan 20.2012.

[139] Diabetes Québec., Canadian Electronic Library (Firm), and Canadian Diabetes Association., Diabetes Canada at the tipping point : charting a new path, (Toronto, Ont.: Canadian Diabetes Association : Diabetes Québec,, 2011), http://www.diabetes.ca/documents/get-involved/WEB_Eng.CDA_Report_.pdf.

[140] Drummond, "Therapy or Surgery?A Prescription for Canada'sHealth System." 5.

[141] Marshal McLuhan and Quentin Fiore, *The Medium is the Message: an inventory of effects* (New York: Bantam, 1967).

sufferers. [142] Mobile technology can do everything from measuring patients' blood-sugar levels and encouraging them to administer insulin in a timely way to checking that they have undertaken testing and encouraging appropriate eating and exercise.

As m-health apps are taken up, an increasing volume of patient data is produced outside the formal healthcare environment. Ontario residents are generating and will generate significant amounts of personal data (such as blood-pressure rates and heart rates) from a wireless device. For example, Digital Cardio Scans, wireless fetal monitors and digital wound care are but a few of the myriad wireless solutions already on the market and accessible to anyone.[146] ABI Research estimates that 15 million wireless m-health devices and sensors will be in place by end of 2012. A means to integrate this with formal data will ensure the ongoing relevance of the public system. Similarly, crowdsourcing, the process wherein individuals equipped with mobile devices contribute to solving a problem or creating a body of knowledge (such

Bant, [148] an iPhone application developed at the Centre for eHealth Innovations at the University of Toronto, helps adolescents monitor trends in their blood-sugar levels in real time, and rewards them for self-monitoring with iTunes redemption codes.[143] Another remote patient monitoring (RPM) application[149] developed by the same laboratory uses a Bluetooth-enabled blood-pressure monitor to send actionable updates to the user as well as critical reports to his or her physician. In a one-year trial, 50 per cent of participants with diabetes were able to keep their blood pressure under good control, compared to 29 per cent of the control-group participants. [144]

In Brazil,[150] Virtual Health Pet builds on the popular Tamagotchi virtual-pet concept. It monitors patients' health and reminds them to take medications, and also provides information from patients' medical teams. The Virtual Health Pet application runs on the patient's mobile phone and is linked wirelessly to the electronic health records system. A failure to respond to messages from one's pet causes messages to be sent to caregivers or emergency services. [145]

[142] Examples of diabetes-related applications include: Gregg Laskoski, "Ford Innovations Help Diabetic Drivers," Clarity Digital Group LLC, http://www.examiner.com/diabetes-in-tampa-bay/ford-innovations-help-diabetic-drivers.; Tom Cafazzo, "mHealth Remote Patient Monitoring Improves Hypertension in Diabetes: A 1-year Randomized Controlled Trial" (paper presented at the American Telemedicne Association - ATA, 2011).; A. Joseph Cafazzo et al., "Design of an mHealth App for the Self-management of Adolescent Type 1 Diabetes: A Pilot Study," *J Med Internet Res* 14, no. 3 (2012).

[143] University Health Network and The Hospital for Sick Children, "Simplify your Diabetes with Bant," University Health Network and The Hospital for Sick Children, http://www.bantapp.com/.

[144] Cafazzo, "mHealth Remote Patient Monitoring Improves Hypertension in Diabetes: A 1-year Randomized Controlled Trial."

[145] As described in Rannu, Saksing, and Mahlakoiv, "Mobile Government: 2010 and Beyond. White paper."

[146] Ford is developing m-health apps to monitor people in their cars. See Neil Versel, "Ford Shows 'Car That Cares' At CES," UBM TechWeb, http://www.informationweek.com/news/healthcare/mobile-wireless/232500114.

as Wikipedia) may be a complementary tool for tracking epidemics and efficiently learning about regional health trends or issues, and has the added benefit of "engaging the public as participants in the public health system." [147]

### 3.1.2 The Shift to Chronic and Community Care

Using wireless technology, Re-ACT© connects seniors living with chronic disease(s) to a registered nurse (RN) who monitors their vital signs remotely and encourages medication compliance, while providing assessment of vital signs (blood pressure, pulse, blood glucose, weight and blood oxygen), information about managing their chronic condition and adjustments to their care plan.

A goal of the Re-ACT program is to help individuals develop skills for healthy living and managing their chronic condition. The program emphasizes the individual and family's role in their health care and encourages them to be an integral member of their health care team. It also engages them in decision making, goal setting, care planning and provides access to education programs and health information.

The project goals were to alleviate emergency room (ER) visits, prevent hospitalizations and prevent alternate level of care (ALC) beds. Participants in the project had primary and secondary chronic disease diagnoses. After setting targets for levels such as heart rate and blood-glucose levels with the individual's doctor, "a user-friendly, wireless monitoring device is installed at the client's home and the client is trained to use it. Measurements of blood pressure, pulse, blood glucose, weight and oxygen level occur once daily from Monday to Friday" [152] (or as needed as indicated by results).

After following 250 participants for a period of two years (before and after joining), the Re-ACT program has had many successes. Not only did the program meet its goals, but the estimated cost savings for just the 250 participants in 2008–10 was more than $1 million, and more than $600,000 once cost of the program was accounted for. Furthermore, the participants and their families reported improved quality of life. This program enables one e-health RN to care for more than 100 patients and reduces doctor care time. In its 2011 pre-budget submission, the Registered Nurses Association of Ontario noted that Ontario had a shortage of nurses, with a ratio of one nurse to every 141 patients.

[147] Clark C. Freifeld et al., "Participatory Epidemiology: Use of Mobile Phones for Community-Based Health Reporting," *PLoS Medicine* 7, no. 12 (2010).

[148] University Health Network and The Hospital for Sick Children, "Simplify your Diabetes with Bant".

[149] Cafazzo, "mHealth Remote Patient Monitoring Improves Hypertension in Diabetes: A 1-year Randomized Controlled Trial."

[150] As described in Rannu, Saksing, and Mahlakoiv, "Mobile Government: 2010 and Beyond. White paper."

Mobility is particularly suited to chronic care, in that it:

- Provides mechanisms for ongoing monitoring of patients.
- Provides the capacity to communicate alerts to patients, caregivers and health practitioners as needed.
- Enables more individuals to move out from acute/on-site care facilities.
- Creates productivity gains, as practitioners in chronic-care settings are able to care for more patients.

M-health also facilitates a distribution of labour within an integrated system in which "nurses, nurse practitioners, personal support workers and other staff members can apply their full range of skills."[151] Expertise can be available as a remote resource that healthcare workers can access as needed.

The ability of m-health technologies to enable better patient care, increased healthcare-provider productivity and cost savings has been shown in the Remote Access to Care (Re-ACT) project [153] carried out by the North Simcoe Muskoka Local Health Integration Network (NSM LHIN) and funded by the Ministry of Health and Long-Term Care (described in the box above). The Re-ACT program resulted in dramatically fewer falls, ER visits and hospital admissions, with

North York General Hospital in Toronto has implemented a mobile system for patient care—eCare—and "92 per cent of physician orders are now entered via a computerized provider order entry (CPOE) through mobile devices."[155] The eCare wireless system enables caregivers using mobile devices to scan bar codes on patient wristbands and on prepared medications before administering the medication, and "this solution has helped catch and rectify more than 1,300 instances in which patients could have been given the wrong medication during the 1st year after go-live. Just as important, the initiative empowers the hospital to audit, track and quantify when and where errors are occurring. NYGH has also unlocked important new efficiencies by leveraging the use of mobile devices [to implement other plan of care orders such as swallowing assessment after stroke] resulting in improvements in patient safety and quality of care." [156]
161 162 163

[151] Commission on the Reform of Ontario's Public Services, "Public Services for Ontarians: A Path to Sustainability and Excellence."

[152] Services We Care Home Health, "The Re-Act Program. Remote Acess to Care Technology," We Care Home Health Services, http://www.wecare.ca/pdf/WhitePaperSinglesWEB.pdf.

[153] Re-ACT is an initiative of the Ministry of Health and Long Term Care carried out by the NSM LHIN and supported by a partnership with NSM Community Care Access Centre and We Care Home Health Services.

[154] We Care Home Health, "The Re-Act Program. Remote Acess to Care Technology".

[155] Ibid.2–3.

[156] Ibid., 2.

savings, on average, of almost $2,900 per person over a 15-month span. Assuming that similar results could be achieved for the roughly 80 per cent of Ontario's 1.8 million seniors who live with chronic disease, the potential savings could be in excess of $3 billion annually. [154]

The North East Local Health Integration Network (NE LHIN) has shown that great savings can be achieved by helping seniors stay at home longer. In the NE LHIN HOME FIRST program, 424 seniors were provided with community care rather than hospital care. One week of hospital care for 424 seniors would cost $2.5 million vs. $125, 000 for home care. [157]

M-health includes the adoption of basic SMS mobility functionality. Finland has proven that text messaging can provide a tool for making health inquiries, scheduling appointments, contacting patients on waiting lists and sending appointment reminders: "The use of electronic services in Finland has grown by as much as 95% in some areas in the past year. Experience shows that e-services free up 30–50% of the time healthcare professionals spend on booking appointments with patients."[158]

The integration of mobility into e-health can assist in the creation of "clerical system navigators" who coordinate appointments and help patients with forms and paperwork; this role has been developed in some parts of Ontario, but should be used across the entire system. "Quarterbacks" can help family health teams (FHTs) and specialized clinics track patients as they move through the integrated health system. [159]

[157] In its 2011 pre-budget submission, the Registered Nurses Association of Ontario noted that Ontario had a shortage of nurses, with a ratio of one nurse to every 141 patients. Re-ACT is an important example of how mobile healthcare can enable reduced nursing staff to care effectively for more patients. David McNeil, "RNAO (Registered Nurses' Assoication of Ontario) 2011 Pre-Budget Submission: Invest for a Sustainable Recovery Speaking Notes to the Standing Committee on Finance and Economic Affairs," ed. Finance Standing Committee on and Affairs Economic (2011). Details on Re-ACT are available at North East LHIN."HOME First Shifts care of Seniors to HOME." *LHINfo Minute, Northeastern Ontario Health Care Update* (2011), http://www.nelhin.on.ca/WorkArea/showcontent.aspx?id=11258.

[158] Rannu, Saksing, and Mahlakoiv, "Mobile Government: 2010 and Beyond. White paper."

[159] Drummond, "Commission on the Reform of Ontario's Public Services Public Services for Ontarians: A Path to Sustainability and Excellence."18.

[160] Ibid., 21.

[161] From http://www.nygh.on.ca/Default.aspx?cid=1102&lang=1.

[162] Mark Hagland, "Embedding Evidence into Physician Ordering ", *Healthcare Informatics*(2012), http://www.healthcare-informatics.com/article/embedding-evidence-physician-ordering.

[163] Motorola Solutions, "Case Study: North York General Hospital" (USA: 2012).

### 3.1.3 Electronic/Mobile Records

The recent Public Service for Ontarians report suggests that the province should "Accelerate the adoption of electronic records, working from the bottom up. Begin with doctors, clinics and hospitals and ensure that they use compatible systems. Then build bridges within a region, then across regions." [160]

Mobile delivery of records and aggregation of patients' self-care and self-monitoring data will be of great importance in the effort to provide quality care and avoid duplication of services or errors in prescription. The movement to electronic health records (EHRs) and electronic medical records (EMRs) in Ontario is an important part of this initiative. Electronic health records (EHRs) and electronic medical records (EMRs) combined with wireless self-care devices enable a complete circle of care without increased resources. The NYGH model should be adopted across the healthcare system.

An ongoing challenge as m-health and e-health continue to expand is the security of patient data. In Ontario, the Personal Health Information Protection Act (PHIPA) sets guidelines for protection of patient data. In 2010, the Information Privacy Commissioner (IPC) issued two guidelines related to information on mobile devices and launched an awareness campaign within the health sector outlining "the need to protect personal health information stored on mobile devices against theft or loss, and unauthorized use or disclosure;" [164] any m-health activity in Ontario must adhere to these practices. In an overview of health-data security systems, it was noted by researchers that "many of the existing data security techniques are not yet robust enough to prevent detection and removal of embedded data." [165] The researchers examine ways to protect the integrity of health data and patient confidentiality. M-health is disruptive and may affect how we define good healthcare. [166] The balance between health-information security and the cultural shift toward mobile services will require ongoing collaboration between the IPC, the m-health industry and practitioners. We see urgency in the creation of a sector/government and industry taskforce to reconcile privacy legislation with the needs of residents and the reconfiguration of the healthcare system.

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[164] Information and Privacy Commisioner of Ontario, "Personal Health Information and Protection Act (PHIPA) Report," in *Information and Privacy Commisioner of Ontario 2010 Annual Report* (Toronto2010).

[165] Ademola O. Adesina et al., "Ensuring the security and privacy of information in mobile health-care communication systems," *South African Journal of Science* 107, no. 9/10 (2011)., http://www.sajs.co.za/index.php/SAJS/rt/printerFriendly/508/781.

[166] "Using social media in health care is about changing the locus of control to the patient and altering the relationships between care givers and care receivers. In this view, patient portals, EHR platforms, blogs, video chat, and 'tweets' won't merely substitute for many one-on-one encounters with providers, but will also allow for richer engagement and deeper doctor-patient relationships." Hawn, "Take Two Aspirin And Tweet Me In The Morning: How Twitter, Facebook, And Other Social Media Are Reshaping Health Care.": 361–68.

## 3.2 Mobility and the Ontario Healthcare Industry

Mobile applications provide significant support for upgrading skills, and there are some 17,000 m-health applications in existence. [167] A very significant number of them target professionals, allowing those working in the healthcare sector to upgrade their learning. Medical education programs targeting physicians and nurses make up 14 per cent of all healthcare-related applications in the Apple App Store.

Ontario is home to a growing m-health industry. Some applications are the result of the successful commercialization of research. Commercialization can be intensified through research coordination between research hospitals and with industry. Canada's third-largest Internet service provider (ISP), TELUS, has made e-health and m-health their future industry focus with their rollout of TELUS Health. [168] Through devising partial but important solutions that can help to shift the burden from acute care to prevention, industry can create efficiencies and improve the quality of healthcare.

The m-health industry has traditionally needed to look outside the borders of Ontario and Canada in order to thrive. The ability of the industry to serve Ontario healthcare is heavily reliant on government policy yet this policy is most effective if co-developed.

## 3.3 M-health Action Plan

M-health as a service and as an industry may be stimulated through specific actions on the part of stakeholders. These solutions may be part of a broader action plan to support the infrastructure for and the privacy of mobile activity. Removing the barriers to mobile healthcare will enable greater efficiency in the healthcare system and facilitate increased productivity by residents, who will benefit from the access to remote healthcare and the improved ability to self-manage chronic conditions. An m-health solution must include strategies for interoperability, a clear regulatory framework for privacy and security and a focus on preventative and remote care. Initiatives to enable remote care may also require new payment models and definitions of fees and services in order to encourage practitioners to adopt remote and mobile care solutions.

### 3.3.1 Private Sector

The private health care industry and public health care providers could take the lead in setting the stage for widespread m-health success:

[167] research2guidance, "Mobile Health Market Report 2010-2015."

[168] http://telushealth.com/en/default.aspx

- ★ Support a self-regulating industry model by adopting interoperability standards to ensure that wireless and other medical devices (such as those provided by the Continua Health Alliance, a non-profit open-industry organization of health and technology companies) have the ability to communicate in a common "language," regardless of the manufacturer, enabling better integration of mobile services and devices by consumers and healthcare providers.
- ★ To be successful, industry and government need to work together to facilitate the commercialization and widespread adoption of innovations, and to establish regulatory policies and best-practice guidelines that will inspire confidence in and promote the use of mobile applications within the public health system. These policies will have the secondary effect of stimulating the industry and supporting job retention and creation in this sector.
- ★ Lead with best practices by rolling out mobile solutions that can help seniors stay independent longer, such as personal emergency response systems (PERS), motion sensors, activity-detection devices, video cameras, vital-signs detectors, pill-compliance devices and iShoe. [169] Educating seniors about how mobile devices can assist with independence is an important solution to facilitating mobile health in this group.
- ★ Develop partnerships with healthcare institutions, such as the 2011 Information Technology Association of Canada Award–winning partnership between Ontario Shores Centre for Mental Health Services and HealthTech consultants, which saw the implementation of Meditech 6.0, a complete electronic health-record system that utilizes mobile devices such as tablets, laptops and mobile-equipped medication carts for point-of-care documentation and treatment. [170]

### 3.3.2 Academia and the Healthcare Sector

Ontario post-secondary institutions and hospital-research institutions—either working alone or in consort with industrial partners—are at the core of innovations related to m-health. The research environment suffers from fragmentation, with the result that successful pilots are not easily generalized. To accelerate capacity-building in Ontario post-secondary institutions and research hospitals, the government can:

- ★ Foster the development of a culture that looks to the commercialization of research and innovation.
- ★ Coordinate m-health research to allow more effective investment by industry and to facilitate outcomes that can be generalized.
- ★ Develop collaborative relationships with industry that enable intellectual property develop-

[169] Paul Sonnier, "Elderley Monitoring with Wireless Sensor Networks," https://www.wirelesshealthstrategies.com/targets.html.

[170] Ontario Shores, "Ontario Shores Advances Technology to Enhance Patient Safety," Ontario Shores Centre for Mental Health, See http://www.ontarioshores.ca/cms/One.aspx?portalId=169&pageId=9604.

ment by industrial partners.
- ★ Include education about the use of mobile technologies and the challenges of data collection and management in doctor and nursing education.

### 3.3.3 Government

As the provider of healthcare for Ontario, the government has the ability to foster m-health solution development and encourage uptake in the province. To achieve this, the government can:

- ★ Modify incentive models through the Ontario Health Insurance Plan (OHIP) to reward m-health solutions that promote prevention and community care over acute care.
- ★ Facilitate the adoption of interoperability standards by industry and, as a condition of funding, require that public-health providers and hospitals include these interoperability standards in any procurement policy for healthcare technology.
- ★ Provide services through mobile platforms that are eligible for OHIP coverage. A payment scheme that makes use of micropayments is needed. There may be cost savings if patients can use a mobile application rather than visiting their doctor in person, so the government could develop payment models like the MiHealth [171] system developed in North Bay, Ontario, that enables physicians to receive payment for services that utilize mobile systems (e. g. , test results, personal health-record validation, updating).
- ★ Follow many other jurisdictions around the world by providing specific industry incentives to encourage the development of m-health applications; examples include Business Link in the UK[172] and incentive changes across the United States that have resulted from the US Health Reform Act. [173] Government can incentivize private-sector/public-health collaboration through funding allocations that favour institutions that innovate.
- ★ Work with stakeholders to develop a regulatory process for m-health applications that provides safeguards but does not stifle innovation or commercialization, and continue to develop appropriate privacy legislation and consumer-protection revisions that take into account the adoption of m-health solutions such as self-care and monitoring by Ontario residents. Protocols for accessing and sharing individual user's data as well as for integrating it into health data such as medical records require systems design and a clear policy regarding data security and

[171] Currently, patients must negotiate a fee with physicians for validation of their Personal Medical Record that occurs more frequently than once a year (e.g., for medication changes). See Ontario Ministry of Economic Development and Innovation, "A North Bay Success Story: Mihealth Mihealth Puts Your Medical Info In Your Pocket," Queen's Printer for Ontario, http://www.mri.gov.on.ca/english/ontario_innovates/mihealth.asp.

[172] Business Link, "Tax advantages for those starting up in business".

[173] The Commonwealth Fund, "The New Wave of Innovation: How the Health Care System Is Reforming."

privacy.

★ Help hospitals and other public-health providers to develop a procurement policy that supports m-health solutions, especially those related to prevention and service for Ontarians in remote locations.

★ Support experiments such as mobile apps that provide real-time updates of ERs' expected wait times, which would allow non-emergency patients to self-distribute to the locations with the shortest wait times, with the result that wait times would equalize across ERs, leading to a more efficient use of healthcare resources. Such an app would enable an even greater equalization of healthcare resources and time savings for patients if it included after-hours clinics, urgent-care clinics and medical laboratories that carry out routine tests. [174]

[174] The Ministry of Health and Long-Term Care publishes monthly average wait times in each hospital's ER. At any given moment, however, relative wait times across ERs may vary from those that are posted, as natural variation in patient loads leaves some ERs overburdened while others nearby may be working at less than capacity.


4

# Government in a Mobile Ontario

## Challenges

- Ensuring connectivity for residents who live in remote areas or cannot afford access. Connectivity is the cornerstone of a digital society, and it is unlikely that market dynamics alone will provide motivation to correct the gap in access between urban, rural and remote areas in Ontario.
- Good government is concerned with delivery of services to residents at a good value. Productivity and efficiency is a constant concern for departments wanting to maintain or expand services while keeping costs down.
- Citizen engagement and responding to citizens in a timely, receptive manner.
- Security and privacy of personal, health and financial information and determining broader access to this information, and how that access is managed.
- Categories of residents such as the elderly may not be comfortable or able to adjust to mobile services.
- Electronic services are vulnerable to power and service failures.
- Provision of inclusive and accessible services that give access to residents regardless of their abilities, as defined by the Access to Ontarians with Disabilities Act (AODA).
- Uncertainty, which requires the capacity to think in the present and the future at the same time—for example, by joining with national and international efforts to adopt scalable infrastructure and technology standards for long-term evolution (LTE).
- The transition to mobile government requires a significant upfront investment.

We make the argument in this section that mobile government (m-government):

- Provides efficient means to make inclusive services available to citizens.
- Opens up new possibilities for use of data-rich government resources.
- Will enable productivity gains while enhancing service offerings.

## 4.1 What Is M-Government?

M-government brings mobility—the integration of individuals, networks, institutions and devices—to the provision of government services, processes and public-sector activities, allowing individuals and systems to interact efficiently with government, and for government to provide first-rate, timely services. [175] M-government applications can be seen as tools for streamlining administration and the flow of information at all levels of government. [176]

We make the argument in this section that mobility brings a number of advantages to government:

- Provides many cost-saving opportunities for government as well as for the citizen (e. g. , automatic data gathering, using SMS).
- Closely aligns efficiency and improved service with cost savings through the reorganization of work process using m-government.
- Allows better management by providing sophisticated monitoring tools to ensure that services are delivered in the most efficient manner possible, helping government to manage allocated financial and human resources.
- Speeds up information flow to enable time saving and speedier data transfer, supporting more efficient decision-making.
- Enables government workers to access data at service sites through context- and location-aware mobility so that they can undertake tasks more efficiently. The same is true for government clients.

[175] There are many definitions of what constitutes "good" governance, but, in the context of m-government, Hellstrom defines it as "characterised by participation, the rule of law, effectiveness and efficiency, transparency (built on the free flow of information), responsiveness, consensus orientation, equity, accountability, and strategic vision."Hellstrom, "Mobile phones for good governance: Challenges and way forward." Similarly, Kuscu et al assert that m-government offers at least four important areas of governance: 1) instant information release; 2) mobile transactions; 3) faster information exchange; and 4) increased feedback and participation. M. Halid Kuscu, Ibrahim Kushchu, and Betty Yu, "Introducing mobile government," in *Electronic government: Concepts, methodologies, tools, and applications*., ed. Anttiroiko Ari-Veikko (New York: Information Science Reference, 2008).

[176] Hellstrom, "Mobile phones for good governance: Challenges and way forward." http://go.worldbank.org/7ZD6MGXWF0.

- Offers public services via mobile phone, which are available to a greater number of people than those offered on the Internet, as mobile penetration begins to exceed fixed Internet penetration.
- Provides a way to reach residents who are not willing to buy more expensive tethered personal computers, but who do have mobile phones.
- Improves access to services for individuals in remote areas who do not have wired access but do have wireless connectivity. [177]
- Offers public announcements via mobile phone, which are accessible everywhere, at all times. This is especially important in case of urgent messages and crisis communication.
- Allows information to reach the preferred addressee at any time through one specific device, because the mobile device is designed for a single user.
- Uses mobile interfaces that can be highly personalized and meet Accessibility for Ontarians with Disabilities Act (AODA) standards of accessibility.
- Provides an open data resource that provides means for residents to engage with all manner of public information in order to affect decision-making.
- Allows engaged citizens can to monitor and report problems such as infrastructure breakdowns. Mobility makes it possible to create bottom-up participation, and ultimately to enhance citizen empowerment.

### 4.1.1 Mobile Governance Extends Accessibility

Mobility makes it possible to create bottom-up participation, and ultimately to enhance citizen empowerment. M-government is especially suited to provincial and municipal government initiatives because of the greater frequency with which citizens interact with these services, and because of their regional focus. A great advantage of m-government is its efficient ability to provide services to citizens where they are and when they need them. M-government supports productivity and efficiency goals for the delivery of services as well as internal applications. The Organisation for Economic Co-operation and Development (OECD) and ITU note that m-government provides better service quality, efficiency and scalability, and helps to reduce costs. [178]

## 4.2 M-government Delivery Models

There are four important "delivery models" that m-government can take:

[177] Rannu, Saksing, and Mahlakoiv, "Mobile Government: 2010 and Beyond. White paper." 7, 21, 99.

[178] Organisation for Economic Co-operation and Development, "Benefits and Outcomes of M-government," ITU and OECD, "M-government: Mobile Technologies for Responsive Governments and Connected Societies," ed. OECD Publishing (2011). 20.

### 4.2.1 Government to Citizen (G2C)

G2C services allow "citizens to stay current on government information, ask questions, request services, complete transactions, submit comments, report problems, request emergency assistance and access data." [179] Mobile technologies allow personalization and accessible interfaces, and can thus engage citizens wherever they are and whatever their abilities. G2C activities could include:

- *Governance and citizen engagement:* For example, involving citizens in policy development and decision-making, and elections and voting.
- *Informational and educational "push" services:* For example, general information (weather, public safety, contact information), emergency alerts (severe weather, terrorism) and notifications (library-book deadlines, security information).

Mobile G2C services can also improve citizens' experiences with services like healthcare, social services and employment services. These G2C services are characterized as:

- *Interactive services:* For example, health services (screenings, tests), filing claims, reporting problems (voting issues, complaints), and information-inquiry services.
- *Transactional services:* For example, employment (job postings, applications), government transfer programs (food coupons, relief compensation), paying taxes and transportation services (buying train tickets, bus tickets). [180]

### 4.2.2 Government to Business (G2B)

G2B services make relationships between private business and government agencies more efficient and flexible. Potential mobile applications include:

- Providing information "related to procurement, licensing, permitting and payment of taxes, as well as support of small and medium enterprises and business development." [181]
- Providing support to rural businesses, "including accessible kiosks and low-cost handsets, digital signature services, SMS weather and market updates, mobile wallets and maps for transport and tourist sites." [182]

[179] OECD/International Telecommunications Union, "M-Government: Mobile Technologies for Responsive Governments and Connected Societies.", 28–40.

[180] Ibid.30–36.

[181] Ibid., 36

[182] Ibid., 37.

### 4.2.3 Government to Employee (G2E)

In G2E services, the focus is on using mobile for increased productivity. Potential benefits include:

- Governments can provide their employees with tools, training and data access that not only assist employees in their daily operations, but can also improve organizational efficiencies and accountability, maximize limited resources and enhance the quality of citizen services.
- Mobile technologies have a substantial impact on improving G2E services, especially for field crews and staff who work in secondary or remote locations, as they enable workers to enter, retrieve and share data in real time. [183]

### 4.2.4 Government to Government (G2G)

A mobile action plan for G2G services allows governments to "transform themselves into a connected entity that more effectively and efficiently responds to the needs of its citizens by developing an integrated back-office infrastructure" [184] These structures might include:

- Improved horizontal connections among and between government agencies, or improved vertical connections between central and local branches.
- Coordination of government activities for inspections, controls and supervisions; security services; emergency management; and access to knowledge bases and records. [185]

At a time when the priority of the Ontario government is looking to improve efficiency within departments and increase productivity, a mobile plan for G2G interactions at the provincial level alone could have tremendous benefit.

## 4.3 Productivity Gains

The report by the Commission on the Reform of Ontario's Public Services entitled *Public Services for Ontarians: A Path to Sustainability and Excellence* argues that "We must sharpen the efficiency of literally everything the government does so Ontarians get the greatest value for money from the taxes they pay." [186] Productivity, especially in the current economic environment, is at the forefront

[183] OECD, "M-government: Mobile Technologies for Responsive Governments and Connected Societies.", 39.

[184] Ibid., 36.

[185] Ibid., 37.

[186] Drummond, "Commission on the Reform of Ontario's Public Services Public Services for Ontarians: A Path to Sustainability and Excellence."1.

of government planning. Government departments require solutions that improve services and efficiency without increasing cost or resources. [187]

Mobile government closely aligns efficiency and improved service with cost savings. Evidence to support productivity gains comes from a recent survey in Estonia, a country that is considered a leader in m-government services. [189]

- In a 2009 survey of Estonian ICT managers, which looked at reasons for developing mobile solutions, more than half the respondents cited "better quality of the service and the lower costs," while the most popular choice was "more effective and faster processes." For 85 per cent, the second most important factor was "the better availability of the services." [190] Research by the European Commission has indicated "the costs of an offline service transaction can be up to 30 times as high as a web-based self-service transaction." [191]

The *2010 Imagination to Innovation: Building Canadian Paths to Prosperity* report emphasized the importance of information and communications technology (ICT) adoption and upgrading to increasing enterprise productivity:

"IT and services can be made more efficient without compromising service delivery—in most cases, these changes will improve it. The government's operating and back-office expenditures include employee compensation, IT, human resource management, financial services, procurement, communications and other services. In many cases, these can be made more efficient without compromising service delivery—in most cases, these changes will improve it." [188]

[187] M-government will be closely tied to e-government, but can move through and jump over stages of e-government to provide capacities beyond current Internet services. It can also provide "multi-channel" accessibility. Science Technology and Innovation Council, "State of the Nation 2010.Canada's Science, Technology and innovation System: Imagination to Innovation - Building Canadian Paths to Prosperity.," ed. Dr. Howard Alper (Ottawa: Government of Canada (Science, Technology and Innovation Council). 2010).

[188] Drummond, "Commission on the Reform of Ontario's Public Services Public Services for Ontarians: A Path to Sustainability and Excellence."42.

[189] Rannu, Saksing, and Mahlakoiv, "Mobile Government: 2010 and Beyond. White paper." 7, 21, 99.

[190] Ibid.., 91; As well, Mobi Solutions notes in its white paper *Mobile Government 2010 and Beyond* that "It is widely acknowledged that e-government can only succeed if online public services are made accessible through a variety of channels relevant to their users' needs (Internet, telephone, info kiosks, etc.)." Rannu, Saksing, and Mahlakõiv, "Mobile Government: 2010 and Beyond."

[191] European Commission, "Multi-channel delivery of eGovernment services," in *Interchange of Data between Administrations* (Amsterdam2004)., 34

- There is an added productivity benefit for users of the services who save time because they no longer need to travel to specific locations or wait for services in office or phone queues.

Singapore has been a leader in integrating government services onto electronic and mobile platforms and has received international recognition for its m-government services. The migration to mobile services provided residents with heightened satisfaction. In 2010, Singapore recorded four million m-government transactions and more than eight out of 10 customers expressed satisfaction with the quality of these services. The integrated government services of which m-government are a part achieved savings of SGD$140 million (about CAD$112) over five years. Similar strategies [192] in Ontario to consolidate services and promote m-government strategies could produce significant savings relative to in-person transactions.

One particularly significant example is USE-ME.GOV, a European G2C "usability-driven open platform" created by a European consortium that "consists of regional government, three local government, two research institutions, two universities and a number of technological companies from France, Italy, Germany, Spain, Portugal and Poland." [193] The project "aims to deal with problems associated with traditional governments such as low throughput, time consuming tasks and staff overload as well as problems with e-government such as long delays in implementation and low return on investment." [194] Another European project, NOMAD, is a "pilot National Project of the UK consisting of 9 authorities" that "aims to facilitate local authorities to begin mobile computing operations and assist staff to be more productive." [195] These examples could be of value to Ontario in creating test beds to bring mobile services to the province.

[192] Infocomm Development Authority of Singapore, "Integrated E-Government Masterplan 2011-2015 Collaborative Government," Infocomm Development Authority of Singapore, http://www.egov.gov.sg/c/document_library/get_file?uuid=4f9e71be-fe35-432a-9901-ab3279b92342&groupId=10157.

[193] Mansoor Alrazooqi and Rohan De Silva, "Mobile and Wireless Services and Technologies for m-Government Solution Proposal for Dubai Government," *WSEAS Transactions on Information Science and Applications* 7, no. 8 (2010).1039.

[194] Ibid.

[195] Ibid.

## 4.4 Privacy

In Ontario, privacy is protected by several provincial and federal acts: the Personal Information Protection and Electronic Documents Act (PIPEDA), the Personal Health Information Protection Act (PHIPA), the Municipal Freedom of Information and Protection of Privacy Act (MFIPPA) and the Freedom of Information and Protection of Privacy Act (FIPPA). Currently, information collected by government services can only be used for the purpose declared and not for any other purpose, even if related. Each point of sharing information requires individual consent. This requirement makes impractical many possible applications that would simplify and improve users' experiences. For example, government is not allowed to use the information it already has from driver's licenses for pre-populating forms for organ donation. Another example: daily insulin readings provided by diabetics to the Diabetes Registry cannot be shared with healthcare providers. The Panorama Project, which aims to put immunization information online as part of pandemic preparedness, is also facing similar obstacles.

The current privacy model is at odds with the huge glut of information on the Internet and the ability to consolidate and aggregate information through applications like Google. The public life of individuals who tweet, keep Facebook profiles, blog and post videos on YouTube suggests that the definition of privacy is changing. At the same time, consumer confidence is predicated on privacy measures. Service delivery that achieves efficiency through shared data is incongruent with privacy protection under the current privacy model. Supporting access from multiple platforms is not a technical issue for the government and it is also not necessarily a cost issue. The deeper issue is broader access to information. There is an urgent need to move to a consent-based environment, but obtaining consent for each individual case is not practical. Also, legislation around this topic is disconnected because it has grown in silos of data. The following action is a crucial next step:

★ A public-private task force dedicated to bring privacy legislation in line with new technologies, emerging services and changing consumer expectations o will be an important next step in enabling privacy protection while removing barriers to the benefits of information sharing.

## 4.5 Open Data

Open data is a significant initiative for all levels of government to undertake, not only to forward m-government initiatives generally, but also to encourage innovation in the mobile ecosystem and, as a result, to offer citizens useful information that would otherwise be unavailable. Open data can encourage better integration of services. Canada, which offers more than 800 data sets, [196] is among

[196] Canada, "Open Data Pilot Project," Government of Canada, http://www.data.gc.ca/default.asp?lang=En.

several other countries (Denmark, Finland, Estonia, Germany, New Zealand, Norway, the UK [197] and the US [198] ) that have developed open-data strategies. The South Korean city of Busan has created the Busan Mobile Application Development Centre, which "assists companies that are developing apps for the citizens, all of which will be hosted on a city app store." [199]

An open-data approach provides government with opportunities to collaborate with other sectors in providing services and developing applications that support the overall goals of government. Open data can:

- Assist with the devolution of government services and information.
- Stimulate the applications-development industry, as access to the government's massive data resources can be used by creative minds to solve problems and provide as yet unimagined services.
- Maximize existing government resources that might otherwise be locked away or underutilized.

Helsinki and Singapore both offer the means for independent developers to create applications through the provision of an application-programming interface (API). In Ontario, the open-data approach is part of a broader national initiative that allows otherwise siloed, aggregate information to be redeployed, often through public-private partnerships.

The Province of Ontario is supporting a project coordinated by MaRS called the Regional Strategic Resource Centre Program (ReSRC). This project provides the infrastructure to collect and share data. Its philosophy is: "With the goal that by sharing and integrating disparate sets of data—often collected in institutional silos—from government, academia as well as the private and non-profit sectors, we will better understand the unique strengths, opportunities and needs of our communities and can more effectively work together to build vibrant, productive regional innovation economies." [200]

An open-data approach is also of value to NGOs and non-profits. Mobile applications can be used to access open-data sets, census data and other important, authoritative resources that can help NGOs effectively achieve their public-service mandates. Organizations dealing with poverty, recent

[197] HM Government UK, "Opening up government," Crown, http://data.gov.uk/.

[198] United States, "Data.Gov - Empowering People. ," http://www.data.gov/.

[199] Lars Cosh-Ishii et al., "The mobile city project – the blueprint of a truly mobilized city," mobithinking, http://mobithinking.com/mobile-city-project.

[200] MaRs, "Program Director – Regional Strategic Resource Centre Program (ReSRC)," MaRS, http://www.marsdd.com/careers/directory/program-director-regional-strategic-resource-centre-program-resrc/.

immigrants, voter registration or preventative medicine could all benefit from such m-government strategies, as much of their work is out in the community and is thus mobile in nature. Mobile applications that help citizens are not the sole responsibility of municipal governments; it is more important that governments provide open access to data so that developers can imagine the next great app. One successful mechanism to spur on this innovation is a contest like the BigApps competition developed by New York City. [201] This contest enables citizens to vote on applications that use NYC Open Data, and awards $50,000 in prizes to winners.

As an initial step toward open data, the Ministry of Government Services (MGS) of Ontario has recently created an open-data web portal at ontario. ca/opendata that enables individuals to more easily access and utilize data sets held by the province. An open platform that will enable developers to build applications that access data through open APIs will be an important addition to this work. For example, Toronto has implemented the GeoReport API, which "allows developers to build applications to report non-emergency issues such as graffiti, potholes, and street cleaning directly to government organizations like cities." [202] Thus access is available not only through a prescribed interface by individuals but also through a machine interface by applications. We strongly recommend that Ontario commission an efficient study to derive an action plan for open data to assist MGS with its open-data goals.

## 4.6 Examples of M-government

Several major international cities offer mobile portals that act as hubs for services ranging from news, legal, health, tourism and visa information to bill-paying applications, online complaint departments, traffic reports and, in some instances, maps. There are a few notable m-government initiatives in Canada, though there has yet to be a comprehensive or unified action at the national or provincial levels. Examples include:

- The mobile portal developed by the Government of Canada, which extends existing e-government by allowing mobile users to access a mobile-optimized website filled with important information and services.[203]
- The Explore Grand River Country application developed by the Grand River Conservation Authority in concert with regional businesses, which guides visitors to tourist attractions. [204]
- Transit mobile applications that can be used to monitor the transportation network's routes and arrival times in real time. Ottawa has a mobile action that focuses on open data, and other cities in Canada have taken similar initiatives focusing on transportation. The Toronto Transit Commission website offers basic information about routes, stops and times. [205]
- Cities with 311 services are beginning to expand this telephone information service to an interactive amenity that enables citizens to contact or request municipal services more easily, and enables municipal governments to be more responsive and efficient. Open311.org, an organization dedicated to encouraging interoperability between 311 data platforms, is supporting the move to open data. Interoperability will facilitate applications being used in multiple jurisdictions, providing economies of scale for developers and cost savings for municipalities. [206]

### 4.6.1 Municipal

Urban portals also provide location information for public or free Wi-Fi hotspots, and offer information in multiple languages. For example, Bahrain [207] and Hong Kong [208] offer mobile portals that are optimized for mobile devices and make important efforts to engage with mobile users. Both these portals not only allow for the dissemination of various types of useful information; they also make important connections to other government and non-government mobile services, useful mobile sites and applications. [209]

Along similar lines, Helsinki has multiple mobile sites that cover the areas outlined above, but also offer the opportunity for users to opt in to SMS notifications for everything from dental appointments to construction projects. There is a site that offers mobile-optimized information regarding cultural activities and allows users (and tourists) to plan their activities in the city accordingly. [210]

Mobile's ability to be in context and immediate is especially useful for the immediacy of mobile interactions, where planning and issues can be taken care of in place and in the moment.

[203] Government of Canada, "Mobile Portal," Canada, http://www.canada.gc.ca/mobile/wireless-eng.html.

[204] Gizmofarm, "Explore Grand River Country From Your iPhone," gizmofarm, http://gizmofarm.com/explore-grand-river-country-from-your-iphone/.

[205] John Tajima, "Open Data Apps Directory - Ottawa," http://opendataapps.org/apps?category=Transportation.

[206] Translink, "Getting you everywhere you want to go in Metro Vancouver," TransLink, http://www.translink.ca/en/Rider-Info/Mobile.aspx.

[207] http://mobile.bahrain.bh/egov/wap/wml/mobile/common/myservices.do.

[208] http://m.www.gov.hk/en/residents/.

[209] http://m.www.gov.hk/en/about/govdirectory/mobilesites.htm.

[210] See: http://helsinki.mobi/In_English/Visitor.iw3.

[211] http://app.mgov.gov.sg/.

[212] Infocomm Development Authority of Singapore, "Integrated E-Government Masterplan 2011-2015 Collaborative Government".

[213] OECD, "M-government: Mobile Technologies for Responsive Governments and Connected Societies." 32.

[214] Infocomm Development Authority of Singapore, "Integrated E-Government Masterplan 2011-2015 Collaborative Government".

One of the most sophisticated mobile city portals is that of Singapore.[211] It combines many of the elements outlined above—ranging from tourism to city directories to feedback functionality in the form of click, calls or emails to civil servants—but also allows access to library services, recent house sales and planning permissions. Singapore has a well-developed multichannel government service. In a 2010 report that examined four years of integrated government services, the government reported that "the greater sharing of systems, processes and data has enabled the government to improve productivity and generate cost savings of more than $140 million over the last 5 years." [212] From a user-experience perspective, the interface adopts much of the functionality and iconography familiar to smartphone users, arguably increasing its usability. In addition, Singapore provides a vast array of SMS-based services, including the ability to send feedback to the government on policies and related issues, as well as up-to-date statistics. Residents can also check on tax-filing information.

In Singapore, more than 150 government services are now accessible via mobile phones using a common SMS number, SGOVT (74688). Also, the Integrated Clinic Management System enables seamless update and retrieval of patients' records, providing real-time access to accurate patient information, using radio-frequency identification (RFID) technology to match appropriate drugs to patients, and providing an alert system that enables doctors to get critical lab results via SMS. The Singapore government report notes that "Government m-services have also been well received with the mobile transaction volume reaching a peak of almost 4 million in 2010.More than 8 in 10 of our customers are satisfied with the quality of government m-services." [213]

As part of its integrated plan, the Singapore government will also continue to meet the needs of its citizens by providing a platform that will allow innovators to build creative solutions and applications from government-held data.[214]

### 4.6.2 Regional—State/Provincial

There are some noteworthy examples of initiatives taken at the regional level, particularly at the state level in the United States:

- New York State provides a mobile application and website for updated traffic data.
- California has focused on mobile to ease the use of transportation services ("My California on the Go").
- Michigan has a "Mobile Michigan" strategy with Department of Human Services, Natural Resources, and Transportation apps for residents. Entire components of their work force such as Human Services and Michigan State Police have gone mobile, resulting in millions in savings, better service and safety. They are launching an open data initiative with competitions and mash-ups.
- Virginia provides a comprehensive mobile portal ("My Mobile Virginia") that allows users to access a range of state-level services and information.

- California and New York have mobile portals that address issues ranging from transportation to crisis communication.
- New York State has a mobile app that gives updated and interactive information about the activities of the state senate, including new or changing legislation. [215]

There are also a number of crisis-communication initiatives organized around the specific needs of regions/states. For example:

- The use of mobile phones for shared and co-ordinated communications among emergency personnel and agency officials in California's National Park Service, the US Forest Service, the Bureau of Land Management, and the California Department of Forestry in their battle against a 10 000-acre blaze in the Cleveland National Forest.
- Texas's emergency system in the United States estimates flooding by using light detection and ranging, or LIDAR, which is similar to the radar used in airplanes and can transmit data over mobile telecommunications devices to emergency personnel in the event of flooding. [216]

### 4.6.3 National

One of the most important—though often contentious—types of mobile initiative at the national level is the mobile-ID initiative, which has been adopted by several countries, particularly European countries such as Finland, Austria and Estonia. Mobile ID means that citizens can:

- Pay taxes, parking fees and fines to city companies and institutions.
- Be paid benefits, wages and refunds by city companies and institutions.
- Gain entry to workplaces, register at doctors' offices and travel on public transport.
- Withdraw library books.
- Cash in loyalty points at supermarkets.

Mobile ID [217] also means that whenever users interact with city institutions and companies, their

[215] New York State Senate, "NYSENATE MOBILE APPS," New York State Senate, http://www.nysenate.gov/mobile.

[216] OECD/International Telecommunications Union, "M-Government: Mobile Technologies for Responsive Governments and Connected Societies."37.

[217] In our interviews with representatives from all levels of government, we learned that there is concern about the lack of a federated identity and authentication framework, and a need to ensure that any independent systems developed are compatible. Fortunately, there is already a pan-Canadian identity-management body—the Inter-jurisdictional Identity Management and Authentication Task Force—that includes privacy commissioners (federal and provincial), ICT executives from all government levels, banks and the Municipal Information System Association (MISA), and is trying to address this challenge for Ontario as well as for other provinces and territories.

personal preferences, purchase history and other contextual details are known. Mobile ID can underpin m-wallets, m-ticketing, m-banking and services based on near field communication (NFC).[218]

Finland has offered a SIM-based national mobile-ID initiative that allows users to "access a range of public- and private-sector services, including electronic banking and government web and mobile services. With their mobile phones, Finns will be able to authenticate themselves when electronically filling tax returns, registering for social security and paying for goods online. Creating a digital signature from the handset may even be used as proof of identity at a physical point of sale." [219]

Austria introduced a mobile-phone signature service, "Handy-Signatur," which is similar to these mobile-ID initiatives. Handy-Signatur acts as both an ID and a qualified electronic signature. "The signature itself is not created inside the mobile phone (SIM card), but it is instead created remotely in a hardware security module. The citizen card concept offers functionality for the identification and authentication and–by using qualified electronic signatures–constitutes the foundation for legal security. As the citizen card concept is built upon open standards, it allows all signature cards and storage mediums, which fulfill citizen card specifications and legal requirements to be used." [220]

In Estonia, "Each SIM card has a unique ID, which acts as a digital signature. First introduced by network operator EMT in 2007, the mobile ID has since been adopted by the other Estonian operators." [221] In the 2011 elections, Estonians could vote over the Internet using their mobile IDs rather than their ID cards. [222]

### 4.6.4 Toward a Ubiquitous Network Society

Some national initiatives go beyond m-government toward a broader notion of a "ubiquitous network society." In this model, it is not a particular technology or setting that acts as the focus, but a general condition of ubiquitous connectivity that sits at the heart of governance itself.

There are at least three important contemporary examples that employ this approach and are worth paying attention to:

[218] Cosh-Ishii et al., "The mobile city project – the blueprint of a truly mobilized city".

[219] OECD, "M-government: Mobile Technologies for Responsive Governments and Connected Societies." 92.

[220] Digital Austria, "Digital Austria: Mobile Phone Signature," Digital Austria, http://www.digitales.oesterreich.gv.at/site/6791/default.aspx.

[221] OECD, "M-government: Mobile Technologies for Responsive Governments and Connected Societies." 138.

[222] Cosh-Ishii et al., "The mobile city project – the blueprint of a truly mobilized city".

- The first two are the ubiquitous Korea and Japan—or uKorea [223] and uJapan [224]—initiatives. These initiatives are important because they focus on an overall media ecology emphasizing connectivity, rather than on a specific technology. In fact, these approaches structure their impact around an ecology of media connectivity that focuses on the uses and applications most relevant to users "where they are."
- The third example is India's ambitious plan to develop a coherent m-government strategy that would make thousands of government services accessible over mobile phones to India's almost one billion citizens. [225]

While what constitutes an "m-government" policy is still somewhat undefined, there are a plethora of global examples that suggest m-government will gain coherence and direction in the very near future. In particular, national strategies outlined in Scandinavia, Korea, Japan and India offer clear models worth examining in closer detail, and, in some cases, emulating.

## 4.7 Action Plan

### 4.7.1 Private Sector

★ Mobile and broadband carriers can help governments to develop ubiquitous connectivity by considering novel solutions for remote connectivity in communities in need. These solutions should go beyond "last-mile" charges to different models of service and ownership.
★ There is a role for the private sector to build on government open-data platforms and to work cooperatively with the public sector to develop applications that will enhance the interaction of residents with government services and information.

### 4.7.2 Academia

There are several actions that academia can lead:

★ Academic researchers have an important role to play in providing government with policy alternatives based on successful practices in other jurisdictions, and in assisting with analyzing the impacts of strategies.

[223] DigitalTechNews, "u-Korea IT839 project," http://www.digitaltechnews.com/news/2005/07/ukorea_it839_pr.html.

[224] Ministry of Internal Affairs and Communications, "u-Japan Policy," Ministry of Internal Affairs and Communications, http://www.soumu.go.jp/menu_seisaku/ict/u-japan_en/index.html.

[225] Sheridan Nye, "India's ambitious m-government plans," Questex Asia media brands, http://www.telecomasia.net/node/23123.

★ Academia, industry and government can create test-bed environments that model productivity gains in public-service delivery.

### 4.7.3 Government

As Ontario retools its information and ICT infrastructure, it has the unique opportunity to engage with private sector partners to plan for mobility, ensuring that residents are served using the broad capacities of mobile systems and creating significant productivity time savings for residents and government workers. The ubiquitous nature of mobile connectivity and services is especially important as a tool for inclusion: "the real value of such 'anytime-anywhere availability' can be better appreciated, if mGovernment is regarded as an effective means for reaching more easily those characterised more broadly as socially excluded." [226]

The following actions will set the stage for mobile take up and stimulate the mobile applications industry:

★ Government can encourage the creative use of government data and continue to make government data sets available through open APIs. This role of government as a platform offers exciting possibilities for creative developers and entrepreneurs to build applications and businesses from the rich data normally held in government silos.

★ Ontario can develop a plan to integrate mobile services by moving from physical to mobile services (without an e-service stage) as part of its efficiency planning. The adoption of mobile technology by civil servants should lead to faster response times and a more efficient deployment of resources. As well, it will allow personnel to work both from home and on location, streamlining the use of office space and reducing costs of capital and infrastructure. A consolidated plan for replacing face-to-face service with mobile capacity (automated as appropriate) should be part of the government's plans as it considers the Public Service for Ontarians: A Path to Sustainability report. Taking Ontario Mobile further emphasizes the value and efficiency that mobile technologies can bring to healthcare productivity, education and post-secondary education.

★ Service Ontario can follow the successful model of governments around the world by transferring important elements of its transactions to mobile platforms and combining these with mobile commerce solutions to enhance its information delivery and allow routine transactions to occur through the mobile Internet.

[226] Maria Emmananouilidou and David Kreps, "A framework for Accessible m-Government implementation," *Electronic Government* 7, no. 3 (2010). 5.

Mobile devices offer the opportunity to integrate a wide variety of disparate yet sensitive personal information about users. A fundamental role for government is the protection of its residents' privacy rights. A key regulatory barrier involves issues of privacy and personal information. Privacy is already protected in FIPPA, the municipal FIPPA, PHIPA and the Archives and Record Keeping Act. [227] While residents may drive demand for m-government services, polls show that there will also be concerns about privacy. It may be necessary to address users' perceptual barriers about privacy and the use of personal information—particularly the misgivings of those in marginalized populations who might perceive that they are particularly vulnerable. [228]

The Ontario Ministry of Consumer Services also provides some protection to consumers, but not with legislation specific enough to address the concerns of many of Ontario's cell phone and Internet users. A proposal to amend Ontario's Consumer Protection Act was put forward in November 2010 as Bill 133, and was reintroduced in November 2011 as Bill 5, the Wireless Phone, Smart Phone and Data Service Transparency Act. The bill has passed first and second readings and awaits a final review by the Standing Committee on General Government. Continual review of this legislation and synchronization with Canadian legislation will be important, as will be efforts to educate citizens about their rights.

For any inclusive action plan to take hold among those who might benefit the most (e. g. , seniors, immigrants, people with disabilities, low-income individuals), it will be beneficial to communicate clearly how mobile privacy is ensured when sensitive data is collected or made available. Equally, it is important to develop a comprehensive and viable solution for privacy. There is a need to move to a consent-based environment, but obtaining consent for each individual case is not practical. Rather, classes of consent could be considered as a solution to privacy and security concerns. There are discussions with the privacy commissioner around consent issues; however, the legislation around this topic is disconnected because it is based on silos of data.

One of the most central principles of m-government, insofar as it attempts to be inclusive, is the basic infrastructure for or access to ubiquitous connectivity. The idea of a ubiquitous network society foregrounds some of the most cutting-edge m-government strategies:

★ Because connectivity is the cornerstone of a ubiquitous Ontario, it is important that the provincial government work with the federal government to continue to incent the private sector to

[227] Lesley Jacobs, Kim Sawchuk, and Barbara Crow, "Research Report Prepared as part of the Office of the Privacy Commissioner of Canada Contributions Program , 2010-2011," (Toronto: York Centre for Public Policy & Law, York University, 2011).

[228] Leslie Regan Shade, "Media Reform in the United States and Canada: Activism and Advocacy for Media Policies in the Public Interest," in *The Handbook on Global Media and Communication Policy*., ed. Robin Mansell and Mark Raboy (Blackwell, 2011).

roll out coverage and ICT services in remote and rural areas.

★ One way to achieve this goal may be to separate highly valued urban zones from rural zones in spectrum auctions to enable a more sustainable return on investment (ROI) for rural infrastructure investment. Ontario can support the federal government's current focus on strengthening competition in the upcoming spectrum auctions.

Ontario can develop services that reach citizens in multiple contexts—people carry their mobile devices with them everywhere. Possible services include:

★ Pull services that capitalize on the geolocation feature of these devices—for example, an application that provides information about services available where the resident is at that moment. These would go beyond traditional e-government and provide a starting point for enhancing e-government services with mobile technology.

★ Geolocation-based push services such as emergency information, which can be sent to specific individuals via SMS and geolocation technology, enabling virtually anyone with SMS capacity in an affected region to receive an alert.

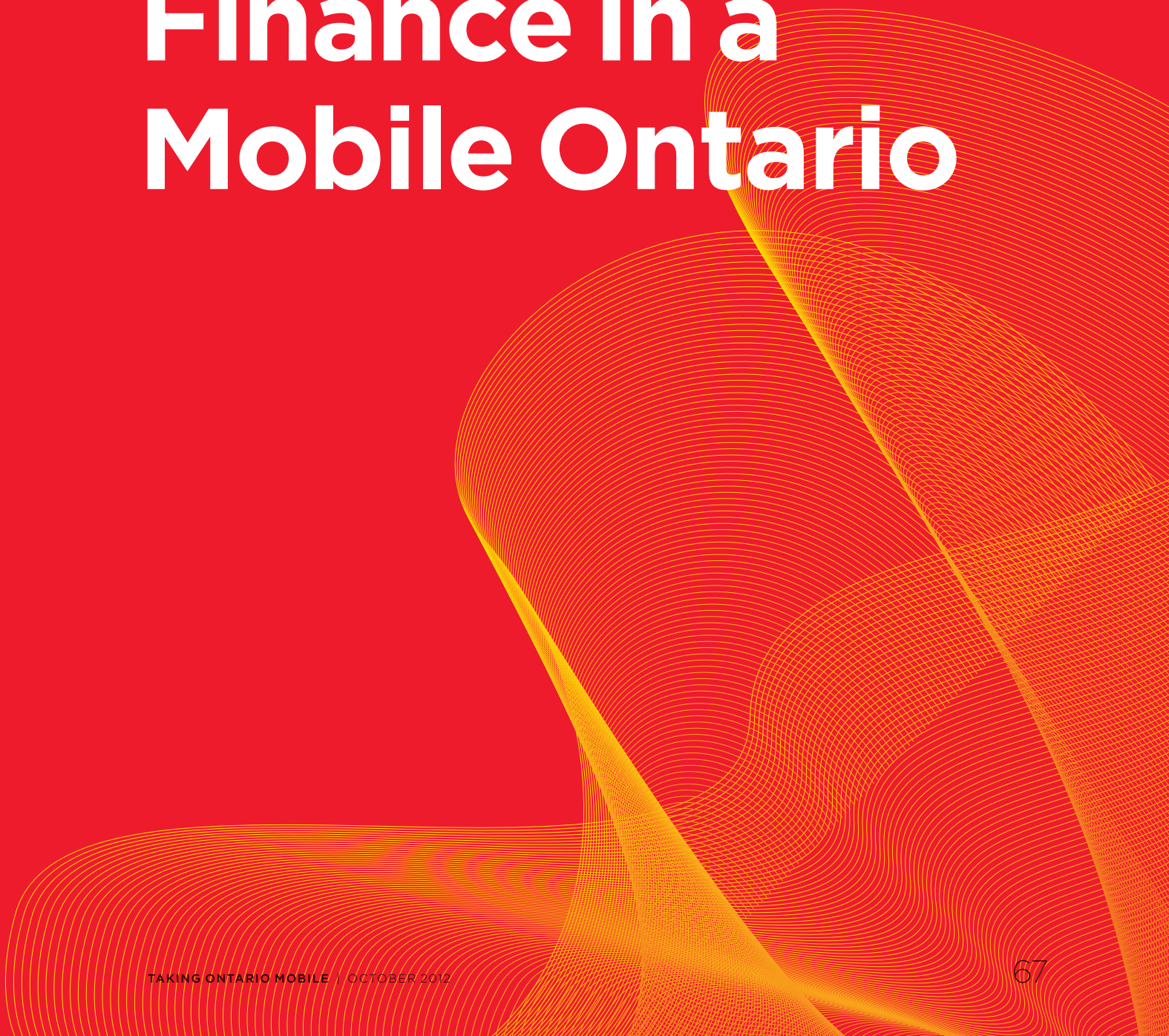
The Ontario public service employs more than 65,000 people and is one of Ontario's largest employers. [229] Mobile solutions that increase productivity by just a fraction have the ability to produce large-scale savings and improvements:

★ Gartner research suggests,[230] for example, that departments try to use tablets for work that is typically done away from the desk or office; this would familiarize public servants with the capacity of mobile technologies and demonstrate the efficiencies in workflow that these devices make possible.

[229] Eluta, "Employer Review: Ontario Public Service," Mediacorp Canada Inc.

[230] Jerry Mechling, "How iPads and media tablets can improve government productivity," Questex Media, http://www.enterprise-innovation.net/content/how-ipads-and-media-tablets-can-improve-government-productivity.

# Commerce and Finance in a Mobile Ontario



## Challenges

- Mobile commerce is a disruptive force that is changing the way Ontarians access and pay for goods and services.
- The current economic crisis has added further stress on industries and businesses that are less competitive and less adaptive to changes in society, consumer behaviour and technology. Jobs that can be easily outsourced or automated will be, while the strategic, technical and design jobs will emerge stronger.
- Consumer buy-in will only occur when systems are secure. As with other forms of payment, the security of mobile transactions and mobile "cards" must be assured. Mobile security must be involved in every stage of the mobile-commerce application-development life cycle, including planning, design, development, testing, retesting, re-retesting, release and post-release.
- Mobile marketers, mobile commerce providers, banks and government need to agree on appropriate privacy provisions for consumer protection.
- Businesses need to understand how to optimize business processes and efficiencies.
- There is the danger of developing regulatory and privacy policies that could stifle innovation and uptake.
- The skills required for effective mobile commerce include design, marketing and business skills that align the shopping experience—whether physical or virtual—with the mobile interface and financial services.
- For the most part, outlets have not installed near field communication (NFC) technology in North America.

In this chapter we argue that mobile commerce (m-commerce):

- Is empowering, shifting the information-retrieval and power equation from the store to the shopper.
- Deepens customer engagement.
- Enhances customer service.
- Creates persistent relationships with customers.
- Links sales, marketing and fulfillment between virtual and physical channels.
- Creates opportunities to continue to build Ontario's successful financial industries.

M-commerce refers to a secure and flexible system that allows consumers to make just-in-time payments remotely or at the point of sale by using a device. M-commerce is any transaction "involving the transfer of ownership or rights to use goods and services, which is initiated and/or completed by using mobile access to computer-mediated networks with the help of an electronic device." [231] These practices are also referred to as mobile finance, which encompasses traditional banking and financial-service institutions (such as credit and debit card companies) and beyond.

The opportunities of m-commerce are described below:

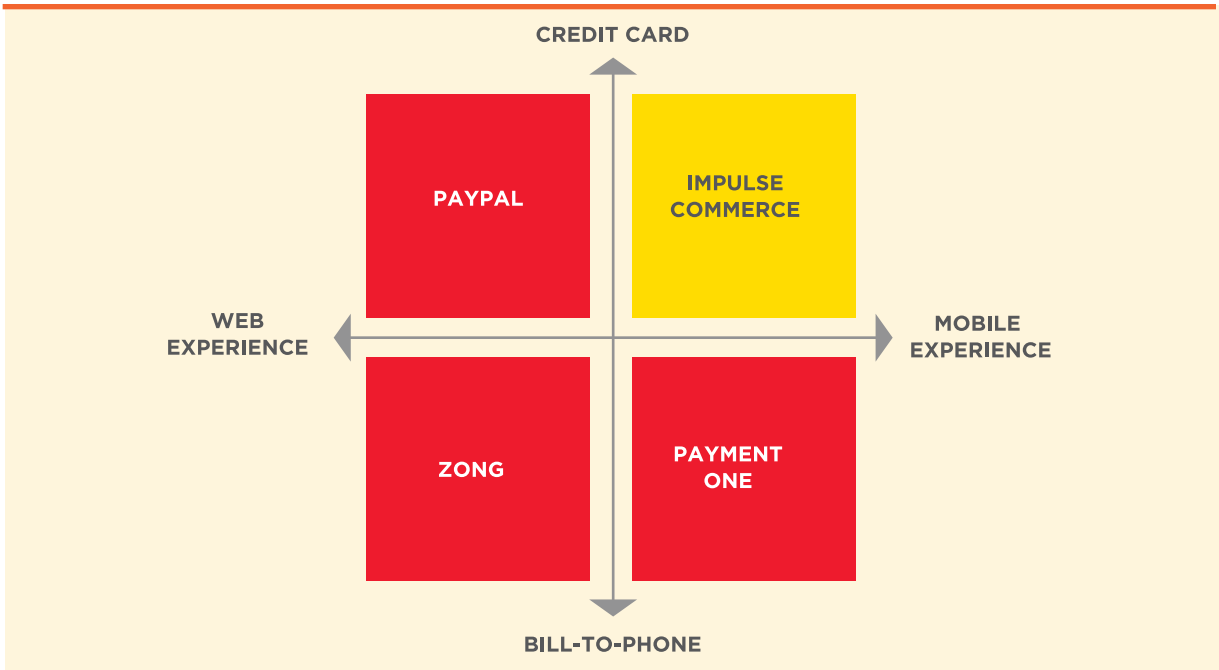
- A mobile wallet is a communication channel that allows consumers to find products and services aligned with their preferences, and to pay for them.
- Mobile wallets solve a derivative problem for brands: how to effectively monetize and complete commerce transactions within cyberspace.
- M-commerce is layered with the ubiquity of information and easy access to products.
- Mobile wallets are personal because they are tied to individual identities and social personalities.
- The mobile wallet is an important actor in the future labour market. Ontario's retail outlets will need to adopt m-commerce strategies if they are to survive in a competitive world in which global commerce has moved onto the mobile platform.
- For some businesses—particularly manufacturers, online brands, start-ups and developers—the mobile channel represents a new way to reach customers more directly, anywhere and anytime.
- M-commerce represents an opportunity for disruption, by bypassing not only the banking industry but also traditional distribution partners like retailers and resellers, as "companies with millions of customers and broad distribution channels, be they mobile operators, retailers

[231] Rajnish Tiwari, "The Mobile Commerce Prospects: A strategic analysis of opportunities in the banking sector."

or on-line brands, have an opportunity to participate in the high margins of financial services, previously enjoyed by banks and associated financial services companies." [232] M-commerce is closely linked with the mobile marketing—a massive growth area (also discussed in the mobile entertainment chapter), through which products and services are pushed to mobile users through the course of the mobile experience. Users are offered opportunities to engage in game play, win prizes and make direct purchases.

The following diagram provides an illustration of the migration of e-commerce to m-commerce, as an example of fast checkout experiences:

**Figure 02:** Quick checkout wallet




## 5.1 Empowering Consumers/Disrupting Traditional Sales

Consumers don't want mobile wallets per se; what they want is the convenience and benefits of services enabled by mobile wallets. Application (app) stores have already established that consumers

[232] Mobile Financial, "New High Margin Revenue Streams," Mobile Financial Services Ltd, http://www.mobilefinancialservices.com/.

are comfortable with m-commerce wallets, especially when their purchase processes are seamless. Direct channels are growing and traditional retail outlets are becoming showcases for online buying. Mobile reinvigorates physical shopping but adds the efficiency of online. [233] Any shopper equipped with a data connection, a barcode-scanning app or search capacity has instant access to vast knowledge on product and pricing recommendation. Once consumers have smartphones, they can search online for opinions and consult authoritative online sources. Early Finnish research has suggested that users who are uncomfortable with e-commerce and online interaction but use basic mobile phones are willing to engage in m-commerce. [234] These conditions provide a motivation for innovation. As Wolfe et al. suggest, "Financial product innovation is induced by unmet needs or preferences of particular customers. It is also motivated by considerations of information asymmetry, agency, and moral hazard, by the opportunity to minimize transaction costs, as a response to taxes and regulations, and as a response to various risks, such as weather or currency volatility." [235] Many successful retailers and brands now pair m-commerce with customer relationship management (CRM) strategies and software. Tom Purves of Visa describes this blend as "augmented retail." [236] Through mobile apps, scale and cross-channel promotions, online brands are becoming increasingly adept at "stealing" sales from retail aisles. For traditional retail merchants, it becomes imperative to consider the mobile, connected layer of their retail experience in order to flourish in this new converged-commerce world. To manage risks such as security and customer needs innovation needs to balance, "reliability, security, profitability, and service quality." [237]

An example of improved productivity is the mobile experience of the Apple Store. Apple enables customers to buy lower-value, lower-engagement (but high-margin) products using the Applestore iPhone app on their mobile devices; this increases store throughput and frees up Apple staff to spend more time with customers on higher-ticket, high-engagement purchases. The Location Based Marketing Association provides valuable support for retailers, brands and advertisers who seek to combine traditional in-store experience with mobile

[233] Following telemarketing in the 1980s and e-commerce in the early 21st century, m-commerce adds a third layer of disruption.

[234] Bill Anckar and Davide D'Incau, "Value Creation In Mobile Commerce: Findings From A Consumer Survey," Journal of Information, *Information Technology, Theory and Application* 4, no. 1 (2002). http://aisel.aisnet.org/jitta/vol4/iss1/8/.

[235] David Wolfe et al., "Innovation and Knowledge Flows in the Financial Services and ICT Sectors of Toronto. A report prepared by David A. Wolfe, Charles H. Davis, Nicola Hepburn, Nicholas Mills & Gale Moore for the Ontario Ministry of Research and Innovation, the Toronto Region Research Alliance, and the City of Toronto.," (Toronto: Munk Institute, University of Toronto, 2011).9.

[236] Tom Purves, "A Collision of Convergence," (Toronto: Visa, 2011).

[237] Wolfe et al., "Innovation and Knowledge Flows in the Financial Services and ICT Sectors of Toronto. A report prepared by David A. Wolfe, Charles H. Davis, Nicola Hepburn, Nicholas Mills & Gale Moore for the Ontario Ministry of Research and Innovation, the Toronto Region Research Alliance, and the City of Toronto..", 12.

M-commerce increases productivity by allowing customers to self-checkout, freeing store clerks to focus on customer assistance and the sale of high-priced goods. For consumers, the ideal of m-commerce is to point your phone at products on the shelf, buy them and walk out, with no line-ups or frustration. [238]

In order to move outside of the existing bill-to-phone relationship, suppliers need to ask consumers to tether their phones to an existing payment method—one that mimics the kind of payment method traditionally found in the wallet. Visa, MasterCard and other commerce giants see their future in physically embedding or attaching secure payment methods (for example, stickers) that presently reside in your wallet into or onto your phone. For Visa payWave and MasterCard PayPass to succeed on the mobile network, they need to be simple and seamless enough to spur consumer adoption. [239] The following sections, developed with Gary Schwartz, author of *The Impulse Economy*, delineate current and future developments in mobile commerce. [240]

## 5.2 Mobile Banking

Mobile banking is a particular division of m-commerce and m-finance. It refers to the provision of banking and financial services with the help of mobile telecommunication devices. The scope of the services offered may include facilities to conduct bank and investment transactions; to administer accounts; and to access customized information. These are specific qualities of mobile banking:

- Mobility helps clients deposit and withdraw funds at agents such as retail and postal outlets—especially for clients in remote locations.
- Mobile banking provides an opportunity to reduce remittance charges and to enable financial transactions without the risks of cash and the inefficiency of travel.
- Financial transactions provide operators or service providers with a stable customer base and revenue from SMS messaging. [241]

Mobile banking assumes the ongoing migration of financial transactions from fixed financial institutions to computer interfaces to mobile devices, as the diagram below indicates.

[238] Strategic Growth Concepts, "Mobile Technology for Increased Productivity and Profitability," Strategic Growth Concepts, http://www.strategicgrowthconcepts.com/growth/increase-productivity--profitability.html.

[239] Gillian Shaw, "BMO Bank of Montreal launches 'tap and go' cell phone payments," Postmedia Network Inc, http://blogs.vancouversun.com/2011/09/13/bmo-bank-of-montreal-launches-tap-and-go-cell-phone-payments/.

[240] Gary Schwartz, *The Impulse Economy* (Toronto: Atria Books, 2011).

[241] Rannu, Saksing, and Mahlakoiv, "Mobile Government: 2010 and Beyond. White paper."7, 21, 99.

**Figure 03:** Evolution of electronic banking technologies from fixed to mobile.


## 5.3 The Mobile Wallet

The sheer number of shoppers that are primed for the mobile wallet is astounding. [242] According to the Global System for Mobile Communications (GSM), there will be 1.7 billion mobile phone users by the end of 2012 who do not have a traditional fixed bank account. The proliferation of screens and the ubiquity of connected platforms will mean that everything will be "mobile enabled" and allow place-based transactions.

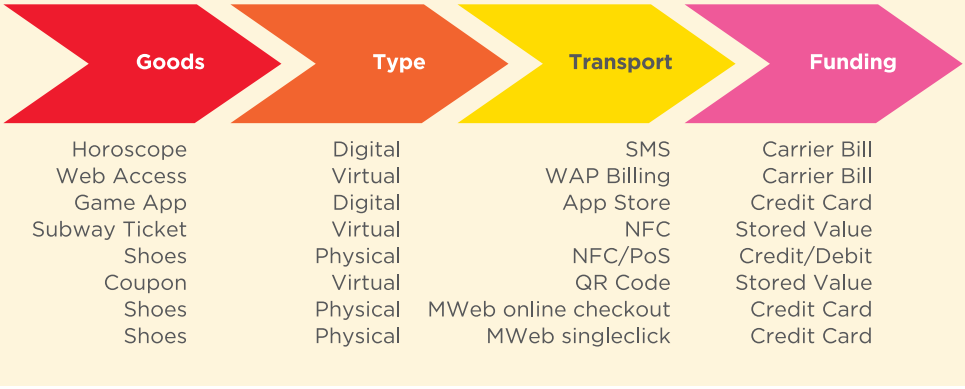
There are three mobile wallets that are either on the market or being beta-tested in Ontario in the next few years:

- Bill-to-Carrier Wallet (payment via the wireless carrier bill)
- Proximity Wallet (contactless mobile payment)
- Quick-Checkout Wallet (traditional payment optimized for the mobile phone)

Each is tied to specific goods, limited to certain business models and adopted by different demographics, and has varied maturity and reach in the current marketplace. The chart below demonstrates examples of goods that are bought (red), the sorts of goods these are (orange), how their purchase if secured (yellow) and the funding source or wallet (pink). For physical goods such as shoes, there will soon be multiple purchase options using varied mobile interfaces. The chart also infers the dependencies that various models have on other entities (carriers/Internet service providers, credit card companies/banks).

[242] Mobile subscriber penetration worldwide will continue to increase, with over 5.4 billion handsets in circulation by the end of 2015.Visiongain, "Payments in Mobile 2010-2015," (2010).

**Figure:** Typology of mobile goods and m-commerce modes.




When a consumer signs up for a phone on a wireless network, she is essentially opening a bank account to debit against. Prepaid accounts have turned many wireless carriers into powerful micropayment banks. There are limitations to this SMS-based carrier-billing channel (premium SMS), and commerce is largely relegated to micro-transactions: beyond ringtones and graphics, payment companies such as Boku, Paymate and Zong use SMS commerce to allow consumers to pay for small virtual items.

Probably one of the best examples of a carrier-billing initiative is Payforit, [243] based in the UK. With Payforit, the user simply hits a link and agrees to make a purchase, after which he can download content that is charged directly to his phone bill. In this scenario, a wide range of goods can be charged through the carrier.

Many companies are trying to expand the carrier wallet, with better business terms that would allow consumers to use their phones to purchase a wider selection of products and services.

[243] Payforit leverages billing directly through the browser's Wireless Application Protocol (WAP). Using WAP billing, shoppers can purchase content with one click, without registering for a service or dealing with a username or password. The challenge in most countries is that WAP billing does not currently cross carriers, and therefore does not have required reach. Payforit is meant to drive reach on web micro-transactions. The initiative was first announced in March 2006 and is supported by all UK mobile operators. The Ericsson Internet Payment Exchange cross-network WAP billing solution was the first mobile payment system to host a live payment service complying with the Payforit scheme in the UK, on the T-Mobile service. See http://www.payforit.org/.

## 5.4 Near Field Communication

One of the main challenges the banking community has faced is how to authenticate a payment or stored value on a mobile device through a simple, secure connection to parties that can verify and settle such payments. Over the past few years, NFC has emerged as the favoured solution for connecting phones to transactions at points of purchase. [244] It works in the following ways:

- *Payment:* If the *phone is the tag*, it can be used to make the phone a secure platform for identification and payment. This tags the phone with mobile-wallet credentials.
- *Marketing:* If the *phone is the reader*, NFC can read external tags to allow for TAP2Web and TAP2coupon proximity. In this case, the tag is on the media or product.

For example, NFC would allow residents to use their phones to:

- Access the subway.
- Enter movie theatres.
- Pay for services.

This is called "contactless" or "proximity" payment (the Bank of Montreal's MasterCard tap-and-go system, which enables small purchases, is one example). Many banks are reissuing their card portfolio with contactless cards; large market trials are in place and nearly every stakeholder in the value chain is discussing virtual cash and mobile wallets.

*Dave Talach, the vice-president of global product management at VeriFone, calls for subsidies for retailers to expand adoption of NFC in the store. VeriFone has backed this up with a commitment to retrofit its payment terminals. Talach says the "deployment and management of complex NFC technologies will require significant ongoing services from the retailer's payment systems provider."*

For the most part, outlets have not installed NFC technology in North America. [245] NFC is maturing, but until the tap-and-go mobile wallet is easy to use and ubiquitous—inspiring confidence and driving revenue—consumers and retailers will rely on effective m-commerce applications that

[244] NFC is a machine-to-machine short-range wireless connectivity payment system that sits on top of the same tagging technology that is used to track household pets and make unpaid-for items set off store alarms. We call this Radio-Frequency Identification (RFID), and it can be used to enable a two-way communication channel for multiple services.

[245] Some exceptions include Japan's operators, who have established a transaction model and have entered the banking market. In the Philippines, mobile money transfer has satisfied a need for low-cost remittance transfer to expatriate communities outside of the country.

do not require any pre-existing relationship but operate only at mobile points of decision.

In time, with the development of the appropriate standards needed to manage backend systems, NFC could achieve consistency and reliability in the mobile ecosystem at a store level. [246]

Adoption and retail culture will still need to change as even with stable technology and systems and consumer demand, the retail outlet remains a major barrier to NFC adoption:

- There are still not enough radio-frequency identification (RFID)/NFC readers in retail to create a viable business in North America. Roughly seven per cent of retail points of sale are equipped for contactless payment. [247] While many merchants discuss the need to invest in NFC for retail stores, few are stepping up to absorb the cost.
- Point-of-sale (PoS) becomes the hub of systems complexity, but the costs of deploying and managing all of this new software should be borne by the new service provider, who stands to gain the most. Retailers will not invest in good faith. [248] The reality is that credit and debit cards are viable for retailers, and mobile-payment options require hardware investment and may at first cost the retailer greater interchange fees because of the perceived risk in proving the mobile owner's identity. [249]

There are many parties interested in advancing and capitalizing on the NFC value chain and revolutionizing the wallet. One challenge that stands in the way of collaborations between financial service providers, retailers, phone manufacturers, wireless carriers, and PoS operators is ownership. Who owns the consumer's mobile wallet?

## 5.5 Mobile Marketing

As the opportunities for commerce via mobile devices proliferate over the next few years, so do the opportunities for enterprises to use the channel to market to existing or prospective audiences. The

[246] www.globalplatform.org is leading the charge in establishing and maintaining an interoperable and sustainable infrastructure for smart-card deployments. Its technology supports multi-application, multi-actor and multi-business model implementations, which deliver benefits to issuers, service providers and technology suppliers.

[247] Schwartz, *The Impulse Economy.*

[248] Dave Talach, "Hey Payments Industry: Here's How You Can Take Mobile Commerce To The Next Level," SAI Contributions(2011), http://www.businessinsider.com/what-will-it-take-to-make-mobile-commerce-fly-2011-3.

[249] Interchange is the fee paid between banks for the acceptance of card-based transactions. Interchange fees have a complex pricing structure that is based on various factors including the risk profile of the transaction (e.g., online, in-store, phone order, etc.). Mobile transactions may lead to higher interchange fees, which would disincentivize retailers from embracing this payment type until the shopper demanded it.

cumulative expenditure on mobile marketing in Canada is projected to be in excess of $1.5 billion over the next five years, growing from a base of less than $50 million in 2010. [250]

As discussed in the mobile entertainment chapter (see page 84) this dramatic growth is not all "net new" monetary investment in marketing dollars, but rather a shift from traditional advertising and marketing channels to incorporate mobile into the media mix. For example, an auto manufacturer may have previously had an advertising campaign that put $5 million into television advertising, but will now put $4 million into television advertising to help create attention and desire, and move $1 million into mobile marketing, for local dealers to invite target consumers for test drives. The overall budgets do not change, but the anticipation is that mobile will be more effective at completing parts of the marketing exercise. This is a large part of the rationale behind the projection for such significant growth in mobile-marketing expenditure.

This phenomenon has been recognized across the world, and significant parties such as banks, retailers, and mobile-network operators are all gearing themselves up to address the opportunity. In many jurisdictions, the large mobile operators have formed joint ventures with their competitors in order to address the opportunity, as well as to embolden their offerings (such as mobile wallet) to stand tall against the inevitable threat from players like Apple and Google. In the US, AT&T, Verizon and T-Mobile have formed a joint venture (ISIS) [251] and in the UK a different joint venture between Vodafone, O2 Telefonica, and Everything Everywhere (T-Mobile & Orange) has been established. Most other large developed economies are also seeing similar ventures formed, although the collaborators vary from one jurisdiction to another.

From an advertiser's perspective, it is undoubtedly useful to have the media inventory of all the network operators available in one entity, be it a joint venture or other structure. If a large food brand wants to advertise a particular beverage to everyone at a concert at the Air Canada Centre using a specific mobile coupon sent to a smartphone, it would be much easier to do this through a media company that had the phone numbers and access to all of the attendees rather than just those on one particular network. All of these opportunities become prevalent now that there is a significant volume of smartphone ownership that makes mass marketing opportunities such as this possible.

Consumers can expect to benefit primarily through the convenience of using their mobile phones to hear about and accept offers they would otherwise have missed. Similarly, a mobile wallet means carrying less cash, and smartphones should theoretically have additional layers of passwords and

[250] Intelligence eMarketer Digital, "Mobile Video Provides Biggest Growth for Ad Support," eMarketer Inc., http://www.public.site2.mirror2.phi.emarketer.com/Article.aspx?R=1008777..

[251] www.paywithisis.com/whatis.xhtm

access controls that make them safer than cash, debit cards or credit cards—although, naturally, an empty battery also means no access to your wallet! While there are significant benefits to consumers from these mobile-marketing opportunities there are also challenges, such as the need to opt in (so you are only receiving very relevant and timely messages), as well as privacy and security.

Finally, we can also anticipate that person-to-person mobile marketing and payments will potentially grow, as with M-PESA in Kenya and other developing markets. The ability to send low-value payments via smartphones (or other devices) can dramatically change markets and behaviours, for example eradicating the need to physically visit a bank branch for a trader who currently only trades in cash.

## 5.6 Opportunities for Ontario Businesses

Canadian businesses have lagged behind those in jurisdictions like the US in making use of the web and e-commerce, and we cannot afford to repeat this condition with m-commerce. When Ontario consumers reach into the cloud to make purchases, [252] they are using the commerce storefront of American companies such as Amazon and Yahoo. A proactive position by Ontario stakeholders will enable Ontario and Canada to avoid the mistakes made with e-commerce, when little was done to promote adoption in Canada; this concentrated the control of the local e-market south of the border. This American control not only leads to the loss of jobs and revenue, it could also expose Canadian data to another country's scrutiny.

### 5.6.1 Building Capacity for M-Commerce Innovation

In their analysis of the Toronto finance sector, David A. Wolfe et al. demonstrate the mutual reliance of financial industries and ICT providers in the drive toward innovation. As we have suggested for other non-mobile industries, close working relationships between these sectors is critical. The report notes the importance of better communication and co-location, [253] as well as formal flows of knowledge and partnerships:

> Overall, evidence of cross-sector partnerships between ICT and financial services firms seems limited within the local sectors. Similarly, instances of collaborative partnership with firms in

[252] Cloud computing is the delivery of computing as a service rather than a product, whereby shared resources, software, and information are provided to computers and other devices over a network.

[253] Wolfe et al., "Innovation and Knowledge Flows in the Financial Services and ICT Sectors of Toronto. A report prepared by David A. Wolfe, Charles H. Davis, Nicola Hepburn, Nicholas Mills & Gale Moore for the Ontario Ministry of Research and Innovation, the Toronto Region Research Alliance, and the City of Toronto.."27.

> unrelated (or outside) industries were not apparent among the survey of local firms. Firms instead maintain strong vendor-client relations when a business partnership is formed regardless of which party proposes the venture. While the planning and strategy role most often falls upon the financial services firm, more symmetrical relationships among client and service firms could allow for greater knowledge spill-overs and synergies among firms increasing the level of innovation in Toronto's financial services industry. [254]

With the growing importance of mobile marketing, creative industries such as advertising agencies must also be drawn into such collaborations; otherwise, there is a risk that such knowledge will be imported—especially by large brands that have had critical success with mobile-marketing campaigns they have used internationally. Ontario has the largest concentration of population in Canada, making it the most attractive place for large brands to initiate mobile into their larger campaigns.

In addition, collaboration between small firms and large financial-industry firms will be needed to develop aligned strategies regarding the regulatory environment. Regulation can inhibit innovation or can propel it forward.

## 5.7 Action Plan

### 5.7.1 Private Sector

It is important that mobile security is involved in every stage of the m-commerce application-development life cycle, including planning, design, development, testing, retesting, re-retesting, release and post-release. In order to foster adoption of m-commerce throughout the retail sector and value chain, it will be necessary to bring together multiple stakeholders to develop successful solutions in the following action:

★ Security will be enhanced by educating developers and testers on different aspects of m-commerce application security and by practicing due diligence in researching different areas of security (including mobile device attack vectors) in order to accurately perform a security audit of m-commerce applications.

M-commerce influences the productivity of consumers, merchants and retailers. One of the greatest challenges for businesses is to understand how to utilize mobile solutions within their business models. The face of m-commerce is still undeveloped, and the area is ripe for design.

[254] Ibid., 25

About 90 per cent of Canadian banks have their headquarters in Ontario. Canada's banks have a long history of leading banking innovation. Canada has the highest rates of electronic payment usage through debit and credit cards and the highest rates of online banking usage, and Ontario was the first region to invest in chip-card technology in North America. [255] Ontario banks should continue this type of leadership with m-payments. The following action would facilitate adoption:

★ Banks and brands could ally to create m-commerce pilots that could help businesses and merchants navigate risk by proving consumer interest and refining interfaces. This collaboration would help to allay concerns as there are high upfront costs associated with new mobile terminals and other technology investments.

### 5.7.2 Academia

It is important for post-secondary institutions to foster a culture of information exchange and cooperation among sectors that are not familiar with the advantages of m-commerce, through vehicles such as the Mobile Experience Innovation Centre (MEIC) and the Wavefront National Centre of Excellence for Commercialization and Research. By collaborating with industry, these institutions could play a neutral role in convening forums to bring retailers and industry sectors together in order to: understand the factors that change consumer behaviour; develop strategies to build needed infrastructure; and determine how to optimize business processes.

Academia can also:

★ Undertake research regarding m-commerce applications and related issues such as privacy and security.
★ Collaborate with the m-commerce industry, to provide needed training for application developers and industry sectors in order to help them to understand, apply and market m-commerce.

### 5.7.3 Government

Ontario could encourage ahead-of-the curve participation in mobile by consumers, businesses, financial institutions and public-sector services. One option may be to develop collaboration tax incentives that would push Canada's banks and merchants to invest in mobile-payment infrastructure; this would help build Ontario into a leading centre of m-commerce and financial services.

Government can also make an impact by taking action on regulatory policy that would enable the

[255] Watch, "Canada Credit Cards".

growth of m-commerce by permitting multiple solutions. For example:

- ★ Ontario can both collaborate with its federal counterparts to ensure that its own consumer-protection legislation is in place. Legislation must protect residents' personal data through appropriate privacy measures. Government could join with industry to oversee the quality of security provisions.
- ★ Bill 5 and future legislation are important initiatives in this regard. Consumer education requirements on the part of industry are fundamental requirements.

Government can directly influence services it subsidizes or controls. Here, Estonia serves as an example: a March 2009 KPMG survey singled out Estonia as the most advanced mobile-payment market in Central and Eastern Europe. [256] There is great potential within these areas to support the development of mobile-payment infrastructure and customer habituation to the conveniences of m-commerce. Ontario can act as a model user of m-commerce and promote a larger mobile Ontario policy that enables convenient access to government services:

- ★ The government can mandate the retrofitting of points of service it funds, subsidizes or contracts out. Further, as Ontario privatizes or contracts components of its services it can mandate mobility as a core quality of new providers.
- ★ Government services should allow the use of the mobile wallet and mobile quick checkout for licenses, tickets, etc.
- ★ Ontario could set an example and help to educate consumers and businesses about m-commerce by encouraging organizations like Metrolinx and PRESTO to invest in m-commerce payments and applications.

In following the strategies above, the government of Ontario can also play a role in job creation by establishing a robust tax regime that favours mobile small and medium enterprises (SMEs) that provide mobile services. In this way, Ontario has the opportunity to ensure that the province remains competitive as m-commerce grows around the world. By using Ontario as a mobile-service-technology beltway, the government will advance conveniences for its residents and economic opportunities for the region.

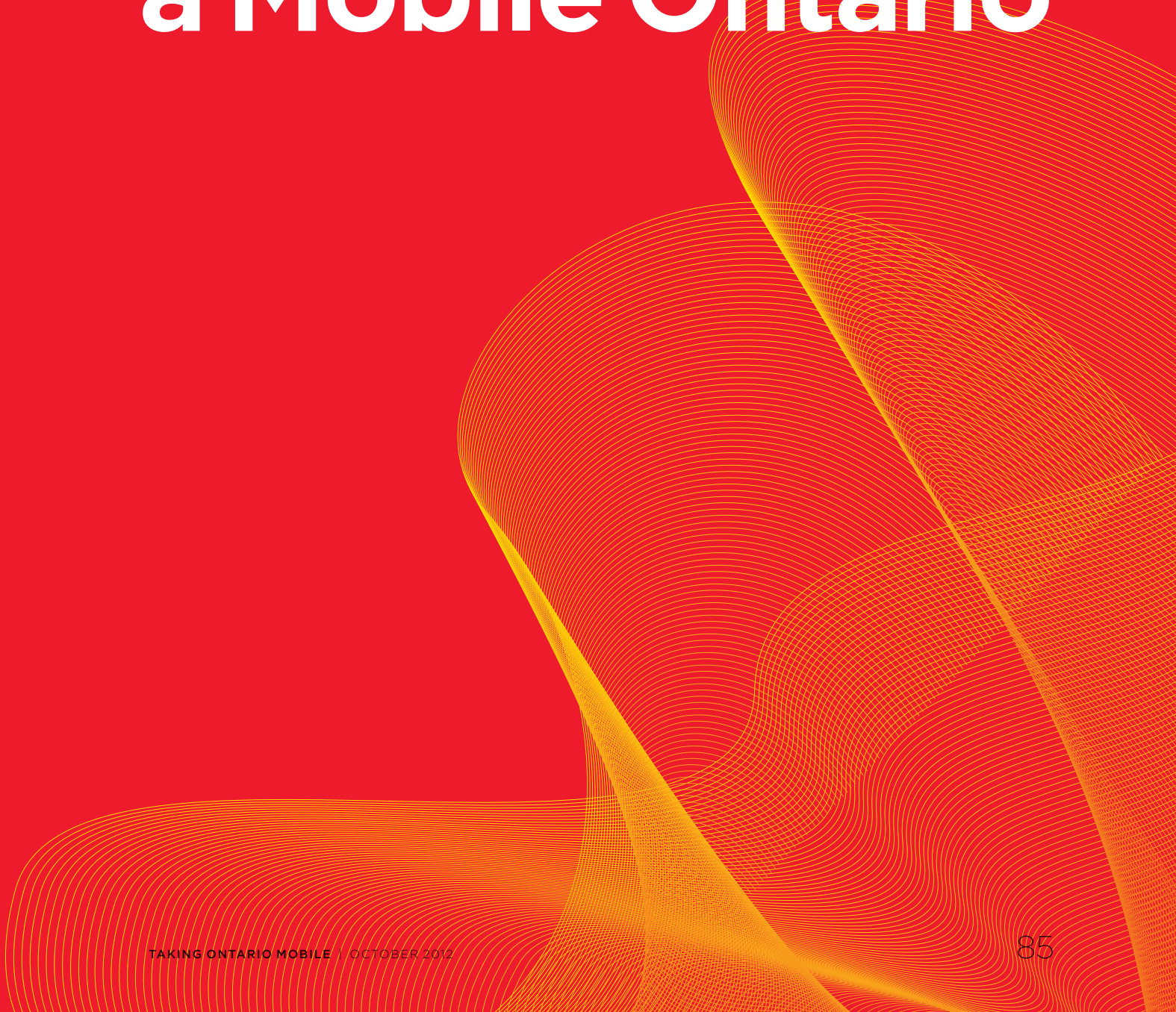
[256] The survey shows that Estonia has advanced beyond the initial mobile-payment phase, while most other Central and Eastern European countries still have much room for improvement. In addition, there has been close cooperation between Estonian mobile-network operators and banks; mobile-payment transactions are executed through a bank-card centre set up by major banks, and a certification centre has been established. KPMG International, "2011 Mobile Payments Outlook. The opportunity is rich: the greatest gains will come from cross-industry partnerships," (KPmG, 2011).

The government could also partner with business through vehicles like MEIC and the Mobile Marketing Association (MMA) in order to support outreach and education for business that are not yet adopting mobile commerce—thus encouraging experimentation in new sectors. For example, the government could:

- ★ Promote m-commerce success stories, such as Indigo/Chapters' Kobo reader, Metro newspapers, the SCENE loyalty program and Air Miles.
- ★ Through the Ministry of Training Colleges and Universities, encourage the creation of education opportunities to ensure there is a talent pool with the requisite design, engineering and business skills to allow Ontario to lead in m-commerce.


6

# Entertainment in a Mobile Ontario



## Challenges

- Audiences require reasonable tariffs to access mobile media.
- Creative-industry producers and distributors need to continue to adapt to the emerging possibilities of mobility.
- Industries, audiences and policymakers are operating in an infinite screen (n-screen) future, which is prompting mergers, acquisitions and the rise of platforms (such as Google) who act as competitors to traditional broadcast and telecommunications companies.
- Canada needs to allocate additional spectrum to meet the growing demand and potential for mobile broadband.
- Technology innovators need to continue research and rollout of compression technology.
- Collaboration is necessary between mobile marketing, advertising, mobile commerce, service providers and media companies to build effective business models.
- Producers face high critical uncertainty regarding the future availability of bandwidth given the projected growth of mobile video and data.
- Sub-sectors of the entertainment industry need new business models in the face of the disintermediation and reorganization of traditional media industries.
- Producers need continued leverage to reach international markets.
- Producers need to be able to locate a talent pool for mobile media (engineers, mobile designers, usability experts, content creators and programmers, as well as business analysts and leaders).
- Funding agencies need to continue to adapt to emerging technology platforms and content strategies, allowing mobile content to be produced both as part of transmedia projects and as standalone applications.
- The province needs to attract more private capital to our creative industries.
- Producers of mobile media need financing vehicles for start-ups and the early stages of production.
- Ontario consumers need greater media literacy information in order to attain an awareness of how media and data-control practices affect them.
- There is a need for device and software interoperability, network neutrality and appropriate privacy legislation.

We make the argument in this section that mobile entertainment (m-entertainment):

- Provides new opportunities to grow Ontario's already powerful entertainment industries.
- Provides new revenue streams and business models.
- Can extend Ontario's wider cultural and tourism industries to international markets.

This chapter provides an overview of the current capacities and opportunities for the integration of mobility into the cultural industry sectors, such as traditional media and new forms of digital entertainment. To further understand the opportunities for creative industries, we refer readers to the in-depth analysis of the mobile industries developed by the Mobile Experience Innovation Centre (MEIC) in its report Mobile Innovation: *Ontario's Growing Mobile, Content, Services, and Applications industry 2012*. [257] It provides in-depth analysis of the needs of the mobile-content producers in Ontario.

Audiences are actively searching platforms like the Internet and mobile for content, and consumers are spending an increasing amount of their time with non-traditional screens. [258] The unique qualities of mobility bring new capacities to the digital-media sector and entertainment industries, for example:

- Mobility is a gateway to accessing international markets.
- Ubiquitous access is propelling another phase of new-media creation as devices move with people as opposed to people having to move to devices.
- Mobile technology has a specific role in an n-screen world—as a platform, a control device, a means to augment linear screen content and a data-collection centre.
- Mobile experiences are designed with attention to two form factors—visual acuity and flexibility—thereby broadening the appeal across generations. [259]
- Multiple consumption channels provide an estimated 7 [260] to 8.5 hours a day [261] of screen exposure and increased access to consumers.
- Mobile media includes "TV everywhere," where the device is used as a media player for traditional media; locally interactive standalone apps, where the device is used like a computing device; and interactive mobile apps that rely on connecting to networks and other devices.

[257] MEIC, "Mobile Innovation: Mobile Content, Services, and Applications Industry 2012."

[258] Neilsen, "Transmedia Design for 3 Screens - Make That 5".

[259] Stein, "2020 Media Futures Trends Package."

[260] Fred Fletcher and Charles Zamaria, "Canada Online! The Internet, media and emerging technologies: Uses, attitudes, trends and international comparisons 2007," Canadian Internet Project. 117.

[261] Richard Zackon, "Ground-Breaking Study of Video Viewing Finds Younger Boomers Consume More Video Media Than Any Other Group," Council for Research Excellence, http://www.researchexcellence.com/news/032609_vcm.php.

- The "app" software model is clearly working: ABI research shows that more than 18 billion apps had been downloaded in the Apple marketplace by October 2011, and more than 10 billion had been downloaded in the Android marketplace by December the same year.
- The emergence of HTML5 will see the movement of some m-entertainment directly onto the mobile Internet.
- Developers are aggregating apps to enable search and brand recognition.

Table 1 indicates the uses in America of smartphones for activities that cover the broad spectrum of m-entertainment:

**Table 1:** Top uses of smartphones among US smartphone owners. [262]

| Activity | % of Users |
|---|---|
| Send or receive text messages | 92 |
| Take a picture | 92 |
| Access the Internet | 84 |
| Send a photo or video to someone | 80 |
| Send or receive email | 79 |
| Download an app | 69 |
| Play a game | 64 |
| Play music | 64 |
| Record a video | 59 |
| Access a social networking site | 59 |
| Watch a video | 54 |

## 6.1 Ontario's Creative Industries: Sub-Sector Analysis

Ontario faces the transition to mobile media with strong resources. It has a robust and multidimen-

[262] Aaron Smith, "Americans and their cell phones: mobile devices help people solve problems and stave off boredom, but create some new challenges and annoyances," Pew Research Center, http://pewinternet.org/Reports/2011/Cell-Phones.aspx.

sional creative-industry sector [263] that ranks third in employment and is among the world's strongest in revenue generation: the creative industries in Ontario generate $12.2 billion in GDP for Ontario's economy annually and are number one in Canada by GDP. [264] Creative-industry GDP is now larger than the GDP of Ontario's energy industry, is approaching 70 per cent of the auto-manufacturing sector's GDP, and surpasses the GDP of the agriculture, forestry and mining sectors combined. [265] The final report by the Consortium on New Media, Creative, and Entertainment R&D in the Toronto Region (CONCERT) [266] shows that Ontario has a history of quality production and breadth across cultural sectors, especially within screen-based industries. The report concludes that the creative-industry cluster is enabled by the presence of the information and communications technology (ICT) industry, which provides needed technologies, a diverse population that allows access to international markets, an ecology of companies that are able to address the full production and distribution cycle, excellent training institutions such as the Canadian Film Centre and post-secondary institutions that are able to create the next generation of talent.

The overall Canadian sector, with its base in Ontario, represents a faster growth number than the Canadian economy: despite the recent recession, 1.1 million Canadians are "estimated to owe their jobs (directly or indirectly) to creative industries." [267] The Ontario sector's job growth grew between 1999 and 2007 at a rate of 38.3 per cent—well over the 17 per cent overall growth of jobs in Ontario. [268] Federal regulation, federal and provincial funding policies that favour Canadian firms and economic support mechanisms from both federal and provincial programs have played an instrumental role in the sustainability of these industries. [269]

[263] The Ontario Ministry of Tourism and Culture provides a comprehensive overview of Ontario's creative industries, which include significant resources to produce m-entertainment (core arts and cultural workers such as those in film and television, supporting industries such as design, and wider creative Industries such as software development), as well as opportunities for the application of mobile content across many industries, such as publishing and fashion. See *Ontario's Creative Cluster Study* (2009), Ministry of Tourism Culture and Sport, "Ontario's Entertainment and Creative Cluster: A Framework for Growth." http://www.mtc.gov.on.ca/en/publications/Creative_Cluster_Study.pdf.

[264] Charles Davies proposes that the total aggregate revenue of the screen-based segments of the Ontario media industry was $6.2 billion in 2006–07, of which around $4.5 billion was accumulated in the Toronto region. He provides an excellent analysis of strengths and weaknesses of the cluster in Davis, "The Toronto Media Cluster: between culture and commerce.", 223–50.

[265] Ministry of Tourism Culture and Sport, "Ontario's Entertainment and Creative Cluster: A Framework for Growth."

[266] Consortium on New Media, "Creative and Entertainment R&D in the Toronto Region."

[267] Ministry of Tourism Culture and Sport, "Ontario's Entertainment and Creative Cluster: A Framework for Growth."

[268] Ibid.

[269] See Scott McKinnon, "From Cultural Nationalism to Regional Development: Examining the Growing Role of Canada's Provincial Cultural Agencies in the Support of the Nation's Cultural Industries during the Era of Globalization" (paper, Ryerson University, Toronto, 2008). This report underscores the importance of provincial intervention in maintaining a healthy industry.

The global digital-media sector is one of the fastest-growing industries in the knowledge economy, with a projected valuation of USD$2.2 trillion in the next five years. [270] Expected growth was targeted at 22 per cent from 2008 to 2012, [271] and American mobile media and entertainment revenues doubled between 2011 and 2012. [272] Mobile strategies include non-interactive media (such as "television everywhere," where the device is used as a media player), standalone apps (where the device is used like a locally interactive computing device), and interactive mobile apps (which rely on connecting to networks and other devices).

Traditional industries such as the broadcast, feature film, music and publishing are adapting to radical changes in the media market caused by the introduction of digital technology, and a second wave of convergence is underway. [273] The *2020 Media Futures Report* reinforces the view that Ontario's cultural industries face disintermediation and transformative challenges in the next decade, including the move to mobility and the dominance of social media content. [274] The pressure is palpable as audiences seeking additional interaction with entertainment properties gravitate toward productions that meet them on their own terms. Mark Greenspan of Achilles Media describes the digital industries in this way: "the convergence of advertising, publishing and broadcasting through the interactive medium of the Internet and mobile devices. This includes a telecommunications company, Research In Motion;

[270] James Quintana Pearce, "US Mobile Media & Entertainment Revenues To Double By 2012: Report," http://moconews.net/, http://moconews.net/article/419-us-mobile-media-entertainment-revenues-to-double-by-2012-report/.Current estimates are likely higher than this article from 2008.The example is in growth rate.

[271] Ron Freedman, "Designed for Impact. Toward a dissemination and Commercialization Investment Strategy for the Art, Design and Culture Sector," (Association of Universities and Colleges of Canada (AUCC)/Association of Canadian Institutions of Art + Design (ACIAD), 2009).

[272] Science Technology and Innovation Council, "State of the Nation 2010.Canada's Science, Technology and innovation System: Imagination to Innovation - Building Canadian Paths to Prosperity.."

[273] See CIAIC (2009). 2008 Canadian Interactive Industry Profile. Toronto: Nordicity for the Canadian Interactive Alliance; Coish, David (2006). Profile of Selected Culture Industries in Ontario. Ottawa: Statistics Canada, 81-595-MIE2006038 and the following reports from Nordicity for in-depth supporting evidence of the discussion that follows: Nordicity (2008a): A Strategic Study for the Music Industry in Ontario. Final Report. Toronto: Unpublished report prepared for the Ontario Media Development Corporation Music Industry Advisory Committee.
Nordicity, "A Strategic Study for the Book Publishing Industry in Ontario," (Toronto: OMDC Book Industry Advisory Committee, 2008); Nordicity, "Economic Profile of the Ontario Computer Animation and Visual Effects Industry," (Toronto: Computer Animated Studios of Ontario, 2008); Nordicity, "Regional Innovation Profile," (Toronto: CONCERT, 2008); Nordicity, "Ontario Profile 2009: An Economic Profile of Domestic Film, Television and Cross-platform Interactive media Production in Ontario," (Toronto: Ontario Producers Panel and Canadian Film & Television Production Association, 2009); Nordicity, "The Greater Toronto Area's Potential for Innovation in the Screenbased Industries," (Toronto: CONCERT, 2008).

[274] VanAlstyne, "2020 Media Futures."

diverse social media service providers like HootSuite, and Radian6; and media conglomerate Vice—all companies that got their start in Canada with some kind of public support." [275]

Industry faces the challenge of maximizing the potential of the n-screen universe and n-screen content, sometimes described as "television everywhere," [276] in which content may flow across many different types of screens with different purposes that therefore warrant specific approaches or require integration. The number of these applications and experiences will only continue to grow: from Smart TV, next-generation Wi-Fi, large-screen applications, mobile experiences, augmented reality (AR) and "transmedia" to smart physical products such as toys and wearables. These products and services will be intelligent, producing data that tracks their uses and relationships. Mobile devices act as means for content display, device control, and commercial transactions and data collection. The n-screen future is a driver, with the resulting trends being: 1) mergers and acquisitions of broadcast and Internet service providers (ISPs), as well as the acquisition of requisite technologies; and 2) the emergence of platforms that act as growing competitors to traditional distribution channels (such as Google, with its acquisition of YouTube). Over-the-top television (Internet television) adds another dimension of competition, marking steady growth and providing opportunities for mobile-content delivery with players such as Apple and Netflix entering the game. [277]

Innovation in the digital-media sector requires responsive market intelligence, strategic foresight, fast prototyping (agile development) and usability, as well as an entity able to take risks in order to propel the consortium of companies forward. [278] Development is no longer staged—testing of new products needs to happen in the marketplace as others come on-stream. Charles Davies's study of the Greater Toronto Area component of the sector makes the following observation: "Migration to digital platforms and distribution systems, development of specializations, spillovers within the urban cultural economy, entry of persons from Toronto's multicultural population into the media industry, extensive trans-local and trans-cluster personal linkages, access to a variety of global production networks, and abundant creative, technical, and financial talent provide potential for many new combinations and growth pathways for this promising media cluster." [279]

[275] Chris Plecash, "Canada's digital economy strategy looks to tap into growing digital media industry," Hill Times Publishing, http://www.hilltimes.com/policy-briefing/2012/01/16/canada%E2%80%99s-digital-economy-strategy-looks-to-tap-into-growing-digital-media/29284.

[276] See https://www.mobitv.com/ for an example of a company that manages television content across multiple devices, and http://glassbox.tv/about-us/ for a company that manages multiple delivery platforms.

[277] See http://www.itvdictionary.com/definitions/over-the-top_definition.html and http://www.bci.eu.com/over-the-top-tv/over-the-top-television-ott-tv/ for discussions of growth.

[278] MEIC, "Mobile Innovation: Mobile Content, Services, and Applications Industry 2012."

[279] Davis, "The Toronto Media Cluster: between culture and commerce.", 250.

The challenge of meeting the potential of the n-screen universe is not only a creative and content challenge for industry. Mobile broadband may well be a better solution for next-generation connectivity than fixed lines. As Catherine A. Middleton and Jock Given point out, "If it does prove to be a disruptive technology, wireless broadband will be the broadband infrastructure of choice for many citizens, and may well become more important than fiber broadband connectivity." [280] There is thus a significant need to allocate more spectrum if Canada is to meet the demand for and potential of mobile broadband. [281] Middleton further argues that "off-network," "open-network" and public-network access is a needed stimulus to fully stimulate innovation and the use of mobile broadband. [282]

A spirit of cooperation and resource-sharing has emerged: Partnerships in Academic Collaboration and Entrepreneurship (PACE), for example, is a collaborative network that links university and college incubators with business/post-secondary incubators such as MEIC, OCAD University's Imagination Catalyst and the Digital Media Zone (DMZ) at Ryerson, facilitating the sharing of resources. Incubators and accelerators provide essential counselling and support for emerging companies, link SMEs to talent and create an ecology in which strategic Canadian and international companies can move their mobile capacity forward by identifying emerging platforms and applications.

### 6.1.1 Media Entertainment Industries

Ontario is the centre of Canada's English-language content industry, hosting the majority of the vertically integrated broadcast, Internet and mobile content industries (including Bell Media, Rogers, Sun Media) and Canada's two national newspapers (the Globe and Mail and the National Post). The following are examples of the adoption of mobile by Ontario media companies:

- Mobile offerings have been a growing profit centre for the *Globe and Mail*; some of which (business forecasting and news applications) function as subscription services and employ in-house teams to develop these.
- The *Toronto Star* has a substantive circulation and is based in Toronto. It offers a mobile version and has also built a mobile infrastructure to coordinate its delivery and the tracking of single-issue sales of physical papers.

[280] Catherine A. Middleton and Jock Given, "The Next Broadband Challenge: Wireless," *Ted Rogers School of Information Technology Management Publications and Researche* (2011), http://digitalcommons.ryerson.ca/trsitm/28., 36–56.

[281] Ibid., Catherine Middleton, "When Reality Meets the Mobile Imaginary: Exploring Constraints in Mobile Technology Use," in *Materialities and Imaginaries of the Mobile Internet Conference* (Kitchener, Ontario 2011).

[282] Middleton, "When Reality Meets the Mobile Imaginary: Exploring Constraints in Mobile Technology Use."

- Media companies not headquartered in Ontario have significant subsidiaries in Ontario, such as Corus Entertainment, a holding of Shaw Communications, Inc. , and Transcontinental, which is headquartered in Quebec and has offices in Ontario.

Major media brands offer mobile experiences as part of crossover or convergent media products. Companies hire application developers or have in-house talent, and often combine both of these approaches. For example:

- Transcontinental has a mobile division that plans and designs its products and then hires application developers to build these; the company also buys existing applications and licenses products.

Some industry sectors and producers—particularly those with more traditional practices—continue to encounter difficulty in adapting to interactive digital media. Producers have difficulty rationalizing expenditure when there isn't a familiar monetization model. At the same time, traditional media companies continue to find their business models disrupted. [283] Broadcasters, film companies, music companies and publishers have little experience with research and development (R&D) in terms of platform experimentation. In a disrupted environment, the companies that survive are those that quickly find ways to adapt.

> *We're still at the stage where we have to bring the horse to the water. . . . I don't think most of these companies are actually ready. Developing for mobile requires a lot of agility and a lot of skills companies in Canada don't have yet, unless they decided to be a digital media company aimed specifically for mobile development. . . . But most of the companies still have to integrate and understand what to do with mobile: how to adapt their content, how to develop, but in terms of skills development, they don't have that in-house, so they have to find partners and be sure that these partners do understand mobile, interface development, coding . . . and all of that is yet to be assimilated.*
>
> *Director, Industry and Market Trends, Media Sector*

In the mainstream entertainment industry (film and television production, music, book publishing and magazine publishing), m-entertainment is an element in integrated media experience or transmedia. Some entertainment companies continue to struggle to define the appropriate use for mobile experiences. One of the experts that we interviewed cautioned that the media industry must avoid "content dumping"—efforts to make everything and anything mobile—and aim for a best fit between technology and what people actually do during the course of their days. [284]

[283] Ontario has notable exceptions to this observation: companies such as Shaftesbury Films, GlassBox TV and Marble Media, which are leaders in providing multiplatform experiences.

Very few traditional Canadian media companies—even vertically integrated telecommunication companies [285]—have specific mobile media content divisions. Rather, these activities are incorporated into the companies' Internet/digital-media departments, or are jobbed out to external specialty agencies, such as mobile-integration services (e. g. , Impact Mobile, Polar Mobile, MyThum) and digital marketing firms (e. g. , henderson bas kohn, Devlin Media, Jet Cooper, Trapeze). The activities may be centred on particular services or media holdings (e. g. , mobile music services, sports franchise holdings). It is not unusual for separate business units within larger organizations to undertake their own independent mobile initiatives.

Canadian telecommunications companies have been perceived as having less interest in developing m-entertainment business, as the primary portion of their revenue comes from access and roaming charges. [286] This model represents a significant challenge for companies that are attempting to initiate m-entertainment services through Ontario carriers. Companies currently face these challenges:

- Small ventures that don't meet billing requirements for a specified volume of transactions and ventures that can't bear the 30–40 per cent revenue surcharge from carriers are unable to achieve deals with the telecommunications companies.
- A common challenge for both old and new players within the entertainment industries is the reaching of agreements with peripheral stakeholders such as trade unions and rights-management organizations.

However, vertically integrated companies with a strong background in telecommunications are moving forward with mobile offerings as they absorb traditional broadcasters. Of significance are BCE Inc. 's mergers w with CTV in 2010 and proposed merger with Astral Media in 2012.The integration of media production into BCE's technical capacity and smartphone offerings has led to an increase in mobile offerings. As well, BCE profit rose by 41 per cent in the last quarter of 2011 through its combination of smartphone mobile use and television growth. [287] It is notable that with the BCE acquisition of

[284] One of our informants, a CSO from a social media measurement company, stated the challenge thus: "Social media is mobile because that makes sense. People are communicating what they are doing and what they like across the day and mobile is good for this because people are actually mobile during the day. And it's within the logic of what you are actually doing to publish your status, express yourself, and communicate to people, as opposed to a fixed terminal."

[285] Rogers and Bell Globemedia have mobile activities that include media production and repurposing of content from other of their owned properties and platforms. TELUS is primarily a distributor.

[286] This is particularly true in the area of music services. iTunes was delayed entry into Canada for two years, and although Spotify (a leading streaming service from Sweden) is licensed to operate here, negotiations with rights organizations over terms of trade are ongoing. Reuters, "Bad news Canada, Spotify losing yet more money on royalty costs," *The Globe and Mail,* Oct. 11 2011.

[287] Iain Marlow, "TV service, smart phones boost BCE profits 41 per cent," *Globe and Mail*, November 3 2011.

CTVglobemedia there has been increased investment in mobile properties.

### 6.1.2 Advertising Industry and Advertising Revenue

Toronto is Canada's English-language advertising hub. It is home to the Mobile Marketing Association, which has significant representation from the Interactive Advertising Bureau (IAB) mobile industry and divisions. These firms often use casual mobile games to engage potential customers for the brands they represent. International brands that reside in Ontario have taken up mobile marketing and advertising, relying on Ontario-based firms to deliver content to their users.

The media industry remains dependent on advertising revenue as its major financing mechanism, and dollars follow usage. Scott Cuthberson and Michael Elkins analyzed the dramatic move to online advertising in 2011:

> At the risk of oversimplifying, digital/online/mobile/social advertising is providing the growth in this business, with traditional media as a whole remaining essentially flat, specialty television and out of home being the exceptions. We expect this and associated trends involving media consumption to continue and gain traction this year. [288]

As media usage moves to mobile devices and usage grows, marketing dollars will move to mobile platforms, including the mobile Internet.

The objective guiding mobile strategy—and any media strategy—is to engage customers/clients wherever they are spending their time. According to forecasts by eMarketer, we can expect ad-supported mobile entertainment initiatives (video, music, games) to expand significantly in the short term; eMarketer predicts a 52 per cent growth in revenue for 2012. [289] These revenues are divided across various players in the value chain from ISPs and broadcasters to independent producers and application developers. Cuthberson and Elkins suggest that there are extensive Canadian business-development opportunities not only for m-entertainment companies but also for the applications that enable mobile marketing:

> As adoption of mobile devices such as smartphones and tablets explode and new open platforms such as Android rapidly gain market share, there is both a tremendous demand for and new supply of applications to simplify most needs. This includes many search, evaluation and mapping func-

[288] Scott Cutherberson and Michael Elkins, "2012 Outlook for Canadian Media: Mid-Life Crisis," (Toronto: TD Securities, Media, 2012), 4.

[289] eMarketer Digital, "Mobile Video Provides Biggest Growth for Ad Support".

tions inherent in the consumption process, and are therefore of core interest to marketers. Canada appears to be a fertile ground for the establishment of new media companies involved in this trend, perhaps ushering in a new wave of media companies in the years ahead. [290]

The overall forecast for mobile revenue models: ad-supported and -sponsored app purchases will grow over the next few years, and the same is likely true for subscription models, which are increasingly being used by news organizations (e. g. , the Economist, the New York Times) and music services (e. g. , Rdio, rara). During the first quarter of 2012, e-commerce sites received more traffic from tablet users than from smartphone users, the first time tablet traffic surpassed smartphone traffic, according to a Monetate analysis [291]. In total, tablet traffic accounted for about 6.5 per cent of commerce-site traffic (versus about 5.4 per cent for smartphones), and is expected to hit double digits by the 2012 North American holiday season. [292] The social media site Twitter, which is primarily driven by mobile traffic, sees most of its revenue from mobile advertisements. [293]

In addition to the traditional advertising model, business models are emerging that provide a glimpse into how the mobile media economy will evolve. These include:

- The proprietary ownership of targeted quality content.
- The production of branded mobile entertainment (in which brands underwrite entertainment content).
- Highly personalized social and local marketing (such as dynamic ad insertion and location-based marketing, with point of sale integrated).
- Subscription services.
- The aggregation of apps.
- Transactional services and "freemium" services (where basic services or content is offered and the user pays for levels and upgrades), in particular in gaming and video offerings.

### 6.1.3 New Media

"New media" companies are seeking to address opportunities presented by emerging markets in Canada and abroad for mobile apps and services. These firms tend to be either SMEs or individual contractors. Charles Davis captures the qualities of micro-companies in the sector:

[290] Cutherberson and Elkins, "2012 Outlook for Canadian Media: Mid-Life Crisis," 4.

[291] Ryan Kim, "Report: Tablets now Drive More Ecommerce Traffic than Smartphones," (2012).

[292] Ibid.http://gigaom.com/2012/06/29/report-tablets-now-drive-more-ecommerce-traffic-than-smartphones/.

[293] Gary Shih, "Twitter's Mobile Revenue Srupassed Web on Many Days: CEO," in *Reuters* (Reuters, 2012)., http://www.reuters.com/article/2012/06/06/us-twitter-mobile-idUSBRE8551JS20120606.

> Multiple factors encourage self-employed individuals to develop minor or major degrees of self-Identity as media entrepreneurs and business persons. Enterprising selves' create value for customers through content production, delivery of professional and technical services, and other firm-based media practices. But ambitious ventures require much greater access to financial, organizational, and human resources than are available to the typical media micro-entrepreneur. Dedicated entrepreneurs know they have to assemble these more considerable resources if they want to effectively pursue their business goals [294]

For SMEs and micro-companies, the challenges are somewhat different. These companies embrace new fields: staying abreast of change and maintaining an R&D sensibility are somewhat second nature. The challenges these companies face are those of businesses in emerging markets. The main challenges include:

- Gaining access to capital and markets.
- Finding and retaining skilled talent.
- Retaining and monetizing intellectual property (IP).

For example, the Ontario-based Canadian Independent Music Association (CIMA) has taken a number of initiatives in order to capitalize on the interest in niche music that the Internet provides, including the Music Export Portal and Mobile Application, which adds functionality to the Virtual Music Export Office initiated by CIMA last year. The latter initiative consists of a website with advanced search functions, tour dates in a calendar format, updates, and social-media integration; it also provides a substantive database of artists and international trade events, and houses 12,000 industry contacts with a special focus on emerging markets. The Independent Digital Licensing Agency's Direct to Consumer Mobile and Online Distribution Platform for Independent Labels and Artists and Indie Pool has built a white-label artist/label branded online and mobile storefront solution that will allow for the direct-to-consumer sale of both physical products and digital files—in a multitude of formats, and with the transaction, pricing and bundling options to be controlled by the artist or independent label. [295]

### 6.1.4 Music Industry

Music has long been a mobile medium, but the predominance of mobile devices has forever changed the way that music is experienced and marketed. Text messaging has become a significant force to market music, as licensing, live performances, merchandising and other revenue streams account for gaps in revenue that once came from traditional distribution sources.

[294] Charles Davis, "New or Small Firms in the Screen-based Media Industry: Startups, Self-employment and Standing Reserve," in *Managing Media Work*, ed. Mark Deuze (Thousand Oaks: Sage, 2010).

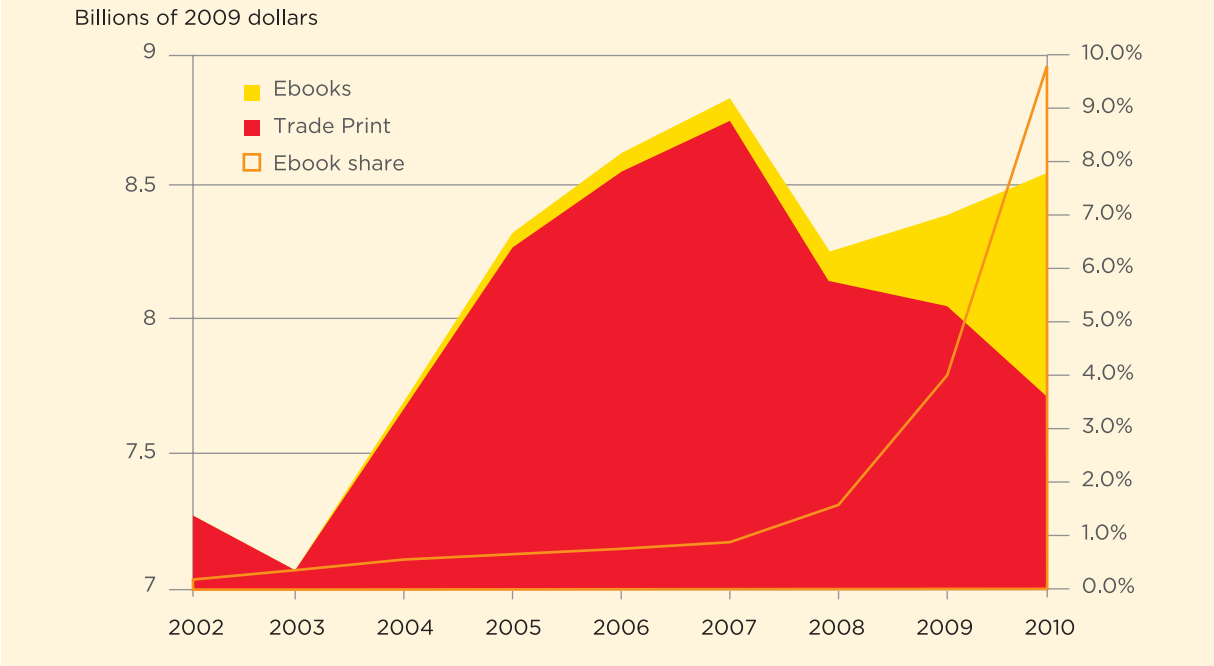
[295] OMDC, "Entertainment and Creative Cluster Partnerships Fund " Ontario Media Development Corporation, http://www.omdc.on.ca/Page5409.aspx.

Digital entertainment has become a global business, and market impediments can constrain competitiveness. Most m-entertainment is consumed via streams and downloads that are reliant on cellular bandwidth or, when out of range, Wi-Fi connections. [296] The music industry is moving toward streaming services such as Pandora, Spotify and Rdio as a primary means of distribution. Lowered costs of data plans will be necessary to encourage Canadians to expand their mobile music consumption habits.

### 6.1.5 Publishing Industries

Digital transformation has put tremendous pressures on the publishing industry, which is one of the industries deeply affected by the growth of tablet computing and mobile e-books. The OMDC acknowledges the challenges that the book-publishing industry is facing, stating that "Ontario's book publishing industry is undergoing significant changes as it adopts digital technologies. Traditional markets and business models continue to generate the lion's share of revenues (and are slowly growing), but online and digital technologies are retooling all elements of the book publishing value chain."[297] Figure 4 provides an example of the challenge for traditional publishers in the trade-book industry:

**Figure 4:** E-book share of trade book publishing sales.




[296] Jenna Wortham, "Cellphones Now Used More for Data Than for Calls," *New York Times* 2010.

As RISI (a subsidiary of UBM) [298] reports the trend to e-books will intensify with the growth of tablet computing,

> The North American e-reader market is expected to multiply fourfold over the next five years, there is substantial room for e-book sales to continue rising dramatically. . . . The market for media tablets, which consists of tablet computers (including Apple's iPad) and electronic readers (including Amazon's Kindle) exploded in 2010.In the first year of availability over 15 million tablet computers reached consumers.... By 2015, almost 200 million tablet computers are expected to be sold in North America and consumers will use them to consume content that was previously found in printed books, magazines and newspapers. [299]

Print-media companies are struggling to capitalize on the migration of sales to a media marketplace. This is a global challenge. A recent Deloitte study for the Netherlands found that in migrating to the sort of ad revenue–based model familiar to the media industries, the following factors would be critical to success:

- The adaptation of content to the device and medium, the "curation" of content, design and niche selection.
- The creation of innovative ads, the leveraging of industry best practices, the combination of ads and sales and the use of cloud computing.
- A dedication to value pricing and working with middlemen. [300]
- According to Justin Pearce, design aesthetics are moving toward a stripped-down look of "beauty and extreme user friendliness." [301]

Many questions about tablet publishing remain unresolved, such as:

- Whether or not there will be industry-standard formats or protected-propriety formats?
- Which operating standard will dominate?
- Whether there will be cloud-hosted or local storage?

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[297] Culture and Sport Ministry of Tourism, "Ontario has Across-the-Board Strength in all Cultural Industries," Queen's Printer for Ontario, http://www.mtc.gov.on.ca/en/creative_cluster/cluster_report_strength.shtml.

[298] UBM is a global live media, communications, events and data provider. RISI undertakes analysis for the media sector. See http://www.ubm.com/about-ubm/ubm-overview.aspx.

[299] RISI, "The Impact of Media Tablets on Publication Paper Markets," RISI Inc., http://www.risiinfo.com/risi-store/do/product/detail/impact-of-media-tablets-on-publication-paper-markets.html?source=PR1108FXPR. , 1

[300] Deloitte, "Impact study of the tablet on the Dutch publishing industry. Point of View," ed. Gideon Mogendorff & Raoul van de Hoef (Amsterdam: Deloitte, 2010).

[301] Justin Pearse, "The impact of tablets on digital media is undeniable," centaur media plc, http://www.nma.co.uk/opinion/the-impact-of-tablets-on-digital-media-is-undeniable/3031116.article.

- Whether apps will be delivered by aggregators or in a standalone fashion?
- Whether programs will be creator-friendly or restrictive?
- Whether traditional publication formats will migrate intact to the tablet or change over time? [302]

In our opinion, the tablet provides an unprecedented opportunity for a multimedia platform that combines media experiences—one dreamed of during the rise of the CD-ROM in the 1980s but unrealized, due either to technical matters or distribution penetration.

### 6.1.6 Mobile Games

The number of people engaging with video games doubled between 2008 and 2011. Mobile platforms contributed heavily to this increased participation, particularly in "casual" games—games that can be played for short periods of time. [303] Some of the major video-game makers for PC and game consoles made major development-company acquisitions in the mobile-gaming sector last year, further demonstrating the importance of adding mobile and casual games to their product lines. [304] In 2008, mobile gaming included a wide range of applications, from mobile gambling to casual games. Mobile-gambling revenue in the UK rose from £19 million in 2009 to £41 million in 2010. [305] Mobile gaming in Korea and Japan is also a high-growth market. Mobile gaming is expected to exceed USD$16 billion worldwide by 2016. [306] Hardware companies such as Sony and Nintendo continue to invest heavily in dedicated mobile-gaming devices like the new Vita and the 3DS, which boasts glasses-free 3D imaging. In 2010, the combination of iOS and Android ac-

Mobile Games Companies

Mobile Market Developers such as:
- Capcom Mobile (Burlington)
- Red Piston (Windsor)
- Rocking Pocket (London)
- Uken Games (Toronto)
- Untitled D (London)

Global Firms:
- Electronic Arts, a comprehensive games publisher, has located its Canadian mobile gaming development capacity in Waterloo

Canadian Cross-platform Companies:
- Silverbirch Studios (Toronto)
- RocketOwl (Ottawa)
- Howling Moon (Rockwood)
- dotBunny (Peterborough)
- Bitcasters (Toronto)

[302] Rob Slkowitz, "Apple's iBooks Push Raises 6 Big Questions About The Future Of E-Publishing," 2012 Mansueto Ventures LLC., http://www.fastcompany.com/1812673/apple-s-big-epublishing-moves-highlight-uncertainties-in-the-market.

[303] Stephanie Fogel, "Gaming population doubles in three years thanks to smartphones, tablets," Venture Beat Partners, http://venturebeat.com/2011/11/10/gaming-population-doubles-in-three-years-thanks-to-smartphones-tablets/.

[304] "EA Acquires Mobile Gaming Company PopCap for $1 Billion," Telecom Blog, http://www.thetelecomblog.com/2011/06/29/ea-acquires-mobile-gaming-company-popcap-for-1-billion/.

counted for 34 per cent of the revenues on portable games. [307]

The games industry has always been at the forefront of digital entertainment, pioneering innovative business, revenue and distribution models for content. Mobile games are sold in several ways:

- By and large, the mobile-game market relies on software distribution through direct download to tablets and handsets. Revenue models consist of direct-app purchases, game subscriptions, free-to-download ad-supported games, free games that lead to the sale of additional games or levels based on popularity, and "freemium" games, which allow the in-game purchase of attributes and game "perks" that allow the player to progress more rapidly. [309]
- As in the music business, the competition for "hit" titles is intense. A small number of titles end up making the lion's share of the revenue. Access to distribution channels is fundamental to success, though social media marketing can still garner significant revenue for titles by independent developers.
- Mobile games (and games generally) are currently seen as major components in "transmedia" storytelling—using a variety of different platforms to relate pieces of the same story.

Ontario magazines are a strong part of the cultural industries but face growing challenges due to globalization and online competition. Magazines Canada's Digital Discovery: The Next Generation (TNG) is a project that will build on its creation of the Canadian Digital Newsstand; the project will "enhance the existing site with dynamic marketing and archiving functions as well as the creation of mobile-friendly websites and a feasibility study exploring the creation of a unique Canadian digital magazine and content platform system." [308]

The Canada Media Fund (CMF) currently requires multiplatform development for producers, and this is where some transmedia experimentation is occurring, using mobile games developed by Ontario digital-media companies. Ontario has a number of accomplished mobile-game developers, such as

[305] Stuart Dredge, "Apps fuelling sharp growth for mobile gambling industry," Guardian News and Media Limited, http://www.guardian.co.uk/technology/appsblog/2011/jun/30/mobile-gambling-apps.

[306] Lauren Johnson, "Mobile gaming expected to exceed $16B by 2016: ABI Research," Mobile Commerce Daily, http://www.mobilecommercedaily.com/2011/07/28/mobile-gaming-expected-to-exceed-16b-by-2016-abi-research.

[307] Frank McPherson, "Smartphone Growth In Mobile Gaming Continues," WebMediaBrands Inc., http://socialtimes.com/smartphone-growth-in-mobile-gaming-continues_b59052.

[308] OMDC, "Entertainment and Creative Cluster Partnerships Fund."

[309] Johnson, "Mobile gaming expected to exceed $16B by 2016: ABI Research."

XMG Studios, Capcom Mobile and Big Blue Bubble. [310]

Industry forecasts predict that the global mobile-game market will continue to grow through 2016 with the addition of new users and the introduction of new platforms and technologies (e. g. , Near Field Communication, 3-D displays). [311]

### 6.1.7 Mobile Tourism

Mobile tourism offers a major opportunity and is a valuable market component of the cultural industries. Mobile maps, tour guides, recommendations, location-based entertainment and information content and AR overlays are of evident utility to tourists. Cultural attractions make use of mobile tourism to market to visitors. Several cities—including Paris, London, Amsterdam, Helsinki and Hong Kong—have focused on developing mobile initiatives for tourists and tourism. In particular, Amsterdam [312] and Hong Kong have developed mobile apps that help tourists plan their visits: "the citizen bus/train ticket system in Amsterdam, the Netherlands, enables passengers to use an IVR or the Internet to request a specific route at a specific time and receive a ticket via SMS sent to their mobile phones; they can then show the SMS (M-Ticket) to the conductor." [313] The Estonian city of Tallinn offers a mobile portal targeted at tourists, which provides information and lists of things to do and see in the city. [314] Hong Kong also offers a "geo-mobile map" that can be accessed via the web. [315]

As noted by MobiThinking, the major obstacle for city-based tourist initiatives is the roaming charges that can accrue when visitors access mobile websites and applications. Canada has among the highest international roaming tariffs, but high roaming tariffs are also a fairly common problem globally. Data pricing for tourists is much higher than domestic charges for data. At a standard roaming tariff of $30/MB, tourists would be subject to theoretical fees of tens of thousands of dollars an hour when using full-speed modern 3G devices. [316] Of course, many tourists now buy roaming packages when planning

[310] In addition, games-based learning continues to grow in importance, as research demonstrates games' ability "to foster collaboration and engage students in the process of learning." The *NMC Horizon Report: 2012 Higher Education Edition* emphasizes three related trends in education: tablet computing, mobile apps and gaming. These combine to create new opportunities for developers of educational games, mobile-gaming companies and traditional gaming companies seeking new markets. Johnson, Adams, and Cummins, "The NMC Horizon Report: 2012 Higher Education Edition."

[311] Ibid.

[312] See http://www.iamsterdam.com/en/mobile-city-guide.

[313] OECD, "M-government: Mobile Technologies for Responsive Governments and Connected Societies." 33.

[314] See http://www.tallinn.mobi/

[315] See http://www1.map.gov.hk/mobile/

[316] Iain Marlow, "Roaming Canadians taking costly wireless hits," *Globe and Mail*, June 8 2011., http://www.theglobeandmail.com/news/technology/mobile-technology/roaming-canadians-taking-costly-wireless-hits/article2051566/

to travel which helps to mitigate against high fees but also tends to limit mobile use to basic utilities. [317] The following actions would strengthen Ontario's attraction for mobile tourism:

★ Free Wi-Fi is thus an important option, but mobile operators should also be encouraged to develop pricing plans that reduce roaming charges.
★ In order to create opportunities for mobile tourism, Canada would need to seek international cooperation to regulate roaming tariffs for data (similar to the measures undertaken by the European Union parliament). Government and industry could also encourage programs to make data-enabled prepaid SIM devices available to tourists to Canada.

### 6.1.8 Cultural Attractions

Mobile communications and business models are important tools to assist cultural institutions, galleries and museums to build their sustainability and create stronger relationships with their audiences. These institutions can leverage their existing assets in many ways:

- Exhibitions come alive with mobile didactics built on mobile phones, tablets or proprietary devices; these services intensify and enhance audience experience.
- Archival holdings can be digitally integrated into exhibition experiences as elements of AR tours, and location-based services can call up collections and archives, bringing assets stored in museums back to their local communities. This is of tremendous importance for Aboriginal communities that have entrusted sacred and traditional objects to museums for conservation. In other instances, assets can be licensed for K–12, post-secondary education (PSE) and lifelong learning.
- Cultural organizations can also deploy mobile social media to strengthen their relationships with audiences.
- The youth demography prizes mobility. This creates opportunities for cultural organizations to build their audiences through mobile marketing and experiences; cultural organizations can thus discover innovative ways to communicate with audiences, exploit content and exhibition archives, and develop new partnerships. Scotiabank Nuit Blanche, Toronto's all-night visual and performing arts festival, has pioneered mobile aides and featured mobile art works. The Museums & Mobile Online Conference and Expo [318] provides an overview of the extensive opportunities available to cultural institutions that take advantage of mobility.

### 6.1.9 Mobile Art

Artists and designers imagine, invent and inform new technologies and applications—such as gesture-

[317] "Roaming in Canada," RoamingAdvisor.com, http://www.roamingsims.com/country/Canada.php.

[318] See: http://www.learningtimes.com/events/museums-mobile-2011/

responsive screens—and also create content. Creative intelligence is necessary to allow for culturally diverse expressions and successful approaches to literacy and scientific learning. The fine line between a global cultural identity and regional and local specificities requires the effective mobilization of artists and designers. The international trend is toward increasing the engagement of art and design with science and engineering. The fostering and support of new-media creativity, digital media production skills and innovative design must be a fundamental backbone of the Canadian digital-economy platform.

An energetic mobile art and design community exists in Ontario, composed of digital-media artists who have combined technical and creative skills to build leading-edge mobile experiences that point to the future of mobile creativity. For example:

- The Mobile Digital Commons Network of York University and OCAD University (with commercial and national partners) and Portage [319] at OCAD University are two large-scale projects that have produced location-based mobile experiences such as outdoor music jams, mobile-driven projected games and annotated park walks and mysteries.

Portage transformed John Street, in the heart of Toronto's entertainment shopping district, into a Broad Locative Environment (BLE)—a space that allows visitors to engage with outdoor multimedia installations and other mobile users.

Users were able to navigate from Grange Park down to John Street through a GPS-enabled way-finding system. Along the way, they could interact with graffiti-like projections and installed artifacts, watch short videos and create with interactive audio dub components.

Through this BLE installation, Portage investigated how cultural content delivery is made possible by emerging multi-capability mobile devices. These devices include cell phones, handhelds and PDAs with Wi-Fi, Bluetooth, GPS and GSM access. Portage also examined the processes by which these technologies can be used in conjunction with one another and with environmental sensors and displays to move the mobile experience "beyond the phone" and to create an interactive and immersive environment.

[319] See http://mobilelab.ca/.

## 6.2 Emerging Technologies for Mobile Entertainment

In Chapter ADD NUMBER, Ontario's Mobile-Industry Capacity: Adoption, Assets and Actions to Build a Strong Mobile Industry in Ontario, we discuss Ontario's capacity in emerging technologies. Here, we note implications for the entertainment industries. Mobile video dominates markets in Asia and will become more popular as compression technology improves and data rates drop. HTML5 provides an efficient means to navigate the mobile web that does not require downloading applications.

AR applications demonstrate features that could be useful for information and entertainment applications. AR provides applications with "augmented" or enhanced views that relay pertinent information to the viewer of the device. [320]

**Figure 5:** An example of an augmented view.


An application such as Layar or Wikitude allows users to scan their surroundings and find specific locations and detailed information on sights and services of interest.

Augmented Reality

- Some of the more impressive AR apps, including Google Sky and Satellite AR, allow users to point their handsets or tablets skyward in order to see real-time astronomical information about constellations or passing satellites. These apps allow users to turn their mobile devices into virtual planetariums.
- AR game apps include games such as the award-winning 2011 AR Invaders, which superimposes flying saucers onto the camera view of handsets in any location, allowing players to combat a virtual invasion of aliens. AR is increasingly being integrated into educational products, as it can assist with both game play and information retrieval.

[320] *Wikipedia* defines augmented reality as "a live, direct or indirect, view of a physical, real-world environment whose elements are augmented by computer-generated sensory input such as sound, video, graphics or GPS data." Wikipedia Contributors, "Augmented Reality," Wikipedia, http://en.wikipedia.org/wiki/Augmented_reality.

The handset is located using GPS and network information and the view (through the device's camera) is married to a data overlay provided by a number of services, such as Twitter, Google and Flickr.

We are still in an interim period, where users and developers are adopting and gaining technical literacy with mobile devices. While there is some scepticism about AR and a sense that the technology is still in the beta phase, AR will continue to be an area of experimentation.

## 6.3 Action Plan

Canada's growing m-entertainment industries are capable not only of valuable innovation but also of developing new fast-tracked research cycles that combine basic research, application research and business models. These cultural industries accelerate economic capacity in many regions. The innovation-to-market ratio in these sectors is very fast (for example, in the mobile-experience and technology industries), but requires diligent support.

A culture of innovation can emerge through cross-sector dialogue and education. When existing companies or cultural and service organizations do not have the right mix of digital experience and mobile expertise, partnerships and the sharing of information will be critical.

### 6.3.1 Private Sector

Traditional creative-industry sectors can benefit by learning as much as they can about transmedia and mobile platforms and how they can be used as additional platforms for storytelling and marketing. Experience requires practice, thus experiments in mobile media will allow these sectors to craft audience and marketing strategies.

There are actions on the part of industry associations such as MEIC that will build mobile capacity in Ontario:

- ★ We have identified a significant gap: high demand from non-mobile industries for mobile products, services and applications and a capable mobile sector without a bridging mechanism between these. Trade associations such MEIC must play a coordinating role between the non-mobile industries and mobile industries, brokering opportunities for mobile applications and services to be built. Trade associations must collaborate with academic institutions to facilitate access for the SME sector to academic resources including applied research and development, incubation and training.
- ★ Mobile business represents a vast global opportunity. Export-support programs created by associations in partnership with government can help companies enter new or emerging markets, and should be developed to increase awareness of market opportunities, connect Ontario entrepreneurs with international partners (distributors, developers, designers), and facilitate matchmaking between local and international businesses.

These are other initiatives that industries could employ to build their mobile capacity:

- Non-mobile companies can expedite the acquisition of mobile capacity by: conducting their own investigations, engaging with trade associations for networking and information exchange, attending conferences, and employing or partnering with people who have digital-media backgrounds.
- Digital-media service agencies would benefit by continuing to educate their prospective customers about mobile applications.
- Investment in applied R&D and commercialization can allow Ontario-based interactive media firms to stay ahead of the innovation curve and remain relevant. Entities such as Ryerson's DMZ, OCAD University's Imagination Catalyst, the Canadian Film Centre's Astound, University of Waterloo's Velocity, George Brown College's gaming incubator, and Communitech are examples. These entities in turn can provide mobile test beds to support the development of applications and user-test mobile content strategies.
- Travel to conferences in major markets can be very important in cultivating global contacts. As mobility is a global market, it will be contacts from outside Ontario that will help propel mobile business success.

### 6.3.2 Academia

Our analysis of Ontario's current capacity to lead in mobility in Chapter Ontario's Mobile-Industry Capacity: Adoption, Assets and Actions to Build a Strong Mobile Industry in Ontario indicates that colleges and universities are building capacity for current and future mobile industries. There is a significant role for post-secondary institutions:

- Post-secondary institutions can provide skill upgrades that allow mobile engineers and designers to keep on top of the changing environment.
- Post-secondary institutions can support m-entertainment by continuing to create programs that develop a wide range of mobile skills, both technical and design-based. For example, continuing studies programs could allow SME entrepreneurs to register as students in order to access academic expertise, library and research resources, and infrastructure and audit courses when appropriate. Wi-Fi networks at colleges and universities could act as test beds and students may provide a community eager to test new products. Ontario colleges, universities and non-profits have created a network of incubators and accelerators. This second wave of programs is relatively new, and quantification of their output is still underway. The Ontario government would benefit from continuing to invest in these entities and in facilitating networks.
- Post-secondary institutions, industry and government can make a significant contribution to building strength by developing well-structured and forward-looking K–12 and post-secondary environments that foster media literacy, creativity and entrepreneurship as well as design, ICT and business-leadership skills. Collaboration with creative industries will be of critical importance in developing the content and mechanisms needed to deliver programs that support learn-

ers' contact with industry through research in mobile media, professional skills and modes of delivery.

★ Opportunities for student internships and undergraduate and graduate degrees with dual industry and post-secondary supervision will be important facets of capacity building. As well, the government can encourage workers with skills in mobile engineering and design to immigrate to Ontario.

### 6.3.3 Government

Recognizing that digital media is the wave of the future, Ontario has endeavoured to assist the key creative-industry sectors in developing a global presence and expanding the marketplace; in addition, the province has provided support for innovation in content delivery and technology adoption in order to enhance productivity, expand digital technologies and leverage the province's strength in ICT and design. Ontario has also committed to encouraging a "modernized federal regulatory environment." [321] The province is looking for a mix of start-ups and established companies that are able to create an interdependent ecology; it seeks talent development—both of fresh talent and reskilling—and recognizes the need for industry-government collaboration.

*Public Service for Ontarians: A Path to Sustainability* states that business development must ensure that "The focus of business support programs should shift from job creation to productivity growth."[322] This approach suggests that government policy and programs should help existing cultural industries grow, consolidate and modernize. The report also states the governments should endeavour to "revive the useful [programs] through the single envelope for business support programs."[323] Business support through the Ontario Media Development Corporation (OMDC) and a healthy tax environment remains an important factor in retaining talent in Ontario. Application developers are often pulled to the US and other jurisdictions, and have questioned the value of staying in Canada. We need their skills. Government will need to formulate policy in an environment that is characterized by rapid change and requires flexibility and constant re-evaluation.

The challenge for government is to balance the demands of traditional interests with the economic imperative of establishing new industries. Mobile operators are a conduit to mobile content developed in Ontario, but there is not a direct role for the regulation of either carriers or content providers to help increase mobile content development. What are more likely to be effective are incentives to potential

[321] Ministry of Tourism Culture and Sport, "Ontario's Entertainment and Creative Cluster: A Framework for Growth."

[322] Commission on the Reform of Ontario's Public Services, "Public Services for Ontarians: A Path to Sustainability and Excellence."

[323] Ibid.

content developers to locate and/or remain in Ontario.

Ontario can stimulate a content industry that includes mass-market forms other than television, and support the transition to a wholly digital and mobile screen–based media industry in part through its collaboration with the federal government on regulatory policy and federal funds.

As stated in the Inclusion in a Mobile Ontario chapter of this report, the recent allowance for increased foreign ownership is expected to make the mobile phone market more competitive, leading to more choice of providers and cheaper, more innovative services. This might indirectly stimulate demand for content, because if the cost of owning phones goes down, people might spend more money on content accessed through their devices. Other actions to encourage take-up are noted below:

- ★ A significant percentage of future spectrum-auction revenues should be reinvested in the mobile and wireless sector, including the mobile-content industries and incentive programs to facilitate the acquisition of mobile services on the part of non-mobile industries through matchmaking services.
- ★ The Canadian Radio-television Telecommunications Commission (CRTC) should continue to regulate mergers and acquisitions, with funding designated to the experimental portion of the CMF, with an explicit focus on mobile content and applications.
- ★ In addition, the CMF should expand marketing support with attention to includes social media support. This would facilitate SMEs bringing their product to international markets, and would benefit their partners.

The *Public Services for Ontarians: A Path to Sustainability* report also states the governments should endeavour to "revive the useful [programs] through the single envelope for business support programs." [324] Business support through the OMDC and a healthy tax environment remains important factors in retaining talent in Ontario. Application developers are often pulled to the US and other jurisdictions, and have questioned the value of staying in Canada. Mobile operators are a conduit to mobile content developed in Ontario, but there is not a direct role for the direct regulation of either carriers or content providers to help increase mobile content development. What are more likely to be effective are incentives to potential content developers to locate and/or remain in Ontario.

Incentives would include encouraging local skills development and supporting local developers (building on existing initiatives at MEIC or the Canadian Digital Media Network). Within the Ontario creative cluster, the following programs could support the transition to mobility and should be retained:

- ★ Tax credits support film, television, music, books, magazines and interactive digital media.

[324] National Angel Capital Organisation, "Innovation and Productivity Tax Credit (IPTC)," http://www.angelinvestor.ca/Tax_Credit.asp.

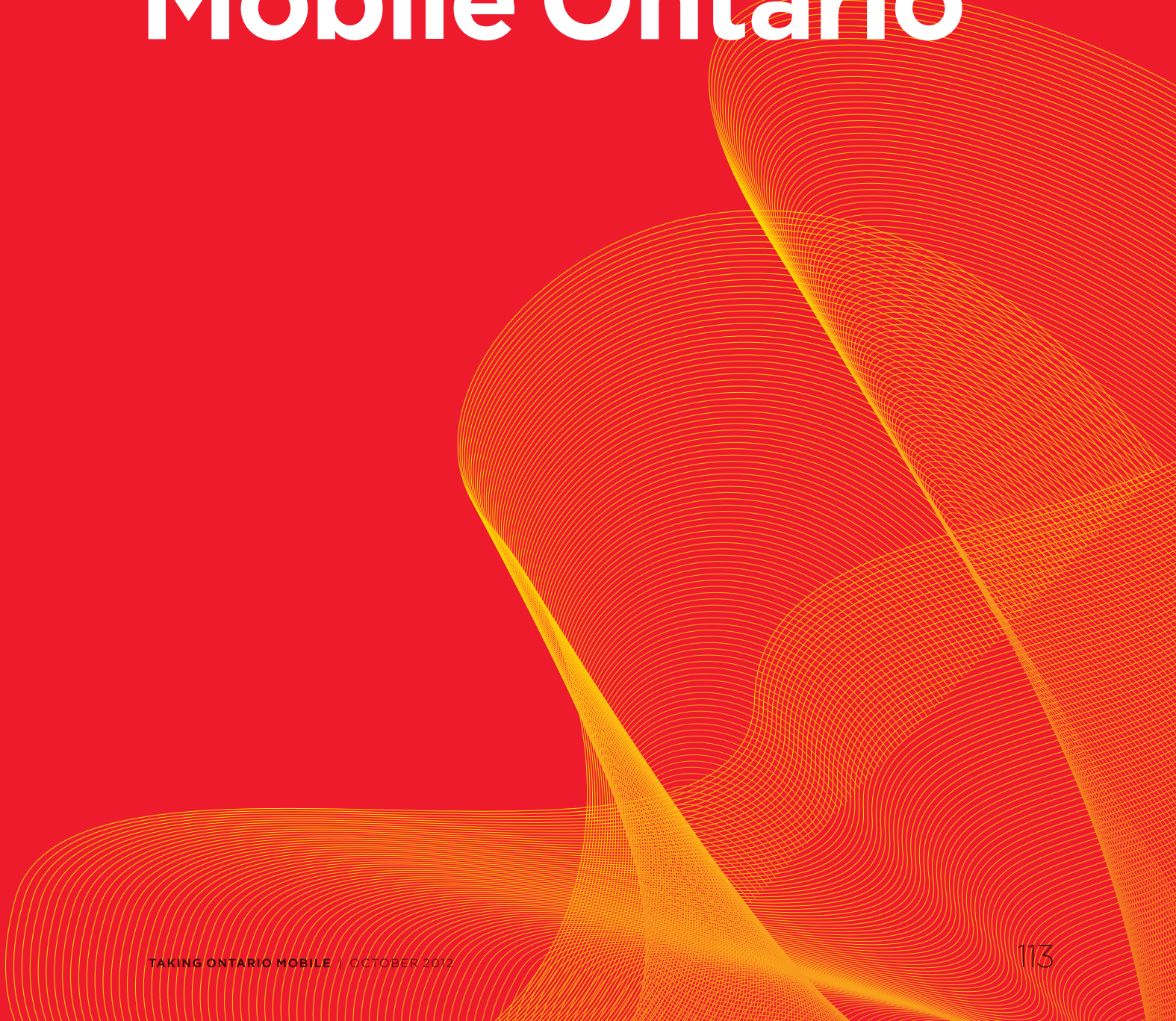
- ★ OMDC content and marketing funds support all Ontario industries, with the exception of television.

Ontario would benefit by aiming to:

- ★ Attract private capital to the entertainment industries. The province can facilitate information exchange between entities (such as the National Angel Capital Organization ) and endorse best practices.
- ★ Provide tax incentives to leverage private capital. In Ontario, there are production tax credits but no venture-capital tax credits; incentives programs that provide early-stage funding to smaller companies fill a gap that exists before angel or venture capital is willing to step in, as most interactive digital-media companies engaged in innovation are SMEs.
- ★ Create a partnership tax credit that encourages digital-media and creative-industry companies to collaborate could serve to fast-track the adoption of mobile strategies.
- ★ Collaborate with industry to sponsor studies that profile Ontario media users and the industry. Most of the data and references used in compiling this report were necessarily derived from foreign sources, as current domestic data is unavailable.

Arguably, many factors that influence media business fall into the purview of the federal government (e. g. , regulatory issues, copyright law) and are determined in large part by the business interests of global media and technology companies. It will be important for the Ontario government to intervene on issues of copyright, privacy, access to the mobile Internet, bandwidth and net neutrality in order to ensure consumer protection and engagement.

# Inclusion in a Mobile Ontario



## Challenges

» Market-failure barriers (where pursuit of industry interests has not led to optimal efficiencies) have caused uneven coverage, meaning that rural and remote areas are excluded from the digital economy.
» High tariffs are a barrier to ubiquitous connectivity for some residents.
» Failure to design software and hardware inclusively presents functional barriers for some residents.
» Barring technological advances, spectrum is a limited resource.

We make the argument in this chapter that mobile inclusion:

- Is a necessary part of any mobile action plan.
- Enables a broad range of residents to have access to digital capital and the benefits it confers.
- Is prevented by cost, geographic, functional and cultural barriers.

Ensuring inclusion is in the interests of industry, the public sector and government. The ability to access and make use of information and communications technologies (ICT) should be viewed as "digital capital" that conveys advantages and opportunities similar to those that result from access to more traditional forms of economic capital. [326] Inclusion refers to the removal of barriers to mobile access experienced by residents of Ontario due to socioeconomic factors, lack of mobile infrastructure and unmet functional needs (e. g. , via a screen magnifier for users with low vision). Providing access enables full participation in social, academic and economic spheres. Mobile communication is increasingly an essential service and utility for all residents, and it offers essential productivity tools that allow users to: communicate with employers, colleagues and customers; interact with children's schools or daycares; arrange appointments with healthcare providers; find out schedules for transportation and travel; and inquire about government services. Barriers due to markets, costs and functions mean that the groups most likely to be excluded from the rapidly evolving mobile marketplace are the same groups that would disproportionately benefit from the increased access to public services, economic inclusion, jobs and productivity that these new technologies will offer.

While access has significantly increased, sectors of Ontario residents cannot achieve the full benefit of mobile technologies due to "market-failure barriers" (i. e. , the free market has not been able to provide these services)—in particular, mobile broadband coverage, cost and design. Ontario residents are diverse in their geographic locations, functional needs and levels of affluence. Seniors (65+), Ontarians with disabilities, Aboriginal people, immigrants, and rural- and low-income residents are often underrepresented in the mobile market. Ontario's mobile action plan can addresses their respective needs adequately.

## 7.1 Cost Barriers

Statistical analyses show that absolute cost is the foremost barrier to computer and wireless phone usage. [327] According to the Organisation for Economic Co-operation and Development (OECD), Canada

[326] Stern, Adams, and Elsasser, "Digital Inequality and Place: The Effects of Technological Diffusion on Internet Proficiency and Usage across Rural, Suburban, and Urban Counties."

[327] Chinn and Fairlie, "The Determinants of the Global Digital Divide: A Cross-Country Analysis of Computer and Internet Penetration."; Kas Kalba, "The Adoption of Mobile Phones in Emerging Markets:
Global Diffusion and the Rural Challenge," *International Journal of Communication* 2(2008).

was the third most expensive country for average mobile users in 2009; mobile use cost consumers approximately USD$500 per year. [328] The issue of high cost extends into all regions and impacts adoption for example:

- The median income of a single full-time worker in Ontario is roughly CAD$29,280, [329] and median family income sits at CAD$69,790.[330] However, the largest proportion (40.4 per cent) of Ontario workers have low-wage service jobs that pay less, are most likely to be part-time and temporary, and have lower unionization rates and fewer benefits than jobs in high-wage service and non-service industries. [331]
- Ontario is one of the main destinations for immigrants coming to Canada: In 2008, the number of temporary residents in Ontario was 240,264, 40.8 per cent of all temporary residents in Canada. [332] 39. 8 per cent of those who immigrated to Ontario between 2005 and 2010 had low incomes. [333]

Ontarians need more low-tariff options for mobile technologies, as well as simplified means for comparing mobile plans.

This high cost of mobile access is also affecting inner-city residents. The effect of low incomes and higher mobile rates is illustrated in the 2007 edition of Statistics Canada's annual Survey of Household Spending, as presented by Steve Kerstetter:

- In terms of annual spending on cell phones and handhelds, 85 per cent of the richest 20 per cent of households spent CAD$1,058 on average, while 40 per cent of the poorest 20 per cent of households spent only an average of CAD$491 on these items.
- Growing competition among service providers will drive costs down and should encourage adop-

[328] OECD, "OECD Communications Outlook," (2009).

[329] Statistics Canada, "Individuals by total income level, by province and territory (ontario)," Statistics Canada, http://www40.statcan.ca/l01/cst01/famil105g-eng.htm.

[330] Ibid.

[331] Campaign 2000, "2010 report card on child and family poverty in Ontario," (Toronto: Campaign 2000, 2010).

[332] In 2008, 44.9 per cent of immigrants to Canada were destined for Ontario (110,895). Ontario's share of immigrant arrivals, however, has been declining annually since its high point in 2001 (59.3 per cent). Moreover, in 2008, immigrants to Ontario came predominantly from non-English-speaking countries: 15 per cent came from India, 11.5 per cent from China, 8.8 per cent from the Philippines and 5.5 per cent from Pakistan. Ontario Ministry of Citizenship and Immigration, "Ontario immigration key facts: Preliminary 2010 data."

[333] Region of Waterloo Public Health, "Immigrants with Low Income," in *Brief* (Epidemiology and Health Analytics: Region of Waterloo Public Health, 2010).

[334] Steve Kerstetter, "The Affordability Gap: Spending Differences Between Canada's Rich and Poor," (Canadian Center of Policy Alternatives, 2009).

tion by low-income Canadians, as could measures that would support community ownership of mobile resources. [334]

## 7.2 Access Barriers to Broadband and the Mobile Internet

In Canada, a growing consolidation of mobile service providers with content producers and rights-holders raises concerns among some sectors, while others perceive it as providing Canada with the means to invest in large-scale projects. In order to achieve the needed level of mobility in Canada, the federal government will need to allocate additional spectrum, and the private sector will need to invest in mobile networks in rural and Northern Ontario. One expert that we interviewed, a CEO of a public-sector organization, noted that regulatory confusion must be addressed so that companies can "know what the future will hold for them."

### 7.2.1 Rural, Remote and Northern Access

A notable challenge to providing ubiquitous mobile services to all Ontarians is the broadly distributed population in rural and remote locations. Our research indicates that for many rural and remote communities, reliable cellular service is unavailable. Respondents told us that future mobile-infrastructure development is a critical issue for populations outside major urban centres. The return on ICT investments in high-cost/low-density areas tends to be significantly lower than in the lucrative urban areas. Under a market-based model without specific incentives, the consequence is a low rate of ICT penetration into rural and remote areas. [335]

There are four potential approaches to helping rural and remote communities overcome these mobile market failures:

- Aggregate demand (through collective contracts with providers).
- Create a local for-profit or non-profit company to provide service.
- Create a public-private partnership (in which the government or a public agency assumes part of the cost).
- Seek public funding (so that public agencies assume the full cost).

> *Invest in infrastructure.... Where there is market failure, I think [we should use] public-private partnerships to create an opportunity to build that infrastructure. . . . Once the [data] highway is there, companies can develop plans to use that infrastructure.*
>
> *CEO, Public Sector Organization*

[335] Dhanaraj Thakur and Susan Cozzens, "Technology Policy and Distributional Consequences: The Case of Mobile Phones in Canada" (paper presented at the Prime-Latin America Conference, Mexico, 2008).

There has been some movement at the federal level to improve access to broadband in remote areas. Through the Canadian Economic Action Plan initiated in 2009–10, the Government of Canada injected CAD$225 million over three years to develop and implement a strategy for providing broadband coverage to underserved and unserved communities around Canada. The largest portion of this plan is the former Connecting Rural Canadians program, [336] which has helped to initiate several projects. [337] While the Canadian Radio-television and Telecommunications Commission (CRTC) indicates that broadband is available to 98 per cent of Canadian households, [338] the Industry Canada maps indicate that many Northern communities are not served. [339]

In the US, the Department of Agriculture has operated a broadband loan program to help rural communities acquire ICT access, and the overall impacts have been positive in terms of increasing employment, incomes and the number of rural businesses. [340] The Eastern Ontario Regional Network (EORN) [341] initiative in Eastern Ontario is guided by three principals—access, service and price—and could be replicated. Hence:

★ Similar financial instruments, created by the private or the public sector or in a joint initiative, could enable rural and remote communities to access wireless communications, and could support and improve the productivity of members of those communities.

Although many of the characteristics of rural and remote communities apply equally to Northern communities, additional aspects need to be taken into consideration for these communities. The increasingly visible pace of climate change and its impact on Northern communities as well as the growing interest in the natural resources of the North have shifted attention to a number of new issues. These include, among others, the need to chart a sustainable development path for the North and the need to assert Canada's sovereignty in Northern areas. In summary:

★ A solid communication and wireless infrastructure is needed if the efforts of government and industry are to succeed. Ontario could promote the use of hybrid solutions that combine lead-

[336] Industry Canada, "Broadband Canada: Connecting Rural Canadians (Budget 2009 and Budget 2010) - Canada's Economic Action Plan," Government of Canada, http://www.plandaction.gc.ca/initiatives/eng/index.asp?initiativeID=96&mode=2.

[337] A complete list of current projects can be found at http://tinyurl.com/62yo9d8.

[338] Canadian Radio-television and Telecommunications Commission, "CRTC Communications Monitoring Report," (CRTC, 2011)., http://crtc.gc.ca/eng/publications/reports/PolicyMonitoring/2011/cmr2011.pdf, 147.

[339] "Unserved Population Map-Ontario North," (Canada: Industry Canada, 2011). , http://www.ic.gc.ca/eic/site/720.nsf/vwapj/ON_North-Nord_18-07-2011.pdf/$file/ON_North-Nord_18-07-2011.pdf

[340] Ivan T. Kandilov and Mitch Renkow, "Infrastructure Investment and Rural Economic Development: An Evaluation of USDA's Broadband Loan Program," Growth and Change 41, no. 2 (2010).

[341] See http://www.eorn.ca.

ing-edge wideband satellite technology with new local-area wireless distribution systems like WiMAX or P2P wireless mesh networks.

## ABORIGINAL COMMUNITIES

Aboriginal communities in remote areas often have multiple barriers to accessing mobile technologies, such as economy, infrastructure and language. The 2004 Aboriginal Community Connectivity Profiles database [342] states that approximately 96.27 per cent of Aboriginal communities have access to high-speed Internet, compared to the Canadian average of close to 80 per cent. [343] However most Internet access at the community level is based on public access points, and not all community administration offices and SchoolNet sites make their connections available to the general public.

Maps of mobile coverage in Northern Ontario by Bell, Rogers and TELUS indicate that coverage is clustered along the TransCanada Highway and not available in communities outside of this route, resulting in little or no mobile coverage in remote areas of Ontario. [344]

Industry, government and affected communities must work together to find equitable and profitable solutions to the inadequate access to mobile technologies experienced by Ontarians in remote areas and especially on First Nations reserves.

Javier Mignone and Heather Henley of the University of Manitoba provide a comprehensive discussion of the impact of ICT in Aboriginal and rural communities in their paper "Impact of Information and Communication Technology on Social Capital in Aboriginal Communities in Canada." [345] In particular, they state that the "ownership of the means of production" (in our case, the ownership of the ICT networks) clearly relates to increased community social capital at the bonding, bridging and linking levels in Aboriginal communities: despite the what of connectivity mattering, it is the how of connectivity that can significantly make a difference in terms of community social capital. What refers to the content of the networks, while how refers to how the networks are developed and operated.

Socioeconomic status may not allow all Aboriginal Canadians to have equal access to Internet connectivity in general and mobile connectivity in particular. Barriers to accessing mobile technology for

[342] Aboriginal Canada Portal, " 2004 Report on Aboriginal Community Connectivity Infrastructure," (Canada2004).

[343] "Aboriginal Communities Connectivity Profiles Ontario: Aboriginal Canada Portal," Government of Canada, http://www.aboriginalcanada.gc.ca/acp/site.nsf/eng/ao31317.html.

[344] Data on specific Aboriginal communities and their access to the Internet can be found at aboriginalcanada.gc.ca/acp/site.nsf/eng/ao31295.html.

[345] Javier Mignone and Heather Henley, "Impact of Information and Communication Technology on Social Capital in Aboriginal Communities in Canada," *Journal of Information, Information Technology, and Organizations* 4(2009). 138.

Two Examples of Aboriginal Networks

In 2006, the Nisichawayasihk Cree Nation (NCN) made a proposal to Industry Canada to develop a cellular network in Nelson House, Manitoba. NCN and Manitoba Telecommunications Services had not been able to come to an agreement for a joint venture in the region, which required NCN to finance upfront development costs of $500,000 [346] and provided no opportunity for revenue sharing. Since then, the NCN Development Corporation has launched and operates NCN's affordable high-speed Internet service in Nelson House using advanced WiMax wireless broadband technology. In its first year, the service attracted 80 customers and 20 were waiting for WiMax receiver equipment. The service has prices that are comparable to the rest of Canada, allows for downloads that are 45 times faster than dial-up, and will be capable of 100 mbps [347]. The project managers anticipate that, along with benefit to individuals within the community, both health and education services in the area will be positively affected by the availability of high-speed Internet. [348]

In April 2012, the Attawapiskat First Nation in Northern Ontario was able to achieve access to cell phone service by launching a community-owned service. This move to 2G GSM technology from a satellite connection was the result of a partnership between Attawapiskat Resources Inc. (ARI) and Keewaytinook Okimakanak's Kuhkenah Network (KO-KNET) which, in turn, partnered with Dryden Municipal Telephone System (DMTS)/Dryden Mobility. Along with improving quality of life and safety, the mobile service is expected to improve the commercial infrastructure of the community. [349]

These examples (as well as K-Net, Ktunaxa and Qiniq, which are successful Aboriginal networks) imply that the power relations between Aboriginal communities and the organizations, governments and private and public corporations that support Aboriginal-driven projects when addressed lead to successful outcomes.

Aboriginal people may extend to those who live off of reserves in rural or urban areas where, even if coverage is available, the tariffs are prohibitive. As noted in the 2004 Report on *Aboriginal Community Connectivity Infrastructure*, personal Internet subscriptions are often beyond the reach of urban

[346] Avi Saper, "First Nation plans Cell Service," www.ctci.ca/news_detail_FirsTel2.html.

[347] Nisichawayasihk Cree Nation, "Nisichawayasihk Cree Nation Year in Review 2009-2010," (Manitoba: Nisichawayasihk Cree Nation 2010).

[348] of Aboriginal Canadians

[349] Brian Beaton, "Attawapiskat Resources Inc. Launcehs new Cell Phone Service for Remote James Bay Area Community," Media KNET, http://media.knet.ca/node/21886.

Aboriginal Canadians:

> Unfortunately, the economic situation facing most urban Aboriginals severely limits their ability to subscribe to Internet services and purchase the required computer equipment. For many, the only means of accessing the Internet is through the network of 116 Native friendships centres. 87% of friendship centres are located within urban areas that have high-speed Internet available to them. 11% of friendship centres are co-located with Industry Canada's Community Access Points (CAP sites). [350]

Javier Mignone and Heather Henley of the University of Manitoba suggest: "Even in urban environments, where basic connectivity infrastructure is well established, the issue of accessibility related to affordability could be addressed through community initiatives using wireless modalities. The potential to develop urban Aboriginal networks would be strong." [351]

There has been unevenness in federal policy initiatives. While $225 million was pledged to enhance access, successful programs like SchoolNet and the Community Access Program have been cut in 2012. [352]

## 7.3 Functional Barriers and Inclusive Design Challenges for Seniors and People with Disabilities

The Province of Ontario has taken a leadership role both in Canada and internationally in promoting inclusion through legislation such as the Accessibility for Ontarians with Disabilities Act (AODA). Mobility is closely linked to independence for people with disabilities.

Most Ontarians have some functional needs that are currently unmet by mobile technologies. These needs may relate to temporary or chronic physical conditions [353] or to context (e. g. , finding it difficult to hear in a noisy location). The percentage of Ontarians with a disability sits at 15.5 per cent. [354] As

[350] Aboriginal Canada Portal, " 2004 Report on Aboriginal Community Connectivity Infrastructure."

[351] Javier Mignone and Heather Henley, "Impact of Information and Communication Technology on Social Capital in Aboriginal Communities in Canada," *Journal of Information, Information Technology, and Organizations* 4, no. Journal Article (2009)., 140.

[352] Rob McMahon et al., "Digital Divides and the "First Mile": Framing First Nations Broadband Development in Canada," *The International Indigienous Policy Journal* 2, no. 2 (2011).5.

[353] In Canada, rates of kinds of disability are as follows: pain (11.7 per cent), mobility (11.5 per cent), agility (11.1 per cent), psychological (2.3 per cent), hearing (5 per cent), speech (1.9 per cent), learning (2.5 per cent), vision (3.2 per cent), memory (2 per cent), and development (0.5 per cent). In 2006, about 4.4 million Canadians, or 14.3 per cent of the Canadian population, had a disability. Statistics Canada, "Participation and Activity Limitation Survey 2006: Analytical report," (Canada2008).

[354] Ibid.

the population ages, this percentage is also likely to grow, placing greater stress on public services like transportation, social security and healthcare.

National statistics indicate that 41 per cent of people aged 65 and over have a disability, while among those aged 15 to 64, 10 per cent have a disability. [355] Of the total population of Canadian children aged 0 to 14, three per cent have a disability. Although one of the youngest provinces, seniors—that is, Ontarians aged 65 and up, according to the 2010 Census—constitute 13.9 per cent of the Ontario population, an increase of 3.2 per cent since 2001. Given current trends, the percentage of seniors in Ontario is projected to reach 23.4 per cent in 2036. [356]

"Projections [for Canada] show that by 2021, seniors with disabilities will outnumber 25- to 64-year-olds with disabilities. In 2026, the majority of people with disabilities will be 65 years of age or older—some 3.05 million people." [357] Based on these national projections, Ontario can expect similar patterns.

Policy initiatives are in place to mandate the removal of functional barriers:

- Ontario has developed the Information and Communication Standard as part of the 2011 Integrated Accessibility Standard for the 2005 AODA. This important legislation, which is now rolling out across Ontario, addresses the necessity of making information and communications services available to people with disabilities.
- For digital content, particularly website design, the legislation requires that all

Sprint Nextel is an American example of a carrier that has addressed accessibility; on January 9, 2012 the company announced that it would require diverse functionality for mobile devices. This US company stated that it will be giving customers with select Android smartphones a free suite of accessibility software (developed by Spain's Code Factory and valued at USD$99), in order to enable individuals with print impairments to have screen text read aloud. This benefit has been provided to all postpaid customers; users have not been required to prove disability or need, a action that enables accessible options to be part of the mainstream. This availability may have interesting outcomes, as all users can benefit from the conveniences afforded by accessibility software (in the same way that captioned television has become a convenience for anyone in contexts where they cannot hear a broadcast).

[355] Toronto District School Board, "Facts and Statistics".

[356] Ontario Ministry of Finance, "Ontario population projections update 2010-2036; Ontario and its 49 census division.," (Toronto: Ministry of Finance, 2011)., 4

[357] Toronto District School Board, "Facts and Statistics"., http://www.tdsb.on.ca/_site/viewitem.asp?siteid=15&menuid=8564&pageid=7492

information be accessible to people with disabilities of various kinds. At the federal level in 2009, the CRTC adopted accessibility guidelines for the telecommunications industry. While the policy did recognize "that persons with disabilities generally are not able to influence the market sufficiently to obtain accessible telecommunications products and services," [358] the CRTC adopted a piecemeal regulatory policy that addresses accessibility only when it comes to services, and does not regulate the actual design of hardware and components. A coalition of disability organizations argued that for a comprehensive accessibility telecommunications strategy, the CRTC must commit to both universal access and design. [359] Support for this effort could strengthen Ontario's ability to implement the AODA.

- In Canada, the Canadian Wireless Telecommunications Association has launched a website, wirelessaccessibility. ca, to help individuals find accessible mobile solutions based on specific access needs.

## 7.4 Action Plan for Inclusion

### 7.4.1 Private Sector

The following examples provide opportunities for service providers to enhance access for residents and build business opportunities:

> *The truth is that [mobile bandwidth] is a limited resource. . . . The whole [current business] model might come to an end naturally because of that.*
>
> *Director, Industry and Market Trends, Media Sector*

★ Service providers could follow an American example. In the US, broadcasters have been making television signals accessible to mobile devices, allowing people to watch advertising-sponsored television without paying a fee on their mobile devices. In Canada, where the telephone companies (e. g. , Bell and CTV) also provide television content, there is no mobile digital television. [360] They could include these new services as part of their business models in order to move efficiently toward new forms of distribution and content.

★ Large firms could be successful by moving into disruptive and emerging mobile fields such as

[358] Canadian Radio-television and Telecommunications Commission, "Broadcasting and Telecom regulatory Policy CRTC 2009-430," CRTC, http://www.crtc.gc.ca/eng/archive/2009/2009-430.htm.

[359] Deborah Stienstra, "Swimming Upstream: Accessibility and Telecommunications Policy," in *The Internet Tree: The State of Telecom Policy in Canada 3.0.*, ed. Marita Moll and Leslie Regan Shade (Ottawa: Canadian Centre for Policy Alternatives, 2011).

[360] Steven J. May, " Commentary: While America Innovates, Free over-the-Air Mobile Digital TV Is Nowhere in Canada. Cartt.ca. from ", June 28 2012.

health and education, offering a wider range of packages that could include less expensive services.

- ★ Providers could create and contribute to a fund that can facilitate inclusion and be directed toward infrastructure and access programs in remote and rural areas, and also be used for programs supporting access in concentrated-poverty urban areas.
- ★ Service providers should develop and commit to an anti-throttling policy rather than selectively reduce the data-transfer rates of certain file types, services or websites.
- ★ Mobile industries can develop and distribute mobile software and applications that can adapt to the specific capacities (including disabilities), contexts and mobile device specifications of users.[361]
- ★ It would be beneficial for industry to collaborate with the provincial government to create a statistical map that outlines data about non-users (that is, those who have yet to be included). This type of data would be invaluable in attaining broad inclusion goals in both Ontario and Canada as a whole. A good model to follow would be the wonderfully comprehensive data compiled by the Pew Internet & American Life Project based in the US. [362]
- ★ Industry could collaborate with the federal government to collect data on mobile access/use as part of the Canadian Internet Use Survey, generating a comprehensive and detailed statistical map of mobile users that indexes a variety of characteristics including age, income, location, education, job data, device type, data and application usage, and mobile subscriber package. This information would assist in rolling out services.

### 7.4.2 Academia

Academia has a significant role to play in facilitating inclusion:

- ★ Colleges and universities should continue to focus on accessibility and inclusion strategies and technologies as part of their research agendas.
- ★ School boards and post-secondary institutions should work collaboratively to negotiate a deeply discounted rate for devices and data plans with the major telecommunications carriers for use in the delivery of mobile learning.
- ★ Public institutions can play a role in providing affordable access through the creation of a network of cost-recovery Wi-Fi access points around public institutions.
- ★ The Ontario Research and Innovation Optical Network (ORION) could be looked upon to support mobile broadband in the classroom, at home, and around regions close to the network.

[361] Aitor Almeida, "Imhotep: An Approach to User and Device Conscious Applications," *Personal Ubiquitous Computing* 15, no. 4 (2011).

[362] Pew Research Center, "Pew Internet & American Life Project," Pew Research Center, http://pewinternet.org/.

### 7.4.3 Government

The federal and provincial governments must act to ensue Ontarians have ubiquitous, high-quality, affordable access:

- Policy leadership at the federal level is needed—first, to facilitate the most effective transfer of available bandwidth from uses such as analog television to enable data-intensive applications, and then to ensure that the regulatory environment supports fair practices and is scalable to future needs.
- The quantity of available data is very important. Service providers that overly cap or limit access to data networks also limit residents' ability to participate and consume mobile content or services. Furthermore, if caps or quantity-of-data allowances do not increase over time, residents are restricted in their ability to participate in future innovation. Regulation should guarantee bi-directional access to networks; residents must be able to upload as well as download bandwidth access. Network speeds are often quoted primarily in peak download rates; however, it is upload speeds that give Ontarians the bandwidth to contribute, publish and be more than consumers of media.
- Government should include mobility as a central tool in acclimatizing immigrants to citizenship in Ontario by making services and information available to them over mobile devices. Many immigrants come from cultures with a heavy dependence on mobile technologies in everyday life.
- Public services should continue to incorporate mobile into existing programs that target seniors—like the Aging at Home [363] and Healthy Aging [364] programs—and use community health centres to both raise awareness and implement mobile strategies among seniors.
- Ontario should encourage federal regulators to develop policies and technologies that make use of "white spaces" (the portion of spectrum vacated by the retirement of analog television) in the wireless spectrum in Ontario. These underused resources can be deployed to provide wireless access to rural communities or low-income public-housing communities. [365]
- Government should look to enable collaborative business models that compel the private-sector network operators to engage communities and stakeholders in the running of local operations, particularly in remote and rural locations. The objective will be to develop skills and local employment to sustain more investment locally, as well as to use the skills and ingenuity of groups such as First Nations communities in the delivery of relevant network solutions.

[363] See: http://www.health.gov.on.ca/english/public/program/ltc/33_ontario_action.html

[364] See: http://thehealthline.ca/listServices.aspx?id=10150

[365] See the recent report by the British regulatory body Ofcom for an elaboration: Ofcom, *White space devices and implementation of geolocation databases: Summary of consultation responses and next steps* (London, England: Ofcom, 2011).

The 700 MHz spectrum has benefits for rural, remote, and urban areas. While greater building penetration is good for urban areas, the need for many fewer towers to get high-speed mobile service deeper into rural and remote areas offers a significant opportunity to encourage mobile access for less investment funds per connected area. The spectrum auction should be constructed to ensure that any winner bidder is inherently obligated to achieve density targets (users or geography) that enable the objective of realizing the social and economic considerations described in this report. This necessarily means delivering higher-speed and more reliably mobile-service capacity across greater swathes of the province, while also understanding that network operators typically need to monetize investments from within more densely populated areas. Ontario should lobby or support the federal government in setting these requirements for upcoming spectrum auctions:

- ★ Imposing spectrum-use requirements on auction winners to encourage competition.
- ★ Setting aside licenses, as in the past, for new service providers.
- ★ Requiring established firms to share their wireless towers with new entrants and setting minimum standards for the quality of "handovers" to improve the quality of service new entrants can provide.
- ★ Returning a portion of spectrum-auction funds to carriers as tax rebates against capital investments in network building.
- ★ Setting aside a portion of spectrum-auction funds as a venture fund to facilitate the development of Canadian application companies and value-added services.

# Ontario's Mobile-Industry Capacity:

## Adoption, Assets and Actions to Build a Strong Mobile Industry in Ontario

Taking stock of Ontario's mobile ecosystem reveals a great depth of resources and capacity that, if deployed in a comprehensive manner, could provide the backbone for a mobile Ontario action plan. The term "mobile ecosystem" refers to interrelated spheres comprising the production, distribution, consumption and regulation of mobility. Ontario has a substantial network of mobile-related creators, researchers, innovators and manufacturers who develop a range of services, including network components, infrastructure, handsets, software and applications. With the requisite regulatory approach and broad inclusion goals, this capacity will make it more plausible to coordinate a successful Ontario mobile action plan. This chapter includes an overall analysis of Ontario's research, training, productive and patent capacities, with snapshots of leading sectors. It ends by placing Ontario in an international context and a jurisdictional comparison. The complementary report, *Research into Ontario's Mobile Content, Services and Applications Industries by the Mobile Experience and Innovation Centre (MEIC)*, provides a detailed profile of Ontario's mobile industries and their requirements for success. It is available with this report.

## 8.1 Mobile Adoption in Canada and Ontario

Ontario's usage sits at the Canadian national average, but is lower than that of Alberta and Quebec. [366] Mobile devices currently present in Ontario include feature phones, smartphones, media players, e-book readers, tablets, netbooks and laptops. [367] Not surprisingly, our research shows that printed information and wired technologies—such as landline telephones or site-specific Internet access—are increasingly regarded as optional, especially among younger people. As you will read in this report, Ontarians are increasingly comfortable with mobility and will increasingly demand mobile services.

One of the most common devices for mobile connectivity is the mobile telephone. According to the 2012 IAB report, by the fourth quarter of 2011, 84 per cent of Canadians used a mobile phone, [368] and there are similar percentages in China (73.6 per cent) and India (74.15 per cent). According to ComScore, SMS messaging led Canadian usage, followed by downloading applications and informa-

[366] harris/decima, "2008 Wireless Attitudes Study Conducted on behalf of the Canadian Wireless Telecommunications Association," (Canada: Canadian Wireless Telecommunications Association - CWTA, 2008).

[367] The broad set of technologies that enable mobility have included a progression from 1G to 2G to 3G to 4G mobile Internet technologies. Soon, near-field Communication and mobile television (using built-in tuners) will play important parts in mobile infrastructure See Appendix 3 Mobile Devices Currently Available in Ontario.

[368] Steve Rosenblum, "Mobile In Canada: A Summary Of Current Facts + Trends," (iab.canada, 2012)., http://www.iabcanada.com/wp-content/uploads/2012/04/IABCanada_MobileInCanada_041012_FINAL.pdf

tion retrieval. [369] Smartphones are increasingly in use, as are other portable devices, such as tablets. In September 2011, eight million people in Canada owned smartphones—40 per cent of the mobile market in Canada, a gain of seven percentage points over the previous six months. [370] A recent Ipsos-Reid study indicated that tablet ownership in Canada doubled between January and August of 2011, and e-reader use grew by 75 per cent. [371] Complementary demographic information collected in a 2011 report produced by Quorus Consulting for the Canadian Wireless Telecommunications Association [372] provides a good starting point for understanding current mobile technology use in Ontario and Canada, and hence the opportunities for using mobile strategies to ensure inclusion: Quorus indicates that close to six per cent of Canadian mobile phone users also have a tablet. [373] Adoption is growing in the 18–34 demographic, as well as among those over 35.The development of application (app) stores, pioneered by Apple, has further enabled smartphone users to customize their devices into very personal platforms. Utility, usability and excellent design have made smartphones the technology of choice for many people. [374] The following provides a snapshot of mobile use in Ontario:

- 62 per cent of Ontario [375] mobile users have a regular cell phone optimized for voice and some SMS/texting functionality.
- 37 per cent of Ontario mobile users have a smartphone with a data plan.
- Ontarians also use mobile devices (including cell phones and smartphones) for many other activities aside from voice, as is shown in the table below:

[369] comScore, "Smartphone Adoption Reaches 40 Percent in Canada," comScore Inc, http://www.comscore.com/Press_Events/Press_Releases/2011/11/Smartphone_Adoption_Reaches_40_Percent_in_Canada.

[370] Ibid.

[371] Mary Beth Barbour, "The Tablet Begins to Take off as Sales Double in Eight Months," Ipsos Reid, http://www.ipsos-na.com/news-polls/pressrelease.aspx?id=5380.

[372] We acknowledge and thank the Canadian Wireless Telecommunications Association for allowing us to reproduce tables from their *2011 Cell Phone Consumer Attitudes Study*.

[373] Quorus Consulting Group, "2011 Cell Phone Consumer Attitudes Study," (Canadian Wireless Telecommunications Association, 2011).

[374] There are five major operating systems for phones and tablets: Android, iOS (Apple), BlackBerry OS, Nokia Symbian and Windows Mobile. The market share for each of these platforms varies between jurisdictions; the current overall leaders are Android and iOS. BlackBerry is a product of the Ontario company Research In Motion, which has encountered recent setbacks. While BlackBerry continues to enjoy significant share—particularly with business and government—it remains to be seen whether RIM can recover its previous position as a market leader and maintain its devoted following among consumers.

[375] This number is conservative compared to a Statistics Canada report, which claims that 81 per cent of Ontario homes have access to a cell phone, Statistics Canada, "Residential Telephone Service Survey," Statistics Canada, http://www.statcan.gc.ca/daily-quotidien/110405/dq110405a-eng.htm. (http://www.statcan.gc.ca/daily-quotidien/110405/dq110405a-eng.htm).

**Figure 6:** Mobile phone activities (by gender and region) [376]

| | Gender | | Region | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Male | Female | BC | AB | MB/SK | ON | QC | ATL |
| Send or receive text messages | 67% | 68% | 72% | 77% | 74% | 70% | 59% | 61% |
| Take pictures | 62% | 63% | 66% | 67% | 60% | 64% | 57% | 55% |
| Send or receive emails | 35% | 28% | 32% | 42% | 30% | 35% | 23% | 25% |
| Use Instant Messaging | 29% | 25% | 24% | 37% | 29% | 29% | 21% | 24% |
| Capture video | 28% | 23% | 31% | 30% | 21% | 28% | 18% | 23% |
| Do online searches | 28% | 22% | 27% | 39% | 23% | 28% | 15% | 21% |
| Listen to music uploaded to phone | 27% | 20% | 26% | 32% | 16% | 26% | 19% | 19% |
| Play games | 24% | 23% | 29% | 31% | 16% | 26% | 17% | 23% |
| Access maps/navigation instructions | 26% | 19% | 24% | 32% | 14% | 27% | 13% | 18% |
| Do social networking or blogging | 20% | 20% | 20% | 30% | 19% | 21% | 14% | 20% |
| Watch live TV or videos online | 12% | 8% | 11% | 14% | 7% | 11% | 8% | 9% |
| None of the above | 22% | 21% | 18% | 16% | 22% | 21% | 26% | 28% |

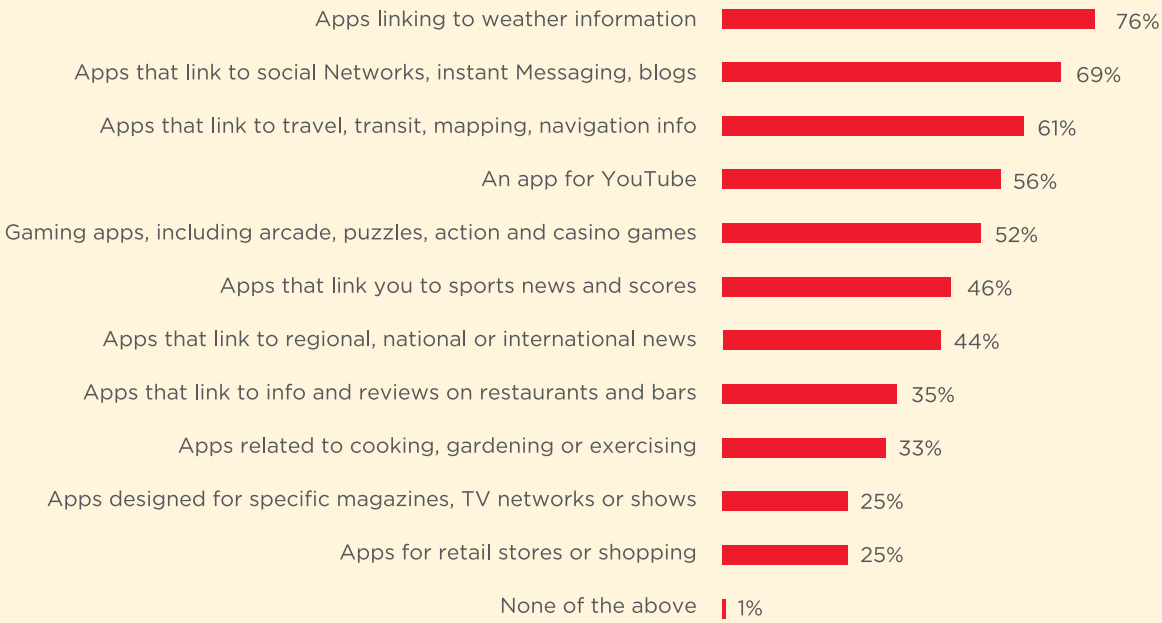
In Ontario, 32 per cent of mobile users can access the Internet on their devices. These demographics align with other Canada-wide usage information, [377] which shows that 50 per cent of mobile subscribers use mobile Internet.

[376] Quorus Consulting Group, "2011 Cell Phone Consumer Attitudes Study."

[377] Rosenblum, "Mobile In Canada: A Summary Of Current Facts + Trends."

The most common activities on mobile Internet browsers are accessing news and bank accounts. Sixty per cent of smartphone users have downloaded one or more apps onto their devices. On average, users have downloaded 12 apps, of which only three were purchased. The most common types of apps are shown in the following table

**Figure 7:** Most common types of apps used on smartphones [378]




Mobile adoption is also substantially influenced by the desires and interests of users. Powerful portable computing devices such as smartphones and tablet computers are increasingly ubiquitous, especially for younger people and white-collar workers. The increased capabilities of these devices have supplanted a previous reliance on other platforms, such as desktop computers, personal digital assistants and standalone media players. American research indicates that consumers use their tablets both as unique environments and as a second screen when accessing media or information on large-screen or small-screen devices. [379]

[378] Quorus Consulting Group, "2011 Cell Phone Consumer Attitudes Study."

In Ontario in 2011, six per cent of mobile users had a tablet. Five per cent of Ontarians had a tablet connected to a cellular network, and one per cent had a tablet not connected to a cellular network. According to *Media Technology Monitor*, tablet penetration in Canada reached 10 per cent in fall 2011. [380]

These statistics—and our own research into Ontarian consumers' needs—show that a growing number of users are willing to use mobile devices for more than just traditional phone calls and texting. As the number of smartphone and tablet users in Ontario increases, there will be a related increase in the demand for mobile applications and affordable data services. For these Ontarians, mobile devices will increasingly be the primary access point for the Internet, and for both private and public information services. As this social and economic exchange grows, care must be taken to include all residents.

### 8.1.1 Mobile Access and Projected Adoption Patterns

Although we see signs of expanded mobile use, Ontarians'—and other Canadians'—adoption of full mobility is constrained compared to other jurisdictions, with many users engaging only in text messaging and voice. Canada still has the world's most expensive data tariffs, which, according to user surveys, inhibit full mobility. [381] The federal government has begun to take action to improve competitiveness in the marketplace while acknowledging the real costs of providing access across a large territory with a small population.

On March 14, 2012, Industry Canada announced its intentions to loosen foreign ownership restrictions on carriers that control less than 10 per cent of Canada's wireless market share by revenue. Ottawa has also indicated that the next spectrum auction—700 MHz spectrum capable of high-speed 4G—will have limits on the amount of spectrum that incumbents can purchase. [382] This decision will provide some incentives for new entrants while sustaining the capacity of the existing service providers and will create reasonable downward pressures on pricing.

[379] NM Incite & Nielson, "State of the Media: US Digital Consumers Report," (New York: Neilson Company, 2011).: The implications of this were reflected by Apple in early 2012: the company announced that it would enter the e-textbook market, and, after posting its first-quarter profit (USD$13 billion) momentarily displaced Exxon as the world's largest publicly traded company. More than 75 per cent of this revenue is attributable to mobile-platform sales (iPods, iPads and iPhones). Ben Rooney, "Apple tops Exxon as most valuable company," (Cable News Network, 2012).

[380] Rosenblum, "Mobile In Canada: A Summary Of Current Facts + Trends."

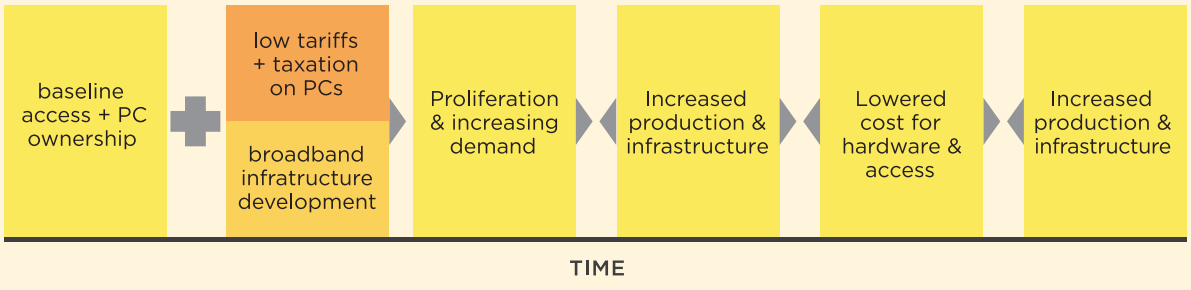
[381] Refer to comparative research conducted by TRRA in this report: section 8.8

[382] ITBusiness, "Wind, Mobilicity split on Ottawa spectrum ruling," IT World Canada, http://www.itbusiness.ca/it/client/en/home/news.asp?id=66563.

Several experts we contacted suggested that by examining the emergence and widespread adoption of wired broadband in Canada, we can understand adoption patterns and requirements, such as the need to provide contiguous, reliable and cost-effective access for a population thinly spread across a large territory. The relatively high broadband penetration indicates that Canadians are interested in online activities and information, and that with appropriate infrastructure development, these needs can be met.

The patterns of adoption characteristic of computing and broadband operate along a pathway where adoption itself fuels proliferation in a mutually enforcing series of events that can be demonstrated through the feedback loop diagram. The widespread adoption of the Internet has been fuelled by consumer interest, affordable technology and available and cost-effective access. These same factors are likely to be important in the Ontario mobile landscape.

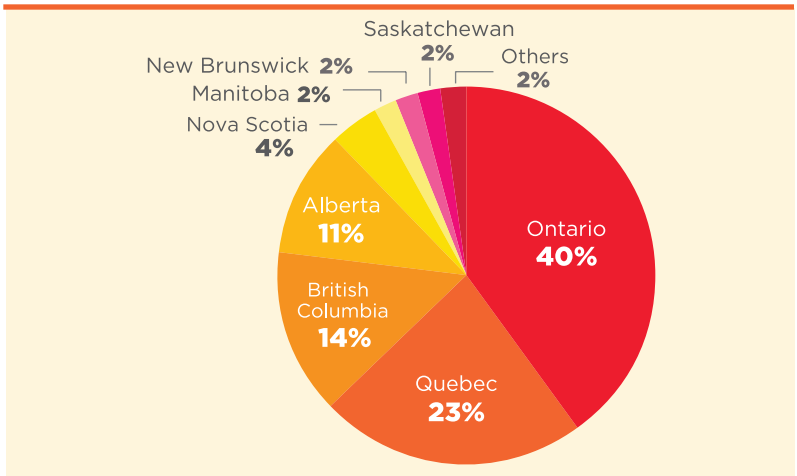
**Figure 8:** Feedback loops in personal computing and broadband proliferation.




## 8.2 Investment in Mobile Capacity

Ontario and Canada have already made significant investments in building Ontario's mobile capacity through investment in research, the training of highly qualified personnel, and infrastructure. According to the Mobile Ontario Asset Map produced by Toronto Regional Research Alliance (TRRA) and provided in Appendix 4, Ontario is home to 40 per cent of the companies, 38 per cent of the mobile-industry labour, and 66 per cent of the patents (2001–10) that comprise the national mobile ecosystem.

**Figure 9:** Distribution of telecommunication companies in Canada.




The significant presence of telecommunications companies in Ontario indicates that there should be capacity in the province to support distribution of mobile services, as well as innovation in the mobile industry.

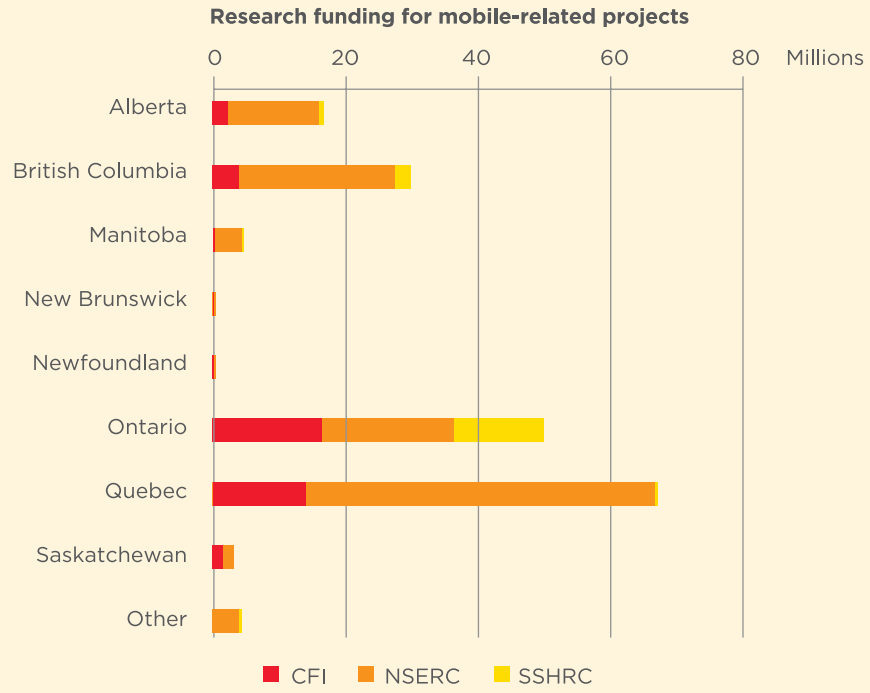
## 8.3 Academic Research

A large portion of Canadian academic research [383] in mobile resides in Ontario:

- Ontario is awarded 43 per cent of the research funding (2001–10).
- Ontario hosts 49 per cent of the experts.
- Ontario researchers contributed to or produced 50 per cent of publications (2001–10).

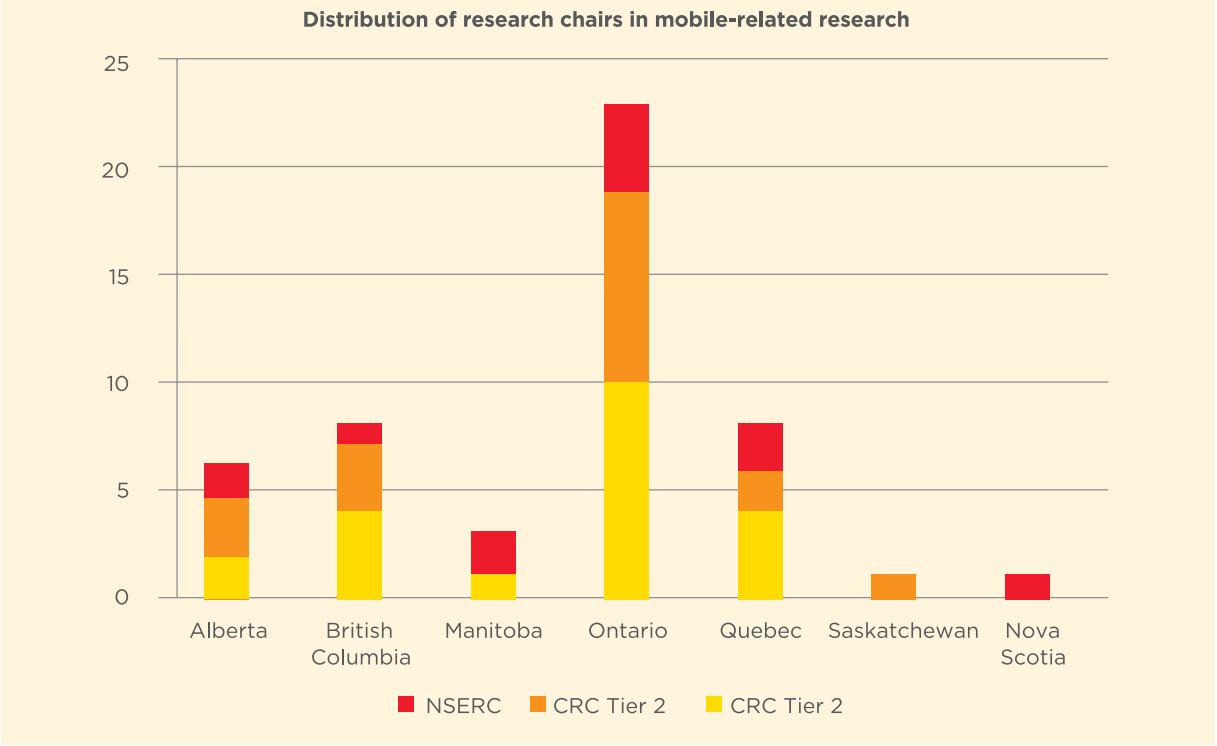
[383] This statistic represents research funded by NSERC, SSHRC, and CFI with title and keyword search parameters of mobile, wireless, handheld and portable

**Figure 10:** The Province of Ontario receives more than CAD$70 million in funding for mobile-related research from the National Sciences Engineering Research Council (NSERC), the Social Sciences and Humanities Research Council (SSHRC) and the Canadian Foundation for Innovation (CFI).




From 2001 to 2010, the Canada Foundation for Innovation (CFI) funded 80 mobile-related research projects valued at CAD$29 million. Ontario received funding for more projects than any other province (34 per cent), valued at CAD$9. 7 million. From 2001 to 2010, the National Science Engineering Research Council (NSERC) funded more than 3,000 mobile-related research projects valued at CAD$146 million. Ontario received the most funding (CAD$62 million) for the largest number of mobile related projects (1,490). Examples of funded projects include *NSERC DIVA: Developing Next-generation Intelligent Vehicular Networks and Applications, Data Communications over Challenged Wireless Networks and Wireless Networks for Data collection From Sensored Homes.*

**Figure 11:** There are 37 Canada Research Chairs (CRCs) in areas related to mobile technologies; 18 are located in Ontario. There are 11 NSERC industrial chairs in related areas; four of them are in Ontario



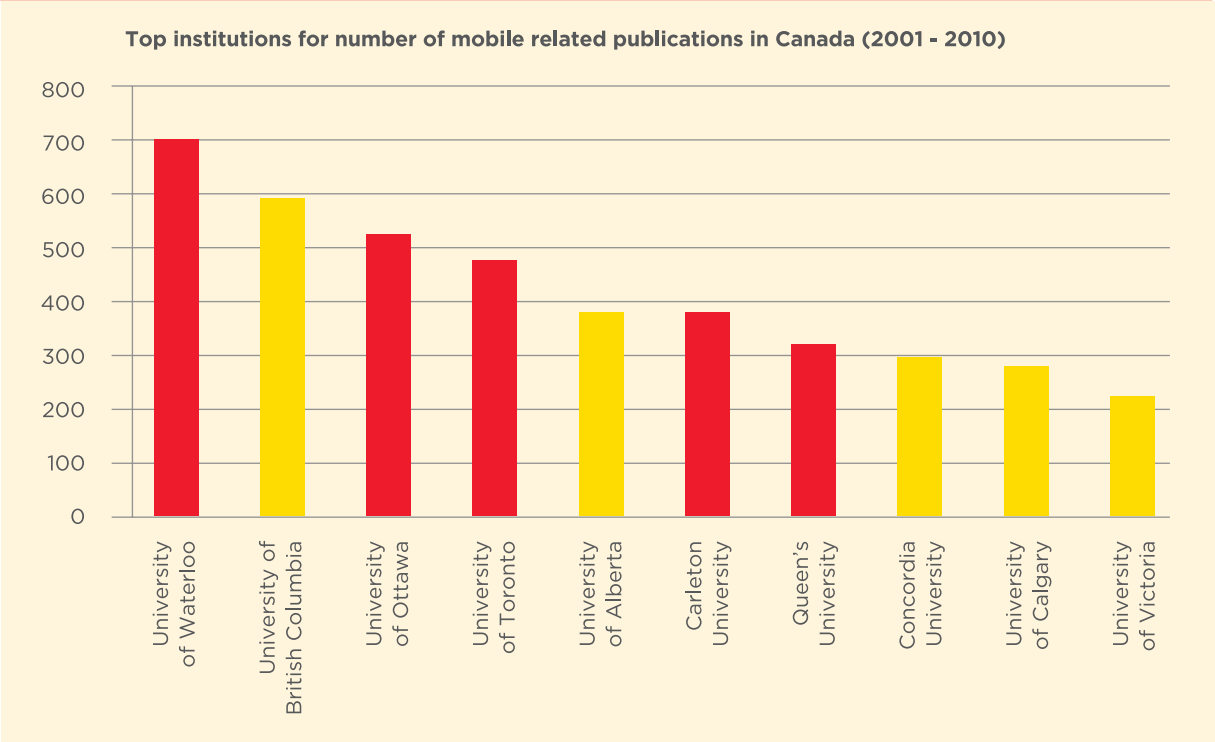

University and mobile research in Ontario has momentum. As is shown in Figure 10, Ontario has the most Canada Research Chairs and NSERC industrial chairs in the field. [384] In fact, Ontario represents about three per cent of all mobile-related publications in the world. [385] In order to fully

[384] A manual search of research chairs' research descriptions was undertaken to find all research specifically related to mobile technology including hardware, software and materials research.

[385] This statistic was drawn from a search of ISI Web of Knowledge with the following parameters: TS=(mobile OR portable OR handheld OR wireless); Refined by: Subject Areas=( engineering, electrical & electronic or telecommunications or computer science, information systems or computer science, theory & methods or computer science, hardware & architecture or computer science, artificial intelligence or computer science, software engineering or computer science, interdisciplinary applications or engineering, biomedical or medical informatics or computer science, cybernetics or mathematics, applied); timespan=2001-2010; databases=sci-expanded, ssci, a&hci, cpci-s, cpci-ssh.

capitalize on this strong capacity in mobile research, mechanisms for commercial development are critically needed.

**Figure 12:** Five of the top 10 institutions for mobile research in the country are located in Ontario (these are noted in red)




The University of Waterloo is among the top institutions in the world for mobile-related publications. The top subjects under which these publications are listed are engineering, telecommunications and computer science.

## 8.4 Training and Production of Highly Qualified Personnel

Two of Ontario's universities are ranked among the top in the world for engineering and information and communications technology (ICT): University of Toronto ranked 14th and University of Waterloo ranked 39th. Moreover, according to *US News*, "Five of the top ten institutions for mobile research in the country are located in Ontario: University of Waterloo, University of Ottawa, University of Toronto, Carleton University, Queen's University." [386] Ontario's colleges train mobile developers. Ontario boasts design programs and curricula at the university and college levels that support mobile development and graduate creative talent; these include OCAD University, George

Brown College and Ryerson University. These universities also house important centres for mobile innovation: MEIC and Digital Media Zone.

**Table 2:** Post-secondary ICT Training.

| | Universities | Colleges |
|---|---|---|
| Number of ICT-related programs | 34 | 162 |
| Students graduated (undergrad/grad) | 5,912/2,716 | 2,376 |

There are several specifically mobile-related programs at Ontario colleges, such as the Wireless Telecommunications program at Humber College and the Wireless Networking program at George Brown College. In addition, there are hundreds of ICT-related programs at colleges and universities that could lead to technical careers in the mobile industry. These include computer science programs and engineering programs. The number of computer science and engineering undergraduates at Ontario universities has declined slightly in recent years; however, the number of postgraduates (Master's or Ph. D. students) has increased, demonstrating that we are producing a highly skilled labour force.

## 8.5 Productive Capacity

Many large, globally successful mobile companies in each component of the mobile ecosystem are headquartered in Ontario. There are more than 1,800 telecommunication companies in Canada, and 40 per cent of these are located in Ontario. Industry Canada's *Canadian Company Capabilities* report lists 304 companies under the Wireless Communication category, and 48 per cent of these are in Ontario. With smartphones and tablets becoming the norm for mobile connectivity, software, apps and mobile web services have become important, particularly for effectively delivering public services. Ontario has substantial capacity to produce mobile software and apps. With an estimated 200 companies, Toronto has been named a "hotbed" for mobile-app development. [388] We discuss mobile entertainment companies in the Entertainment in a Mobile Ontario on page 84.

[386] USNews, "World's Best Universities: Subject Rankings".

[387] Council of Ontario Universities, "Common University Data Ontario," (2011).

[388] Stuart Weinberg, "Toronto Becoming A Hub For Mobile-Apps Companies," *Wall Street Journal* 2010.

Ontario is home to the Canada Digital Media Network, a centre of excellence for commercialization and research, and also has important ICT clusters like the Greater Toronto Area (the GTA and the "Golden Horseshoe"), Kitchener-Waterloo-Guelph (the "Technology Triangle") and Ottawa Valley ("Silicon Valley North"). These developers cross many sectors, from education to wellness, from healthcare to marketing, and from entertainment to sustainability.

**Handset Manufacturers** [391]**:**

- Research In Motion (RIM): Leading smartphone developer, maker of the BlackBerry and the PlayBook, and a central component of the mobile ecosystem in Ontario. RIM is also a software developer with an ecosystem of application providers that use its platform.
- Psion: Provides innovative and rugged mobile computing solutions.
- Allegro Mobile Solutions: Provides an end-to-end solution offering including software, hardware, integration, service and support, including mobile computing, wireless infrastructure and mobile printing.

The wavering of Research In Motion (RIM), a former giant in mobile handsets and services, opens up important questions around the leadership and health of Ontario's mobile capacity. While RIM is an important link between research and development in the Waterloo area and represents a large number of Ontario-held mobile patents, there is still significant research and production capacity in Ontario beyond RIM, within the province's numerous mobile-related companies. The boxes in this section highlight a few of the leaders in the Ontario mobile ecosystem.

**Software Developers** [392]**:**

- Polar Mobile: A global mobile content distributor and app developer platform with 750+ apps launched, 300+ customers globally and 9+ million subscribers.
- Mitel Mobile: A global provider of business communications and collaboration software and services.
- Five Mobile: A software developer recently acquired by Zynga.
- Seregon: A mobile enterprise applications developer.
- MyThum: A developer of SMS and mobile payment services.
- Kik: A mobile messaging service.
- Xtreme Labs: A multiplatform mobile app developer with more than 100 apps developed and more than 100 million downloads.
- Diversinet: Provides "patented and proven secure application platform that enables healthcare organizations to rapidly deploy HIPAA-compliant mobile healthcare (m-health) applications to anyone, anytime, anywhere, on mobile devices so everything is Connected and Protected."
- Impact Mobile: Develops mobile marketing solutions including applications.

**Network Component Manufacturers** [390]**:**

- Ericsson Canada Inc.: Offers mobile broadband infrastructure.
- Sierra Wireless: Comprehensive offering of hardware, software and connected services for mobile lifestyles and machine-to-machine communications.
- Redline Communications: Specializing in broadband wireless solutions.
- Alcatel-Lucent: Providing solutions to deliver voice, data and video communication services to end-user.

## 8.6 Patents

Since 2001, Canada has had the third fastest growth of mobile-related patents [393] among the top 10 countries, behind South Korea and Taiwan, as indicated in the graphs below. Canada is fourth in the world in the number of mobile-related patents. From 2001 to 2010, more than 2,500 mobile-related patents were granted to Canadian inventors, and 66 per cent of these had inventors in Ontario.

[389] To learn more about network component manufacturers, visit: http://www.ericsson.com/ca; http://www.sierrawireless.com/; http://www.alcatel-lucent.com/wps/portal/!ut/p/kcxml/04_Sj9SPykssy0xPLMnMz0vM0Y_QjzKLd4x3NgvRL8h2VAQAo_k0pg!!#Ottawa.

[390] To learn more about network component manufacturers, visit: http://www.ericsson.com/ca; http://www.sierrawireless.com/; http://www.alcatel-lucent.com/wps/portal/!ut/p/kcxml/04_Sj9SPykssy0xPLMnMz0vM0Y_QjzKLd4x3NgvRL8h2VAQAo_k0pg!!#Ottawa.

[391] To learn more about handset manufacturers, visit www.rim.com; http://www.psion.com/us/index.htm; http://www.allegrowireless.com/welcome.html.

[392] To learn more about software developers, visit: http://www.polarmobile.com/about-polar; http://www.mitel.com/DocController?documentId=9795; http://www.xtremelabs.com/; http://www.diversinet.com/about.htm; http://www.impactmobile.com/.

[393] Patent statistics are sourced from Delphion Research and represent searches on 63 patent classes that can be summarized by the following categories: Telecommunications; Multiplex Communications; Data Processing; Electrical Computers and Digital Processing Systems; Other Communications; Information Security or Cryptography; Computer Graphics Processing and Selective Visual Display Systems; Error Detection/Correction and Fault Detection/Recovery; Image Analysis; Coded Data Generation or Conversion.

**Figure 13:** Comparison growth of mobile-related patents in Canada and the world.

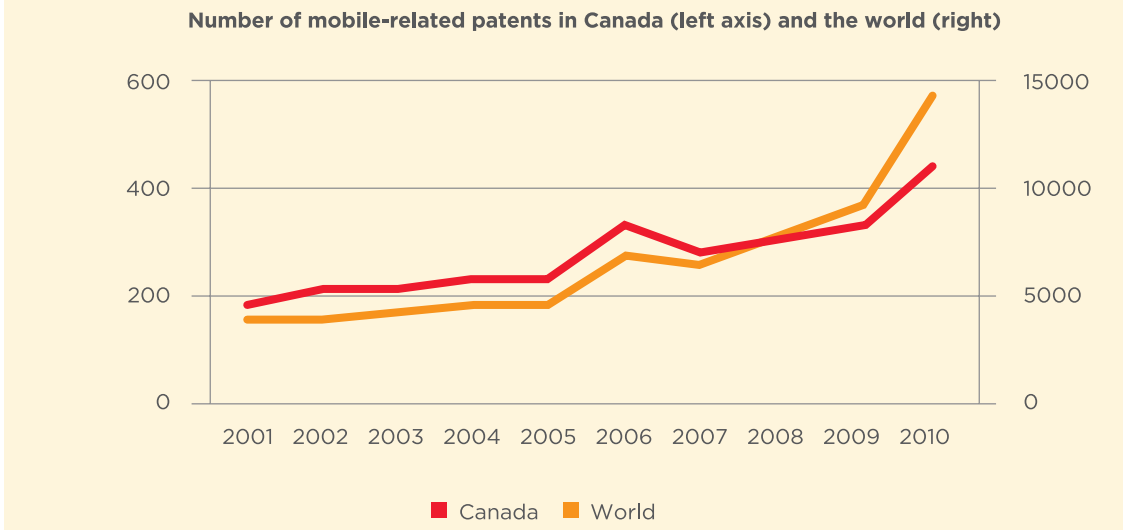



**Figure 14:** Mobile-related patents in Ontario.

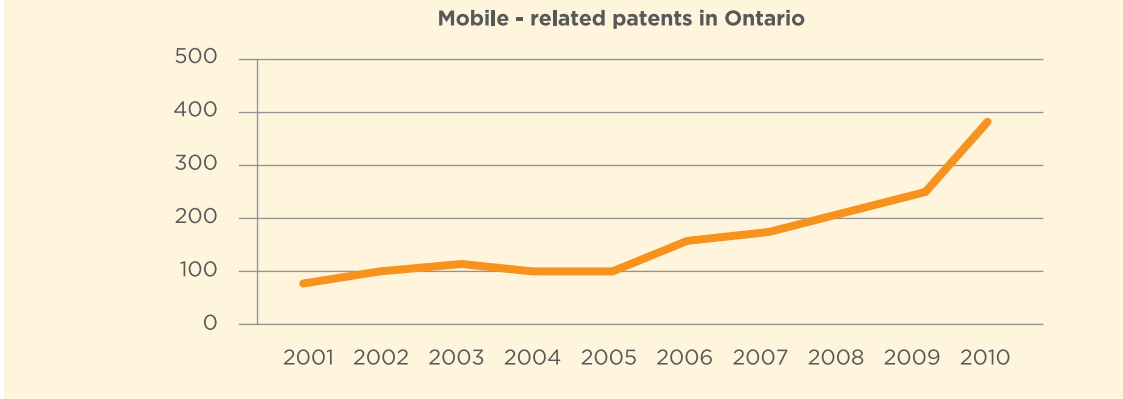


**Table 3:** Patents in Canada and comparator countries.

| | Number of Patents 2001 | Number of Patents 2010 | Change % | Total Patents (2001–10) |
|---|---|---|---|---|
| US | 2,760 | 6,874 | 249. 06% | 42,404 |
| Japan | 835 | 1,643 | 196.77% | 11,944 |
| South Korea | 145 | 951 | 655.86% | 4,196 |
| Canada | 131 | 549 | 419. 08% | 2,578 |
| UK | 126 | 313 | 248.41% | 2,007 |
| Germany | 106 | 361 | 340.57% | 1,964 |
| Finland | 99 | 255 | 257.58% | 1,792 |
| Taiwan | 47 | 250 | 531.91% | 1,499 |
| France | 86 | 199 | 231.40% | 1,301 |
| Sweden | 126 | 143 | 113.49% | 1,063 |

The number of patents in Ontario for mobile technologies has grown rapidly, suggesting a significant capacity for innovation. The top assignee in the province (and in Canada) is RIM.

**Figure 15:** Distribution of mobile-related patents in Canada (2001 - 2010)

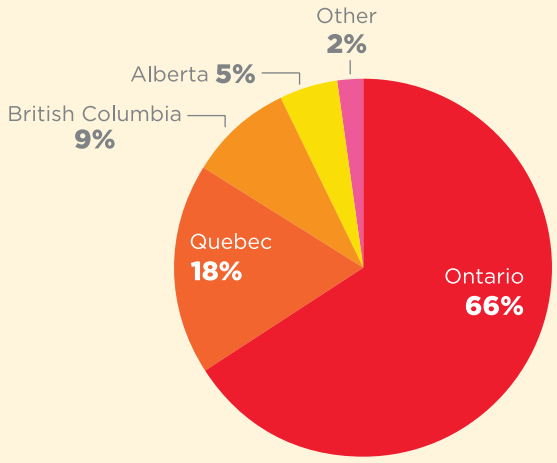
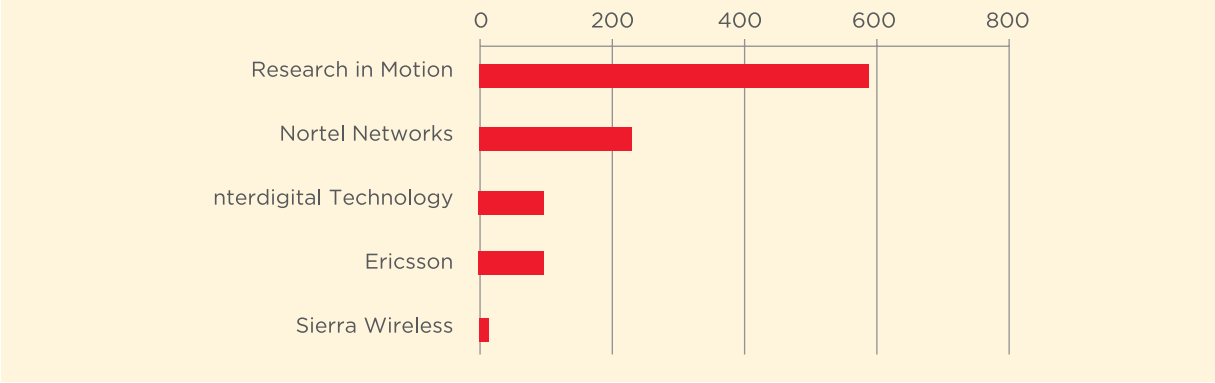


**Figure 16:** Top mobile-related patent assignees in Canada.




The disintegration of Nortel resulted in significant upheaval in Ontario's research capacity, as well as a loss of Canadian intellectual property. Ontario's position as a mobile leader will be negatively impacted as Research in Motion (RIM) continues to encounter severe difficulties. RIM's future strategy is not yet known, but could include: contraction, with concentration on its business market; division; merger with an international company; or the sale of components of its assets to other companies. RIM is drastically reducing its employment base as well as shifting its company priorities and research investments. It will be important for the Ontario government to work closely with the company and the federal government to ensure that components of the company and its critical intellectual property (IP) are retained in Canada—this retention did not occur with the Nortel transition. Canada and Ontario (and their taxpayers) have made significant investments in RIM. A wireless and mobile industry will remain, but it will be comprised of small and medium enterprises (SMEs) and start-ups, and will require policies and supports appropriate to that scale of industry. With RIM's diminution, Canada (and Ontario) could be left with only Open Text as a mid-size international company in the technology sector.

### 8.6.1 Wireless Providers and Internet Service Providers

Like much of the rest of Canada, Ontario is primarily served by three national telecommunications providers: Rogers, Bell and TELUS. Both Bell and Rogers offer multimedia or "quadruple play" bundles that include mobile, a fixed telephone line, cable/DSL broadband Internet and television services.

While these companies do offer regular-feature cell phones optimized for voice and texting (SMS), they also offer smartphones that run on the three dominant global operating systems:

- iOS (Apple iPhone)

- BlackBerry OS (Bold, Torch, Curve and Pearl)
- Google's Android (an open standard used by several device manufacturers like Samsung, Motorola and HTC)

In addition, each company offers packages for connecting other types of devices like tablets and laptops. [394]

Canada has three national carriers:

- Rogers is the largest national carrier, and holds a significant portion of the mobile market in Ontario. The bulk of Rogers' clients are in major urban centres. Nationally, Rogers has 9.3 million subscribers, with CAD$6.6 billion in revenue from wireless. [395] Rogers also owns the discount brand Fido, which offers relatively cheap service plans and a limited selection of handsets.
- Bell is the second-largest national carrier and, like Rogers, has a large share of the wireless market in Ontario, particularly in urban areas. Bell has 7.4 million wireless customers in Canada, with CAD$5.2 billion in wireless revenue. Bell operates portions of the Virgin discount brand. Virgin offers no-contract service plans (albeit by offloading handset costs onto consumers), and is a major provider of prepaid services. [396]
- TELUS is the third and smallest national carrier. Unlike the previous two carriers, it focuses primarily on wireless services, although it has recently begun offering other wire-line telecommunication and media services. TELUS has 7.3 million wireless consumers, with CAD$5.5 bil-

Network and Brand Information for New Entrants to the Wireless Market:

- Wind Mobile purchased spectrum licenses for a national network but has only rolled out services in major urban centres in Ontario, including the GTA, Hamilton, Oshawa and Ottawa. It uses a Wideband Code Division Multiple Access (WCDMA)/HSPA+ network for 3G connectivity. Given its rapidly growing user base, Wind is on track to becoming the fourth major national telecom provider.
- Public Mobile at present only offers service in Toronto, and uses a CDMA (Code Division Multiple Access) network.
- Mobilicity uses a WCDMA/HSPA+ network for 3G connectivity and covers the GTA and Ottawa.
- A few winners of the 2008 spectrum auction have licenses to provide services in Ontario markets, but have yet to begin rolling out services and infrastructure, including Mobilicity Wireless for Southern/Eastern Ontario; Eastlink Bragg Communications for parts of Northern Ontario; Celluworld for Chatham, Ontario; and Public Mobile for urban Southern Ontario.

[394] MEIC, "Mobile Innovation: Mobile Content, Services, and Applications Industry 2012."

[395] Rogers Communications Inc., "Rogers Annual Report," (Toronto: Rogers Communications Inc., 2011).

[396] Bell Canada Enterprises Inc., "BCE Inc. 2011 Annual Report," (Bell Canada Enterprises Inc. , 2011).

lion in revenue. [397] TELUS operates and owns the discount brand Koodoo.
- Bell, Rogers and TELUS all use some version of a High-Speed Packet Access (HSPA+) network, offering 3G connectivity.

Ontario is also served by several regional carriers:

- One example is TBayTel, which serves Thunder Bay and surrounding areas and has a user base of 33,322 and a national share of 0.14 per cent of the mobile market.
- Another is Dryden Mobility, which serves Dryden and surrounding areas and has a base of 9,219 users and a market share of 0.04 per cent.
- NorthernTel, a division of Bell Alliant, serves Northeastern Ontario communities, providing a range of wireless services. [398]
- Finally, as a result of the 2008 Advanced Wireless Services (AWS) spectrum auctions, Ontario has new entrants serving selected areas, each at various stages of development.

As these new entrants roll out services to match their spectrum licenses, there will be greater competition for wireless services, albeit only in select areas.

In addition to wireless service providers, Ontario boasts many fixed-line Internet service providers (ISPs). [399] While the bulk of mobile access is routed through wireless service providers, mobile content—particularly via smartphones and tablets—can be consumed in the home through Wi-Fi connections, or through Internet hotspots outside the home. We will not enumerate the volume of these ISP providers, but only note that Internet-enabled mobile devices make use of these types of non-contract-based connections with increasing regularity, particularly as they are used either in the home, or in free Wi-Fi hotspots like libraries, universities, colleges or commercial outlets.

## 8.7 Emerging Technologies Leadership Is Changing the Nature of Mobile Industries

Developments in mobility are rapid, and new applications for mobile technology are constantly emerging in ways that were unimaginable just a few years ago. The mobile industry will soon be defined very broadly as wireless connectivity becomes commoditized and viewed as just another way to interconnect. The ongoing conversion to IPv6 will add to this view as more Internet Protocol (IP)-address space is created, enabling many new applications to enter the mobile space, including

[397] Telus Corporation, "Telus 2011 Annual Report," (Telus Corporation, 2011).

[398] See http://northerntel.ca/inside_ntl/.

[399] For a comprehensive list, see http://www.canadianisp.ca/cgi-bin/ispsearch.cgi?f=Search&p=ON.

smart-home applications, security applications, [400] healthcare-monitoring and -compliance applications, and a plethora of sensor-based applications that incorporate machine-to-machine communications using various wireless infrastructures. All metrics associated with the value of technology, application development and mobile services such as mobile advertising representing explosive growth. We are in the very early stages of an evolution, from connectivity defined by devices and restricted locations to the so-called ubiquitous or "ultramedia" environment/ecosystem.

In this context, Ontario is showing leadership in development of the Internet of Things, the maker movement and augmented reality.

### 8.7.1 The Internet of Things

The "Internet of Things" (IoT) is an emerging concept that some analysts suggest is the 'next big thing." [401] Technically, IoT is the array of all connected devices enabled by digital networks whose data can be read and connected to data-collection devices, databases, controllers and computing devices. Mobile networks play a huge role in enabling data devices that may be embedded in objects. A good example of early IoT deployment is the use of "smart metres" to measure electricity use in Ontario, resulting in smart cities of which smart metres are an important component. Soon, we will have many devices in our homes that may not necessarily have screens but will be "addressable" as they will have IP addresses [402] and radio-frequency identification (RFID) tags. Wearable technologies—of tremendous value to healthcare, health prevention and security—add another dimension. Other jurisdictions, such as California's Silicon Valley and the EU through its Framework program, have established capacity in this significant field. In 2009, the EU created a Strategic Research Roadmap that established a common definition and research rollout across the vast array of industries affected by these emerging technologies and their impact on products, supply chains and environments. This roadmap provides an overview of research prior to 2010 and toward 2020. [403] Such an enterprise would greatly benefit Ontario and Canada, given our strengths in engineering research.

[400] Rogers launched a smart home-monitoring service in 2012 that links mobile users with surveillance technology in the home.

[401] IBM and the Boston Consulting Group, in a study commissioned by Google, have recently declared it the "Internet of Everything" and are predicting that the digital economy in the G20 nations will double by 2016, in large part due to the proliferation of mobile connectivity and the IoT. Lisa Kwon, The Internet of Things, vol. Video, (IBM;, 2010), Video/DVD.; A 2011 report by the Paul Budde Communication group in Australia states, "The Internet of Things (IoT) is going to be a real game-changer. It will transform every single sector of society and the economy; and it will be out of this environment that new businesses—and indeed new industries—will be born." Kylie Wansink et al., "Global - Internet of Things - A Business Game Changer," (BuddeComm, 2011).

[402] Rogers Smart Home Monitoring is a good example.

[403] Ovidiu Vermesan et al., *Internet of Things Strategic Research Roadmap* (Brussels: European Commission, 2010).

Ontario's Ministry of Economic Development and Innovation might want to initiate such as exercise.

### 8.7.2 The Maker Movement

The "maker" movement leads significant activity surrounding IoT. [404] It is the design engineering equivalent to open-source software. Makers also take their inspiration from tech inventors and the do-it-yourself (DIY) consumer trend (including the pop-up trend for fashion and product designers): working in the "garage" tinkering with technology, often through a design or design/engineering lens. Most major cities boast maker-movement communities, and Ontario is no exception. Toronto hosts the ThingTank Lab and Hacklab. TO. Waterloo is home to Kwartzlab. OCAD University supports the Social Body Laboratory. There is evidence of other emerging initiatives across Ontario in Ottawa, Kingston and London. [405] In May of 2012 Southern Ontario held a "Mini Maker Faire" and there are plans for future conferences. [406] Much of the activity of these communities centres on ideation, experimentation and the creation of pre-commercial prototypes. In the international context, organizations and individuals in the maker movement are beginning to attract the attention of major commercial enterprises and venture capitalists. [407] For example, the American Defense Advanced Research Projects Agency (DARPA) just invested $3.5 million in TechShop, a distributed centre for the maker movement in the US. [408]

### 8.7.3 Augmented Reality

Augmented reality (AR), discussed in the mobile entertainment chapter in some detail, is a live view of the world that is enhanced by computer-generated media such as sound, video, graphics, text or GPS data. Additional information is provided for the viewer, who is situated in a location that is enhanced and extended through technology. Global revenues in AR products are expected to reach $600 billion by 2016, according to Semico Research. [409] Ontario is home to significant AR

[404] Tim Carmody, "Big DIY: The Year the Maker Movement Broke," Wired.com, http://www.wired.com/business/2011/08/big-diy/., http://www.wired.com/business/2011/08/big-diy/

[405] See http://hackerspaces.org/wiki/Ontario for a list of spaces. Examples include Diyode Guelph, Hack Kingston, Think-Haus and many others.

[406] See http://makerfairetoronto.ca/.

[407] Instructables, an online community for makers, was recently acquired by Autodesk.

[408] John Koestier, "DARPA Invests $3.5m in TechShop to Create Pop-up Weapons Factories," VentureBeat (May 24, 2012) http://venturebeat.com/2012/05/24/darpa-invests-techshop-pop-up-factories/.

[409] Michael Prunty, "Augmented Reality: Envision a More Intelligent World," (Semico, 2012)., http://semico.com/studies/category.asp?id=14#1474

research. For example, York University's Augmented Reality Laboratory (Department of Film, Faculty of Fine Arts) is of world-class quality and explores creative, technical and theoretical implications of AR. The Ontario Augmented Reality Network [410] includes private-sector developers, cultural agencies (such as the National Film Board), incubators, universities (Brock University, University of Western Ontario and Ryerson University), Niagara College and municipalities. It develops training, knowledge-sharing (through conferences, workshops and an online community), and research, with test beds in London, Toronto and St. Catharines. In the private sector, the Ontario Real Estate Association is experimenting with AR on mobile devices in order to assist realtors and their clients. Compatible strengths lie at research universities and commercial ventures in the US (MIT Media Lab, University of California, Georgia Tech), New Zealand (HITLabs at University of Canterbury, University of Washington), Japan (University of Tokyo), the UK (University of Bedfordshire, Luton) and Germany (University of Konstanz).

## 8.8 Jurisdiction Review

In 2011, more than 85 per cent of handsets will be able to access the mobile web. There are 1.2 billion mobile-web users in the world, with mobile-broadband outstripping fixed-broadband subscriptions two to one. [411] China has the majority of mobile Internet users and Asia continues to dominate the mobile market; mobile web penetration is also growing in Africa. Here are notable trends:

- ABI Research predicts that 2.1 billion mobile devices will have HTML5 browsers by 2016 (up from 109 million in 2010): "HTML5 will help to deliver a richer, more interactive mobile Web experience, including being able to play video without needing a plug such as the Adobe Flash Player." [412]
- The recent *Digital Consumers Report* indicates the growing trend toward mobile video consumption relative to over-the-top services and traditional television among Americans ages 11 to 24. [413] In Pacific Asia, the Middle East, India and Pakistan, 37 to 41 per cent of audiences view video on a mobile phone daily, with more than 50 per cent watching across a range of devices (tablets, handheld multimedia devices). [414]

[410] Funded by the Ontario Media Development Corporation's Creative Clusters Partnership Fund and Ontario Centres of Excellence.

[411] ABI Research, "2.1 Billion HTML5 Browsers on Mobile Devices by 2016 says ABI Research," Allied Business Intelligence Inc., http://www.abiresearch.com/press/3730-2.1+Billion+HTML5+Browsers+on+Mobile+Devices+by+2016+says+ABI+Research.

[412] Ibid.

[413] NM Incite & Nielson, "State of the Media: US Digital Consumers Report."; ibid. 5.

[414] Ibid., 14

- Ovum [415] predicts that service penetration for mobile commerce and financial services will reach between 30 and 40 per cent of the emerging market's mobile users in 2014. The design and sale of apps is a multibillion-dollar business that has emerged in only the last four years. Gartner 2009 estimates for global app sales, for which North America accounts for half, were USD$15.1 billion for 2011, and predicted to balloon to USD$29. 5 billion in 2012. [416] In 2011, Canalys noted that app store direct revenues would reach USD$14.1 billion in 2011 and would reach USD$37 billion by 2015. [417]

Given this global growth context, The Toronto Regional Research Alliance (TRRA) undertook a jurisdiction comparison as part of our research for *Taking Ontario Mobile* in order to understand the relative development of and potential for mobile services in Ontario. The research team developed a framework for jurisdiction selection, and six areas were studied based on the following criteria: similar demographics; inspirational markets; or rapidly growing markets. Two jurisdictions were selected for each of the three categories:

- Sweden and Illinois (USA) were selected for similar demographics.
- Finland and South Korea were selected for inspirational markets.
- Brazil and Russia were selected for rapidly growing markets.

Demographic and telecom/Internet penetration information is provided for each jurisdiction in the appendix. The main objectives of this study are:

- To benchmark Ontario against the selected jurisdictions.
- To better understand the developments that are shaping each of these mobile ecosystems, in the hope of drawing conclusions applicable to Ontario.
- To underscore the breadth of global mobility.

Key findings from this review are excerpted in this chapter and the full text of the review and all accompanying visuals are included in the report as Appendix 6.

[415] Mobile News, " 2012 predictions: Ovum research director Tim Jennings," Clark White Publications Ltd, http://www.mobile-newscwp.co.uk/2012/01/2012-predictions-ovum-research-director-tim-jennings/.

[416] Gartner Group, "Worldwide Revenues from Mobile Applications," (Gartner, 2011).http://www.statista.com/statistics/176750/worldwide-revenues-from-mobile-apps-since-2009/ These estimates include only "sold" apps. Many more are free and accounted for through other means, such as marketing budgets. As such, these revenue estimates undersell the opportunities for developers.

[417] Canalys, "App stores' direct revenue to exceed $14 billion next year and reach close to $37 billion by 2015," http://www.canalys.com/newsroom/app-stores-direct-revenue-exceed-14-billion-next-year-and-reach-close-37-billion-2015.

### 8.8.1 Demographics

**Table 4:** Demographic and telecom penetration information for select jurisdictions.

| Demographics | Sweden | Illinois (USA) | Finland | South Korea | Brazil | Russia | Ontario (Canada) |
|---|---|---|---|---|---|---|---|
| GDP-nominal (USD $M) | 337,893 | 644,200 | 239,232 | 1,007,000 | 2,090,000 | 1,465,000 | 612,993 |
| Population | 9. 35 M | 12.8 M | 5.4 M | 48.9 M | 190.7 M | 142.9 M | 13.2 M |
| GDP per capita(USD$) | 47,939 | 50,328 | 44,488 | 20,590 | 10,900 | 10,437 | 46,401 |
| Area (km2) | 443,718 | 149,998 | 338,424 | 100,210 | 8,514,877 | 17,075,400 | 1,076,395 |
| Population density (km2) | 20.79 | 85.54 | 15.88 | 487.73 | 22.40 | 8.37 | 12.27 |
| Population urban (%) | 84.5 | 88 | 63.3 | 81.5 | 85.6 | 72.8 | 85 |
| Median age | 41.7 | 34.7 | 42.3 | 38.4 | 29. 3 | 38.7 | 37.6 |
| GDP-nominal (USD$M) | 337,893 | 644,200 | 239,232 | 1,007,000 | 2,090,000 | 1,465,000 | 612,993 |
| Population | 9. 35 M | 12.8 M | 5.4 M | 48.9 M | 190.7 M | 142.9 M | 13.2 M |
| GDP per capita (USD$) | 47,939 | 50,328 | 44,488 | 20,590 | 10,900 | 10,437 | 46,401 |
| Area (km2) | 443,718 | 149,998 | 338,424 | 100,210 | 8,514,877 | 17,075,400 | 1,076,395 |
| Population density (km2) | 20.79 | 85.54 | 15.88 | 487.73 | 22.40 | 8.37 | 12.27 |
| Population urban (%) | 84.5 | 88 | 63.3 | 81.5 | 85.6 | 72.8 | 85 |
| Median age | 41.7 | 34.7 | 42.3 | 38.4 | 29. 3 | 38.7 | 37.6 |

| | Sweden | Illinois (USA) | Finland | South Korea | Brazil | Russia | Ontario (Canada) |
|---|---|---|---|---|---|---|---|
| Mobile penetration | 116.1 | 90 | 156.4 | 105.4 | 104.1 | 166.3 | 78 |
| Mobile broadband (2009) | 125.8 | 39 | 144.6 | 83.6 | 4.5 | 32.9 | 17 |
| Landline telephone | 53.5 | 52 | 23.3 | 59. 2 | 21.6 | 31.5 | 50 |
| Internet users | 90 | 72 | 86.9 | 83.7 | 40.6 | 43 | 81.6 |
| Fixed broadband | 31.6 | 25 | 29. 1 | 36.6 | 7.2 | 11 | 29. 8 |
| Penetration (%) | | | | | | | |
| Mobile penetration | 113.5 | 90 | 156.4 | 105.4 | 104.1 | 166.3 | 78 |
| Mobile broadband (2009) | 125.8 | 39 | 144.6 | 83.6 | 4.5 | 32.9 | 17 |
| Landline telephone | 53.5 | 52 | 23.3 | 59. 2 | 21.6 | 31.5 | 50 |
| Internet users | 90 | 72 | 86.9 | 83.7 | 40.6 | 43 | 81.6 |
| Fixed broadband | 31.6 | 25 | 29. 1 | 36.6 | 7.2 | 11 | 29. 8 |

### 8.8.2 Regulatory Environment

Most jurisdictions reviewed have an independent regulatory agency in charge of telecommunications and/or wireless policy implementation, and the main goals of policy include the promotion of competition and the efficient provision of services. As in Canada, the allocation of RF spectrum is usually undertaken through auctions and/or evaluation of capabilities. Spectrum auctions in Canada are the responsibility of Industry Canada, as opposed to the regulatory agency (the CRTC). It is interesting to note that in Finland, where fees for RF spectrum use are much lower than in Europe or North America, the regulatory agency is inclined to monitor prices and competition much more closely. The Korea Communications Commission (KCC) in South Korea has also enforced measures to reduce service prices.

Five of the jurisdictions studied were countries that have sole control of policy regulations; in contrast, Illinois and Ontario are bound by regulations set at the federal level. Although Ontario and Illinois are similar in terms of GDP and population, Ontario's size relative to Canada means that it is able to wield much more influence in federal decisions than Illinois does in the United States. For these reasons, our report suggests federal policy interventions that Ontario could make.

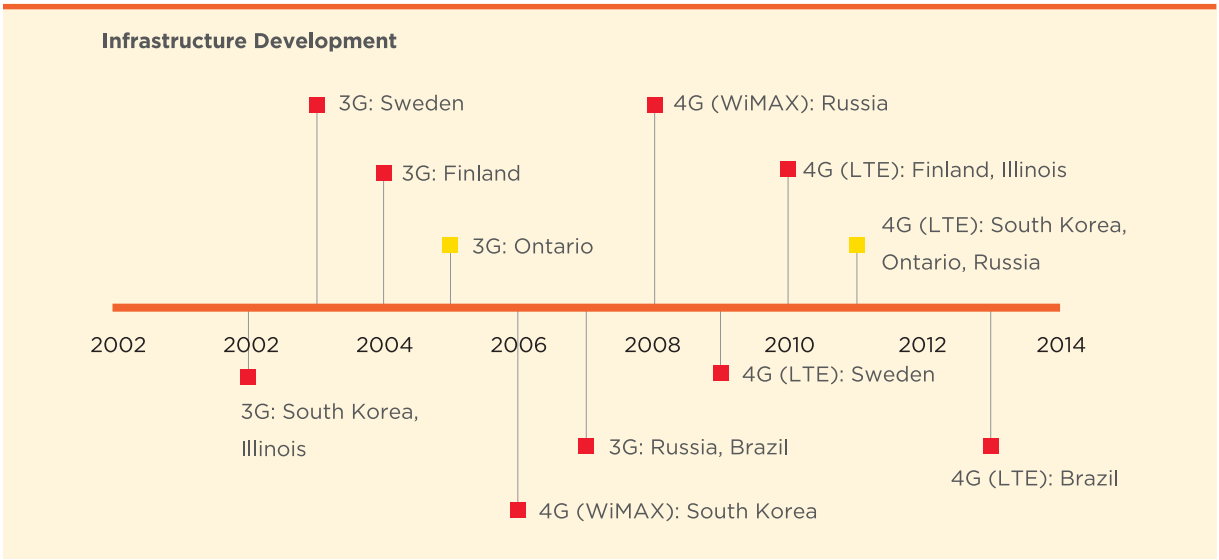
Canada, South Korea, Brazil and Russia have foreign-ownership barriers for mobile telecommunications companies, Finland and Sweden do not, and the United States has some limited restrictions. Canada has recently loosened its foreign-ownership restrictions to allow firms with less than 10 per cent of market share by revenue to have investment from foreign sources.

### 8.8.3 Infrastructure Development

Ontario has been relatively slow to adopt new wireless infrastructure, with 3G first launched in 2005 and 4G in 2011. Small and densely populated countries such as South Korea have incredible ease in deploying new technology, which means that the country is at the leading edge of mobile innovation. Although it is the case that Ontario's vast area makes widespread deployment of infrastructure much more expensive in comparison to other jurisdictions, Ontario would benefit from continuously promoting the adoption of new wireless technologies within densely populated areas if it is to take full advantage of the latest mobile applications and services. It would also benefit by supporting federal policies to provide specific competitions and subsidies for rural and Northern communities.

As is shown in Figure 16 all of the comparison jurisdictions are moving to or have already moved to 4G long-term evolution (LTE) infrastructures.

**Figure 17:** Infrastructure development across jurisdictions indicates widespread movement to 4G (LTE) by 2014.




The deal for separation of network ownership and service provision that has occurred in Russia is an excellent case study to follow and analyze. Yota, a Russian network provider, has signed an agreement with the country's four major network operators to make Yota their 4G network provider, and guarantees rollout of its LTE network over 180 cities by 2014. Each service provider will have the option to buy a 25 per cent stake in Yota. Given Russia's vast territory, the agreement promises to be an efficient way to deploy 4G services in the country. Fortunately, in the context of a rigorous debate, the Government of Canada followed advice from public consultation that noted that market failure in providing service to rural Canadian required government intervention. The decision to set aside the 700Mhz spectrum in the 2013 spectrum auction for rural service along with the requirement for these spectrum-auction winners to deploy next generation service to 90 per cent of the existing mobile broadband network footprint in five years and to 97 per cent in seven years will help rural Ontarians receive the same quality of service enjoyed by their urban counterparts and create valuable opportunities for service providers and subsidiary industries to develop and roll out new products and services in health, entertainment, education and commerce.

### 8.8.4 Competition

As is the case in all of the jurisdictions we examined, market share in Ontario is dominated by a few big players. Rogers, Bell and TELUS control 97 per cent of the market, with shares of 47 per cent, 30 per cent and 20 per cent, respectively. Countries with only a few players may achieve strong competition through effective regulation and price monitoring, as we have seen in the jurisdictions we examined. The KCC has achieved price reductions in South Korea, and Finland offers some of the

most competitive rates in the world despite its "tri-opoly." Impacts of concentration are discussed in the Inclusion chapter (see page 112 ).

Rogers, Bell and TELUS are some of the most profitable mobile providers in the world. New entrants like Wind Mobile and Mobilicity gained about 2 per cent of market share in Ontario; a relatively small coverage area may have impeded them from gaining a larger number of subscribers. Despite this, their entrance seems to have had a positive effect on competition in the province: in 2010, average revenue per user (ARPU) went down for the first time in five years, to $59 from $63 in 2009. Continuing to relax Canada's foreign ownership restrictions (as has been done in the recent past with Wind Mobile, and has been indicated in recent Industry Canada policy) will lead to further increases in competition. Sweden and Finland, where no restrictions exist, are among the leading countries in the world for cheap mobile services.

In addition to evaluating policy regulations at the federal level, other approaches to encourage competition at the provincial level may also be examined. Developing and promoting a consumer-oriented guide like the Telepriskollen web portal that is used in Sweden—where service prices are easily and clearly compared—could further encourage service providers to lower their prices and provide better services. A federal online cell phone plan calculator tool was scrapped in 2009; records suggest that the decision was made after lobbying from Canada's wireless companies. [418] We encourage the carriers to introduce a price comparison web portal.

### 8.8.5 User Characteristics

Although Canada has very active users of mobile services, with an average minutes of use (MOU) of 388 minutes per month, Ontario also has the smallest mobile-penetration rate (78 per cent) and the largest ARPU ($59) of the jurisdictions examined.

An aging population may be a barrier to increased adoption of mobile services; however, the jurisdictions of Sweden, Finland, Russia and South Korea have older populations than Ontario, and have some of the highest penetration rates in the world.

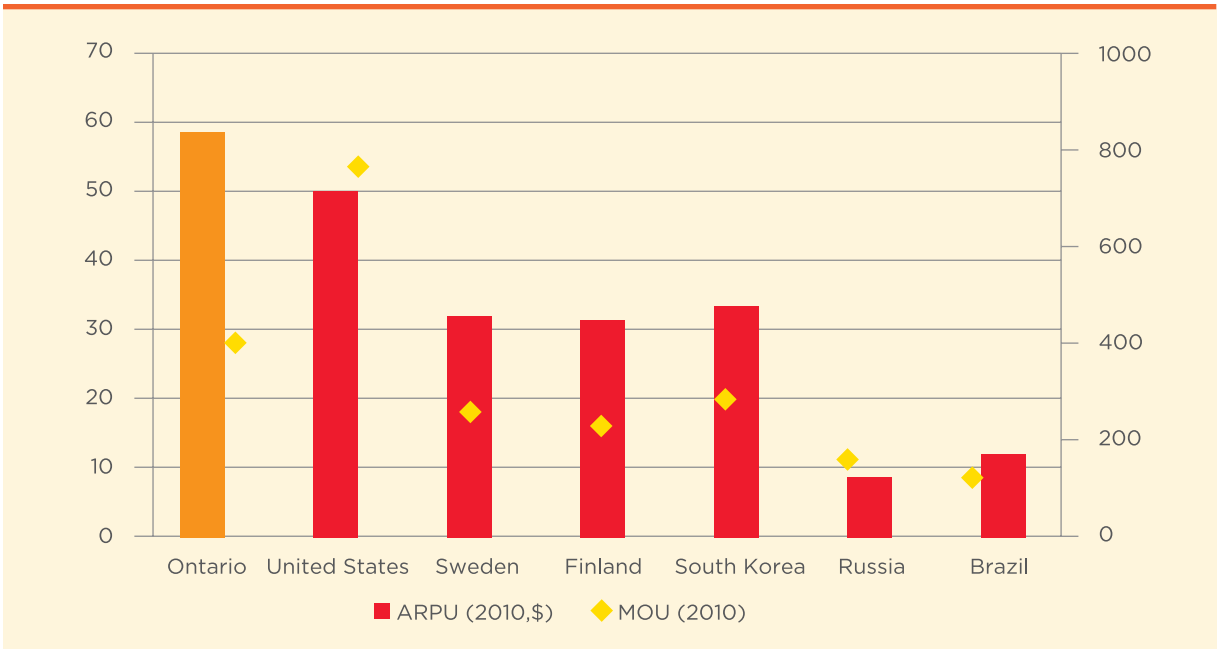
A great majority of mobile users in Brazil and Russia use prepaid subscriptions; this has led to rapid and widespread adoption of services (although ARPU is small). Encouraging service providers in Ontario to promote and make available prepaid SIM cards may help to reduce the current mobile-penetration gap.

[418] Michael Geist, "Ottawa killed cellphone cost calculator," The Star, August 31, 2009 2009., http://www.thestar.com/business/article/688547--ottawa-killed-cellphone-cost-calculator

### 8.8.6 Service Prices

The Organisation for Economic Co-operation and Development (OECD) ranked Canada 20th, 28th and 19th, respectively, for prices of low-, medium- and high-usage mobile baskets. This is better than the US but still puts Canadian rates higher than the OECD average. Rogers offers a plan with 200 minutes, unlimited messaging and one gigabyte of data for CAD$55. Although different characteristics and bundles make the plans difficult to compare, this seems higher than most of the jurisdictions we analyzed (with the exception of Brazil). In particular, rates for data services in Ontario seem substantially higher than those in South Korea, Finland, Sweden, Russia and the US.

**Figure 18:** Average ARPU and MOU (monthly data).




### 8.8.7 Research and Commercialization Capacity

Ontario has very competitive research and innovation assets. Four of the jurisdictions we selected—namely, South Korea, Finland, Illinois and Sweden—are global leaders for the development of mobile technologies, both in the infrastructure (with Ericsson and Nokia Siemens Networks) and devices (with Nokia, Samsung, LG and Motorola). Patent output for mobile technologies in each of these jurisdictions is heavily dominated by these industry leaders. In Ontario, a majority of patents come from RIM and Nortel (although these have been recently acquired by a consortium of companies that includes Apple and Microsoft, among others). Ontario has produced almost 1,700 related patents in the past decade. Ensuring that this intellectual property is retained by Ontario residents

and developed in Ontario and Canada should be a priority for the Ontario government.

**Figure 19:** Number of patents for comparison jurisdictions. Source: Delphion Research

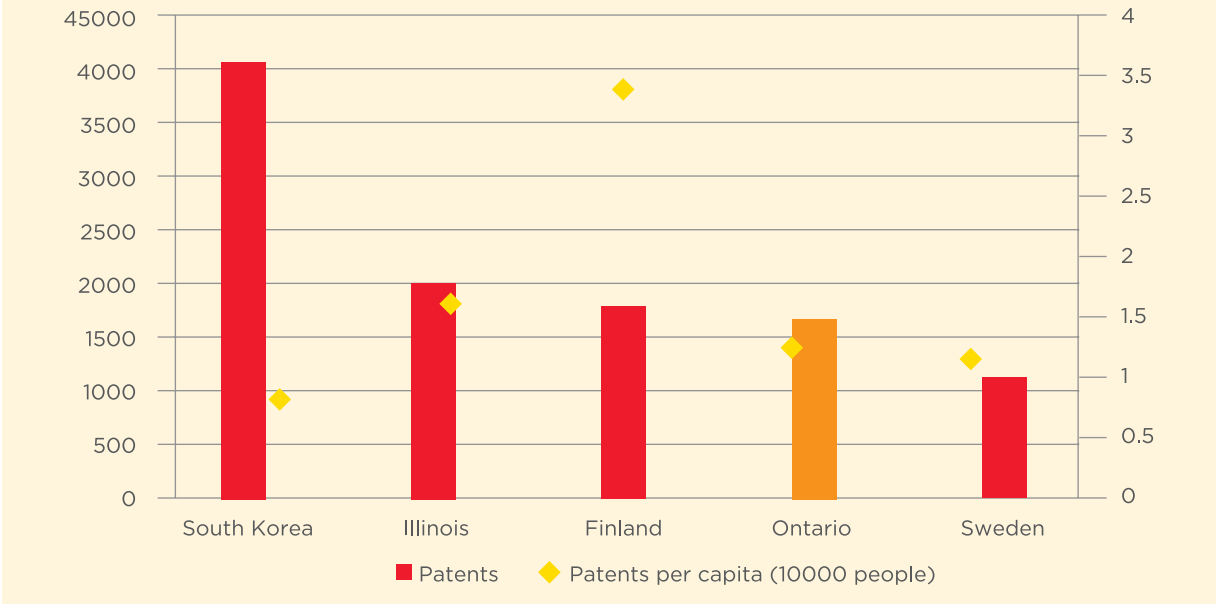
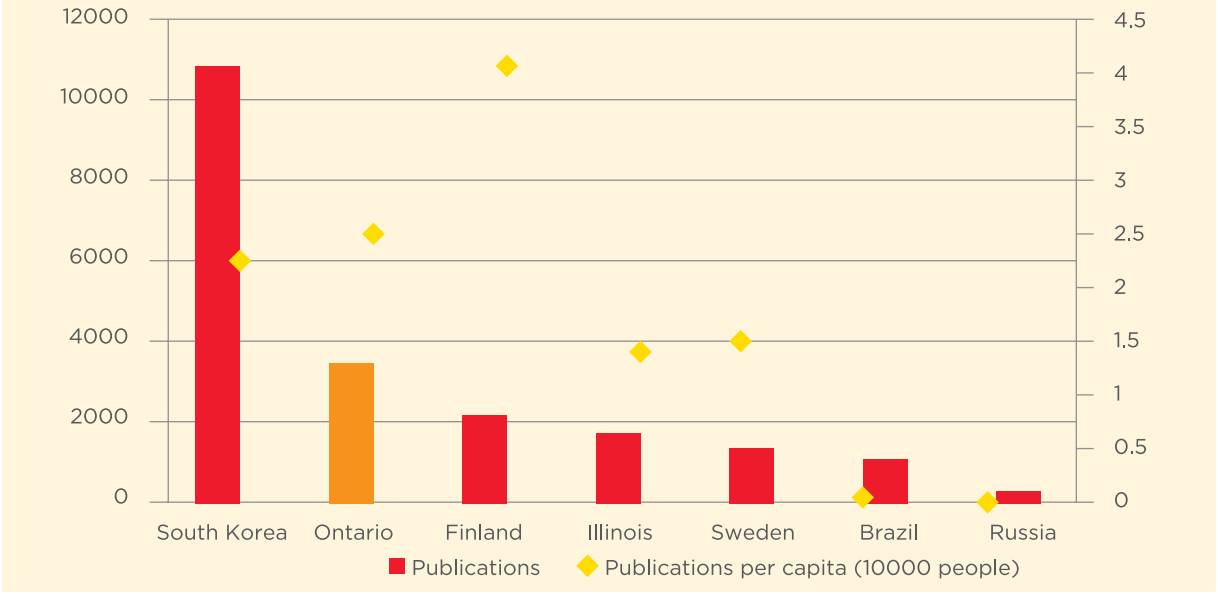



**Figure 20:** Number of publications for selected jurisdictions. Source: ISI Web of Knowledge



Ontario is also a leader for academic research and stands up well against other jurisdictions as seen in the publication results in Figure 20.

Public universities and government funding play important roles in the development of mobile technology; only three of the 14 universities identified in the jurisdictions reviewed are private institutions.

In per-capita terms, Ontario ranks third in patents and second in publications among the studied jurisdictions. This represents great potential for further adoption of mobile technologies in the province, and for the development of innovative services and solutions.

### 8.8.8 Mobile Content Development

Like Canada, Brazil has had a high degree of ISP concentration, which was perceived by developers as slowing innovation and interest in mobile-content development. This has begun to shift with the growth of the application market. Similar to how Finnish mobile developers strongly supported the now defunct Symbian platform, Ontario has had a strong BlackBerry development community that has had to rapidly adapt to changes in the marketplace. While many companies compete locally, creating solutions tailored to their specific cultures, others try to reach a wider audience through popular platforms like Android or iOS. Taking advantage of the strong mobile development capacity by fostering partnerships between development companies, network carriers— such as Google, which has located its mobile research centre in Waterloo—and device manufacturers can help drive the mobile industry in Ontario forward.

### 8.8.9 Other Interesting Points

Like other native players in each jurisdiction, RIM has represented the largest share of smartphones in Canada and plays an important role in Ontario's high-tech economy. As mentioned, recent circumstances have seen RIM lose significant share value. Ontario would benefit from paying close attention to these developments and might consider providing support to the company if necessary—as Illinois and Finland have done with Motorola and Nokia (which now works with Microsoft on the Windows platform), respectively. The province should also continue to promote research and SME development, so that its high-tech economy relies less on the fate of a single large player.

## 8.9 Action Plan for a Robust Mobile Industry

There are roles for industry and government to support growth of the mobile industry in Ontario. Some approaches are outlined in the following discussion.

### 8.9.1 Private Sector

Through effective collaboration industry can play a significant role in building capacity in Ontario:

- Utilize government business centres as gateways to link industry sectors with mobile-application developers.
- Industry can subsidize training programs that build awareness of how to use mobile technologies to help to stimulate uptake of mobile in sectors that have been cautious. An alliance with Ontario government business centres could help to communicate this initiative.
- To build Research capacity in the mobile sector, Ontario requires industry investment in enterprises' research and in partnered or contract research with universities and colleges. The mobile industries would benefit from a consortium approach to research using a model like that of TR Labs in Alberta.
- Membership in relevant trade associations is invaluable for networking and information exchange.
- Mobile business represents a vast global opportunity. Export-support programs created by associations in partnership with government can help companies enter new or emerging markets and should be developed to increase awareness of market opportunities, connect Ontario entrepreneurs with international partners (distributors, developers, designers) and increase facilitated match-making between local and international businesses. Mobile industries should create coordinated international marketing campaigns. Travel to conferences in major markets can be very important in cultivating global contacts.
- The Apprenticeship Training Tax Credit (ATTC) is a refundable tax credit available to businesses on the salaries and wages paid to eligible apprentices in designated construction, industrial, motive-power and service trades. Industry should work with the government to expand the list of "qualifying trades" under the ATTC to include classes for mobile service and production trades employed by businesses involved in the creation, marketing and distribution of mobile products, which would stimulate hiring, innovation and growth in the sector.

### 8.9.2 Government

*Mobile is about knowing and reacting to what is going on around you at any moment.*

*Director, Industry and Market Trends, Media Sector*

The Government of Ontario can build on its track record of supporting industry development in the following ways:

- The development of government procurement programs that rely on Ontario firms to supply innovative technologies would result in significant social gains: these programs would not only increase public-sector productivity, but also drive innovation by nurturing developing firms. This will allow those firms to showcase their technologies, realize a larger market and ultimately achieve scale economies.
- Ontario should lobby for a modernization and broadening of Business Development Bank of

Canada definitions of qualified industry sectors to include mobile product and service firms, in order to further contribute to the mobile sector's capitalization. Ontario should ensure that media industries qualify for government-backed private capital.

★ As part of its adoption of a mobile action plan, Ontario can support the development of a mobile-learning content industry by issuing funded requests for proposals for mobile training and just-in-time information within selected government departments, and using Ontario firms to fill those needs.

★ As the Ministry of Economic Development and Innovation continues to refine its research focus on Ontario's growth areas, it can invest in research through programs such as the Ontario Research Fund (ORF) in order to guarantee future commercial possibilities and retain the presence of large companies with investment in mobile capacity and products.

★ Ontario can continue to accelerate the capacity of small and medium mobile companies through industry support of incubation programs in partnership with existing mechanisms such as the Ontario Centres of Excellence.

★ A coordinated mobile policy across the province will enable resources to be allocated efficiently and effectively; this has not always been successful in the deployment of fixed-line broadband, specifically in rural or remote regions.

# What Ontario Residents and Experts in the Field Told Us

This section of *Taking Ontario Mobile* provides the reader with a snapshot of current attitudes toward mobility on the part of Ontario residents and implementation plans on the part of industry and non-profit sectors. It provides the ability to draw some tentative conclusions regarding the distance we will need to travel to meet the proposals in this document.

## 9.1 Survey and Interview Data

As a fundamental cornerstone of *Taking Ontario Mobile*, we undertook the following research to assist us in developing an understanding of what Ontario residents want from mobility:

- An online survey of Ontario residents, conducted in order to gauge interest in and ability to access mobile technologies and services.
- An online survey of industrial and non-profit sectors, conducted in order to understand how mobile technology is being used by the labour force in a variety of industries.
- A survey of Ontario industries in order to understand their current and planned use of mobile technologies.
- Surveys of the mobile industry undertaken by the Mobile Experience Innovation Centre (MEIC) as part of its report *Research into the Ontario/GTA Mobile Content, Services and Applications Industry* (2012), a report for the Ontario Media Development Corporation (OMDC) undertaken in order to determine the needs of Ontario's mobile industries. This report is available with *Taking Ontario Mobile*.
- Interviews with leaders in the mobile sector, with potential users of mobility and with key policymakers.
- Interviews undertaken by Copernicus Research in order to determine the mobile needs and strategies of Aboriginal and rural Ontarians.

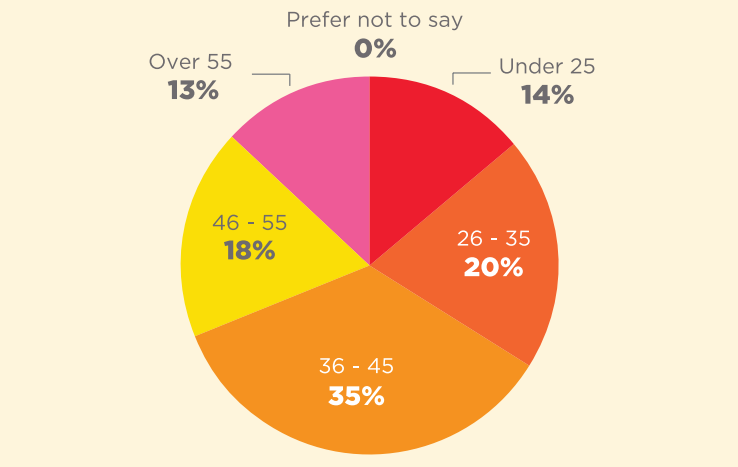
### 9.1.1 Descriptions of Respondents

Because the resident survey [419] was conducted and advertised via the Internet and social media, survey respondents are Ontarians who utilize technology already and have access to the Internet. While this demographic may at first appear to be somewhat narrow, it illustrates how the broader population may soon use technology that is in the process of rapid adoption. These mobile-technology users (99 per cent report using mobile technology and 94 per cent own a cell phone) are likely to lead the uptake and use of mobile services; hence, they serve as a valuable gauge for determining mobile trends

[419] 82 respondents completed the survey. Generally, the resident survey has a confidence level of 90 per cent with an interval of nine per cent; in some cases, a large percentage of the respondents favoured a response, and in these cases the interval may be smaller.

in the province. Survey respondents were distributed across Southern and Central Ontario, and this distribution closely maps onto the population distribution of the regions. [420] 56 per cent of respondents were female, 42 per cent of respondents were male and 2 per cent did not specify their gender.

**Figure 21:** Resident-survey respondents' ages.




The industry survey was focused on businesses outside of the mobile sector. It was advertised through technology-industry media and trade-and professional-association mailings. We approached 250 Ontario industry associations, and 25 agreed to distribute the survey to their members. We also distributed the survey through multiple professional associations in key sectors; as a result, the survey responses [421] are well distributed across commerce, education, healthcare and other sectors.

We derived our understandings of barriers to access and mobile-technology use and the needs of technology non-users through the literature review, panel discussions and expert interviews.

## 9.2 Analysis of Surveys and Interviews

### 9.2.1 Definition of Mobility

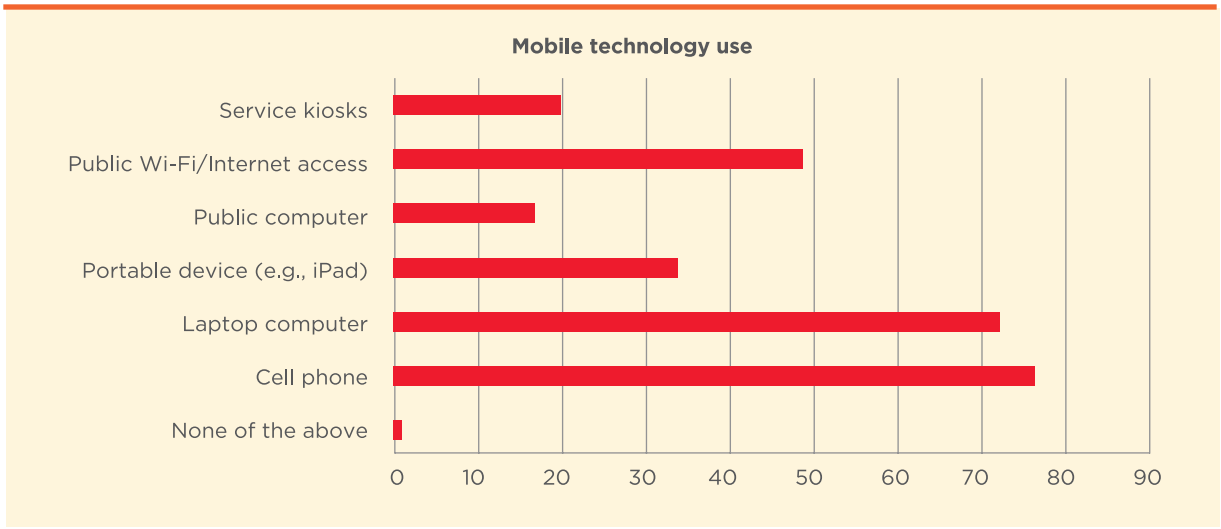
Our definition of mobility proposes a network in which individuals have connectivity throughout their activities that is mediated, enhanced or driven by technology. This definition focuses on enabling the mobility of the individual. As the ubiquity and affordances of kiosks, Wi-Fi and the mobile Internet expand, mobile technologies are increasingly integrated into multiple daily activities.

Given this definition, Ontario residents use a range of technological platforms:

[420] Based on 2009 Ontario region population figures from the Ontario Ministry of Finance. Ontario, "Ontario population projections update: 2010-2036 ontario and its 49 census divisions," (Toronto: Ministry of Finance. Queen's Printer, 2010).

[421] 103 individuals responded to the survey. The industry survey has a confidence level of 95 per cent with an interval of eight per cent general questions. Sector-specific results reflect trends within the respondent group only.

**Figure 22:** Mobile technology use as a percent of respondents (multiple responses permitted).




Our survey respondents reflected the growing interest and use of mobile technology that was identified in our expert interviews. In our sample:

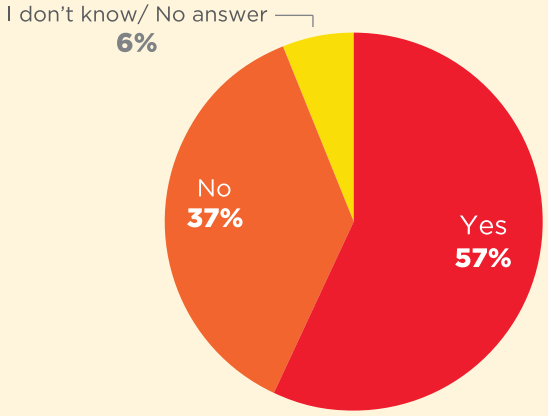
- 99 per cent of respondents reported using some form of mobile technology.
- 77 per cent owned a cell phone.

> *The users are getting more intimate with their mobile devices. That is the kind of experience we want to live: constant connectivity, geolocation, hyperlocality, ability to do whatever we need to do.*
>
> *Director, Industry and Market Trends, Media Sector*

The integration of mobility into everyday life is fuelling demand for increased mobile services. Also driving this demand is individuals' intimate, personalized relationships with their mobile devices. Like many jurisdictions, Ontario sees an increasing trend toward smartphones and tablet computers, due to the wide range of applications these devices can support.

Figure 23 shows the percentage of respondents with a smartphone.

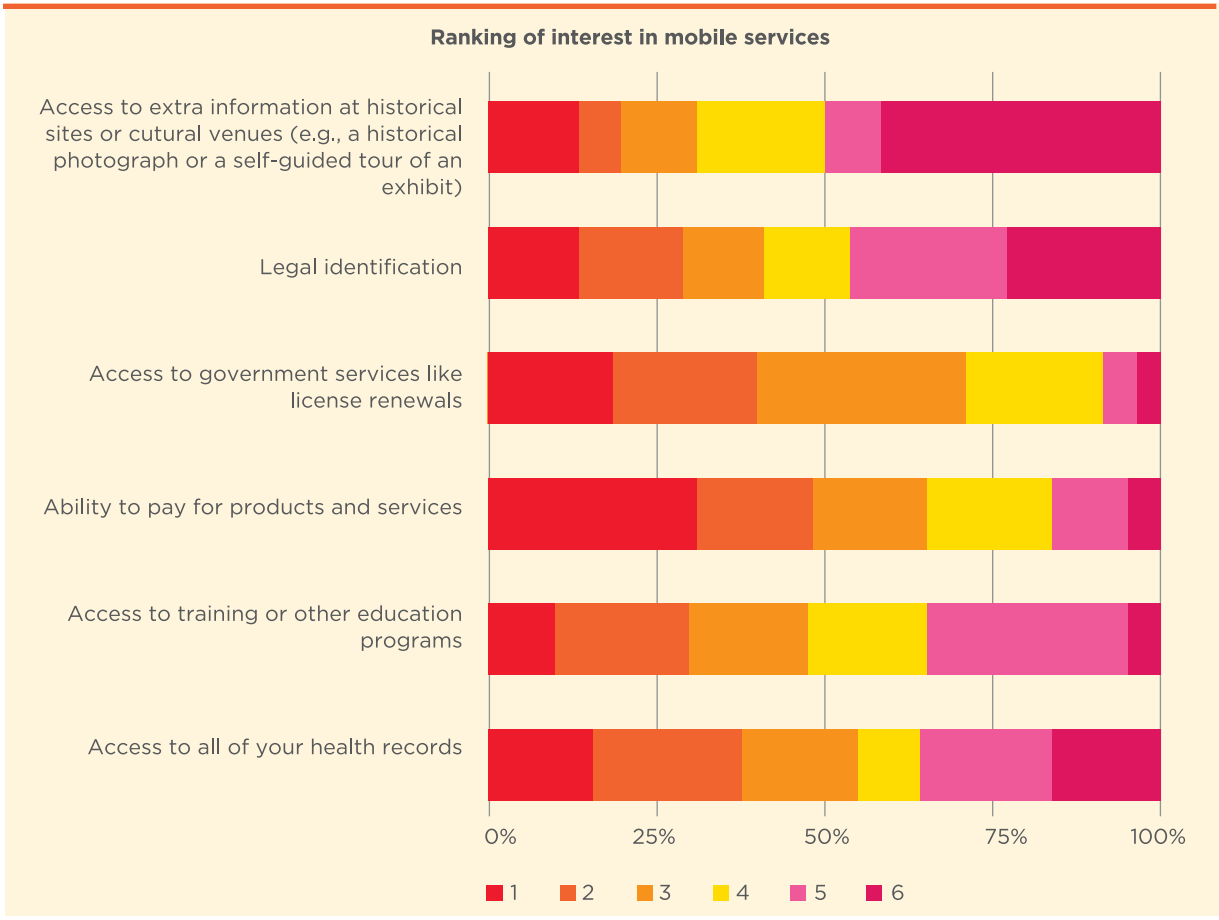
**Figure 23:** Smartphone use.



In this mobile cultural shift, "design leads desire," resulting in devices that are functional, ergonomic and aesthetically pleasing. Our interview data strongly reinforces the conclusion that experience design, industrial design and attention to ergonomics are critical factors for the success of products. Embedding effective, aesthetically sophisticated design into mobile experiences will foster increased mobile engagement. Sales trends indicate the companies that pay attention to design will prosper, as well as those offering low-cost entry points coupled with effective navigation. Brands with design or interface challenges, such as Nokia and RIM, have faced stiff competition even within previously loyal markets, as even corporate Canada moves over to bring- your-own-device (BOD), and as individuals increasingly integrate their work and leisure lives and devices.

As illustrated in Figure 23. , respondents asked to rank their interest in types of mobile services placed prime importance on access to government services and the ability to pay for products and services using a mobile solution.

**Figure 24:** Ranking of interest in mobile services.

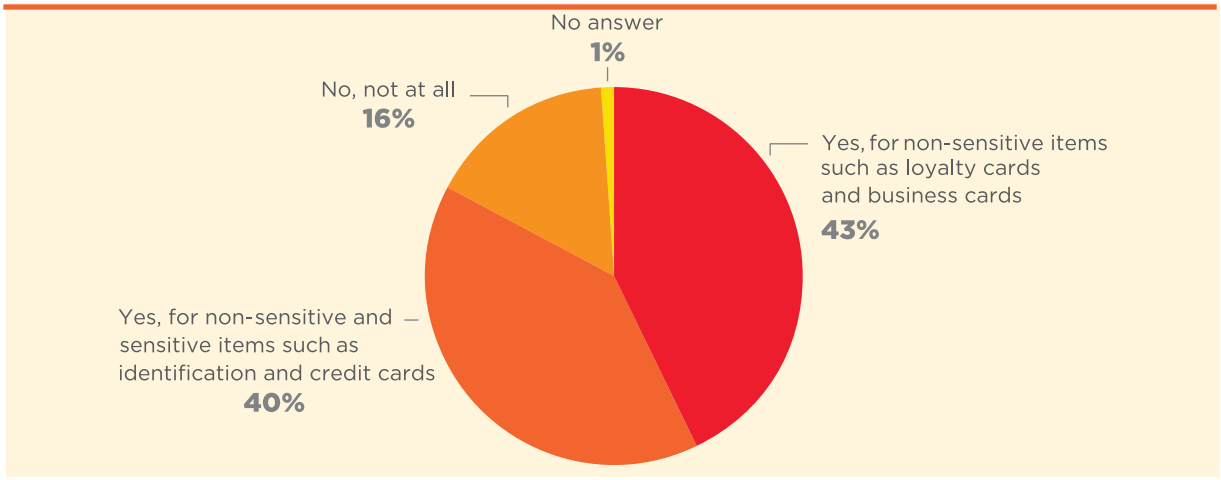


The responses suggest that government would benefit from prioritizing the consolidation of its services into a mobile platform. It also suggests that Ontario consumers may gravitate to other jurisdictions if they cannot access excellent mobile commerce opportunities at home that provide them with lifelong learning, health information and entertainment opportunities.

Respondents also showed a great deal of interest in some form of a mobile wallet. We asked: "The mWallet refers to the ability to use a mobile device to accomplish the same tasks that you would do with common wallet items such as money, credit cards, bank cards, loyalty cards, business cards, identification cards. Would you be interested in using mWallet services?" Of our respondents:

- 83 per cent were interested in using mobile devices to carry non-sensitive information like loyalty cards.
- 40 per cent wanted to have sensitive information such as identification and credit cards on a mobile device.

**Figure 25:** Percentage interested in using a mobile wallet




In Ontario, mobile identification and payment are relatively rare, so the interest in these services is indicative of the fast-growing demand for the services and conveniences afforded by mobile technologies, and of respondents' awareness of the availability of these services in other jurisdictions. Even inexperienced users may be drawn into the mobile-technology revolution by

*Most users only expect from mobile technology what they can see and visualize from their own experience: "It's a telephone." Gradually, as they learn more, if they want to learn, they will advance to more advanced.*

*Indigenous Rights Activist and Telecommunications Expert*

quite straightforward applications and with this initial draw, increasingly sophisticated opportunities to learn and engage with the technology arise. These observations return us to the centrality of access to networks, and the importance for new users of making a link to familiar technology such as telephones or televisions. These rather simple starting points can help to grow mobile adoption, even among population segments that may initially appear to have little interest.

We asked respondents whether they agree with statements relating to mobile access and services. This group viewed current coverage for cellular and broadband services as reasonable, although our interviews with experts indicate that Northern and remote regions of Ontario face insufficient household access to broadband and uneven mobile service. In thinking about the future, it is worth noting that respondents indicated that mobile technology has a great importance, and showed a strong interest in accessing more services through mobile technologies (78 per cent) and learning about how mobile technologies can augment or replace common tasks (74 per cent).

**Table 5:** Agreement with statements related to mobile technology access across all respondents.

| Statement | Agree | Disagree |
|---|---|---|
| Mobile service coverage in my region is good. | 89% | 10% |
| High-speed Internet service coverage in my region is good. | 85% | 14% |
| Access to mobile technologies and services will be very important to me in the next 5 years. | 84% | 13% |
| I would like to have more services available through a mobile device. | 78% | 15% |
| I would like to know more about how mobile technologies can augment or replace common tasks. | 74% | 20% |
| I have good access to public mobile services like Wi-Fi, public computers and government kiosks. | 51% | 40% |
| Mobile phone/Internet plans are priced reasonably. | 16% | 83% |

This research shows that Ontario residents expect access, yet there is considerable variation about how "access" might be defined and achieved, given that user expectations around mobile technology unfold along a continuum:

- At one end are basic considerations about whether cellular networks are available or reliable in the local community. The cost of service contracts or the devices themselves may be prohibitive;

for many potential users, expectations will thus revolve around obtaining technology and access to networks.

- At the other end of the continuum, user expectations are evolving into something more. One expert we interviewed described a growing trend toward mobile access conceived of like a "utility" and available "like tap water:" everywhere, all of the time and on demand. This expert suggested that for experienced users, the ideal is ubiquitous connectivity.

> *Mobility is all about continuous connectivity, instant reaction, all the time from the user. . . . You can access any time because you are wearing, carrying [your device], all the time. Each time you have a few minutes, you connect.*
>
> *Director, Industry and Market Trends, Media Sector*

High cost as a barrier to access and perceived lack of competition between carriers were common themes in our discussions and interviews with experts. Although pleased with the range of current services, the price-point concern is reflected by our survey respondents: 83 per cent indicate that they feel overcharged for their service-delivery option.

There was no agreement among our experts about pricing and lack of competition. Concerns about the cost of mobile access are common, but one expert adopted the position that we need to weigh costs against the challenges of a dispersed population and quality of service:

> *There is a big debate about whether Canada is too expensive or not. I fall in the view that we are not too expensive. We have extremely good networks—some of the best networks in the world. We have these very, very big networks that work because they were created, facilitated by good regulation, and rendered profitable by a few small players, which is in fact the only way we could do it for transnational coverage across such a large territory.*
>
> *CSO, Social Media Measurement Company*

In turn, some experts were concerned that the cost of mobile access may be out of sync with what users in other jurisdictions are able to expect, and may limit opportunities for content or service providers. To address this issue, one expert suggested: "I would increase access to stimulate business based on content consumption. But now, it is the opposite: we pay so much for accessing the network that we are not willing to pay for the content" [422].

Collectively, these "big picture" policy concerns—the creation of ubiquitous and seamless national networks, the provision of quality services, Canadian Radio-television and Telecom-

[422] Director, Industry and Market Trends, Media Sector

munications Commission (CRTC) policy decisions and domestic and international competition—are shared by many of the experts we interviewed, and are reflected in our recommendations.

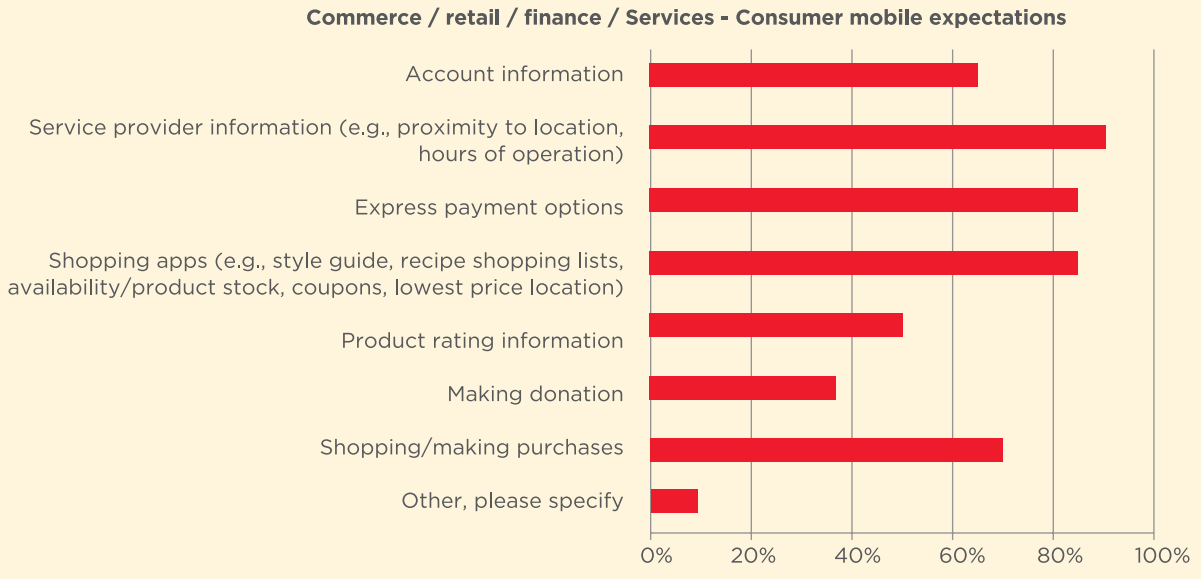
## 9.3 How Industry and Sector Respondents See Residents' Needs

Through our interviews and surveys, we solicited opinions about Ontario residents' perceived mobile-service needs.

We asked industries that were not in the mobile sector about their perceptions of their consumers' expectations for mobile commerce (m-commerce). This exercise allows a comparison between what industries believe their customers expect and what customers in fact expect. The following graph provides an overview of perceived consumer expectations for two potential m-commerce services as determined by our industry survey:

- Enhanced flexibility when shopping
- The ability to make a purchase on location, after a mobile search, on impulse
- Financial management

**Figure 26:** Industries' analysis of their consumers' expectations of mobile commerce

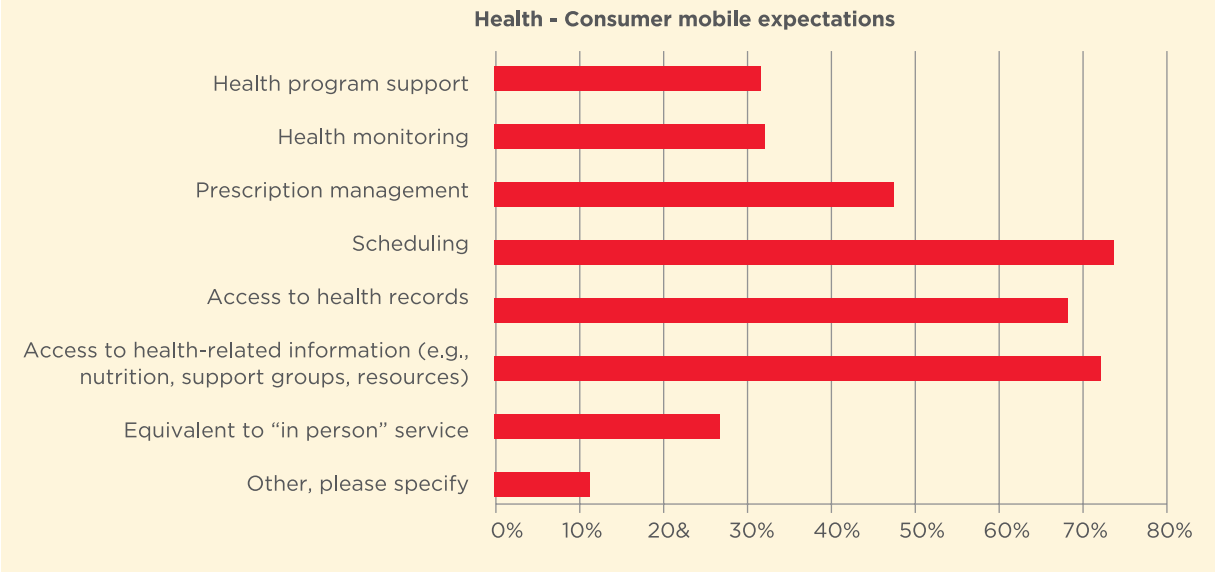



Consumers' interest in mobile-payment opportunities aligns with industry perceptions.

We also asked healthcare workers about consumer/client expectations. Figure 26 indicates the priorities these respondents believe will drive user demand for mobile health in Ontario:

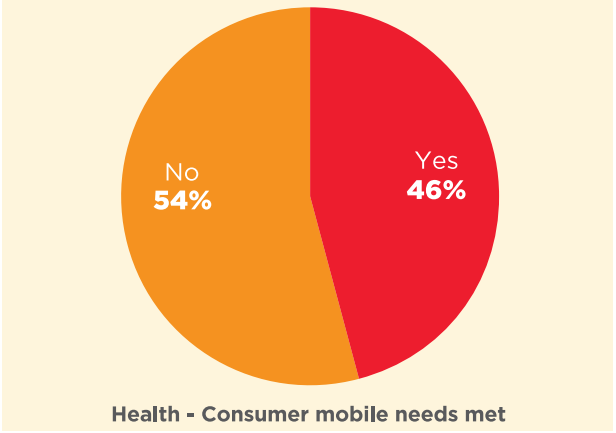
- Scheduling
- Access to health records
- Health information
- Prescription management

**Figure 27:** Health-sector workers' analysis of their clients' expectations of mobile health




Data in our mobile health (m-health) chapter suggests that Ontario residents are using mobile applications for access to information, preventative help and social media support. When asked if these m-health consumer expectations had been met, a majority of industry/sector respondents stated that these expectations had not yet been met. There is clearly a need for the sector to coordinate its efforts in providing mobile services; the need for clear policy that will erode barriers in delivery of services and significant opportunity for Canadian m-health businesses.

**Figure 28:** Ability to meet consumer m-health needs.

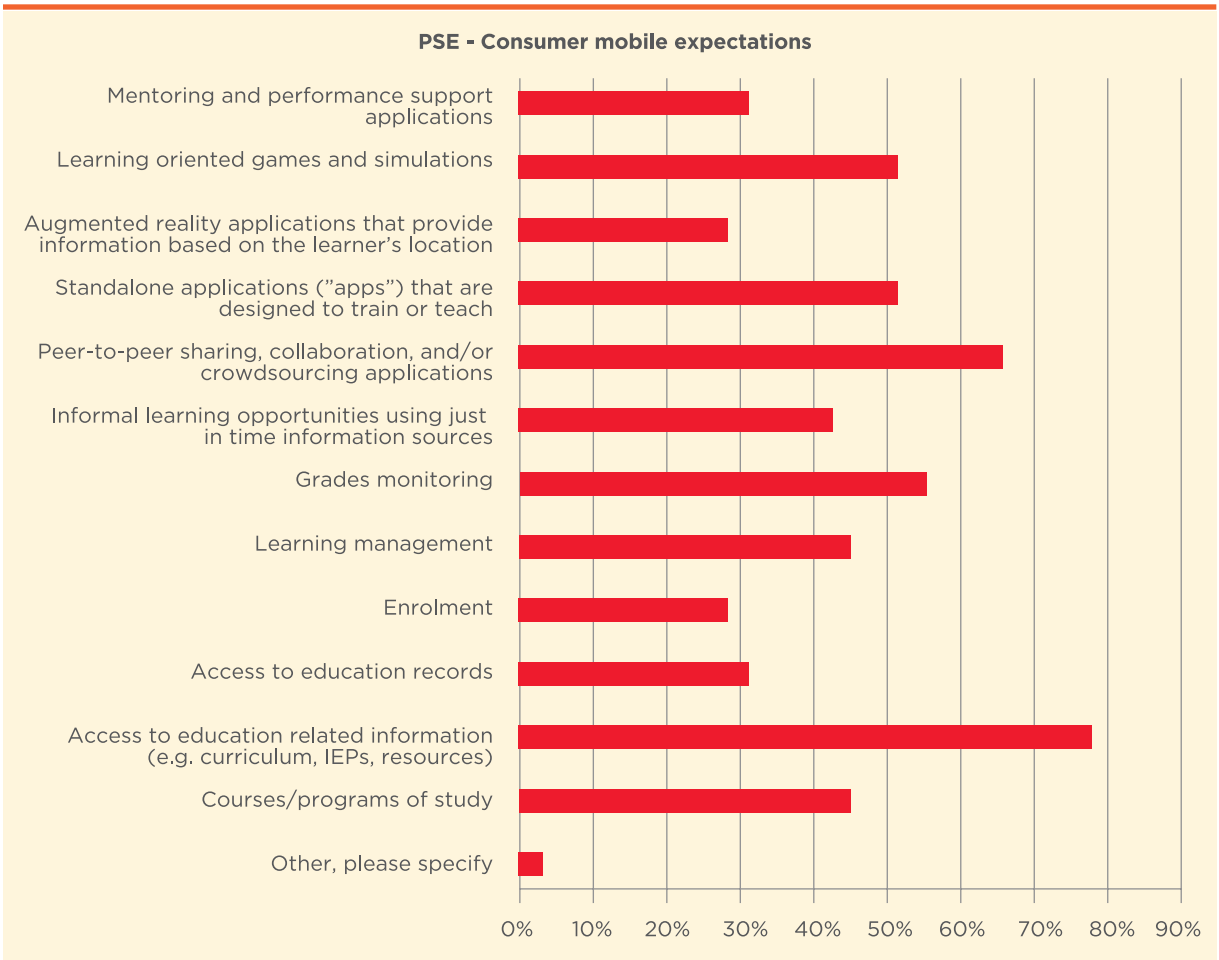


We made a special effort to reach out to teachers, faculty and administrators in K–12 and post-secondary education (PSE) to understand their views on the adoption of mobile technologies. Survey participants in the PSE sector prioritized:

- Access to education-related information
- Grades monitoring
- Peer-to-peer collaboration
- Standalone applications
- Learning-oriented games for their mobile user

The following chart indicates survey participants' perception of users' expectations within PSE.

**Figure 29:** PSE-sector workers' analysis of learners' expectations of mobile PSE



The challenge of understanding needs and making decisions for service provision was echoed by other respondents, as was the challenge of scaling up highly successful experiments with mobile learning (m-learning). One educator noted, "[Student expectations are] beginning to be met. I think this is a very new field and education institutions and software providers are still figuring out what the appropriate services are and the appropriate delivery mechanisms (apps vs. mobile web)." Another said, "I think we are just on the tip of the iceberg in understanding what needs to be met and how to do it. It's evolving." The m-learning chapter of this document provides a sense of the monumental tide of mobility adoption among children, youth and adults. There are gaps between the pace of educational change (in K–12 and PSE) and the lifestyles of students.

We surveyed other sectors including government employees to learn about their priorities for mobile-service provision. The following diagram indicates present uses of mobile technologies in government and service sectors other than health, commerce and education.

**Figure 30:** Government/Other current mobile application functions

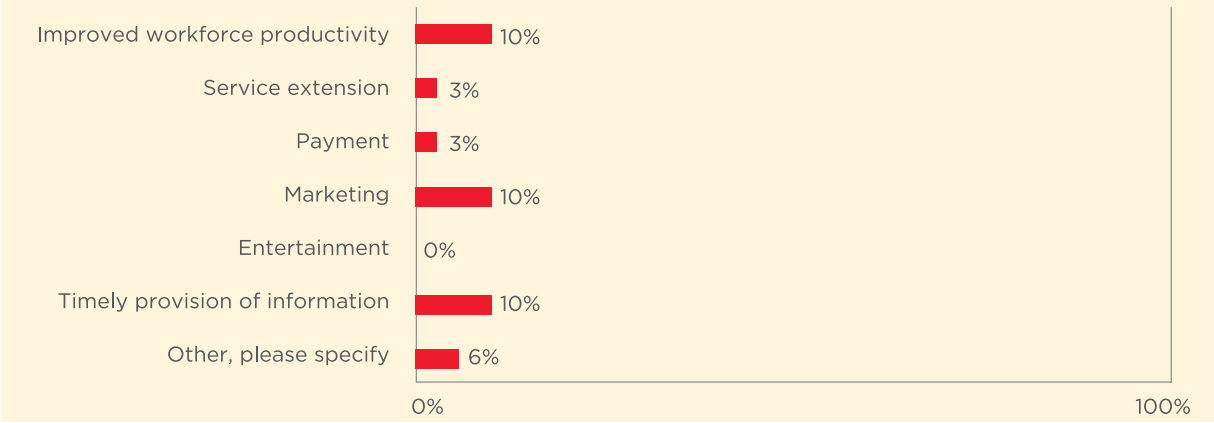
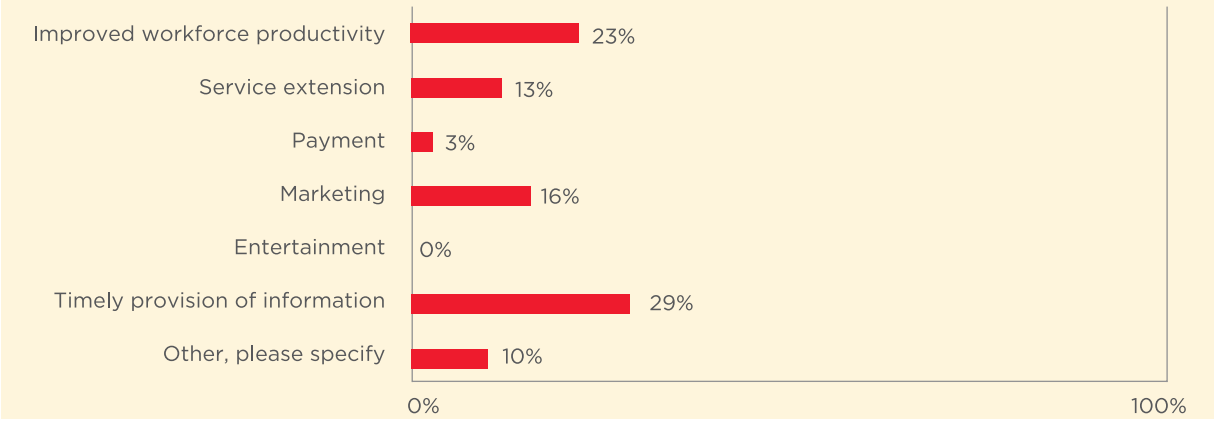


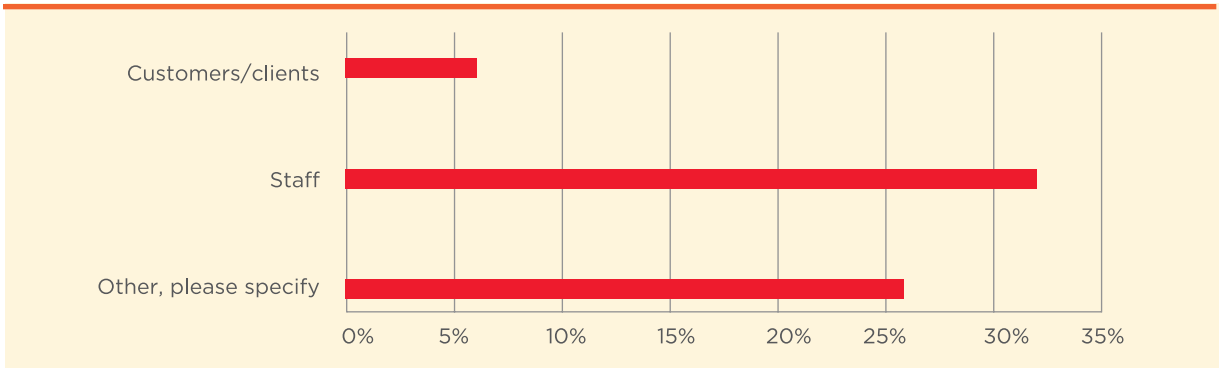

**Figure 31:** Government/Other future mobile application functions



Projections of future mobile uses by those in government and other service sectors continue to indicate the importance of productivity in the delivery of government and other services, as well as the importance of marketing and the timely conveying of information.

When asked who the priority users would be for these mobile services, respondents suggested these would be residents and then employees, as Figure 32 illustrates:

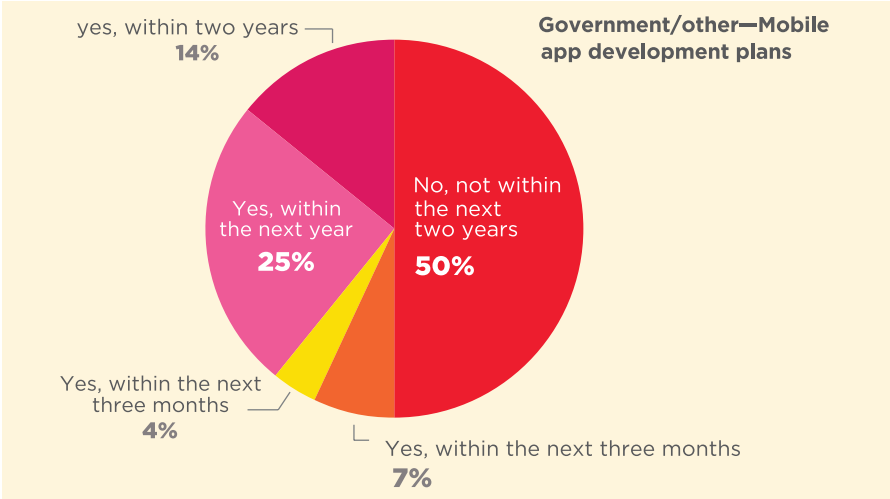
**Figure 32:** Government/Other future mobile application users




Just over one third of respondents in this vertical expressed the view that most mobile services would come online within one year, and 50 per cent anticipate having mobile solutions developed within two years. Figure 32 shows the timelines with greater granularity. Given the pace of adoption, this suggests that development may not keep pace with users' expectations.

There was not agreement across the sectors about how well residents' expectations for mobile services were being met, nor was there agreement about what these expectations are. This is not surprising, as Ontario is a relatively young market and technology capacity is changing rapidly, with the advent of powerful mobile computing devices

**Figure 33:** Timeframe for developing planned future mobile applications



such as tablets and smartphones. As well, many studies are national, not regional (with the exception of Quorus).

When we asked our experts about user expectations, they spoke about innovation and access. Simply put, they felt that users want "innovation that works for them." As well, they saw cost-savings potential for consumers/clients, who can eliminate redundant expenses such as landline telephones.

One respondent who is the president and founder of a software company in the health sector articulated this need well: "App developers need more funding as well as access to the healthcare [sector] to find out what is needed. There is no one area of coordination; each hospital does their own thing." A manager from the City of Toronto also calls for the need for partnerships and states that they "will be crucial to innovate and employ emerging mobile technologies with local government operations." Thus, where existing companies or cultural and service organizations do not have the right mix of digital experience and/or mobile expertise, partnerships and the sharing of information will be critical.

Two strategies emerge from our discussion with experts:

- ★ The need for a coordinated implementation plan for mobility and the corresponding policy pieces across the health sector in Ontario.
- ★ Brokering connections between investors, sectors and developers to facilitate development of mobile applications that meet the needs of users. Hence there is a need to establish systems (such as those of MEIC) to facilitate sharing information and creating partnerships between local government and others with needs for mobile applications and the mobile industry.

Our experts suggested that—much like the process of learning a new language—we must collectively learn to think "in mobile."

## 9.4 Industry Survey

In order to understand capabilities and needs of Ontario's non-mobile industries, we surveyed a wide range of business sectors that are primarily outside the mobile industries. The survey also suggests opportunities for the mobile sector to create new alliances and business opportunities. One third of these are small companies, and the rest are medium to large companies. Respondents to our industry survey represented a variety of industries, sectors and company sizes. The following tables and figures illustrate the proportions of each.

We asked companies into which sector their business falls, and grouped multiple business types within the sectors shown below. [423]

The companies surveyed defined Canada and Ontario as their primary markets, with the following breakdown of geographic focus within the province (reflecting the companies' locations):

**Figure 34:** Size of companies surveyed

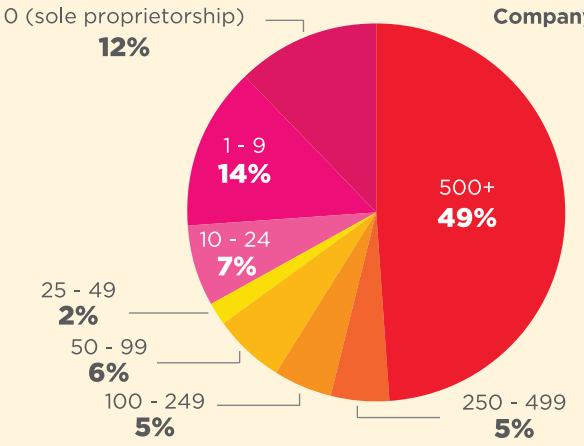
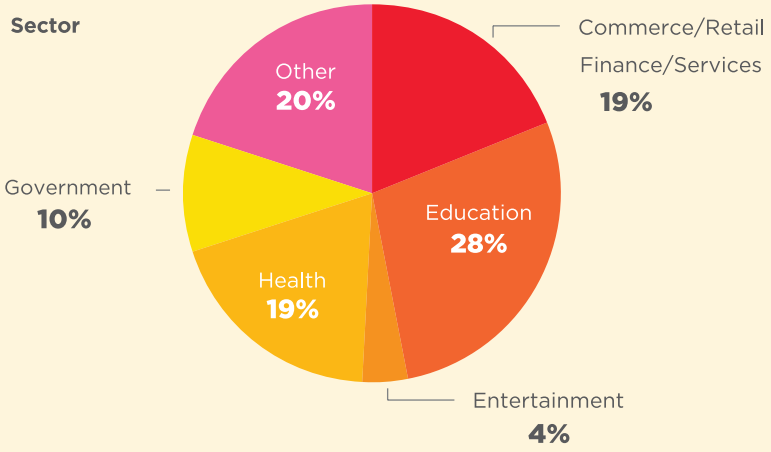
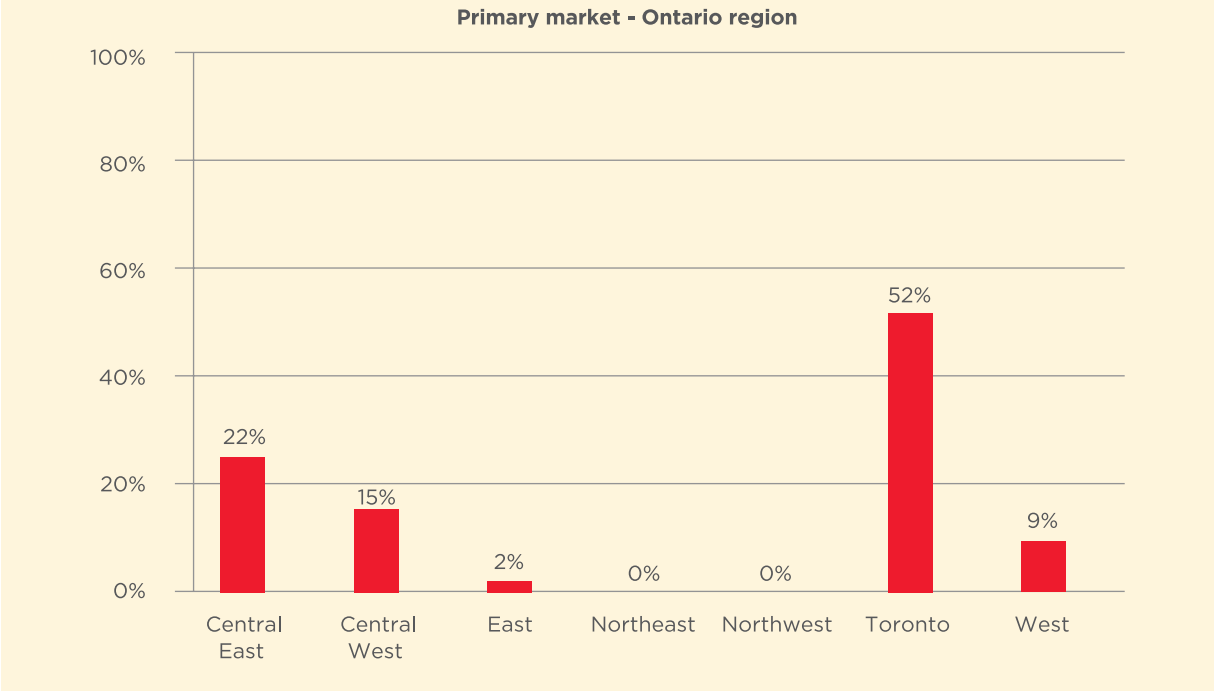



**Figure 35:** Distribution of industry survey respondents across sectors




[423] The survery utilized North American Industry Classification System (NAICS) sectors: Agriculture, forestry, fishing and hunting; Mining; Utilities, construction and manufacturing; Wholesale and retail trade, transportation and warehousing; Finance and insurance; Real estate; Professional, scientific and technical Services; Management of enterprises and administrative support; Waste management and remediation; Educational content, products and services; Healthcare and social assistance; Arts, entertainment and recreation; Accommodation, food services, tourism and hospitality; ICT; Freight and international trade and logistics; Transportation, including air; Warehouse/distribution; Sports; Distribution and printing industry; Automotive; Brewing; Sustainability; Engineering; Communications; Media, Publishing and telecommunications; Home Owners.

**Figure 36:** Primary markets




Most companies surveyed were not technology companies, and the development of their enterprises' mobile components was at quite distinct stages:

- Of the companies surveyed, 67 per cent were not a mobile company but used mobile services.
- Eighteen per cent did not use mobile services.
- Eight per cent built products or services for mobile devices.
- Seven per cent supplied services or technology to companies who built mobile devices or systems.

**Figure 37:** Extent of mobile development

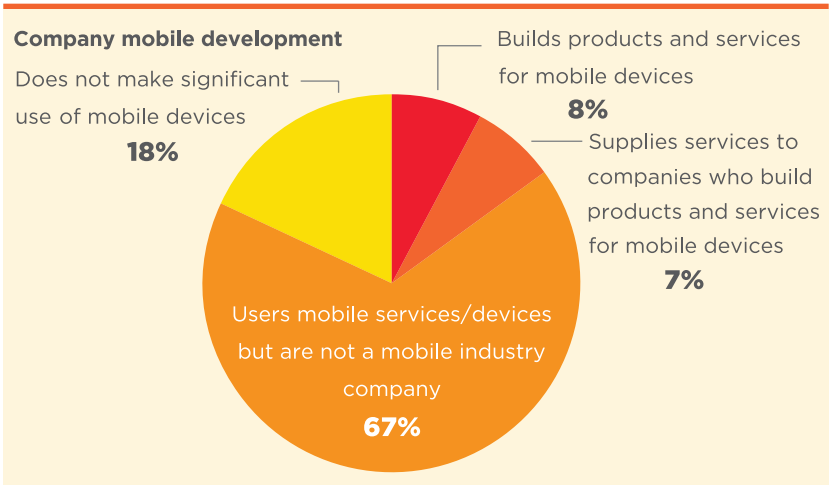


Figure 37 indicates the distribution of respondents' relationship to mobility.

We asked all respondents whether they agreed with statements about mobility. Respondents most strongly agreed with statements about expansion and demand for mobile services, for both service providers and service users.

**Table 6:** Desire for expanded mobile services

| Statement | Agree | Disagree |
|---|---|---|
| I would like to see expanded use of mobility and mobile technologies in this segment. | 94% | 4% |
| Users in this segment want more services available via mobile technologies. | 87% | 7% |
| Service providers in this segment want to provide more service via mobile technologies. | 87% | 7% |
| This segment is open to service delivery via mobile technologies. | 80% | 18% |
| Mobile technologies will improve access to our products/services for individuals with disabilities. | 75% | 11% |
| Mobile technologies are a critical means for providing services to users. | 75% | 24% |

Industries currently use mobility for customer-service applications, media delivery, marketing and internal productivity as noted below:

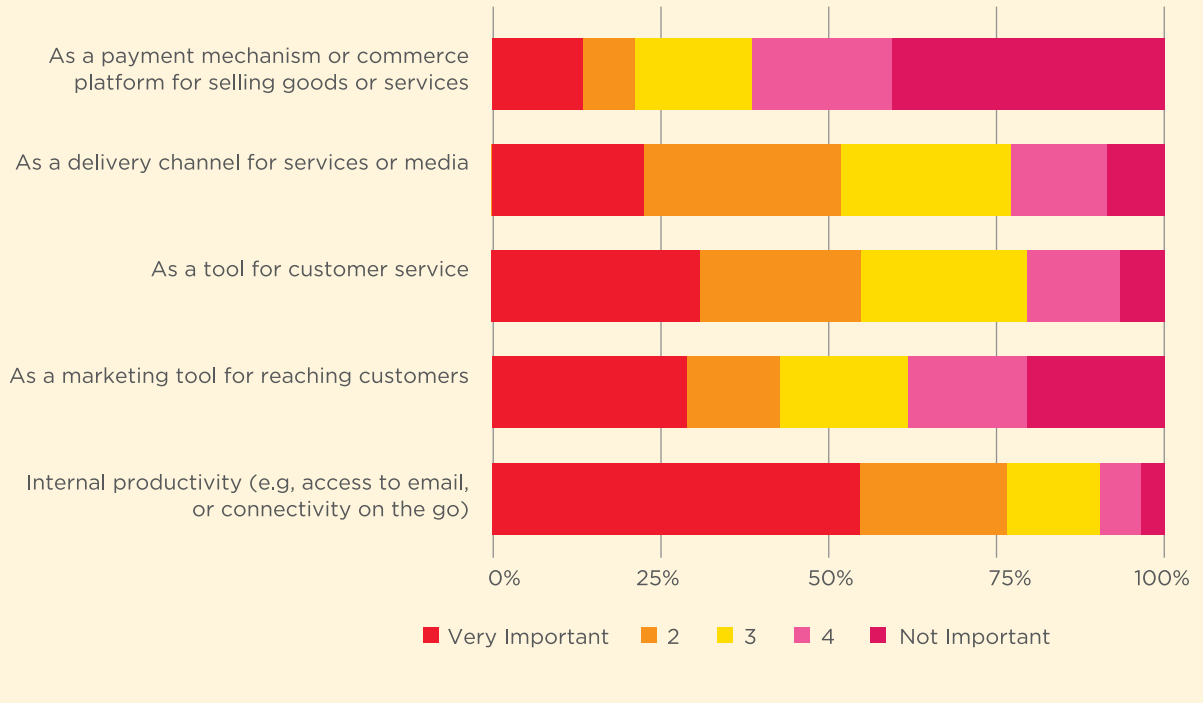
- Internal productivity is the priority of large companies, while small to medium enterprises (SMEs) are more interested in the innovation that mobility can bring to their products. Industries saw the advent of mobile technologies and believed that their trade associations were aware of the importance of the "mobile turn."
- The vast majority believed that consumers wanted more mobile services, and that providers knew they needed to provide these services to remain current.
- More detailed questions in the survey found that mobility is used for these tasks: advertising, archiving, payment, desktop replacement, on-the-go document preparation, GPS mapping and directions, technical documentation, location-based information, 24/7 customer relationship management (CRM), product development, market research, product marketing, social networking, marketing, and voice and email content.
- The most common use of mobile technology reported by our respondents was voice and email contact with employees (75 per cent), followed by social networking (41 per cent).

- Less significant uses such as "on the go document preparation" and "payment mechanism" indicates trends for the future, as mobile becomes ubiquitous.

The low rates for uses of mobile technology outside of communication suggest that there is still a great deal of room for education about mobile services as well as development and implementation of mobile services across all sectors. Structured efforts by the mobile sector to reach out to other industries whether through their associations, brand challenges or direct marketing is a necessity.

In a related set of questions, we asked respondents to consider the importance of mobile technologies in a number of broad areas for the present and for five years from now. Figure 38. and Figure 39 illustrate the responses.

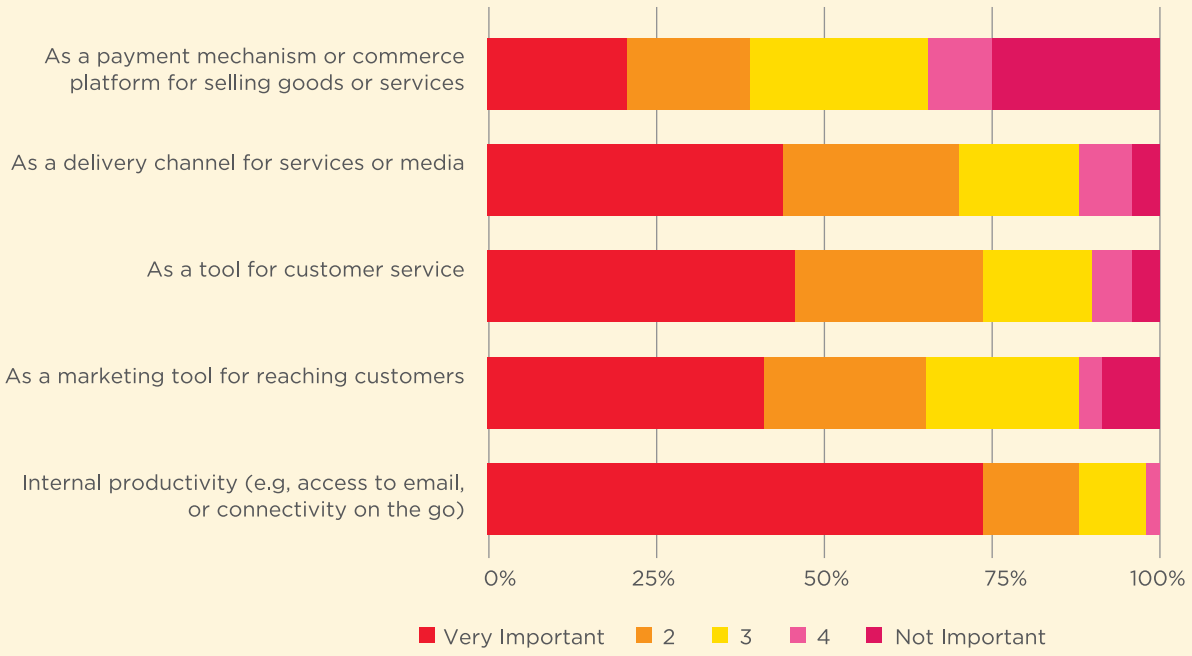
**Figure 38:** Current importance of mobile technology for business functions.




The illustrations strongly indicate that mobile technologies are increasingly seen as important across multiple business functions as indicated by the following data:

- Currently, only about 50 per cent of respondents think that mobile technologies are important as vehicles for delivery, customer service and marketing.

**Figure 39:** Anticipated importance of mobile technology for business functions in five years.




- This number jumps to about 75 per cent when respondents are asked to anticipate the importance of mobile technologies to these three areas within the next five years.

Businesses perceive mobile technologies as an important aid to productivity: 76 per cent felt that those mobile technologies were important to productivity today, and that number increases to 88 per cent when estimating the importance of mobile technologies to productivity in five years from now.

To better understand the potential of mobility to better productivity across industries and the public sector we also surveyed residents about the actual impact of mobile technologies on their productivity, testing for extra work performed and for time savings.

**Figure 40:** Time saved through use of mobility.

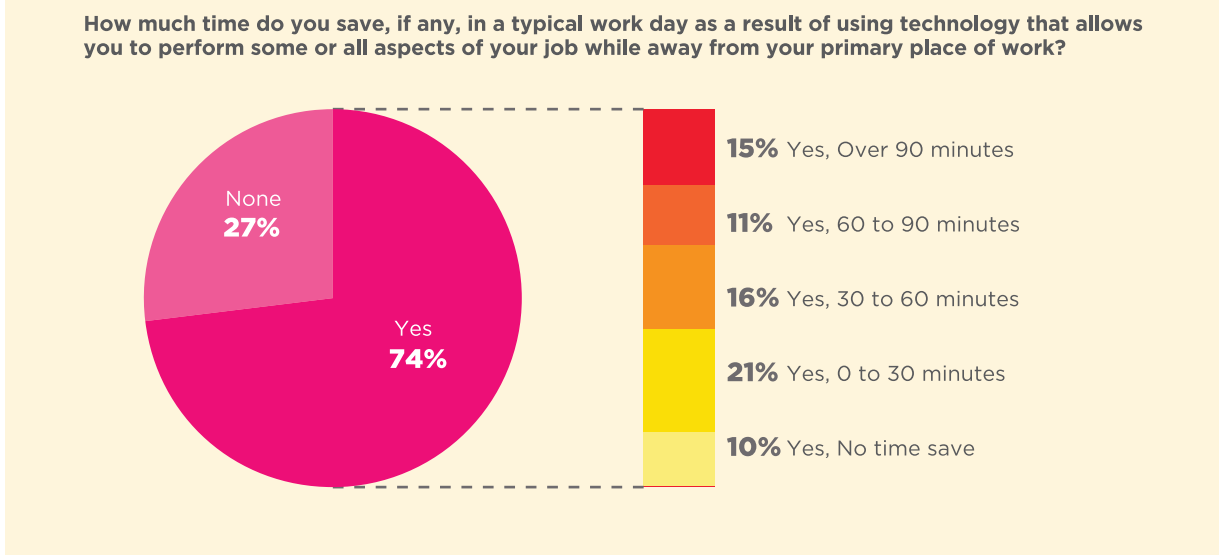
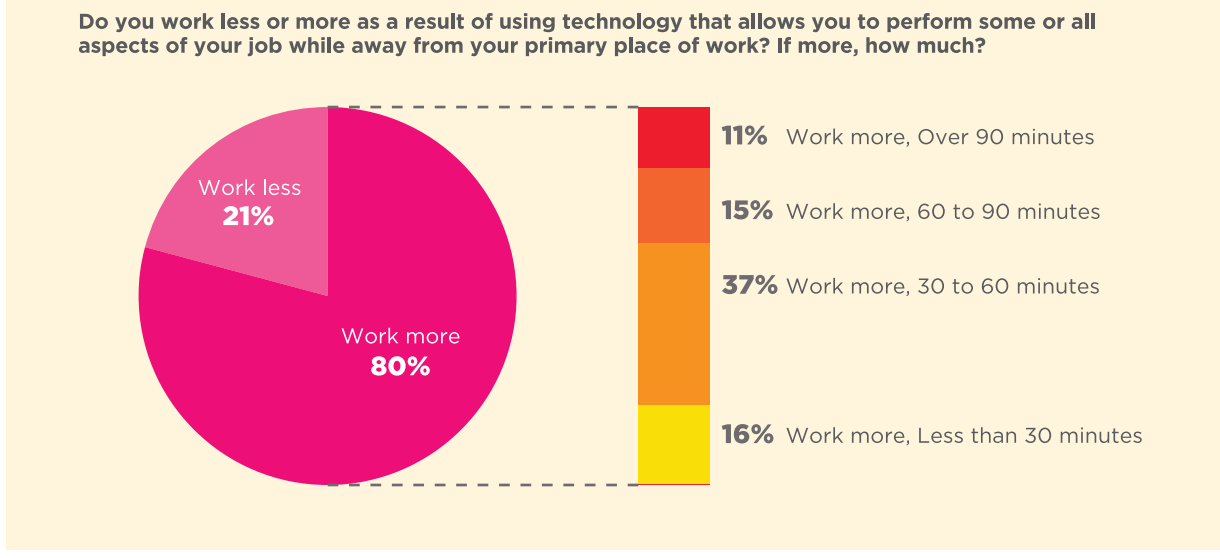



**Figure 41:** Ability to perform work away from primary place of work.



When asked about using mobile technology to work outside of the primary place of work, participants responded as follows:

- 73 per cent of respondents indicated that they use mobile technology to work from other locations.
- Of that group, 86 per cent indicated that they saved time, and 84 per cent reported saving at least 30 minutes daily.
- In addition to saving time, 79 per cent of those who used mobile technology outside of the primary workplace indicated that mobile technology enabled them to work more hours daily.
- For 63 per cent of mobile workers, this increase in work was 30 minutes or more. Some mobile workers also reported being able to work less in a typical workday as a result of mobile technologies; this result may represent greater efficiency for the worker attained due to mobile technology.

Clearly, mobile technology enables greater productivity and efficiencies, as workers no longer have to travel to their primary workplace to carry out tasks. This discovery should figure into government and industry efforts to increase productivity.

There appears to be a relationship between mobility and changing workplace norms; in some sectors, ubiquitous connectivity is related to continuous availability:

> Another piece is people's expectations about work. . . . It's only ten years ago that if you worked late, you worked late at the office. There wasn't a huge expectation that you work a lot of overtime or weekends. Now, ten years later, I mean at my organization, my board and my staff expect me to be available pretty much all the time: to midnight every night, and on the weekend. And I don't expect that of my staff, but most of my staff are available that way. It has become a cultural expectation. [424]

Thinking about user expectations thus requires that we take into account not only what individual users expect of technology or networks, but also what users increasingly expect of one another in rapidly changing cultural and institutional conditions.

We asked industry respondents to identify the best ways to keep abreast of mobile technology developments and best practices. The highest ranked option was internal research and development:

[424] [CEO, Public Sector Organization]

**Table 7:** Rank order of best methods to learn about mobile technologies and best practices.

| Mobile Technology Learning Methods | Rank |
|---|---|
| Through internal research and development | 1 |
| Through outside consultants or analyst reports | 2 |
| From vendors | 3 |
| Through trade publications | 4 |
| At local conferences or trade events | 5 |
| By travelling to conferences or trade events held internationally | 6 |

Many respondents also added that they rely on word of mouth and personal networks to learn about mobile technologies and capabilities.

Interviews and survey results point that in order to facilitate adoption, it is important to reach out to industries that are not yet using mobility to the fullest extent possible. As one respondent stated:

> We're still at the stage where we have to bring the horse to the water. . . . Developing for mobile requires a lot of agility and a lot of skills that companies in Canada don't have yet. . . . So they have to find partners and be sure that these partners do understand mobile, interface development, coding.[425]

The research undertaken indicates that there is a growing interest in greater mobile interactions by both industry and consumers, but that the forms that these interactions may take are not yet fully understood or realized. As noted earlier, there is a need to create mechanisms that foster partnerships between those with industry knowledge and those with technical know-how.

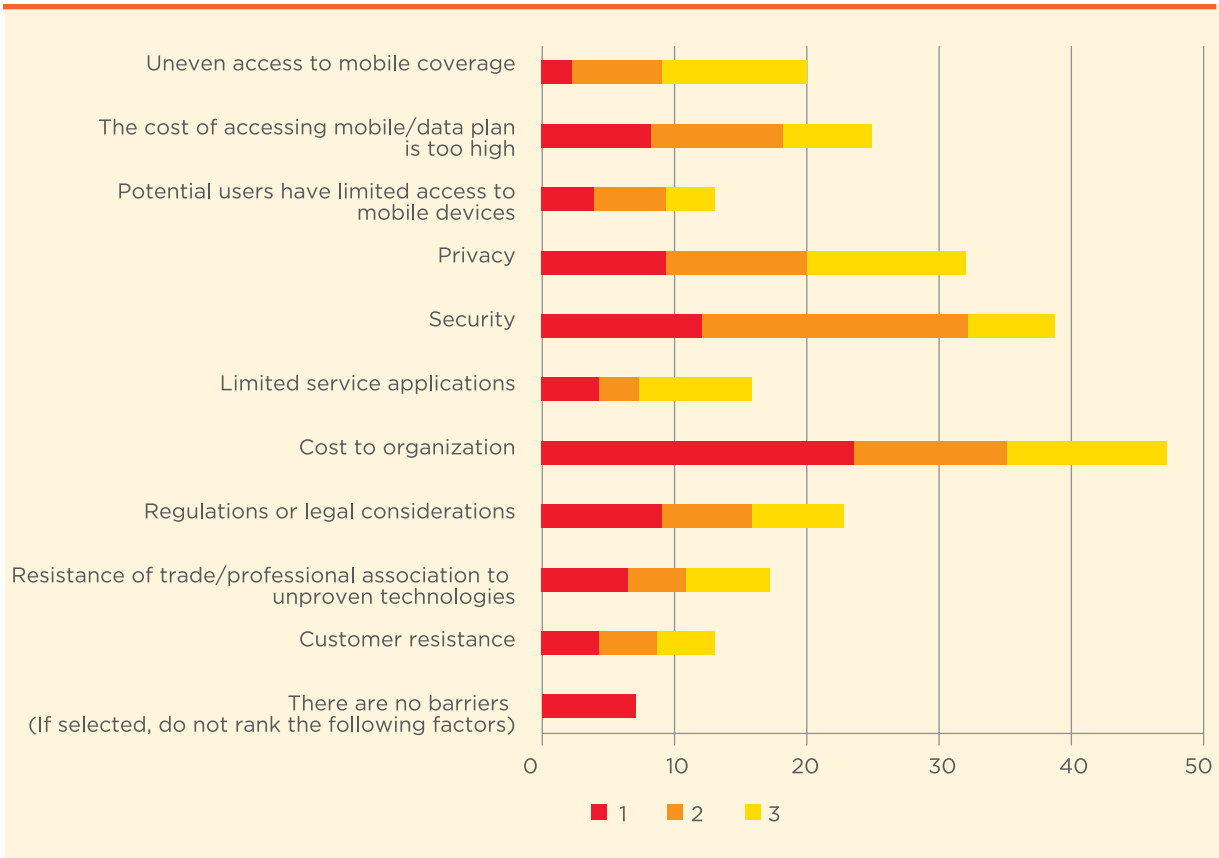
[425] Director, Industry and Market Trends, Media Sector

Finally, we asked our industry participants if there were any barriers to adoption of mobile technologies in their industries and, if so, to rank them:

- The most common response was cost to the organization, followed by security and privacy.
- The challenges of access to the mobile Internet, interoperability between platforms and inclusion (mobile access of their clients/customers) emerged in both our survey and in our interviews with experts.

The following diagram shows the ranking of participants' concerns:

**Figure 42:** Top three mobile-service barriers.




Concerted cross-sector action on security by mobile developers and infrastructure providers as well as updated privacy legislation and efforts to expand mobile broadband and ensure competitive pricing will help to accelerate both uptake and the expansion of mobile offerings to meet growing consumer interest. These recommendations are reflected throughout this report.

# Risks to Ontario in Failing to Adopt Mobility

We have established in this report that mobility is driving the modernization of the developing and advancing worlds; creating competitive advantages for many sectors of industry; addressing critical gaps in education; providing new tools to move healthcare downstream to chronic care, communities and prevention; giving governments opportunities for citizen engagement and efficiencies; producing new forms of wealth in entertainment and commerce; shaping the experiences and expectations of young residents; and affecting the day-to-day experiences of adults and seniors. We have also shown that Ontario has built significant infrastructure to excel in the mobile world: competitive industries, research and innovation leadership, and pilots that point the way to a mobile province. Now is the time to act with comprehensive policy and action plan.

If we fail to act, we face the following future:

- A widening gap between those who have access to and can afford mobility and those who remain without access.
- Lack of competitiveness of Ontario-based private-sector firms in a world that favours location-based point of sale, mobile services and mobile commerce.
- Loss of local context for the development of mobile enterprises and hence an accelerated flight of capital and hollowing out of the mobile sector.
- An outdated financial industry.
- Loss of tourism dollars because of high roaming tariffs.
- Migration of research and innovation talent to other parts of Canada or other jurisdictions where research in the broad mobile field retains ongoing support.
- Added inefficiency to government and privately offered services as systems become more complex and continue to rely on face-to-face mechanisms in a time of budget attrition and less staffing.
- Alienation from governments and heightened cynicism as residents become accustomed to using mobile and social media to make decisions and hold dialogues in their daily lives.
- Accelerated breakdown of healthcare support and intensification of acute -care needs because of failures to use mobility and related community health services to allow for aging-in-place, distributed health-support teams, and effective chronic and preventative care.
- Intensified privacy infringement in the face of ineffective management of data and residents' rights.
- Increased distraction, leading to lowered completion rates as students throughout the K–12 and post-secondary education (PSE) system live mobile lives that are not amortized into learning experiences in the classroom.
- Students who leave high schools without the skills needed to manage in a competitive, technologically infused world.
- PSE institutions that cannot compete effectively against international competitors in a world of shifting credentials.

- Entertainment and culture that is primarily produced and delivered outside of Ontario and Canada, and hence a significant impact on Canadian values.

# Action Plan for a Mobile Ontario

We developed our call to action for a mobile Ontario using the following resources: 1) best practices derived from our review of jurisdictions with comparative challenges and resources; 2) analysis of current Ontario government priorities, initiatives and policy; 3) analysis of federal initiatives regarding spectrum and regulation; 4) extensive secondary research concerning key sectors, as well as infrastructure, technology, social impact, culture and economy in the context of mobility; 5) data collection and analysis of the needs, capacities and plans of Ontario residents, industries and public entities; and 6) foresight work that derived best-case scenarios for mobility. In developing a call to action, we addressed opportunities for: industry (either as a whole or in critical sectors); public and non-profit entities (academia, healthcare sector); and government. Some proposals require action on the part of one entity, and many others require collaboration.

## 11.1 Theme 1: The Need for an Ontario Mobile Policy

Ontario needs an overarching policy on the part of its government that privileges and prioritizes the adoption of mobility and creates a context that will benefit market forces and private-sector development. In leading mobile adoption, government brings efficiency and productivity to Ontario's critical private and public sectors, and will eventually provide access to excellent mobile products and services for all Ontario residents. In some instances, we propose a staggered approach to building mobile capacity, testing and scaling up implementation as infrastructure and access increase throughout the province. There are significant pilot projects—for example in K–12 education or in mobile healthcare—that are already underway. In other instances, significant action is required in order to allow us to turn the corner, for example on the costs of data or in enabling mobile commerce (m-commerce). Public-private partnerships must move forward now and not wait until all modes of access are equally available and affordable. We suggest that the Ontario government develop an overarching mobility policy that takes up key elements of the strategies below.

Mobility in the full sense—the integration of personalized services and data, the availability of information and interaction 24/7 in any place, the access to rich context information, and the possibility of learning, working and recreating without physical infrastructure—allows unforeseen possibilities for efficiencies, cost-savings and productivity while improving the quality of services. These capacities can be applied to key high-cost sectors, to the government's ways of conducting business, to infrastructure investment and to expectations of the larger business environment.

Our survey and broader research reinforces the fact that the adoption of mobility leads to time efficiencies and a quantitative increase in output. The measures below would all contribute to creating enhanced productivity in Ontario while guaranteeing that we create jobs for the future. Enhanced productivity may play out in different ways, where large companies seek productivity applications and small and medium enterprises (SMEs) seek a competitive advantage by using mobile technology to expand their markets and products. In addition, the individuals, government staff, administrators and

companies we surveyed and the participants who took part in round-table discussions all expressed an interest in using mobile technology to increase productivity.

Mobility enhances productivity in other ways, as has been demonstrated throughout this report: it allows better use of capital infrastructure, as entire functions can be coordinated by the Internet and work can occur outside of capital infrastructure; it can also speed up the provision of services, as staff realize efficiencies in workflow gained through mobility. Enhanced productivity could be achieved through the wholesale movement of services onto mobile platforms and the adoption of applications that help to better organize the work process, provide just-in-time information or training, and organize activities and expenditures. We address recommendations on productivity in relation to health, learning and government.

The lack of coordinated policy can cause investments to be misdirected, however well intentioned. We cite the example of investments in Northern Ontario, in places like Sioux Lookout, where subsidies and encouragement led to carriers targeting the main part of the town, where they could hope to recoup their investments (schools, libraries, hospitals, etc. ). However, this led to exceptional oversupply in this part of the town, such that prices for high-speed connection have had to be reduced to the point where the investment is hard to justify economically for the providers. It also means that for the same investment funds a significantly greater part of the town could have been connected to high-speed Internet connections.

Successful transformation to create a mobile Ontario will require action by industry, academia and government—at both the provincial and federal levels. [426] Many times, public-private partnerships (PPPs) are required for success; in other instances, sectors can act alone. Government can set the framework for this transition through regulatory and legislative action. We have organized our recommendations thematically, considering three engines for change: industry, academia and government.

To position Ontario as a leading mobile jurisdiction:

- The Ontario government could convene a voluntary advisory council that could assist in implementing the proposed action plan, offering advice and helping to align programs.

[426] We remind the reader that we define mobility as the capacity to move seamlessly through work, leisure and personal life wherever one is located. There are four qualities to mobility: 1) 24/7 connectivity; 2) intensive personalization; 3) social media; and 4) context and location specificity. Our recommendations are grounded in these qualities.

## 11.2 Theme 2: A Mobile Ontario Requires Ubiquity, Accessibility, Quality Infrastructure and Affordability

To take advantage of the efficiencies, connectivity and economic-development benefits of mobility, Ontarians must have ubiquitous, high-quality, affordable access. This goal requires action at the federal and provincial levels through government policy. It also requires action on the part of access providers to enhance coverage and thus build their potential market share as mobile products and services in all domains come on stream. Industry will ultimately benefit by extending the consumer base for mobile networks, services and content and lower data tariffs are crucial to affect a larger base.

### 11.2.1 Regulatory Environment

Ontario could play a leadership role in developing a mobility policy in relation to federal regulation that ensures access to mobile networks through a nuanced approach that incorporates affordability, recognizes the challenges of Canada's geography and population, and addresses additional factors such as: privacy, security, reliability, high availability, quality of service, quantity of service offered, bi-directionality, speed and latency of networks, openness and network interference, and reasonable price points.

Policies would ensure that the regulatory climate enables competitive mobile service provisions and the ability to roll out comprehensive, secure and coherent mobile offerings in key verticals such as financial services, commerce, health and lifelong learning.

The province will need to collaborate with the federal government to ensure that there are future spectrum auctions and to extend legislation for such auctions that continues to address the lack of competitiveness that has been identified in the telecom industry through changes to foreign ownership rules and spectrum-ownership limits. This policy would:

- Continue to reduce foreign-ownership restrictions.
- Impose spectrum-use requirements on auction winners.
- Continue to limit spectrum ownership to increase competition.
- Support and incent highly differentiated and localized value-added services such as health or education.
- Set aside licenses, as in the past, for new service providers.

Ontario's goal must be ubiquitous connectivity to high-speed data connections in their various forms (e. g. , mobile, wired, Wi-Fi) for all Ontario residents. A federal/provincial and private-sector partnership is needed to develop an action plan and investment program to roll out high-speed mobile networks in rural and Northern areas of Ontario. This project will build on Canada's previous Connecting Rural Canadians program, and can build on and link to existing infrastructure such as CANARIE and the Ontario Research and Innovation Optical Network (ORION). It can also use models such as the

current Eastern Ontario Regional Network (EORN) being developed in the 13 counties of Eastern Ontario.

To redress the incomplete coverage of rural and northern regions of Ontario, spectrum auctions could be structured to:

- Impose minimum rural/Northern wireless-tower density requirements on auction winners.
- Set aside spectrum licenses for firms that will be required to provide a defined minimum level of coverage in rural and Northern regions.
- Separate highly valued urban zones from rural zones in spectrum auctions to enable a more sustainable return on investment (ROI) for rural infrastructure investment.
- Require established firms to share their wireless towers with new entrants and set minimum standards for the quality of "handovers" to improve the quality of service new entrants can provide.
- Investigate the potential for a separate entity (perhaps a PPP, such as ORION) to operate and manage all the wireless towers, enabling equal access for operators who rent space on the towers. The entity would operate and manage the wireless towers, potentially allowing a balance of costs so that rural and remote areas are not disadvantaged. Local employees could participate in the build and maintenance, and the winning licence operators would rent space on whatever terms are deemed necessary to make a sustainable business case (even including differentiated pricing).

Affordability and access can be increased by improving the fixed costs and spectrum-cost investment required by carriers. Spectrum auctions, while relatively efficient for distributing a scarce resource, also imposes great costs—essentially a sizable tax—on the telecommunications industry. A better use of these funds would be to assist in reducing the cost of access to Canadians. We propose the following actions:

- Return a portion of those funds to carriers as tax rebates against capital investments in network building.
- Provide tax rebates to mobile subscribers below the poverty line.
- A portion of these funds could be set aside as a venture fund to facilitate the development of Canadian application companies and value-added services.

### 11.2.2 Private Sector

The private sector can facilitate the rollout of ubiquitous services through the following activities:

- Service providers face tremendous opportunities to build a broader customer base through ubiquitous coverage and the provision of a wide range of services—for example, in health, education and products for the business and consumer markets. Large firms could be successful by moving into disruptive and emerging mobile fields and offering a wider range of packages, including less

expensive services.

- Providers could create and contribute to a fund that can facilitate inclusion and be directed toward infrastructure and access programs in remote and rural areas, and also be used for programs supporting access in concentrated-poverty urban areas. This fund can be modeled on CRTC regulated social-benefit programs, where companies are required to give back to build Canadian capacity. One form of this mandate could be a PPP broadband-loan program or repayable seed grants, which would help rural communities acquire access and would act as complements to existing programs such as the Northern Ontario Heritage Fund Emerging Technology Program and the recently completed Broadband Canada Program. This support for infrastructure would provide opportunities for firms to sell data packages.
- Competition would be enhanced by providing the consumer with greater information about mobile plans. Industry should undertake clear communication without compulsion from government. Developing and promoting a consumer-oriented guide where service prices are easily and clearly compared (such as the "Telepriskollen" web portal that is used in Sweden, discussed in Inclusion in a Mobile Ontario, Chapter 7), could further encourage service providers to lower their prices and provide better services. Information should include accurate statistics regarding relative pricing, true network performance and service interruptions.
- Mobile and broadband carriers can help develop ubiquitous connectivity by considering novel solutions for remote connectivity in communities in need. These solutions should go beyond "last-mile" charges to different models of service and ownership. For example, financial instruments created by the private or the public sector or in a joint initiative (similar to broadband-loan programs or EORN) could enable rural and remote communities to access wireless communications, and could support and improve the productivity of members of those communities.
- The quantity of available data is very important. Service providers that overly cap or limit access to data networks also limit residents' ability to participate and consume mobile content or services. Furthermore, if caps or quantity-of-data allowances do not increase over time, residents are restricted in their ability to participate in future innovation. Regulation should guarantee bi-directional access to networks; residents must be able to upload as well as download bandwidth access. Network speeds are often quoted primarily in peak download rates; it is, however, upload speeds that give Ontarians the bandwidth to contribute, publish and be more than consumers of media.
- Mobile network operators should be encouraged to reduce contract lengths for smartphones and tablets and the cancellation fees associated with them. While the carriers express the need for profitable business models, large cancellation fees and lengthy contracts impede the volume of churning and the access to used smartphones on the market. Current legislation being enacted across different provinces should be coordinated to encourage consistency. This should increase overall ownership of smartphone devices, as those who cannot afford them at the moment have access to used units (often from friends and family, or from online sales), and current users are incented to upgrade sooner.
- Service providers should develop and commit to an anti-throttling policy rather than selectively

reducing the data-transfer rates of certain file types, services or websites.

### 11.2.3 Public Institutions

- Public institutions can play a role in providing affordable access by creating a network of cost-recovery Wi-Fi access points around public institutions. We suggest that associations or municipalities create partnerships with carriers to provide this service. A business model could be for public institutions—perhaps through their associations or through the municipalities—to pool and create a partnership with carriers to provide this service.
- School boards and post-secondary institutions should work collaboratively with the major telecommunications carriers to negotiate a deeply discounted rate for devices and data plans used in the delivery of mobile learning. This approach could be similar to the process that vendors currently use to negotiate bulk prices for educational software in the province. By providing pre-loaded devices with freemium content, this approach will stimulate the educational application industry, build brand loyalty and extend the base of mobile users.
- The ORION network already covers 65 per cent of the Ontario school population with high-speed broadband connectivity and could assist in supporting mobile broadband in the classroom, at home and around the regions close to the network. This could also be extended to enable ORION to act as a consolidator in providing last-mile connectivity for other public services such as the health network.

## 11.3 Theme 3: Creating Confidence in Mobile Services: Privacy, Security and Consumer Protection

As demand for mobile services increases, there is a need to put in place regulations and legislation that protect consumers, their data and their mobile transactions. This protection will build consumer confidence and trust in services mediated through mobile technologies and, as a result, enable and support their widespread use.

### 11.3.1 Private Sector

Industry has a critical role to play in initiating self-regulation as discussed below:

As mobile data collection crosses many points of contact (collection, transmission and sharing), a multi-sector approach is needed in relation to mobile privacy. Rather than waiting for government regulation, mobile and wireless associations in concert with relevant industry associations should adopt a cross-sector approach and create an industry standard and self-regulation mechanism regarding the use and sharing of individuals' data.

- Security oversight is the other side of privacy protection, and is fundamentally the responsibility of industry. For example, excellent security will expedite the take-up of m-commerce, the adop-

tion of mobile identity and the regulatory process of approving medical applications for mobile devices. Mobile industry associations must develop a comprehensive and publically available security policies and guarantees of security.
- Ontario would benefit from the creation of an industry-government m-commerce task force that would detail the appropriate forms of regulation and self-regulation and would provide a detailed road map to accelerate adoption of m-commerce.

### 11.3.2 Academia

Education and information about mobile services can boost consumer confidence and promote implementation and the use of mobile services in the private sector. Post-secondary institutions have a role in researching and disseminating the advantages of mobile services:

- Academic institutions should undertake research regarding m-commerce applications and related issues such as privacy and security.
- Post-secondary institutions should collaborate with the m-commerce industry to provide needed training for application developers and industry sectors in order to help them understand, apply and market m-commerce. Post-secondary institutions can thus foster a culture of information exchange and cooperation among sectors that are not familiar with the advantages of m-commerce.
- Security will be further enhanced by educating developers and testers on different aspects of m-commerce application security and by practicing due diligence in researching different areas of security (including mobile-device attack vectors) in order to accurately perform a security audit of m-commerce applications.

### 11.3.3 Government

Ontario can develop its own legislative reforms in fields where it has provincial jurisdiction, ensuring that these are compatible with federal law. Effective privacy, security and consumer-protection legislation can help to stimulate the adoption of mobile services and products by ensuring consumer confidence. At the same time, it is important to create a competitive environment for Ontario businesses as they adopt m-commerce and cloud-based mobile checkouts, and provide all manner of services that rely on personal data. The Government of Ontario should play a leading role in modernizing policy related to privacy and security:

- Working closely with the Privacy Commissioner, government would be wise to reconcile Bill 5 with a modernized privacy policy that uses consumer demand for services across multiple sectors (e. g. , government services, health services, m-commerce) as a lever to include mobility in current privacy legislation. For example, privacy-protection legislation and consumer-protection revisions must take into account the adoption of mobile health (m-health) solutions such as self-care and monitoring by Ontario residents. There is a need to move to a consent-based environment, but obtaining consent for each individual case is not practical. Rather, classes of consent

could be considered as a solution to privacy and security concerns.

- It will be important for the Ontario government to intervene on issues of privacy in order to ensure consumer protection and engagement. Working closely with the private sector and federal government, Ontario should develop a unified mobile identity for federal, provincial and commercial uses in order to encourage the adoption of mobile services, aggregate personal data, and enhance efficiencies, productivity and security. The unified identity card can also be used to adapt technology to users' accessibility needs by storing information about access preferences or functional requirements.

## 11.4 Theme 4: Increased Quality, Accessibility and Productivity in the Delivery of Healthcare

Mobility is a critical lever in moving acute care downstream to chronic care and even further downstream to community care, remote care and prevention, thus creating tremendous savings. Mobility can provide efficiencies, resource management, improved safety and communication within the acute-care environment. A mobile health solution must include strategies for device interoperability and data standards, and a clear regulatory framework for privacy and security.

Our findings and resident surveys conclude that there is an opportunity for technology to provide a combination of user satisfaction and healthcare savings (see Efficiencies within the Healthcare System p. 24). Policy and actions across the sector should work toward the eventual integration of self-care and self-monitoring data with formal health-sector data to allow caregivers to better analyze their patients, help patients adhere to programs and provide support for users. The Ontario government, working closely with the private sector and public healthcare providers, would be wise to integrate mobility and m-health as a fundamental component in the next phase of systems reform.

### 11.4.1 Private Sector/Public Institutions/Government

To create efficiencies in the acute-care sector, a coordinated effort across Ontario hospitals could lead to the generalization of these examples:

- The North York General e-Care CPOE system, which monitors medication, patient safety, recovery patterns and post-hospital care using mobile devices.
- A mobile app providing real-time updates of each emergency room and emergency clinic's expected wait time, and enabling better distribution of patients across available services.
- The creation of "virtual wards" to reduce hospital readmissions by providing short-term, transitional home-based healthcare to high-risk and complex patients. The use of mobile devices to monitor patients and engage them in their own care following discharge creates a communications and support nexus between patients and their support teams.

### 11.4.2 Increase Take-up of Mobility in Community-based Care

Mobility can be an important asset in addressing the shift from acute to community care. This shift is particularly important for Ontario's aging population. Independent living when coupled with team-based and community support is important for quality of life for many seniors, and is more cost-effective than hospital care. Development of mobile-supported health-monitoring systems targeted at individuals that rely heavily on emergency care could reduce preventable emergency-room visits, which would then drive down costs and provide labour efficiencies.

The most important initiative will be a coordinated effort to accelerate the generalization and adoption of successful mobile pilots and best practices across Ontario's community-health system through collaboration between local health integration networks (LHINs), health practitioners, public institutions, telecommunications service providers and the mobile health sector. Initiatives could include:

- Giving priority to the adoption of mobile programs and services that provide efficiencies in chronic care (e. g. , diabetes, heart disease), long-term care and aging-in-place.
- Incorporating mobile delivery into existing programs that target seniors, like the Aging at Home[427] and Healthy Aging[428] programs.
- A PPP investment fund should be created to support partnership opportunities with the m-health sector, health-technology sector, hospitals and healthcare providers, in order to provide residents and caregivers with health monitoring and health support systems. A quality and economic-impact study should be carried out prior to launch of the investment fund.

To accelerate capacity-building in Ontario, the PSE and research-hospital sector can:

- Foster the development of a culture that looks to the commercialization of research and innovation.
- Develop collaborative relationships with industry that enable industrial partners' intellectual-property development.
- Coordinate m-health research to allow more effective investment by industry and to facilitate outcomes that can be generalized.
- Include education about the use of mobile technologies and the challenges of data collection and management in doctor and nursing education.

[427] See http://www.health.gov.on.ca/english/public/program/ltc/33_ontario_action.html.

[428] See http://thehealthline.ca/listServices.aspx?id=10150.

### 11.4.3 Match Need with Resources

Mobile technologies are the core enabler for expert networks and can bring down healthcare costs by improving the speed and capacity of intervention. Any geographical mismatch between the locations of patients and necessary healthcare providers causes delays and reduces the capacity for medical intervention. Healthcare professionals such as nurse practitioners need mobile access to experts. Team-based healthcare delivery relies on mobile communication and data exchange. An investment policy in remote medicine that includes the use of mobile devices and team-based health care delivery is relevant for Northern, remote and Aboriginal communities, but is equally relevant to a decentralized community/home-based care environment.

The following actions would provide efficiencies and better quality service:

- Using mobile technology to match patients, regardless of their locations, to a network of medical experts would reduce delays, equalize access and quality of care across the province, fully utilize available healthcare expertise, and ultimately improve health outcomes.

### 11.4.4 Mobile Health Care Industry Guidelines and Standards

The health care industry and sector has a critical role to play in generalizing best practices. For example:

- The adoption of interoperability standards would ensure that wireless and other medical devices have the ability to communicate in a common "language" (regardless of the manufacturer). This is a requirement for the successful rollout of mobile health. Government can encourage this by requiring hospitals and public-health services, as a condition of funding, to include these interoperability standards in any procurement policy for healthcare technology.
- The m-health industry can work with the Government of Ontario to develop guidelines that will help to expedite the regulatory process of approving medical applications for mobile devices. The US Food and Drug Administration (FDA) draft guidelines, released in 2011, proposed to regulate medical apps for personal mobile devices, may serve as a model for the kind of regulatory oversight that Ontario industries could develop with government to ensure consumer protection [429]. Protocols for accessing and sharing individual users' data as well as for integrating it into health data such as medical records require systems design and a clear policy regarding data security and privacy. The challenge will be to create a regulatory process for m-health applications that provides safeguards but does not stifle innovation or commercialization.

[429] See http://www.fda.gov/medicaldevices/productsandmedicalprocedures/ucm255978.htm.

- Hospital and public-health procurement policy can support a wide range of m-health solutions including those related to prevention, service to Ontarians in remote locations and effective chronic care. Procurement policies will be most efficient if privacy and security concerns are already encompassed in a broader government action plan to manage the security of data collected from and about Ontario residents.

### 11.4.5 Reimbursement Scheme for Mobile Health

In order for m-health to be effective, services—including micro-services—need to be integrated into the Ontario Health Insurance Plan (OHIP) with an m-commerce payment scheme. M-health delivery must be reimbursed to incentivize participation of healthcare providers. Greater participation in m-health solutions could reduce unnecessary doctor visits and enable a more effective utilization of provider time.

Shifts in payment policies are needed if change is going to succeed:

- Modify incentive models through OHIP to reward m-health solutions that promote prevention and community care over acute care.
- Develop a system of micropayments and communication that will enable doctors to provide secure remote care and eliminate the need for patients to visit their doctor's office. For example, the MiHealth system, [430] created by a North Bay doctor, enables physicians to receive payment for services that utilize mobile systems (e. g. , test results, personal health-record validation, updating).

## 11.5 Theme 5: Increased Quality, Accessibility and Productivity in Delivery of K–12 Education

Mobile learning (m-learning) appears to facilitate student retention through more flexible learning options and possibly through greater student engagement. The current cost for educating a student in Ontario is $11,207 annually. [431] This represents a significant annual investment, with a graduate representing the return on the investment. M-learning encourages continual access to the learning experi-

[430] Currently, patients must negotiate a fee with physicians for validation of Personal Medical Records that occur more frequently than once a year (e.g., for medication changes). Ontario Ministry of Economic Development and Innovation, "A North Bay Success Story: Mihealth Puts Your Medical Info In Your Pocket". http://www.mri.gov.on.ca/english/ontario_innovates/mihealth.asp.
[431] Drummond, "Commission on the Reform of Ontario's Public Services Public Services for Ontarians: A Path to Sustainability and Excellence."

ence, which can help to reshape the speed of learning and teacher and student productivity. Multiple industries, from service providers and publishers to application developers and future employers, benefit from a well-integrated and accessible mobile learning environment in Ontario.

The following initiatives will assist in the adoption of m-learning:

- Ontario can continue to encourage the integration of m-learning skills and outcomes within learning objectives by providing school boards with the tools to create and implement curricula.
- As part of an investment in mobile education, there is a need to address access. A PPP initiative of industry and government could develop a program to ensure that students have access to devices that support m-learning. The program would provide every student with access to mobile devices through a combination of public resources, resources brought from home and devices provided by industry. Industry would gain increased access to the youth market and could seek opportunities in developing m-learning services and content. An appropriate incentive such as large orders or other credit may be needed in the development of industry partnerships.

### 11.5.1 School Board Initiatives

School boards can play a leadership role in enabling mobile adoption:

- School boards could create support for positive m-learning policies and leadership through multi-year projects that allow for the growth of m-learning in each school.
- Budgets need to be changed in order to reduce the number of laptop and desktop computers that are purchased and increase the purchasing of mobile devices.
- Technical support and best practices must be provided to enable educators to use these technologies easily and effectively and to reflect the excellence of Ontario education.
- Boards should be guided in policies related to safe wireless exposure by Health Canada guidelines.
- Ensure that appropriate guidelines for the focused use of mobile devices in the classroom and mobile etiquette are integrated into the adoption of mobility.
- Working in collaboration with service providers, school boards will need to set up loan programs to provide mobile devices for those students who cannot bring their own to school, in order to ensure that no students are left behind for economic reasons.

### 11.5.2 The Mobile-Application Industry, in Collaboration with Publishers and Teachers

The following actions on the part of the private sector would enable more effective take up of m-learning:

- Build a consortium of companies in the mobile-application, educational-publishing and e-learning sector to enable development of Ontario-specific content that takes advantage of the

strengths of multiple learning technology devices.

In order to meet resource needs for Ontario educators, m-learning and e-learning industry associations can make connections between traditional resource developers, mobile-application developers and school boards in order to facilitate the creation of applications with content specific to the Ontario curriculum.

## 11.6 Theme 6: Increased Quality, Accessibility and Productivity in the Provision of Post-secondary Education

The use of mobility to deliver curricula in colleges and universities will yield returns that take a number of forms. The affordances of mobility—24/7 access, context-related information, ease of collaboration and personalization—may improve the efficiency with which PSE delivered. Mobility can provide post-secondary students with opportunities to use ever-changing technology, thus preparing students for a labour market that demands these skills. Moreover, the use of mobile technology may improve student engagement and student learning, thereby increasing post-secondary retention and graduation rates. [432]

M-learning brings the capacity for personalization, contextualization and collaboration between learners, as well as between learners and their faculty. Mobility can provide increased productivity in the use of capital resources, allowing students to learn outside of PSE infrastructure by integrating location-based and internship-based learning. Further research should explore this concept:

- The Higher Education Quality Council of Ontario (HEQCO) should be commissioned to undertake a rigorous, Ontario-wide study regarding the impacts of m-learning on student retention, including the retention of students in rural, Northern and Aboriginal communities.

### 11.6.1 Post-secondary Education

E-learning that has a strong focus on mobility benefits from its pervasive and collaborative qualities

[432] Todd Stinebrickner, an economist who studied factors affecting PSE drop-out rates in a US college where students have full economic support, found that 45 per cent of students who left after their first year did so because of poor grades; Todd R. Stinebrickner and Ralph Stinebrickner, "Learning about Academic Ability and the College Drop-out Decision," *National Bureau of Economic Research Working Paper Series No. 14810*(2009). (http://www.nber.org/papers/w14810.pdf).; Students in a first-year sociology course using m-learning material had better outcomes than students who did not. Douglas McConatha, Matt Praul, and Michael Lynch, "Moble Learning in Higher Education: An Empirical Assessment of a New Educational Tool," *The Turkish Online Journal of Educational Technology* 7, no. 3 (2008).

and provides an intensification of the learning process. Mobility will serve as an important tool for those programs, and for students who wish to participate in accelerated-study programs (such as three-year programs), as mobility supports self-learning and distance learning. PSE institutions can take advantage of the desire to learn through continuing education as well as through the integration of mobility in undergraduate and graduate curriculum; for example:

- Colleges and universities could create a resource to develop and pilot m-learning curricula and methods throughout Ontario, either through their separate organizations or through a shared initiative, in association with mobile application industries and PSE researchers. The associations could create a prize for innovation in m-learning through the Ontario Online Institute or another appropriate vehicle.

PSE institutions must take steps to move their offerings towards mobile platforms, by, for example:

- Developing small-group tutorials over lecture formats for courses that enable the use of mobile.
- Developing enhanced collaboration opportunities and new methods of assessment and evaluation for team success that better suit the access to information of connected learners.
- Developing programs of study that have flexible timing for completion.
- Developing technical-support centres for student-owned devices.
- Developing training and providing support for faculty in using m-learning infrastructure and devices and developing curricula.

Mobility provides a means to increase administrative productivity and efficiency through requiring the automation of systems:

- PSE institutions should move to mobile commerce standards for the provision of services and charges for students, stimulating m-commerce solutions and eliminating service inefficiencies. This initiative would decrease administrative costs by automating payments and unifying automatic payment processes and would ensure a mobile link to enterprise.

### 11.6.2 Private Sector

The private sector can support and benefit from the intensification of mobile learning in PSE in the following ways:

- At the industry level, service providers and the mobile industry could join with universities and colleges to provide funding for special programs to produce mobile materials at the post-secondary level.
- An aggregate approach of industry associations could create an opportunity for Ontario firms to develop methods of converting e-learning materials into content that will run well on mobile devices.

- Higher education textbook publishers should develop mobile electronic versions of their major textbooks that include interactive simulations, instance evaluative feedback and online activities.

Mobility provides special advantages for training and retraining the labour force, as it is an excellent resource for context-based, self-paced and just-in-time learning. Retraining programs can help to reduce Ontario's unemployment rate through study-at-home and on-the-job learning that helps workers to adapt to changing technology and skills needs. The rapidly shifting needs of the labour market will require a large portion of the workforce to frequently retrain in order to remain productively employed.

Apprenticeship programs that use mobility as a training method will help to prepare learners for a future work force that will rely on mobile technologies:

- The mobile industries should undertake a concerted effort to reach out to employers who make use of apprenticeship programs, and develop training programs with stakeholders.
- Working in tandem with application providers, the government's efforts in support of apprenticeship and skills retraining could include an enhanced encouragement to use mobile applications.

### 11.6.3 Government

Government and PSE institutions share an interest in intensifying of the use of capital resources that currently exist in the college and university system. M-learning and virtual classrooms enable colleges and universities to serve more students with existing physical infrastructure by distributing students between online and campus learning environments, and over three semesters. In considering future investment, the Ontario government faces the challenge of managing demographics. Ontario has required PSE institutions to develop long-term capital plans and has also proposed the possibility of three new campuses. The following actions would support efforts to build m-learning:

- Colleges and universities should continue to build their m-learning environments and study the impact on space use and student productivity.
- The province could divert a portion of its planned investment in physical infrastructure to virtual infrastructure. It could broker PPPs to support m-learning infrastructure. [433]
- The Ministry of Training, Colleges and Universities (MTCU) could create an experimental fund

[433] The federal and provincial government have used a variety of vehicles such as the Knowledge Infrastructure Program (KIP), the Strategic Capital Infrastructure Program (SCIP) and the Facility Renewal Program (FRP). Future programs could support a mix of physical and virtual infrastructure.

for m-learning, one that would support programs to pilot curriculum focused on new learning approaches and learning outcomes.
- The government could respond to PSE m-learning initiatives by supporting online and m-learning through strategic mandate agreements that include e-learning and m-learning. This approach would provide support for internships and place-based learning.
- Develop training and provide support for faculty in the use of m-learning infrastructure and devices, as well as the development of curricula.

## 11.7 Theme 7: Increased Productivity and Quality in Provision of Government Services

Mobility allows governments to provide services through electronic platforms using less expensive channels than traditional means. As research indicates, the adoption of mobile technologies and practices enhances worker productivity and greatly reduces loss of labour through commute time. Ontario can develop a plan to integrate mobile services by moving from physical to mobile services (without an e-service stage) as part of its efficiency planning. The adoption of mobile technology by civil servants should lead to faster response times and a more efficient deployment of resources. As well, it will allow personnel to work both from home and on location, streamlining the use of office space and reducing costs of capital and infrastructure. Offerings must be usable, accurate, available and secure.

The following actions on the part of the Government of Ontario would accelerate the use of mobility and provide enhanced productivity:

- Working with experts in the mobile application and infrastructure design, each ministry could be asked to develop a plan to use mobility to increase its responsiveness and productivity with less labour time invested. Government should develop a study to document and analyze the cost/savings ratio.
- Government should consider a plan to consolidate government databases into an Ontario mobile portal in order to offer services to residents through a centralized portal wherever they are.
- Service Ontario can follow the successful model of governments around the world by transferring important elements of its transactions to mobile platforms and combining these with m-commerce solutions to enhance its information delivery and allow routine transactions to occur through the mobile Internet.
- The provision of services that use mobile applications in specific geographic locations (such as tourism or emergency service information).
- Introduce the use of tablet computing to familiarize public servants with the capacity of mobile technologies and to demonstrate the efficiencies in workflow that these devices make possible.
- Ontario could follow an EU example, where a research pilot and test bed was created between a set of universities, industries and regional governments to develop and test mobile productivity tools, standards and outputs from the public service.
- Government could require that services that it subsidizes develop mobile commerce solutions.

For example, in transportation this would be MetroLinx or PRESTO.

## 11.8 Theme 8: Increased Productivity, Accessibility and Quality Across Ontario's Non-mobile Industries

Our respondents and broader research indicates that consumers expect that industry from all sectors will provide services, information and the ability to undertake mobile transactions. We have also seen that mobile marketing, information, location-based awareness and actual mobile services provide a competitive advantage for industries, as well as efficiencies in the delivery of products. Industries have indicated an interest in moving to mobile platforms, but have also expressed challenges in finding the training and resources to do so. The stimulation of new industrial sectors to move to mobile solutions should result in partnerships with mobile application and content providers, and add demand for mobile-technology companies, services and service providers. The following section provides recommendations for the mobile industry to broaden the take-up of mobile solutions across non-mobile industry sectors.

### 11.8.1 Mobile Sector, Industry, Nonprofits and Government

Our Ontario survey indicated a tremendous pent-up need for the creation and provision of mobile services, applications, m-commerce, and other components of mobility. An all-out effort should be undertaken to bring clients and providers face to face.

### 11.8.2 Private Sector

Working with government agencies, mobile industry associations such as MEIC should assertively reach out to non-mobile clients. This could occur through ideas such as brand competitions or mobile-application camps.

M-commerce influences the productivity of consumers, merchants and retailers. One of the greatest challenges for businesses is to understand how to utilize mobile solutions within their business models.

Banks and brands could ally to create m-commerce pilots that could help businesses and merchants navigate risk by proving consumer interest and refining interfaces. This collaboration would help to allay concerns about the high up-front costs associated with new mobile terminals and other technology investments.

### 11.8.3 Academia

Academia can build on its track record of mobile research, extending into m-commerce applications and related issues such as privacy and security.

### 11.8.4 Government

Government can directly influence services it subsidizes or controls. There is great potential within these areas to support the development of mobile-payment infrastructure and customer habituation to the conveniences of m-commerce. Further, as Ontario privatizes or contracts components of its services, it can mandate mobility as a core quality of new providers. Actions include:

- Require the retrofitting of points-of-service (PoS) it funds or subsidizes or contracts out.
- Government services should allow the use of the mobile wallet and mobile quick checkout for licenses, tickets, etc.
- Promote Ontario's m-commerce success stories.

Ontario could encourage ahead-of-the curve participation in mobile by consumers, businesses, financial institutions and public-sector services and take the following action:

- Develop collaboration tax incentives that would push Ontario's merchants and financial industries to invest in mobile-payment infrastructure; this would help build Ontario into a leading centre of m-commerce and financial services.

The Government of Ontario has an important role to play in supporting industry engagement:

- Partner with and continue to support organizations such as MEIC and Wavefront that bring together mobile and non-mobile industries and trade association to enhance take-up of mobile capacity and to connect people, knowledge and resources.
- Promote mobile best practices at the local level and enhance opportunities for knowledge exchange such as workshops, conferences or peer-learning programs focused on disseminating best practices learned in "on the ground" settings.
- Utilize government business centres as gateways to link industry sectors with mobile-application developers.

Industry has an important role to play in building a skilled mobile workforce:

- Industry can subsidize training programs that build awareness of how to utilize mobile technologies to help stimulate uptake of mobile in sectors that have been cautious.
- Industry would benefit from partnerships with PSE to develop experiential learning programs that embed co-op students in firms for the purpose of modernizing their digital/mobile capacity. This kind of program would provide real-world experience for students as well as provide businesses with an inexpensive resource dedicated to developing digital and mobile capacity. The federal MITACs program, a national research organisation offering unique research and training programs to graduate students and postdoctoral fellows, is a valuable resource for supporting this initiative, as is the Ontario Centres of Excellence experiential-learning program.

- The Apprenticeship Training Tax Credit (ATTC) is a refundable tax credit available to businesses on the salaries and wages paid to eligible apprentices in designated construction, industrial, motive-power and service trades. Industry should work with the government to expand the list of "qualifying trades" under the ATTC to include classes for mobile service and production trades employed by businesses involved in the creation, marketing and distribution of mobile.

## 11.9 Theme 9: Job Development and Retention to Build a Strong Mobile Business Sector

A mobile job-development and job-retention plan recognizes the importance of the growing specialized mobile industry sector and the accelerating adoption of mobile services by the public sector and private industry. Ontario could benefit from building its own capacity rather than relying on imported products. Action on these initiatives requires close coordination between government, industry and post-secondary institutions. Many of the initiatives in this section are relevant to building and retaining the larger information and communications technology (ICT)/digital media industries in Ontario, not only the mobile sector. These recommendations echo those in the *2012 Innovation and Insight: Mapping Ontario's Mobile Industry* report by MEIC.

### 11.9.1 Government

The following government initiatives will assist in strengthening mobile industries:

- Utilize angel networks to inform private investors about the mobile-content industry, related investment strategies and opportunities for investment. Plus, continue the activities of the Ontario Venture Capital Fund to invest in first- and late-stage companies, as well as to provide leverage for private capital.
- To promote innovation and competitiveness among financially underserviced start-up and early-stage mobile-sector firms, federal and provincial tax incentives can substantially improve after-tax returns and thereby attract the private-sector investment required to reduce the "$5 billion funding gap" that is "holding back the country's economic development." [434] The creation of an Innovation and Productivity Tax Credit (IPTC) similar to the Enterprise Investment Scheme (EIS) or the Venture Capital Trust (VCT) scheme implemented in the UK over the past 10 years could help to fund the mobile sector, promoting employment, innovation and competitiveness. Those measures were successful; an estimated "52-62%" and "70-87%" [435] of the monies invested

[434] Organisation, "Innovation and Productivity Tax Credit (IPTC)". http://www.angelinvestor.ca/Tax_Credit.asp.

[435] Nic Boyns et al., "Research into the Enterprise Investment Scheme and Venture Capital Trusts " (UK: PACEC Public and Corporate Economic Consultants, 2003).136, 138.http://www.angelinvestor.ca/userfiles/file/IPTC/Supporting%20Docs%20for%20IPTC/IPTC%20-%20UK%20Tax%20Credit.pdf.

would not have been available in the absence of the EIS and VCT schemes, respectively.

- In addition to tax incentives, the federal government's establishment of new publicly provided capital will target innovative, high-growth firms in the technology sector at the start-up and later stages of growth, and further redress the funding gap. Ontario might consider a similar initiative. Access to those funds could be structured to ensure strong private-sector participation and leadership. [436]
- Ontario should lobby for a modernization and broadening of Business Development Bank of Canada definitions of qualified industry sectors to include mobile products and services firms and to further contribute to the mobile sector's capitalization.

### 11.9.2 Federal Policy Initiatives

As stated in Chapter Seven, Ontario has a critical role to play in establishing the appropriate federal framework for mobility to develop some considerations for policy include:

- Allowing for increased foreign ownership is expected to make the mobile phone market more competitive, leading to more choice of providers and cheaper, more innovative services. This might indirectly stimulate demand for content, as if the cost of owning phones goes down, people might spend more money on content accessed through their devices.
- A significant percentage of future spectrum auction revenues should be reinvested in the mobile and wireless sector, including the mobile-content industries, as well as incentive programs to facilitate the acquisition of mobile services on the part of non-mobile industries through match-making services.
- The CRTC should continue to regulate mergers and acquisitions, with funding designated to the experimental portion of the Canada Media Fund (CMF) with an explicit focus on mobile content and applications.
- In addition, the CMF should expand marketing support to include social media support. This would facilitate SMEs bringing their product to international markets, and will benefit SMEs and their partners.

### 11.9.3 Tax Policy and Incentives

The province should continue to promote research and SME development, so that its high-tech economy relies less on the fate of a single large player. Retaining a tax regime that encourages emerging companies as well as strategic companies and partners to stay in Ontario will be critical, as strong

[436] Jenkins, Tom. "Innovation Canada a Call to Action: Review of Federal Support to Research and Development - Expert Panel Report." [S.l.]: Industry Canada, 2011.

pressures pull talent and companies out of Ontario and Canada. In addition, specific tax incentives can help to build research and industry capacity in the mobile sector, incent innovation and fund the constant upgrading of knowledge for workers in these industries. For example:

- Refundable tax credits designed to promote the expansion of knowledge-based industries, including the mobile sector. A number of options for modifying existing tax-credit programs exist. For example, the Ontario Interactive Digital Media Tax Credit (OIDMTC) could be adapted to allow for commissioning companies to apply for the tax credit on behalf of projects they fund—thereby stimulating increased fee-for-service work in Ontario.
- Recognize vertical integration as a global industry trend and encourage federal regulators to impose sanctions on media acquisitions by telecommunication companies in order to finance an investment fund for the development and commercialization of innovative mobile content.

As the Ministry of Economic Development and Innovation continues to refine its research focus on Ontario's growth areas, it can invest in research through programs such as the Ontario Research Fund (ORF) in order to guarantee the commercial possibilities of the future and retain the presence of large companies with investment in mobile capacity and products.

### 11.9.4 Post-secondary Education

PSE can continue to make all facets of mobility research—from the economic and technical to the creative and social—a priority. In particular:

- PSE can support Centres of Excellence, incubators and accelerators. Ontario has achieved significant momentum as a mobile-development environment. Industry respondents and our broader research have indicated the value of environments such as Communitech, Digital Media Zone (DMZ), MEIC's Incubator, and PACE (a network of university and college incubators), which have resulted in viable new companies and support for business development for existing mobile companies.

All of our respondents underscored the value of the incubation support structures. Incubators in Ontario can also create links with those in other countries, leading to co-development of market opportunities.

### 11.9.5 Research Capacity

A strong industry is built on continued innovation through research. Ontario has substantive university, university/industry and college research capacity with significant patent activity that is relevant to mobility, whether in engineering, design or specialized areas such as m-health. Research capacity may be strengthened through directed efforts by industry and government as follows:

- Research capacity-building in the mobile sector requires industry investment in research in industry enterprises as well as partnered or contract research with universities and colleges.
- The mobile industries would benefit from a consortium approach to research using models such as TR Labs in Alberta.

### 11.9.6 Private Sector

We have identified a significant gap: high demand from non-mobile industries for mobile products, services and applications, and for a capable mobile sector without a bridging mechanism between these. Trade associations such as the MEIC must play a coordinating role between the non-mobile industries and mobile industries, brokering opportunities for mobile applications and services to be built.

Mobile business represents a vast global opportunity. Export-support programs created by associations in partnership with government can help companies enter new or emerging markets, and should be developed to increase awareness of market opportunities, connect Ontario entrepreneurs with international partners (distributors, developers, designers) and increase facilitated match-making between local and international businesses. Mobile industries should create coordinated international marketing campaigns. Travel to conferences in major markets can be very important in cultivating global contacts. Mobility is a global market, and it will be contacts from outside Ontario that will make a business a success in Ontario.

### 11.9.7 Government

The development of government procurement programs that rely on Ontario firms to supply innovative technologies would result in significant social gains, not only by increasing public-sector productivity, but also by nurturing developing firms and therefore driving innovation. This will allow those firms to showcase their technologies, realize a larger market, and ultimately achieve scale economies.

As part of its adoption of a mobile action, plan Ontario can support the development of an m-learning content industry by issuing funded requests for proposals for mobile training and just-in-time information within selected government departments, and by using Ontario firms to fill those needs.

The 2012 MEIC report on mobile content, services and the applications industry notes the need for Ontario/Greater Toronto Area private-sector assistance with business and marketing skills [437]. Whether this is in the form of assistance with promotion and branding or wider marketing skills (such as the

[437] MEIC, "Mobile Innovation: Mobile Content, Services, and Applications Industry 2012."

creation of unique value propositions, pricing strategies, competitive analyses or market research), these skills are deemed to be necessary for the success of these mobile companies. Assistance could be provided through tax incentives or credits, or by providing incentives for using students in business schools to collaborate with firms to develop business plans that integrate mobile applications.

### 11.9.8 Private Capital

There are debates about the reasons why there is a lack of venture and angel funding available in Canada, and this report does not focus on this topic. However, we consistently heard the need for angel and venture funding in the start-up, mobile-content and medium-enterprise sectors. In a February 2011 report, the Business Development Bank of Canada (BDC)'s Venture Capital Industry Review [438] noted that low returns have caused private investors to exit the venture capital market, and it will take significant efforts to encourage their re-entry. In the last decade, Ontario has moved to create policies that seek to attract venture and angel investment to Ontario. It has provided some support for programs that focus on early-stage funding for small companies (through the ONE network, for example). The venture capital system fails where there is not clear value. Without the private sector taking on financial risk, there needs to be government involvement.

### 11.9.9 Market Base

Ontario mobile companies need a market base in the province in order to build their capacity and reach out across Canada and to international markets. Membership in relevant trade associations is invaluable for networking and information exchange, and trade associations such as MEIC must work with institutions to facilitate SME sector access to academic resources, including applied research and development, incubation and training.

Ontario can continue to accelerate the capacity of SME mobile companies through industry support of incubation programs in partnership with existing mechanisms such as the Ontario Centres of Excellence.

### 11.9.10 Talent-Development Initiatives

While there are PSE programs that teach mobile research and skills, there is a growing and insatiable need for homegrown talent. Industry continues to hire outside of Ontario as well as within and talent is hard to retain, as markets in other centres are booming.

[438] Business Development Bank of Canada, "Venture Capital Industry Review," (BDC, 2011).

#### 11.9.10.1 PRIVATE SECTOR

Training and retraining program partnerships between industry, colleges and universities are required to support lifelong learning within a constantly changing environment.

#### 11.9.10.2 ACADEMIA

Post-secondary institutions need to continue to create programs that develop a wide range of mobile skills, both technical and design-based. For example, continuing studies programs could allow SME entrepreneurs to register as students in order to access academic expertise, library and research resources and infrastructure, and courses. Wi-Fi networks at colleges and universities could act as test beds, and students could provide a community eager to test new products. Colleges and universities should commit to the cost of program development and staffing as the mobile industries will continue to play a major role in Ontario.

#### 11.9.10.3 GOVERNMENT

MTCU can also encourage the creation of education opportunities to ensure that there is a talent pool with the requisite design, engineering and business skills to allow Ontario to lead in mobile content, engineering and emerging fields such as m-commerce. As part of the learning experience, co-op programs will provide mechanisms for students to learn within the context of the mobile industries and support their recruitment into firms.

### 11.9.11 Addressing the Central Role of Research In Motion

The Ontario government has made great investment in mobile research and development. This support has made Ontario a top producer of mobile patents and a home to industry leaders. Protecting this investment should be a part of an Ontario mobile action plan:

- The province would benefit from paying close attention to current developments regarding Research In Motion (RIM), and might consider working closely with both the company and the federal government to ensure that components of the company and its critical intellectual property are retained in Canada—similar to what Illinois and Finland have done with Motorola and Nokia (which now works with Microsoft on the Windows platform), respectively.

## 11.10 Theme 10: Citizen Engagement and Inclusion

The qualities of mobility provide governments with an excellent opportunity to make their services and data more transparent, engage directly and immediately with residents, keep a pulse on local conditions and issues, and personalize services. The same is true for residents in relation to their government.

### 11.10.1 Open Data and Services

Our report has indicated the value of open data in order to provide a source of information and a means to stimulate the creation of applications for citizen engagement. Municipalities such as Toronto are moving toward the open data standard open311, which enables mobile developers to build applications that interface with city data and provide citizens with convenient services and ways to interact with municipal services and departments.

### 11.10.2 Government

There are a number of initiatives that government can undertake to encourage residents' engagement:

- Encourage and enable an open-data approach to provincial data biased to industry standards in order to provide access to information for Ontario residents and create an environment that allows the mobile industry to build applications that meet a wide range of needs.
- Government can use mobile technology to provide Ontario residents with tools to report issues and incidents and evaluate government responses and services. Mobility can allow immediate feedback opportunities for participants and the ability to intervene quickly. Whether adding mobile interfaces for government services, creating a centralized service bureau or creating complaint lines, mobile communication as simple as SMS messaging can allow governments to build a relationship with their publics.

### 11.10.3 Emergency Alert System

Governments around the world have moved to mobile alert systems to increase response capability in all manner of emergencies and security threats. Ontario could undertake the following:

- Work with commercial developers to create a "mobile alert system" (such as those discussed in Chapter Four) that is a far-reaching crisis communication system that can push information to mobile users in the event of national, or provincial emergencies (e. g. , pandemics, evacuations). This benefit could be paid for by all mobile subscribers in the same way that all phone subscribers support the 911 system.

### 11.10.4 Mobile Inclusion

Inclusion is a critical aspect of a mobile Ontario and is the responsibility of industry, academia and—especially where the market fails to create access—government.

#### 11.10.4.1 MOBILE INDUSTRY

Ontario industries will benefit from extending access to mobile tools and applications:

- Mobile industries should develop and distribute mobile software/applications that can adapt to the specific capacities (including disabilities), contexts and mobile device specifications of users.
- For any inclusive action to take hold among those who might benefit the most (e. g. , seniors, immigrants, people with disabilities, low-income individuals), it will be beneficial to communicate clearly how mobile privacy is ensured when sensitive data is collected or made available.
- Promote and make available prepaid SIM cards in order to reduce the current mobile-penetration gap.
- In a partnership with government, develop a comprehensive public/private market analysis that uses census information matching against user rates/demographic groups to provide a comprehensive and detailed statistical map of mobile users that indexes a variety of characteristics including age, income, location, education, job data, device type, data and application usage, and mobile subscriber package. Similarly, it would be beneficial to create a statistical map that outlines data about non-users; that is, those who have yet to be included. This type of data would be invaluable in attaining broad inclusion goals both in Ontario and Canada and would promote industry growth and development.

#### 11.10.4.2 ACADEMIA

Colleges and universities should continue to focus on accessibility and inclusion strategies and technologies as part of their research agenda.

#### 11.10.4.3 GOVERNMENT

There are a number of significant initiatives that the Government of Ontario can undertake to broaden mobile inclusion:

- Identify key areas or clusters of marginalized groups (e. g. , low-income areas, areas with a high immigrant density, ethnic clusters, communities of seniors) and develop or utilize existing community based programs or drop-in sessions to educate them on how to use mobility effectively to access public services and important information.
- Include mobility as a central initiative in acclimatizing immigrants to citizenship in Ontario by making services and information available to them over mobile. Many immigrants come from cultures with a heavy dependence on mobile technologies in everyday life.
- Develop a plan for broadband and Wi-Fi coverage of Aboriginal communities in the North and access in urban environments, drawing from the successful models of community-owned networks for the public use of computers and connectivity. Link coverage to efficiencies in the provision of remote healthcare and education support.
- Encourage federal regulators to develop policies and technologies that make use of “white spaces” in the wireless spectrum (the portion of spectrum vacated by the retirement of analog television) in Ontario. These underused resources can be deployed to provide wireless access to rural communities or low-income public-housing communities.
- To enable the Accessibility for Ontarians with Disabilities Act (AODA) rollout, lobby CRTC regulators to require universal access and design.

# Taking Ontario Mobile Timeline and Priority Actions

While connectivity and access to mobile technology is not uniform across Ontario, it is important that mitigating this inequity moves forward concurrently with other initiatives and policy recommendations made in this report. Given the fast pace of developments in mobile technology and the rapid adoption of mobile technology by consumers, it is important to implement policies that will enable the efficiencies, improved service and productivity improvements afforded by mobile technologies to be realised by the province and its residents. Following is a suggested action plan for implementation of strategies and policies that have been designated as priority goals by the *Taking Ontario Mobile* research team.

Below, we provide a series of "quick wins" that we encourage readers of this report to initiate in order to move forward with taking Ontario mobile:

**Table 08:** Quick Wins

| Timeline | Timeline | Proposed owner |
|---|---|---|
| Mobile-development industry can create prize for innovative mobile-learning projects | Winter 2013 | MEIC + INTERACTIVE ONTARIO |
| Collaborating healthcare providers can create a mobile application to post real-time wait times at hospitals, clinics and laboratories | Apr 2013 - Oct 2013 | HEALTHCARE INSTITUTIONS |
| Service providers could create a publicly available, detailed statistical map of mobile users and non-users | Winter 2013 - 14 | INDUSTRY ASSOCIATIONS |
| Government can create mobile-learning priorities for school boards | Jan 2013 - Dec 2013 | MINISTRY OF EDUCATION |
| Government can prioritize mobile learning and services through PSE Innovation Fund | Oct 2013 - Dec 2013 | MINISTRY OF TRAINING, COLLEGES AND UNIVERSITIES |
| Government can extend mobile service through optimized websites | 2013 - 2014 | MINISTRY OF GOVERNMENT SERVICES |
| Government can promote the development of applications built on government open data through contests | Jan 2013 - Dec 2013 | MINISTRY OF GOVERNMENT SERVICES |
| Government can selectively deploy mobile devices to departments for work typically done away from a desk to allow employees to discover work efficiencies | Winter 2013 - Fall 2014 | MINISTRY OF GOVERNMENT SERVICES |

We have derived the following charts to show a summary of the actions mentioned in the themes in the previous section. The charts contain actions to be undertaken within the confines of Ontario, and—where possible—actions that can be implemented immediately, do not necessarily need new budgets or long investment-analysis cycles, and will result in high impact. Some actions advocate altering budget spending but not necessarily finding new money sources; for example, diverting schools' funds from PCs and laptops to mobile devices. However, we recognize that even actions such as these also need an alteration in extended areas such as technical-support skills, so we have identified those also.

These actions are not inextricably linked, and can often act in isolation. But, overall, they are dedicated to achieving the same end and combine to add merit to the overall goal of making Ontario a centre of mobile excellence.

**Table 09:** High Impact Actions

| Action | Timeline | Proposed Owner |
|---|---|---|
| Creation of brand "Ontario" as a centre of mobile excellence | Winter 2013 | MEDI + MINISTRY OF TOURISM, CULTURE AND SPORT |
| Government to recognize mobile-health solutions that promote prevention and community care | Apr 2013 - Oct 2013 | MINISTRY OF HEALTH |
| Support mobile-learning projects as part of MTCU Innovation Fund | Dec 2012 - Mar 2013 | MINISTRY OF TRAINING, COLLEGES AND UNIVERSITIES |
| Create plan to use mobility to increase responsiveness and productivity of government services | Oct 2013 - Oct 2014 | MINSTRY GOVERNMENT SERVICES |
| Promotional awareness campaign of m-commerce benefits to non-mobile industry | Dec 2012 - Mar 2013 | MINISTRY OF ECONOMIC DEVELOPMENT AND INNOVATION |
| Government to establish voluntary advisory council to offer advice, coordinate action and align programs to make Ontario a centre of excellence for mobile | Fall 2012 - 2014 | MINISTRY OF ECONOMIC DEVELOPMENT AND INNOVATION |
| Initiate m-commerce task force across industry and government for privacy and security | Fall 2012 | MINISTRY OF CONSUMER SERVICES |
| Commission study to assess impacts of mobile learning in K–12 and PSE | Dec 2012 - 2013 | MTCU + MIINSTRY OF EDUCATION |
| Investigate potential of ORION as network option | Fall 2012–Summer 2013 | ORION |

## **Table 09:** High Impact Actions (Cont.)

| Action | Timeline | Proposed Owner |
|---|---|---|
| PSE to direct research efforts into mobile industries | Winter 2013–Fall 2015 | UNIVERSITIES +COLLEGES |
| Academia to collaborate with industry to develop experiential-learning programs | Dec 2012–Fall 2015 | UNIVERSITIES +COLLEGES |
| Enhance training for app developers | Fall 2012–2014 | MEIC |
| Industry to collaborate with health-sector subject-matter experts to create standards, services and applications | Oct 2012–Mar 2014 | MOBILE INDUSTRIES + MINISTRY OF HEALTH |
| Industry to build consortium with publishers, e-learning sector and teachers to migrate Ontario-appropriate content to mobile platforms | Dec 2012–Oct 2013 | MEIC + SCHOOL BOARDS + MINISTRY OF EDUCATION |
| Industry to collaborate with PSE subject-matter experts to develop and disseminate applications | Dec 2012–Mar 2014 | MEIC + COU + COLLEGES ONTARIO |
| Industry to collaborate with government to develop and test productivity tools | Mar 2013–Oct 2014 | MEDI + MINISTRY OF FINANCE |
| Finance sector to collaborate with government to incentivize angel investment | Winter 2013–2014 | MEDI |
| Government to work with commercial developers on “mobile alert system” | Mar 2013–Oct 2013 | MINISTRY OF COMMUNITY SAFETY AND CORRECTIONAL SERVICES |
| Mobile industries to establish consortium approach through associations to fast-track mobile and application adoption in non-mobile industries | Fall 2012–Fall 2014 | MEIC WITH MEDI |

**Figure 43:** First 3 months of action

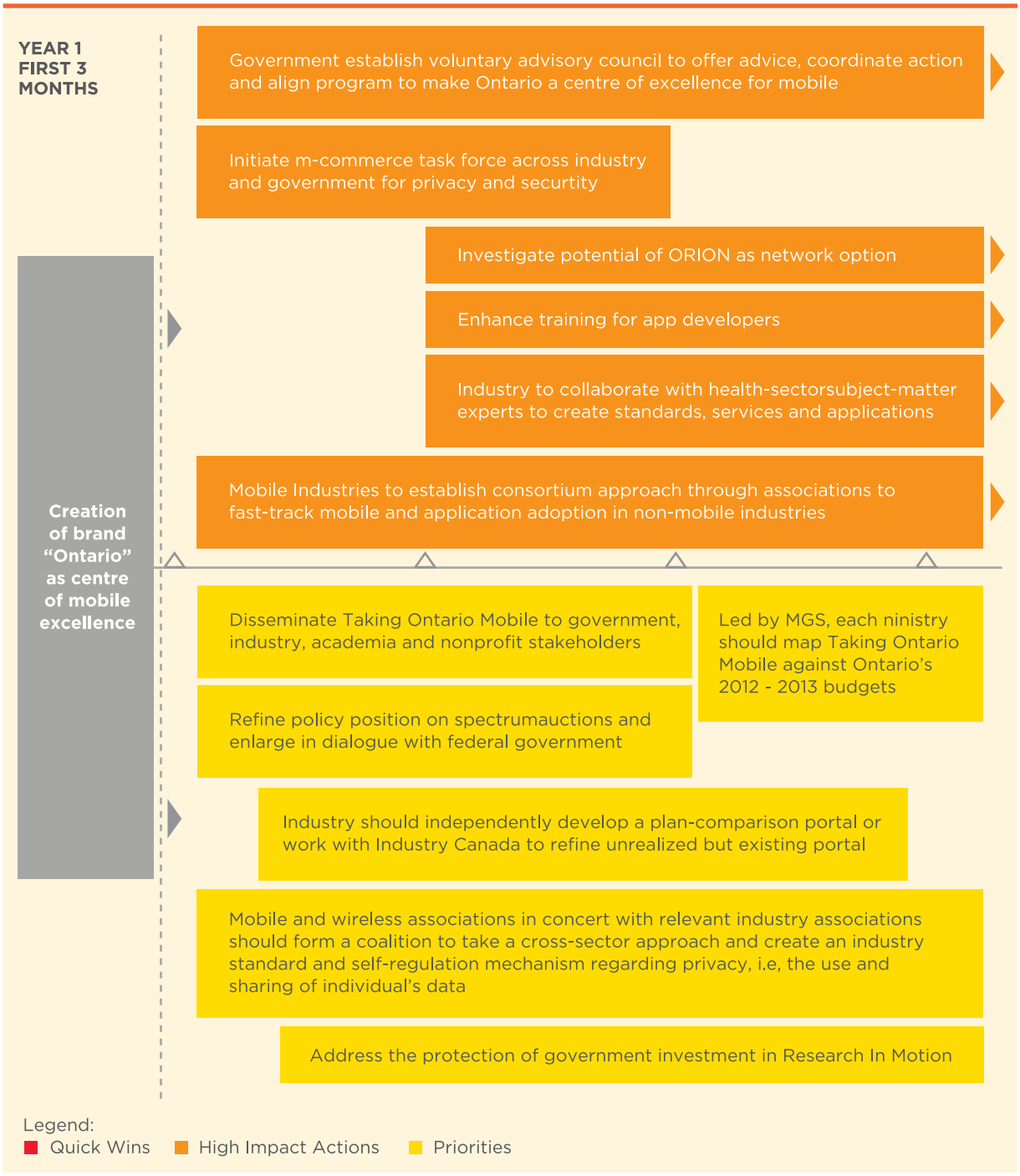


**Figure 44:** First 6 months of action

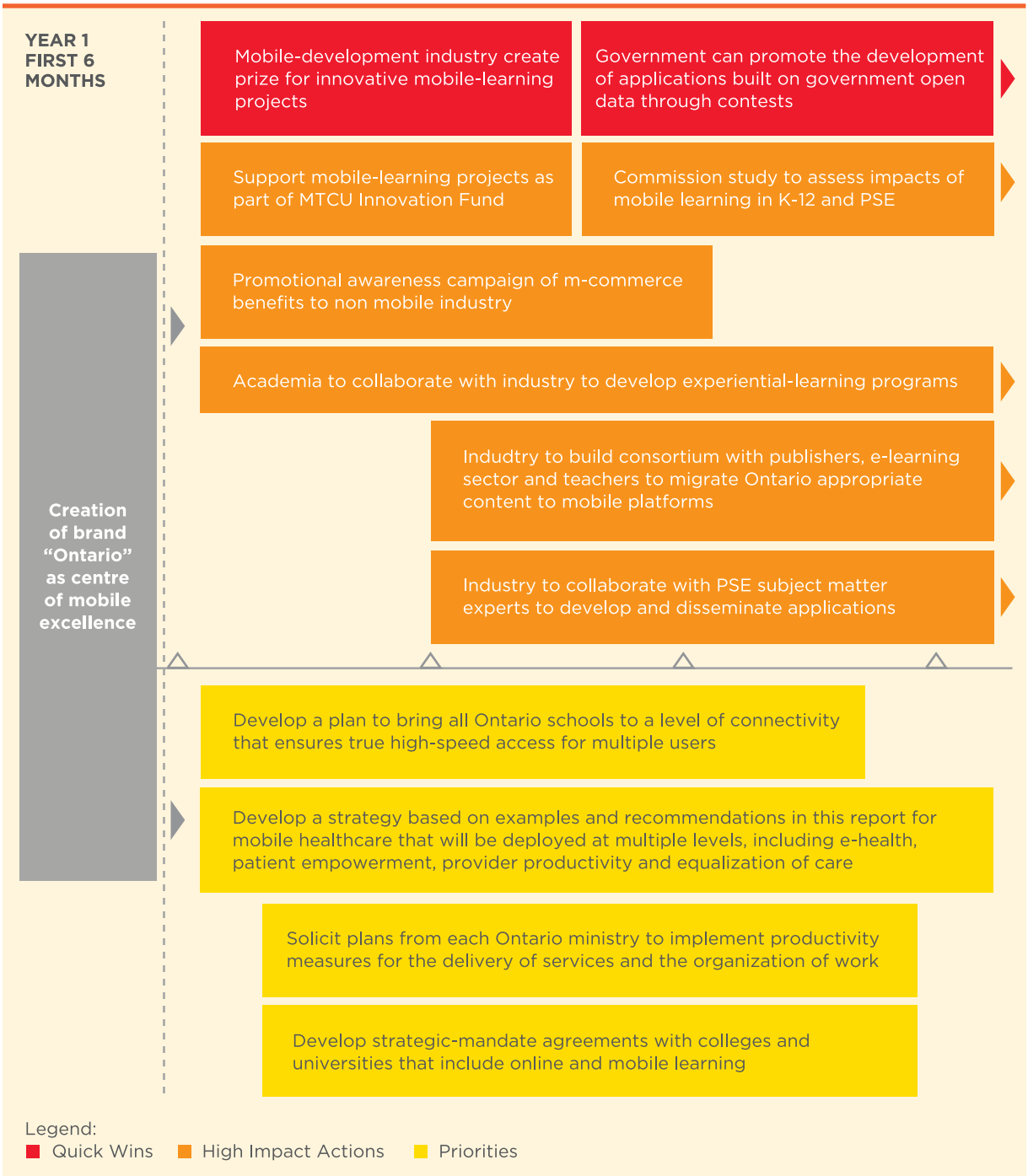


**Figure 45:** First year of action

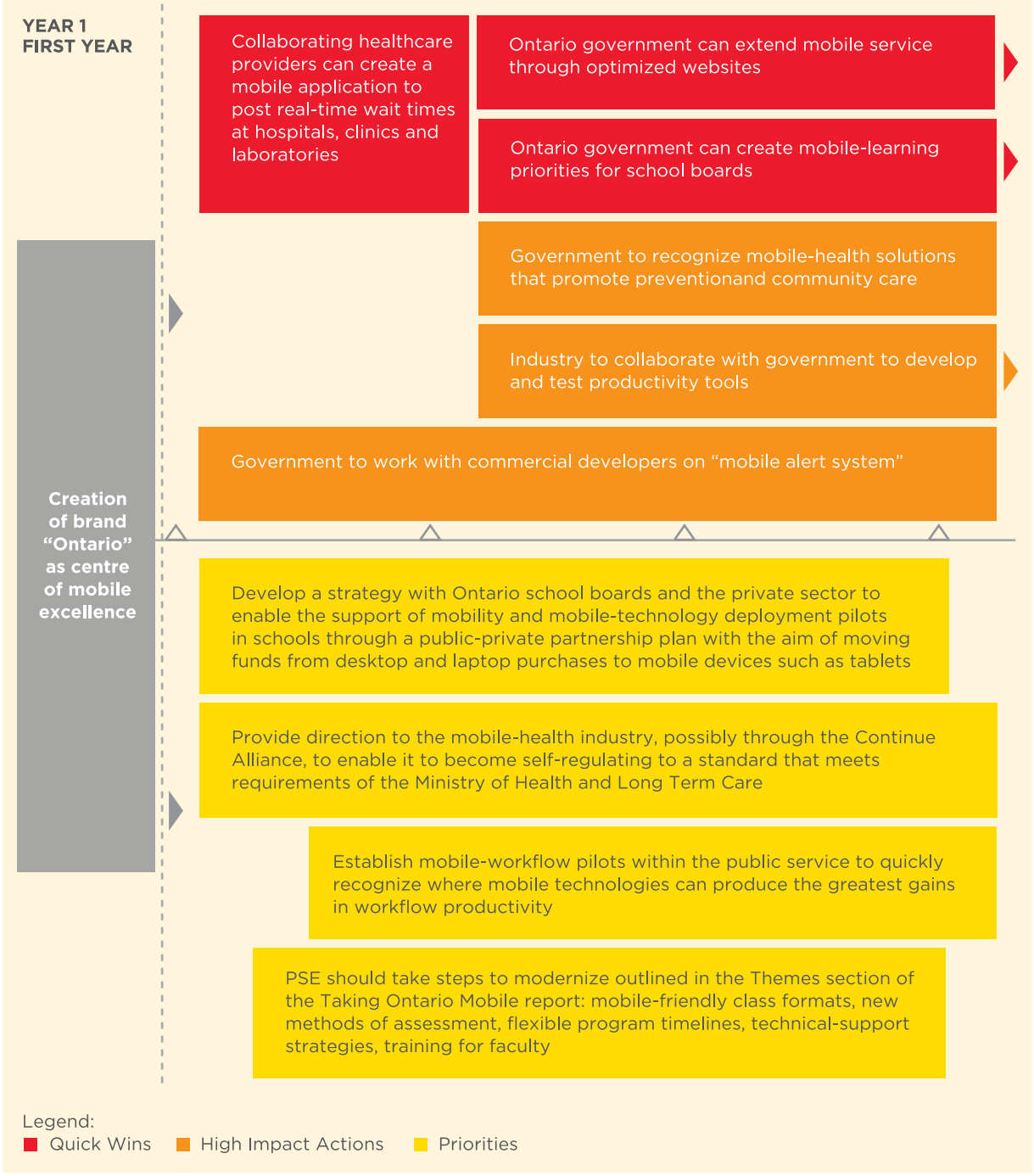


**Figure 46:** Years 2 & 3 of action

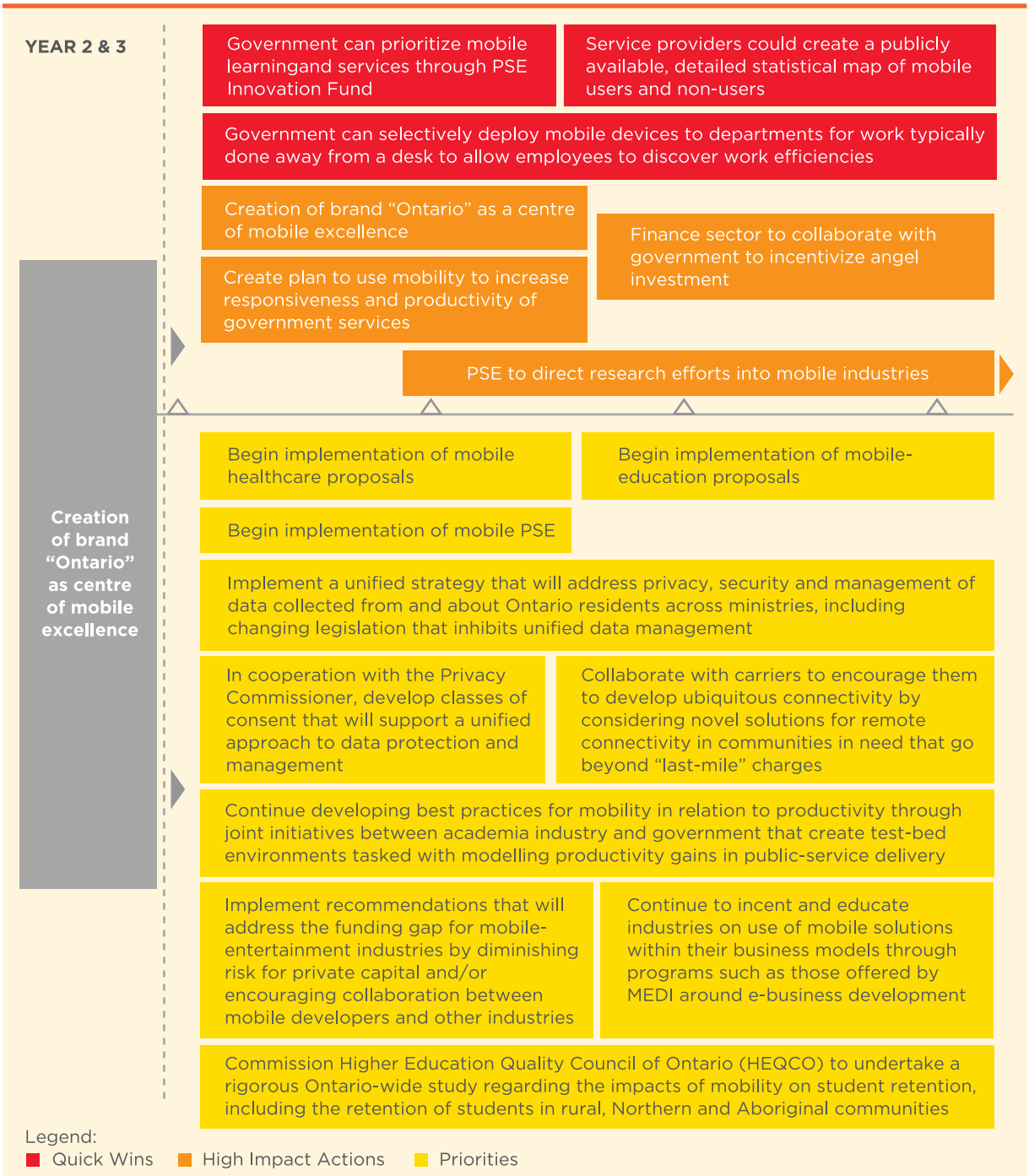


**Figure 47:** Years 4 & 5 of action

## **Table 10:** Theme Actions and Leads

| Themes | | Private Sector | Academia | |
|---|---|---|---|---|
| | | | K-12 | PSE |
| Provincial Government establish voluntary advisory council to offer advice, coordinate action and align programs to make Ontario a centre of excellence for mobile | **1. Create Ontario Mobile Policy** | | | |
| | **2. Infrastructure** | Service providers could create a publically available detailed statistical map of mobile users and non-users | | |
| | **3. Privacy** | Initiate M-Commerce task force across industry and Govt for privacy & security | | Enhance train app develope |
| | **4. Health** | Industry to collaborate with health sector subject matter experts to create standards, services and applications | | |
| | **5. K-12** | Industry to build consortium with publishers, e-learning sector and teachers to migrate Ontario appropriate content to mobile platforms | | |
| | **6. PSE** | Industry to collaborate with PSE subject matter experts to develop and disseminate applications | | Mobile development industry for innovative mobile learning |
| | **7. Government** | Industry to collaborate with Government to develop and test productivity tools | | |
| | **8. Non-Mobile** | Mobile industries to establish consortium approach through associations to fast-track mobile and application adoption in non-mobile industries | | Academia to collaborate w to develop ex learning progr |
| | **9. Job Development** | Finance sector to collaborate with Govt to incentivize angel investment | | PSE to direct efforts into m industries |
| | **10. Citizens** | | | |

☐ Quick Wins ☐ High Impact Actions

| | Government | | | Citizens |
|---|---|---|---|---|
| | Federal | Ontario | Municipal | |
| | | Establish Working Group of Industry and Government to Create Policy | | "Buy Local" |
| | | Investigate potential of ORION as network option | | |
| ing for rs | | | | Become informed about mobile security<br><br>Download Amber Alert |
| | Government to recognize mobile health solutions that promote prevention and community care | | | Utilize apps such as health monitoring systems |
| | | Collaborating health care providers can create a mobile application to post real-time wait times at hospitals, clinics and laboratories | | Utilize mPayment |
| | | Ontario government can create mobile learning priorities for school boards | | Donate used smartphones & tablets to schools |
| create prize projects | | Support mobile learning projects as part of MTCU Innovation Fund<br><br>Ontario government can prioritize mobile learning and services through PSE Innovation Fund<br><br>Commission study to assess impacts of mobile learning in K-12 and PSE | | |
| | Create plan to use mobility to increase responsiveness and productivity of Government Services | | | |
| | | The Ontario government can promote the development of applications built on government open data through contests<br><br>The Ontario government can selectively deploy mobile devices to departments for work typically done away from a desk to allow employees to discover work | | |
| ith industry periential rams | | Promotional awareness campaign of M-commerce benefits to non mobile industry<br><br>Ontario government can extend mobile service through optimized web sites | | |
| research obile | | Creation of brand 'Ontario' as a centre of Mobile excellence | | |
| | Government to work with commercial developers on 'Mobile Alert System' | | | |

## 12.1 Timeline Commentary

The first year will focus on actions by industry, academia, and government that will build a scaffold for the ongoing implementation of mobile services. Of overarching importance is the need to align the actions under a common vision–that of 'Ontario' as a centre of mobile excellence. Ontario must create a voluntary advisory council to lead this process. There are some immediate high impact actions, such as investigating the potential of ORION as a network option, able to work with private and public sector partners and galvanize disparate parties. The recognition of the importance of mobility will be compounded when tangible benefits are delivered through quick wins, such as hospitals producing mobile apps with real time wait times at clinics, hospitals and laboratories.

The first year of the plan should end with actions to implement mobile strategies across sectors that are under the direction of the government. Within education there should be direction to boards for funding of mobile technologies as well as continued efforts to equalize access to high speed connections across all schools. Within healthcare the transformation and delivery of health services using the mobile channel should be underway starting with simple changes such as location aware services and transition of e-health services to include mobile platforms. Industry-led standards for mobile health should be under development with consultation with government. Within the Ontario Public Service, pilot projects for mobile technology within workflow should be moving towards implementation of projects that bring greatest efficiency and productivity gains.

Priority actions for the second phase of mobile implementation should focus on planning solutions for data management as well as streamlining of processes for consent. By year two the creation of mobile digital portals that link residents and government should be underway. By year two there should be actions to improve access for remote and underserved populations; and the stimulation of mobile industries. With a more integrated collaboration between industry and government across a range of sectors we would expect to see actions such as incentives for angel investment helping to implement and communicate the notion that Ontario is becoming a centre of mobile excellence.

By the end of three years, there should be solutions in place for data management, security and privacy. These solutions should be developed and deployed in tandem with expanded health, education and PSE services. This period will also have seen expansion of mobile applications by industry to improve productivity.

With scaffolding and data management strategies in place or underway the third phase of implementation of mobile strategies can have a broader focus and wider participation. Priority in this phase should be on strategies and actions that: facilitate knowledge-building across sectors in use of mobile technologies, support mobile industries through procurement strategies and access to data, provide mobile services to residents and promote consumer confidence in mobile payment.

These actions over the course of five years will provide strong support and impetus for the uptake

and implementation of mobile solutions across multiple sectors as well as provide stimulus for mobile industries. These priority actions are organised to provide appropriate supports, resolution of barriers and models for implementation of mobile strategies. It is anticipated that these actions will produce a domino effect that will spur on uptake of mobile solutions and implementation of mobile services across sectors and industries in Ontario.


1.3

# Areas for Further Study

*Taking Ontario Mobile* brings forward a number of areas that would benefit from further investigation. We recommend that the following work be undertaken to inform decisions around investment in mobile technologies and infrastructure:

- We strongly recommend that the Ontario public service commission an efficient study on a strategy for open data to assist the Ministry of Government Services in designing and implementing its open-data strategy.
- Higher Education Quality Council of Ontario (HEQCO) should be commissioned to undertake a rigorous longitudinal Ontario-wide study regarding the impacts of mobile learning on student retention, including the retention of students in rural, Northern and Aboriginal communities.
- It will be fruitful to develop further economic analyses for the implementation of mobile in specific sectors, along with correlative economic analyses for the failure to implement. These analyses should include the economic benefit of the greater inclusion of diverse regions and individuals that may be supported by mobile technology investments.
- The Ontario public service should develop a task force representing private and public interests to determine how privacy legislation can be aligned with the capacity of and demand for digitally mediated services and information.

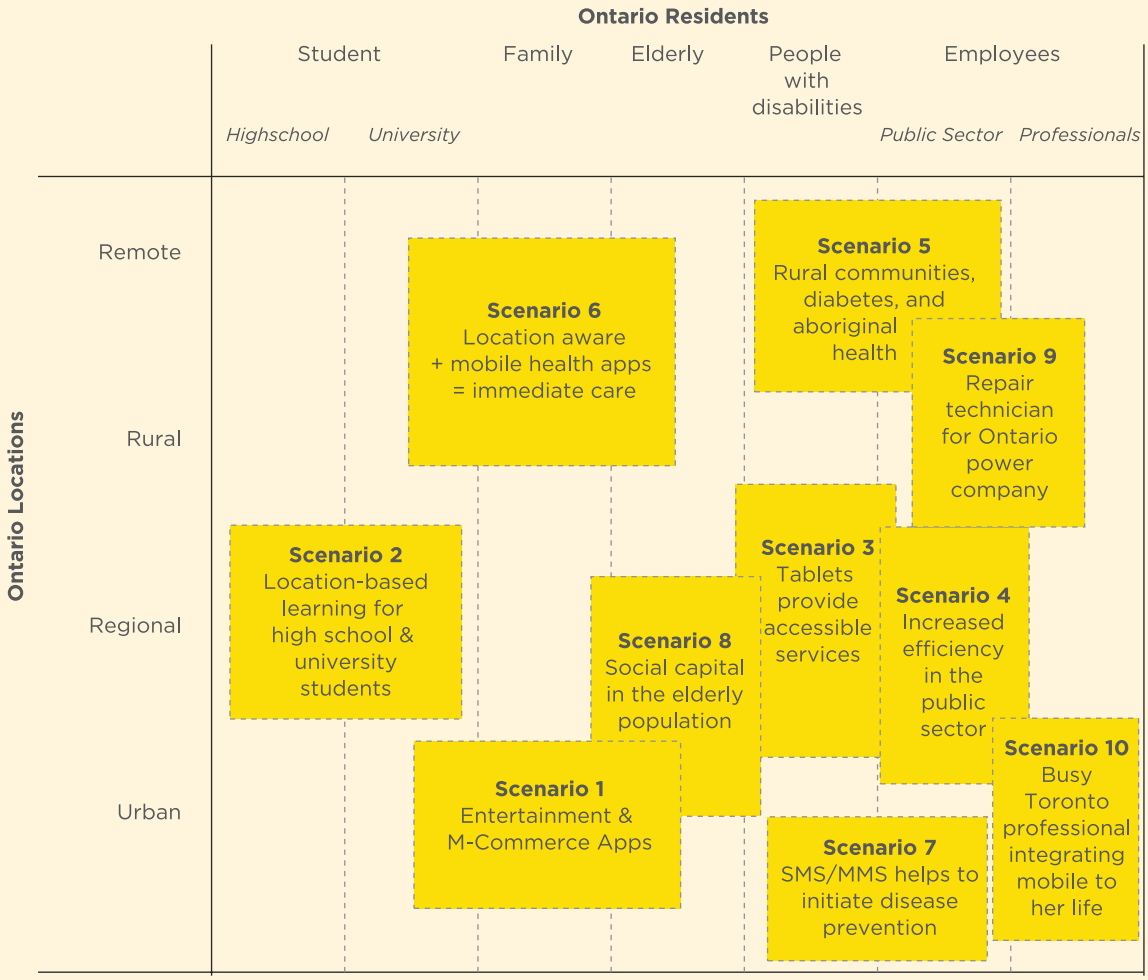

14

# 4 Mobile Ontario Scenarios

The following scenarios provide a glimpse of how mobility could help to transform the lives of Ontario residents in positive ways.

The following map demonstrates how the scenarios have been developed to show how mobile will affect residents across Ontario.

**Figure 48:** Scenario Map for impact on Ontario residents



## 14.1 Scenario 1: Entertainment and M-commerce Apps Assist with Quality of Life for a Suburban Family

Each morning, Sunil, like many Ontarians, looks at his smartphone before he looks at himself in the mirror. A quick glance at his calendar reminds him that he and Connie have tickets for the theatre—"better shave," thinks Sunil. Downstairs, he joins the morning bustle of his household, and after his 11-year-old fails three times to hear him speak, Sunil walks over and removes the tablet Josh is holding. Having gained Josh's attention, Sunil asks him to get dressed for school. With a rolling of his eyes and a loud sigh, Josh reluctantly heads to his room, calling to anyone who will listen, "I get the tablet when I come back!"

Connie is already looking a bit frazzled as she juggles making breakfast for eight-year-old Jasmine and demands from two-year-old AJ to get picked up. Given her busy working life, she has planned their breakfast and made their lunches with Sunil's help, using a shopping app to plan meals. The app also provides nutritional content and provides engaging stories about the food's local origins. On the weekend, Connie and Sunil used the apps via Wi-Fi while shopping in-store, although they often use the app to place orders from their devices. The app is tied to their grocery store's inventory, so the food is always fresh. Sunil successfully distracts AJ by handing the toddler his mobile phone with a preschool app open. AJ doesn't seem to know he can't move the puzzle pieces if his fingers are touching the screen elsewhere, but seems content with his random ability to move the pieces anyway.

Jasmine has already retrieved the discarded tablet and is engrossed in a copy of *Hardly* magazine: "Wow, they can surf in BC—that would be so cool!" Sunil wonders if Jasmine is growing up too fast, but is glad she is interested in articles that are not about Justin Bieber. Before Sunil can respond, Josh has returned with his hair still a mess, demanding that Jasmine give the tablet back. Sunil turns and walks away. This is a battle for the kids to sort out first.

Finally, each of the kids is fed and Sunil delivers them to their destinations for the day before driving to work; he uses his Bluetooth to catch up on the day ahead with his assistant. Connie hops on the GO train after waving her smartphone in front of a tap-and-go reader. When she arrives at Union Station in Toronto, she heads over to her favourite coffee shop and uses her phone to pay for her non-fat, lactose-free Irish cream coffee. Before heading out to the street, Connie opens the Rocket Radar smartphone app. The app makes use of Toronto Transit Commission's open-data tools to tell her when the next streetcar is coming; it also helps her optimize her route and uses Metrolinx's open application programming interface to build the most economical fare plan for her journey. With a touch of her finger, she purchases a day pass just before hopping on the streetcar. Connie shows her phone pass to the driver and begins her travels through the city.

Connie pauses on her way to the office to scan a QR code on a billboard, which gives her the schedule and information for a city arts festival taking place next weekend. In the office, Connie begins her review of applications for funding by gaming entrepreneurs who are collaborating with educational

or cultural content organizations to develop new ways to deliver Ontario content to a wider audience. One application that grabs her interest is for a history app that would use GPS information to serve up related archival images and data. It is an alternate world inhabited by animals from the neighbourhood's past. Children search for clues while competing with other teams in order to save a magic dog with a hurt paw that is trapped in a virtual building in the radius of their play area. As they navigate the neighbourhood, checking their smartphones, they receive clues to the whereabouts of the creature. Characters jump out at them and they can hear the dog barking in the distance. They piece fragments of a puzzle together to create a magic collar and set about freeing the pup. Connie can imagine the app crossing over from learning to entertainment. She begins to run through her scoring table for the application and moves on.

That night, at the theatre, Sunil sets his phone to silent mode and wears his headset. As part of the Accessibility for Ontarians with Disabilities Act, this theatre has developed a system that utilizes Bluetooth technology to send audio and visual descriptions to enabled personal devices. Sunil has a slight hearing impairment but is able to tune in and turn up the volume on his phone so that he can fully access the performance.

At intermission, the theatre encourages audience members to answer a survey via their mobile devices. The survey enables the theatre to collect important information about their audience and to gather contact information so it can send out promotional information and even solicit donations to its Kidzart program. Sunil, a captive audience with a desire to provide feedback, participates.

Finally home again, Sunil and Connie spend a few minutes reviewing the evening news on their tablets, plug in their phones and go to bed.

## 14.2 Scenario 2: Mobile Phones Provide Location-Based Learning for High School and University Students

Dusty McCain is enthusiastic about the use of mobile devices in his Sudbury Grade 11 classroom, as almost all his students carry devices they use frequently during the day and charge each night. As such, his school board has encouraged more field trips outside of the classroom that make use of mobile devices to supplement what the students see in their travels. Today's field trip is to a nickel mine. When the students arrive at the mine site, they're able to point their mobile phones at the different buildings on the site and receive additional information through augmented-reality software that tells them the purpose of the buildings and what is found inside each one. As the students travel down the mineshaft elevator in small groups, their access to GPS data is interrupted because they are underground. However, they observe signs on the elevator and in the underground tunnels that have large QR codes on them. By pointing at the QR codes with their mobile phones, they are able to access the names and definitions for each piece of machinery they see. As they move through the tunnels, the students take pictures of seams of rock for later discussion and analysis. The entire class is able to pool the videos and photographs they have taken, label them with simple-to-use software, and post them to a blog so other

students can read about and comment on their field trip. One of Dusty's students, Selena, is interested in the engineering history of the mines their relationship to urban and environmental engineering in Sudbury. She uses her mobile device to create an engaging, annotated, location-aware video. Selena graduates a year and a half later and enters a university program in Environmental Engineering.

Selena introduces her professor to Dusty and they agree it would be exciting if the Grade 11 students could interact with Selena's university class, even though they are in different cities. They decide to document and compare pollutants in relation to traffic patterns at a selection of major intersections in their respective downtown cores at a specific time of day. Teams of high school and university students are twinned. The teams of students go to different intersections and, at precisely 11 a. m. , start to collect data. Using a tablet computer, each team films its assigned intersection for 15 minutes. While the filming is taking place, sensors in a mobile device attached to the student's belt record levels of key pollutants at that intersection. Other information, such as the weather at the time of filming, is automatically downloaded from the Internet and attached to the other data. When finished, the teams upload their videos and sensor data to a cloud-based collaborative-learning application. The teams collaborate in analyzing the data, creating visualizations of each city and drawing conclusions. Two days later, students dispersed between the Environmental Engineering classroom, their homes and the Sudbury classroom use live web-conferencing software. Students who miss the discussion are able to review the recording of it at a later date, and add their comments. Not surprisingly, a number of the high school students follow in Selena's path and enroll in the engineering program several years later.

## 14.3 Scenario 3: Tablets Provide Accessible Services

Sandra Dowel, a young woman with a hearing impairment, logs into Service Ontario to renew her driver's license and health card, and to change her address after getting married. Previously, Service Ontario would have had to ensure that someone who knew sign language was on the premises, and Sandra would have had to be there in person. Sandra's request is answered on a tablet computer by Kuan-Yin, an employee who has been working at Service Ontario for more than 10 years. Using an interface that adapts to her functional needs (she requires alternatives to audio), Sandra is able to select the appropriate services she needs by indicating her accessibility needs; she does not have to identify as having a disability. To communicate in real time with Sandra, Kuan-Yin uses a real-time text-based application for individuals who prefer text-based communication rather than verbal communication; it connects Kuan-Yin's work computer to Sandra's tablet and allows her to dialogue with the young woman and to answer a few questions about the required forms. Before long, Sandra has successfully communicated her needs, saved several hours of transit and line-ups, and avoided potentially frustrating communication barriers and feelings of alienation.

The use of tablets has allowed for seamless communication between the general public and the Ontario government. One of the most important and valuable skills Kuan-Yin requires is the ability to adopt different communication styles when interacting with the general public. In the past, it has been difficult to respond to people with diverse access requirements due to hardware limitations (e. g. , small

screens or broken speakers), environmental factors (e. g. , noisy environments), disability or languages barriers. As a result of this new technology, Kuan-Yin has experienced greater efficiency in her job performance as well as improved job satisfaction. She has received verbal and non-verbal feedback indicating satisfaction among Service Ontario customers, particularly those that have hearing, vision, physical or language barriers associated with accessibility challenges.

## 14.4 Scenario 4: Increased Efficiency in the Public Sector

Ajeet Vankwani is a manager in the Ministry of Community and Social Services who works for the Family Responsibility Office (FRO). The FRO enforces child and domestic court-ordered support payments, which are automatically registered. His work entails coordinating enforcement actions against individuals who fail to pay child support, which involves following up with individuals in arrears before action is taken. Ajeet and his team are involved in a pilot project in which they work outside their office for three days of the week, saving transportation and energy costs. This project is being undertaken across all Ontario ministries as the Ontario government seeks better efficiency, energy savings and heightened productivity from its employees.

Ajeet and his team can access the needed databases of payees, banks, credit bureaus, property records and licenses through their mobile devices (tablets and smartphones), and use their devices to document materials needed for cases and undertake videoconferencing. They can access their offices as needed for face-to-face meeting or court proceedings, but much of their work takes place with electronic records. The use of mobile communication adds an additional level of security to their work, through location-based monitoring and enhanced emergency support if needed. The Ontario and federal governments have created a federated identity available on mobile devices that creates significant efficiencies for individuals and also provides a valuable tool for the FRO. Location-based information helps Ajeet and his coworkers find individuals. When they need to take enforcement actions, they are able to access passports, identity cards, driver's licenses and pilot's licenses.

## 14.5 Scenario 5: Rural Communities, Diabetes and Aboriginal health

Martha Cheechoo is a community health worker specializing in chronic disease management; her current work is with a First Nations community in a remote part of Northern Ontario. Diabetes in this community occurs at higher than provincial average rates, and Martha has been searching for tools that will help the community monitor and prevent this condition. Although the community is only accessible by plane or boat, it does have broadband and mobile communications, thanks to some important government initiatives that provide links Canada's remote communities. In her research, Martha learned about an inexpensive project created by Dr. Josh Nesbit at Stanford University, which facilitates community healthcare in Malawi using an SMS network. Martha received the step-by-step guide from Dr. Nesbit and worked with members of her community health team and the hospital that serves her community to develop a similar action for diabetes care. The new SMS health network enables the team at the community health team's office—eight hours away—to receive and monitor ongoing

information about vitals such as blood-glucose levels, and to send patients reminders about self-monitoring. The team is also able to provide information about maintenance, and tips for controlling the condition through diet. In addition, Martha uses the system to let patients know about support-group meetings, and to coordinate patient care before monthly visits from the doctor. The ease of the system and the improved contact has helped Martha's community receive better care and has led to improved outcomes—all in the comfort of the patients' own homes and community.

Peter is a 16-year-old student living in the community. He is one of four children and lives with his parents and aging grandmother. His father works for a mining company, while his mother stays at home to care for his younger siblings and his grandmother. Peter was diagnosed with diabetes three years ago and manages his blood sugar with insulin. He has an after-school job, at which he earns minimum wage. As a result of their remote location, Peter's family does not own a home computer or have access to the Internet. Peter does have the opportunity to use the Internet at school, but there is usually a time limit and the connection can be slow. Recently, Peter purchased a smartphone and signed up for a prepaid data plan using the money he saved from his job and a contribution from his family. Peter now has access to the Internet via a 3G wireless connection. He receives SMS information from Martha Cheechoo's program and has signed up for a games-based mobile app that reminds him when to take his insulin and rewards him with game points when he is timely. His health has improved.

During a recent information session with Martha Cheechoo, Peter's class was provided with an overview of useful websites for health, employment and youth-networking resources. With his smartphone, Peter was able to explore the web resources at his own pace and sign up for emails and newsletters about the health and employment topics of his choice. Peter was able to join social-media sites and form networks with family and friends in other cities and towns. As a person with diabetes, he has used these services to connect with a broader diabetic community within his remote town and beyond; this has helped him cope with his illness and connect with teenagers in similar situations. His experience and new network have encouraged him to think about the possibility of a future career in health services, health communication or engineering.

## 14.6 Scenario 6: Location-Aware + Mobile Health Apps = Immediate Care

Mai is enjoying a ski vacation at a ski resort in Northern Ontario when she has an accident on the hill. Though the injury appears minor, the ski patrollers who attend to her on the hill notice that a relatively small scratch will not stop bleeding. Thinking there may be more at play, the patrollers take a peripheral blood smear and stain it for mobile imaging. Images of the smear are recorded by a smartphone 2G microscope equipped with a one-millimetre ball lens. These results are then transmitted to the emergency doctors at the local hospital, who review the images and confirm that although the sample appears somewhat abnormal, the patrollers should follow regular procedures to stop the bleeding. At the same time, the doctors instantaneously send the results to Dr. Patel, Mai's physician. He receives the alert on his tablet, checks a recent set of tests that have been stored there, and is able

to confirm that Mai does not have a blood condition.

A few days later, Dominic, one of the ski patrollers, is visiting friends in Cornwall. At lunch one day, he bites on something hard. Thinking he might have broken his tooth, he uses his mobile phone to find a local dental clinic. Through his phone's GPS, Dominic accesses his geolocation service, which identifies his location and the nearest dental clinics. The service then culls the data from real-time booking services to check for clinics' working hours. Dominic selects a suitable appointment time and books an appointment. He then receives driving directions and real-time traffic information that route him to the clinic.

## 14.7 Scenario 7: SMS/MMS Mobile (and Successor Technology) Helps to Initiate Disease Prevention

Paul, who is from Huntsville, had recently been hospitalized for mental illness. Prior to his hospitalization, he had been feeling really down but hadn't recognized that his mood had shifted dramatically. Paul's wife, Audrey, had been concerned about Paul and had begun to access information about depression from some health websites; she had even downloaded some literature on the subject to her mobile phone's e-reader app.

When Paul went into crisis, Audrey used a downloaded crisis-response guide to work with Paul and help him recognize his need to go to the hospital. At the hospital, Paul was asked to provide his Ontario Health Card, which is part of the new Ontario unified identity card and the Mobile Ontario Government Online (MOGO) program. By showing his health card and other important data via his mobile phone, Paul was seen by the emergency doctor after only a short wait and assessed. The doctor used her tablet to take notes during her assessment, and her records were transferred wirelessly to Paul's MOGO account. In trying to select appropriate medication to help Paul, the doctor was notified via MOGO that medication Paul was required to take for a chronic condition would interact with the serotonin-specific reuptake inhibitor she had been considering. The doctor selected an alternate medication, and the prescription was sent to Paul's phone. At the drugstore, Paul used his phone to submit his prescription and initialize a claim to his company's benefits carrier. Paul was also referred to a Toronto rehab institute for two months of weekly outpatient treatment.

Now Paul has completed his therapy and gone back to his daily life: living in Huntsville with his wife and family and going about his normal work life. Before his treatment had ended, Paul was provided with a number of tools to help him manage his condition and keep in contact with his clinician. Things seemed to be going well and Paul has made several changes to help maintain his greater emotional stability. He uses his relaxation-training phone application whenever and wherever he needs it and attends a support group via the Internet. He has even started using an app that his wife downloaded on her own smartphone to help her improve her fitness levels by training for a marathon—she was already up to 7K after just a month or so!

Last weekend, Paul used his phone to trigger a crisis response. His response immediately text messaged his clinician and a designated friend; both were able to contact Paul and de-escalate a serious episode. While waiting for help, Paul also worked with a crisis-management app on his phone that guided him through some coping techniques he had learned at the rehab institute. The episode resolved with a short visit to an emergency room, rather than an extended relapse in a mental-health facility. Within hours, Paul was back at home with his family.

## 14.8 Scenario 8: Social Capital in the Elderly Population

Mr. Galiano is a 78-year-old man living alone in a small apartment in an urban area. He lives with a hearing impairment and chronic arthritis, and requires mobility aids like walkers and canes. He takes regularly scheduled medications for blood pressure, cholesterol and pain management. He has weekly visits from his daughter, son-in-law and their two children; his daughter worries about his safety and wishes she could visit him more often. Otherwise, Mr. Galiano does not do much socializing. For Christmas, Mr. Galiano's daughter presented him with a tablet and spent several weekend visits showing him how to use it to access various resources. After a few weeks of practice, Mr. Galiano now turns on his tablet each day to access information such as general news, schedules for local senior-group and interest-group meetings, and emails to and from his family. This is especially useful because Mr. Galiano lives in what is referred to as a naturally occurring retirement community (NORC), which houses various residential buildings for seniors as well as resources such as grocery stores, senior community centres, pharmacies and multidisciplinary aging programs. He uses his tablet to receive reminder emails from his daughter related to doctor appointments and medications, and has established a routine of checking in each morning and evening with his daughter to let her know he is safe. He has also learned to use the video-chat function with a headset, and can now communicate with out-of-town family members. All of Mr. Galiano's increased communication has led to his improved socialization and fewer instances of him feeling isolated—two outcomes that have been proved to be assets for aging individuals.

Sometimes, Mr. Galiano attends a healthy-aging program that provides monthly how-to sessions for the use of mobile devices at his local community centre, where he learns about new mobile services. Mr. Galiano now socializes, tells stories, provides advice and engages with his larger community online. His tablet experience and knowledge was easily transferred to the smartphone that has replaced his worn-out feature phone. His devices have helped him reconnect with some of the war-veteran friends with whom he had lost touch. He now hosts a potluck and card-game event at his apartment every month, inviting new friends that live right in his apartment building. He has signed up for FourSquare and his family can track his whereabouts. His health is improving and he is less dependent on government and health resources.

## 14.9 Scenario 9: A Repair Technician Uses a Smartphone to Find Out More about the Transformer She Is Trying to Fix

Jameela is a highly trained repair technician for Ontario Power Generation. Today, her assignment is to climb to the top of a newly installed windmill to fix a problem generator. This particular generator is operating at only 30 per cent capacity; built-in analytics have indicated that a particular component is about to fail. It is Jameela's job to remove the component and replace it with another one. This involves several hours of taking apart the generator to get at the component in question. In the past, Jameela would consult the large manual to familiarize herself with the generator at each stage of disassembly. Today, however, she has the complete set of manuals for this generator on her smartphone, and is able to point her camera at specific parts to receive animated instructions. Nevertheless, all does not go as planned. In the course of disassembly, Jameela discovers an extra wire that is not in the manual; apparently, this has been added at the factory without the manual being updated. This does not slow her down very much, however, because she is able to phone the manufacturer directly, take a picture of the part in question and ask a support technician about the discrepancy between what she is seeing and what is in the manual. The support technician quickly sends an updated version of the manual to her smartphone. The entire exchange is logged by the phone and will be archived in the company's database in case another repair technician runs into the same problem. This form of performance support is also a kind of mobile learning: the next time this situation happens, Jameela will know where to go for the answer.

## 14.10 Scenario 10: A Busy Mother in Toronto Finds Mobility Integrated into Media and Her Everyday Life

Nadia is a busy urban professional with two elementary-aged children. This morning, she is awoken by her smartphone alarm, and her "personal assistant" application tells her the weather—it will rain, so she will need her white coat today. While in the car on the way to drop the kids at school, Nadia hears an advertisement on the radio for special offers at her local grocery store—but only for registered applicants. When Nadia gets to work, she logs on to the grocery website and registers to receive the special offers, but selects only the three categories that are of interest to her. At lunchtime, Nadia passes her favourite seafood restaurant chain and notices a digital billboard in the front window. She clicks the 2-D barcode and notices a "free entrée" offer for those who make reservations before 2 p. m. She books a table for tonight. On her way home, she goes to the grocery store; on entering, she receives a welcome message on her smartphone. As it is her first visit since registering online, all her purchases today will receive double points—all she needs to do is scan the barcode at the cash. She notes that she receives a similar coupon every time she shares the coupon with friends on her social network.

When Nadia arrives home, she sees a program on her digital television about a new hybrid car. The show prompts her to download an app for her smartphone, which also contains a link to her local dealer that allows her to arrange a test drive. Nadia's appointment is confirmed on her way to dinner, and when she is seated at her table, the waiter brings over a tablet computer that contains the menu

and the wine list, and allows Nadia to connect the wines to the menu items and see a short video from a leading sommelier about the wine she chooses.


1.5

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Appen

# dices

# 16. Glossary

| | |
|---|---|
| **1G** | The first generation of wireless telephone technology. This analog technology, available in the 1970s, transmitted voice only. |
| **2G** | The second generation of wireless telephone technology, which was easily distinguished from the 1G system by the fact that it was digital. First launched at the end of the 1980s, this digital system was used to encrypt voice conversations and enabled the sending of the first SMS messages. |
| **3G** | First launched at the beginning of the new century, 3G technology refers to a system capable of speeds up to one megabyte (MB) per second, enabling systems to transmit voice, SMS, email, Internet, video calls and mobile TV. More recent upgrades have been dubbed 3.5G and 3.75G, and provide faster mobile Internet connections, support to smartphones and mobile Internet access for laptops (through tethering). The technology first became available in Canada in 2005. |
| **4G** | 4G wireless technology has been difficult to define. Data speeds range from 100 Mbps (in a moving vehicle) to up to one GB. This technology became available in Canada in the summer of 2011 when Rogers launched its 4G wireless modem in Ottawa; this service was extended in fall 2011 to Toronto, Montreal and Vancouver. |
| **ALC** | Alternate level of care is a designation for patients in hospital care who no longer require the intensity of services in that clinical setting and require transfer to another care setting such as a nursing home. |
| **analogue television** | Video programming that is transmitted using AM and FM signals or radio technology. |
| **AODA** | Accessibility for Ontarians with Disabilities Act. |
| **API** | Application programming interface is a series of tools and protocols that enable development of software. |
| **app** | Common short-form of application and usually refers to software for mobile devices. |
| **ARPU** | Average revenue per user is a measurement for communications. |
| **augmented reality** | The layering of the real environment with computer generated environments for example viewing an historical site with a camera and having the image include computer generated details correct to an earlier historical period such as a horse-drawn carriage. |
| **AWS** | Advanced wireless services refer to the frequency of wireless spectrum used to transmit mobile and data services such as voice, messaging and video. |
| **BANs** | Body area networks refer to wearable technologies, computing or sensors. |
| **Bill 5** | An Act to provide transparency and protection for consumers of wireless telephone services, smart phone services and data services in Ontario. |
| **bill-to-carrier wallet** | Refers to mobile payments made from accounts with one's mobile services provider. |
| **blended learning** | Use of technologies and traditional teaching methods. |
| **blog** | A web log that documents areas of personal interest. |
| **Bluetooth** | A wireless technology designed to replace cables between communication devices. Its range is 10 metres. |

| | |
|---|---|
| **broadband** | High bandwidth communication signals. |
| **CDMA** | Code division multiple access enables transmission of more than one communication transmission on the same frequency. |
| **CFI** | Canada Foundation for Innovation. |
| **chronic care** | Treatment for a disease that lasts longer than three months. |
| **CIMA** | Canadian Independent Music Association. |
| **cloud** | Web-based computing particularly storage of information and application on external servers. |
| **CODE** | Council of Ontario Directors of Education. |
| **Connectivity** | Ability to access mobile and wired signals for telecommunications or web-based interactions. |
| **contactless smart cards** | Cards containing an embedded chip that communicates with a card reader via radio-frequency identification technology. Their range is 10 centimeters. |
| **context-aware services** | Applications that make use of GPS information to provide information relevant to one's location (e.g. Nearest public washroom or nearest coffee shop). |
| **convergence** | The integration of multiple technologies onto one device (e.g. Web browser, phone and camera are typically built into "smart phones"). |
| **CRC** | Canada Research Chair. |
| **CRM** | Customer relationship management. |
| **CRTC** | Canadian Radio-Television and Telecommunications Commission. |
| **curriculum documents (Ministry of Education)** | Documents that define what children are taught in Ontario public schools. They detail the knowledge and skills that students are expected to develop in each subject at each grade level. By developing and publishing curriculum documents for use by all Ontario teachers, the Ministry of Education sets Standards for the entire province. |
| **data** | As a mobile service, refers to the ability to access web-based content. |
| **DSL** | Digital subscriber line. |
| **e-government** | Web-based government services. |
| **e-health** | Web-based health care services. |
| **EHR** | Electronic health record. |
| **e-learning** | Web-based learning. |
| **EMR** | Electronic medical record. |
| **ER** | Hospital emergency room. |
| **e-reader** | A device (usually portable) used to display digital texts for reading. |
| **e-service** | Web-based services. |
| **FHT** | Family health team. |

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| **FIPPA** | Freedom of information and privacy protection act. |
| **freemium** | Premium mobile services offered for free as a marketing tool. |
| **G2B services** | Government to business. |
| **G2C services** | Government to citizen. |
| **G2E services** | Government to enterprise. |
| **G2G services** | Government to government. |
| **G2NGO services** | Government to non-governmental organization. |
| **GDP** | Gross domestic product. |
| **geolocation** | Technology that utilizes GPS to determine one's location. |
| **GPS** | Global positioning system. |
| **GSMA** | GSM (global system for mobile communications) Association. |
| **GTA** | Greater-Toronto area. |
| **handset** | Mobile or cellular phone. |
| **HSPA+** | High-speed Packet Access. |
| **HTML5** | Hypertext mark-up language that enables rich media applications. |
| **ICT** | Information and communication technology. |
| **infrared (IrDA)** | A technology developed as a standard for exchange of data over infrared light. Its range is one metre or less with line of sight. |
| **Interoperability** | Ability for different devices to communicate or utilize the same information. |
| **IoT** | Internet of things refers to devices, and everyday objects that are connected to the internet but do not necessarily have a screen. |
| **IP** | Internet protocol. |
| **IPv6** | Internet protocol, version 6. |
| **ISP** | Internet service provider. |
| **IT** | Information technology. |
| **ITAC** | Information Technology Association of Canada. |
| **ITU** | International telecommunications union. |
| **just-in-time** | Provision of information or a service when and where it is needed. |
| **K-12** | Kindergarten through grade 12. |
| **LAN** | See local area network. |

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| **local area network (LAN)** | A computer network that interconnects computers in a limited area such as a home, school, computer laboratory, or office building using network media. |
| **location-based service** | Location-based services are a general class of computer program-level services used to include specific controls for location and time data as control features in computer programs. LBS is used as an entertainment service, which is accessible with mobile devices through the mobile network and which uses information on the geographical position of the mobile device. |
| **LTE** | Long term evolution. |
| **m-commerce** | Mobile sales transactions. |
| **MCTU** | Ministry of Colleges, Training and Universities. |
| **media player** | A device that will play digital information in multiple formats (e.g. Music, video). |
| **MEIC** | Mobile experience innovation centre. |
| **m-entertainment** | Mobile entertainment. |
| **m-finance** | Mobile banking. |
| **m-government** | Mobile government. |
| **m-health** | Mobile health. |
| **m-learning** | Mobile learning. |
| **MMA** | Mobile marketing association. |
| **MMS** | Multimedia messaging service. |
| **mobile banking** | Banking via web-based portable devices. |
| **mobile gaming** | Entertainment on portable devices. |
| **mobile ID** | Secure identification that is carried on one's mobile phone or portable device. |
| **mobile television (mobile TV)** | Television watched on a mobile device. In Canada, Internet service providers (ISPs) are not motivated to sell mobile phones with this feature since users can access broadcasts for free, while those who use the mobile Internet to stream video provide profit for the ISP. For this reason, cell phones with a mobile TV feature are not generally available in North America. |
| **mobile wallet** | Refers to the ability to use a portable device such as a smart phone to make payments and carry information such as legal identification. |
| **mobility** | In the context of T.O.M., mobility refers to the fact that the individual moves through a variety of environments and contexts during the day and will desire or require the same connections to information and services that he/she would experience in a stationary environment such as at a desktop computer. |
| **MOU** | Memorandum of understanding. |
| **Multichannel** | Communications across more than one mode such as television, internet, video or audio. |
| **MVNO** | Mobile virtual network operator is a wireless communications services provider that does not own the radio spectrum or wireless network infrastructure through which it provides services to its customers. |

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| **near-field communication (NFC)** | A technology currently being tested in Canada, with plans to introduce it into smartphones in late 2012. NFC is a wireless technology that can transmit information from one device to another within a range of four centimeters or less, helping to ensure the security of that information. An NFC-enabled smartphone would have the ability to read and write information, thus allowing users to treat their smartphones like mobile wallets. |
| **net neutrality** | A principle that advocates no restrictions by Internet service providers or governments on consumers' access to networks that participate in the Internet. |
| **NFC** | Near-field communications. |
| **NMC** | New media consortium. |
| **NORC** | Naturally occurring retirement community. |
| **NSERC** | National Science and Engineering Research Council. |
| **NSSE** | National Survey of Student Engagement. |
| **OECD** | Organization for Economic Cooperation and Development. |
| **OHIP** | Ontario hospital insurance program. |
| **OMDC** | Ontario Media Development Corporation. |
| **open data** | Sharing of databases with application developers who may be able to utilize the data. |
| **ORF-RE** | Ontario Research Fund-Research Excellence program. |
| **OSSD** | Ontario secondary school diploma. |
| **P2P** | Peer to peer. |
| **PC** | Personal computer. |
| **PDA** | Personal digital assistant. |
| **PHIPA** | Personal health information protection act. |
| **policy and resource documents (Ministry of Education)** | Documents that set government standards. Resource documents support implementation of policy. |
| **proximity wallet** | Mobile technologies used for payment via mobile device. |
| **PSE** | Post-secondary education institution. |
| **Pull services** | Consumer-driven services. |
| **push services** | Enterprise-driven services. |
| **QR code** | Quick response code is the trademark for a type of matrix barcode (or two-dimensional code) that consists of black modules (square dots) arranged in a square pattern on a white background. QR codes are easily scanned by smartphones allowing users to access web sites of brands or other kinds of content. |

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| **quick check-out wallet** | Mobile devices that enable fast-payments at commercial enterprises. |
| **R&D** | Research and development. |
| **radio-frequency identification (RFID)** | An automatic identification method that stores and retrieves data via RFID tags. An RFID tag is a small object that contains silicon chips that can be attached to or incorporated into a product. An active RFID tag (i.e., one that has its own power but otherwise follows RFID protocol) may have sufficient range to be tracked by satellite. A passive RFID tag (i.e., one that does not have its own power source) has a range of 10 centimeters to 100 meters if it passes through a strong enough field isolated from sources of interference. |
| **RFID** | See radio-frequency identification. |
| **RIM** | Research In Motion. |
| **RN** | Registered nurse. |
| **roaming** | Refers to the region for wireless signals that is outside of one's local calling zone. |
| **ROI** | Return on investment. |
| **RPM** | Revolutions per minute. |
| **secure payment system** | Electronic system for financial transactions. |
| **self-care** | Monitoring and treatment of one's own medical conditions. |
| **SIM** | Subscriber identity module. |
| **smartphone** | A mobile phone that is able to browse the internet and run applications. |
| **SME** | Small to medium enterprises. |
| **SMS** | Shot-code message system. |
| **social media** | Online networking sites such as Facebook and twitter. |
| **social networking** | Using web-based applications to connect with other user who have a shared interest in a topic. |
| **SoLoMo** | Indicates the combination of social, local and mobile in technology. |
| **Spectrum** | Range of frequencies for telecommunications. |
| **spectrum auction** | Sale of frequencies to telecommunications providers. |
| **tablet computer** | A mobile device that has the functionality of a computer but is also portable. |
| **Transmedia** | Entertainment that spans multiple media (e.g. Television and computer). |
| **TRRA** | Toronto regional research authority. |

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| **TTC** | Toronto Transit Commission. |
| **Ubiquity** | Referring to being in all environments. |
| **UX** | User experience. |
| **Vlog** | Video blog. |
| **VPN** | Virtual private network. |
| **WAN** | Wide area network. |
| **WCDMA** | Wideband code division multiple access. |
| **web conference** | Presentations and sharing of information and research via intent communications tools. |
| **white space** | Area on the spectrum left open with the retirement of analog television. |
| **Wi-Fi** | A technology designed and optimized for local area networks. It provides an extension or replacement of wired networks for dozens of computing devices. Its range can amount to over 100 meters. |
| **WiMAX** | Worldwide Interoperability for Microwave Access. |
| **wireless** | Telecommunications on a device that is not physically connected to a network. |


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# 17. Researchers

**Dr. Bruce Cater** is Associate Professor of Economics at Trent University. His research interests include contract theory and applied econometrics.

**Peter Chen** is a graduate from the Rotman MBA program at the University of Toronto with an Honours B.A. from the University of Toronto Mississauga in Digital Enterprise Management. He has extensive experience in the IT sector and financial services. He has a strong passion for technology, innovation and the design of business. In his free time, Peter consults for start-ups on marketing and business development.

**Dr. Barbara Crow** is the Associate Dean Research in the Faculty of Liberal Arts & Professional Studies at York University. Crow's current research interests relate to the social, cultural, political and economic implications of digital technologies. Her most recent project, which she is undertaking in collaboration with Professor Kim Sawchuk of Concordia University, is funded by a SSHRC Standard Research Grant, focuses on senior citizens and mobile technologies. She has also edited collections on mobile technologies, including: *The Wireless Spectrum: The Politics, Practices and Poetics of Mobile Communication* (UTP, 2010), co-edited with Michael Longford and Kim Sawchuk; a special issue in 2008 of the *Canadian Journal of Communication* entitled "Wireless Technologies, Mobile Practices," co-edited with Kim Sawchuk and Richard Smith; and a special issue in 2008 of *Atlantis* entitled "Digital Feminisms," co-edited with Sheila Petty.

**Rachel Crowe** holds an M.A. degree in Communication and Culture from the joint program at Ryerson and York Universities. She works as a Research assistant with Dr. Catherine Middleton at the Ted Rogers School of Information Technology Management at Ryerson University. Her research interests include Internet technology, online media and intercultural communication.

**Dr. Sara Diamond**, co–principal investigator of *Taking Ontario Mobile*, is the President of OCAD University, Canada's "university of the imagination." She holds a Ph.D. in Computer Science and degrees in New Media Theory and Practice, Social History and Communications. She is an appointee of the Order of Ontario and the Royal Canadian Society of Artists. While retaining OCAD University's traditional strengths in art and design, Diamond has guided the university in becoming a leader in digital media, design research and curriculum through the Digital Futures Initiative and new research in Inclusive Design, health and design, and sustainable technologies and design. Currently, she serves on the Ontario Ministry of Culture's Advisory Council on Arts & Culture, ORION (Ontario's high-speed network), SHARCNET, Interactive Ontario (IO), Canadian Women in Communications and i-Canada, and is Chair of the Scotiabank Nuit Blanche Toronto Advisory Committee. Diamond serves the larger university community through her membership on the Standing Advisory Committee on University Research (SACUR) of the Association of Universities and Colleges and as Chair of the Standing Committee on Relationships with Other Postsecondary Institutions for the Council of Ontario Universities. Diamond is a member of the Council of the Canadian Academies' expert panel on the State of Science & Technology in Canada. Diamonds is a data visualization, wearable technology and mobile media researcher, artist and designer. Diamond is the founding Chair of the Mobile Experience Innovation

Centre, and the current Co-Chair (with Royal Bank of Canada (RBC)). She is co–principal investigator of the Centre for Information Visualization/Data Driven Design, an OCAD U/York University major initiative, and sits on the board of the National Centre of Excellence GRAND. Diamond continues to write and lecture on the subjects of digital media history, digital media, strategic foresight, and mobility and design strategy for peer-reviewed journals and acts as a reviewer and evaluator for the Institute of Electrical and Electronics Engineers (IEEE) and the Association for Computing Machinery (ACM) conferences and journals. Her artwork is held by prestigious institutions such as the Museum of Modern Art and the National Gallery of Canada. Diamond was the Artistic Director of Media and Visual Art and Director of Research at The Banff Centre, where she created the Banff New Media Institute (BNMI) in 1995 and led it until 2005. She has recently published *Euphoria & Dystopia: The Banff New Media Institute Dialogues* with Dr. Sarah Cook.

**Iwona Gwozdz** is a tech-savvy innovation strategist. She has worked on a number of marketing, design and consulting projects in the healthcare, telecommunications and retail sector. She has worked in the non-for-profit sector in online and print communications for international development projects. In addition, she has travelled to China and India to learn about business in rapidly growing economies. She focuses her studies around innovation, strategy and entrepreneurship. Gwozdz holds an MBA (2012) from the Rotman School of Management, University of Toronto and a B.A. in Media, Information, and Technoculture from the University of Western Ontario.

**Dr. Nabil Harfoush** is currently a Senior Fellow at the Strategic Innovations Lab and Assistant Professor at OCAD University's Strategic Foresight & Innovation graduate program. He is also a Fellow of the College of Design, Engineering & Commerce of Philadelphia University. Prior to that, he served as Chief Information Officer for HelpCaster Technologies, MedcomSof, and Nightingale Informatix. Harfoush has more than 40 years of professional experience as an engineer, technology executive and entrepreneur. He has consulted for enterprises, national governments and international organizations including the World Bank, the World Health Organization, UNESCO and the International Development Research Centre. He serves on the board of the Chief Information Officer (CIO) Association of Canada (Toronto Chapter), the Toronto Regional Immigrant Employment Council TRIEC and the Board of Tides Canada. He is co-founder of the Canadian Dawn Foundation and volunteers for several organizations including the International Development & Relief Fund, the Canadian Centre for Diversity and the One Million Acts of Innovation initiative. He is a regular volunteer mentor for men and women seeking to start new enterprises.

**Dr. Sam Ladner** is a sociologist specializing in the social aspects of technological change. She mixes private-sector consulting work with academic research and teaching. Primarily an ethnographer, Ladner is founder and principal with Copernicus Consulting, a social research company that consults on digital and industrial product design, organizational change and consumer culture. She is also a Post-doctoral Fellow at the Ted Rogers School of Information Technology Management at Ryerson University. She has published in peer-reviewed journals such as *Time & Society* and *The Canadian Journal of Communication*. She is currently managing the Mobile Work Life project, which is investigating smartphones and work/life balance.

**Vincent Manzerolle** is a doctoral candidate and lecturer in the Faculty of Information and Media Studies at the University of Western Ontario, as well as a researcher with the GRAND NCE research network. Generally, his research examines the history and political economy of information and communication technologies. He has published articles and presented papers on a number of topics related to digital and new media including smartphones, social media, mobile advertising and participatory marketing, consumer databases and credit-rating systems. His dissertation research examines the rise of "ubiquitous connectivity" through the technical, political economic and symbolic evolution of the smartphone.

**Dr. Rhonda McEwen** is an Assistant Professor at the Institute of Communication, Culture, and Information Technology at the University of Toronto in Mississauga. She holds an MBA in IT from City University in London, England, an MSc in Telecommunications from the University of Colorado, and a Ph.D. in Information from University of Toronto. McEwen's research and teaching centre on information practices involving new media technologies, with an emphasis on mobile and tablet communication, social media design and youth information practices. She has worked and researched digital communications media for 15 years, both in companies providing services and in management consulting to those companies. McEwen is currently researching the use of tablet devices by non-verbal autistic children for communication and sociality in two Toronto school settings.

**Dr. Catherine Middleton** holds a Canada Research Chair in Communication Technologies in the Information Society. Her research focuses on the development and use of new communication technologies, with specific interests in mobile devices and fixed and wireless broadband networks. She is also interested in how Canadians use (or don't use) the Internet in their daily lives. In October 2010, Middleton gave a "Big Thinking" lecture to Canadian parliamentarians, exploring what is needed to develop a digital society for all Canadians. Middleton's research has been funded by SSHRC, Infrastructure Canada, and the Institute for a Broadband-Enabled Society, Statistics Canada and Ryerson University. Current projects investigate the use of ubiquitous communication technologies (like BlackBerries) in organizations, the development of next-generation broadband networks, competition in the Canadian broadband market, and Canadians' Internet use. She was the principal investigator for the Community Wireless Infrastructure Research Project. Middleton is a member of the GRAND Networks of Centres of Excellence project, and the leader of the New Media Challenges and Opportunities research theme. She also leads the GRAND Digital Infrastructures project.

**Michael J. O'Farrell** is the founder of The Mobile Institute, Research Fellow at Moxie Insight; Board Member of the Mobile Experience Innovation Centre; and co-author of *Mobile Internet For Dummies*. As a global subject matter expert on the mobile industry, O'Farrell has been a notable mobile technology pioneer and is considered a leading mobile industry futurist. In addition to shaping the early market practices of the Open Mobile Alliance, O'Farrell was a co-founder of MOBILEINNOVATIONWEEK, the dotMobi Advisory Group & Policy Advisory Board, the Wireless Advertising Industry Association (now the Mobile Marketing Association), the PCIA Global Initiative and the WAP Forum's Developers Expert Group (now the Open Mobile Alliance). Since the early 1990s, O'Farrell has been a featured speaker at more than 100 intercontinental events, chaired international forums, and co-authored mobile industry best practices, guidelines, research, articles and interviews focused on the next wave of opportunities to service more than five billion mobile consumers worldwide.

**Dr. Katherine Osterlund** is a sociologist and research consultant with Copernicus Consulting Group who specializes in the study of social policy and diverse communities. She has applied qualitative and quantitative approaches to understanding user experience with information technologies; policy development and impact assessment; and socio-legal transformation. She has also taught research methods and professional writing at York University. Osterlund holds a B.A. and M.A. in Sociology from the University of Toronto, and a Ph.D. from York University.

**Iva Parisi** is a Finance and Economics graduate from the Schulich School of Business at York University, and is also a chartered accountant. She has extensive business consulting experience in the public sector, information technology industry and financial services. She has a strong record of delivering value to organizations and taxpayers through the implementation of rigorous financial-options analysis, cost-benefit analysis and operational-efficiency optimization. She led one of the largest successful privatizations for the province of Ontario, and has executed several value-for-money projects in the province, which have yielded significant value to taxpayers. She has spent more than 12 years working for Tier 1 global consulting and accounting firms in Toronto and New York.

**Sam Punnett** is a 25-year veteran of the digital media business. He runs a special projects consultancy in Toronto called FAD Research Inc., which currently undertakes product development related to Internet business, mobile media and 3D film productions. Punnett is an advisor to the University of Toronto's ThingTank Lab makerspace and believes that the "Internet of Things" will be "the next big thing." Punnett is a co-founder of the Canadian New Media Awards and one of five current Canadian members of the US Academy of Television Arts and Sciences' Interactive Media Peer Group, where he served on the committee that created the Emmy Award for interactive media. He was a founder, Chief Knowledge Officer and CTO at Delvinia, a major Canadian Internet marketing and strategy firm. In addition to completing corporate research projects for clients in financial services, media and pharmaceuticals during his tenure at Delvinia, he has directed and written policy projects relating to economic development and the future of media that have been used for Canadian Radio-television and Telecommunications Commission submissions and guidance for three levels of Canadian government institutions.

**Thomas Purves** is a product designer and electronic payments perspective specialist. For the past two decades, he has been at the forefront of digital innovation in Canada's financial services and e-commerce industries. Purves contributed to the development and design of the first online banking services, email money transfers and online debit in Canada, and more recently has helped to create next-generation mobile commerce and cloud-based wallets. Historically, he has also been a fixture and familiar event organizer within Toronto's technology and start-up community, and a frequent speaker on issues of innovation and mobile policy. He holds a degree in Electrical and Computer Engineering from Queen's University and an MBA in Finance and Strategy from the Rotman School of Management at the University of Toronto. Purves is a Senior Business Leader of Product Innovation at Visa Inc. in San Francisco.

**Dr. Vera Roberts** is the co–principal investigator of *Taking Ontario Mobile*. She holds a Ph.D. in Applied Cognitive Science from the Ontario Institute for Studies in Education at the University of Toronto. Roberts's primary research area is inclusive design of technology and digital media. As a researcher at the Inclusive Design Research Centre (IDRC, formerly ATRC/UofT) at OCAD University, Roberts has participated in numerous multi-partner inclusion projects including Barrier-free Access to Broadband Education, Canadian Network for Inclusive Cultural Exchange, CulturAll, Stretch and The Inclusive Learning Exchange, and has pioneered self-sign protocol, the accessible usability evaluation method. Roberts been invited to speak about inclusive design at national and international conferences and has consulted on Accessible Design to the Alberta Ministry of Education; prepared accessibility policy overviews for the Accessibility Standards Advisory Committee, the group responsible for the ICT standard of the Access for Ontarians with Disabilities Act; and contributed to publications and reports on accessibility and inclusive design, such as *Releasing Constraints: Projecting the Economic Impacts of Increased Accessibility in Ontario*. Roberts also manages the inclusive education arm of the IDRC, known as the Special Needs Opportunity Window (SNOW) portal, and is an instructor in the Masters of Design in Inclusive Design Program at OCAD University.

**Howard Rosen** graduated with an MBA in International Finance & Marketing and has spent the past 25 years producing over $100 million of feature films and television programs. While working on an interactive DVD on Type II Diabetes, he developed an interest in inventing LifeWIRE, a patent-pending technology designed to foster patient engagement by pairing interactive mobile technology with content. As a knowledge leader in the mobile health industry, Rosen has played a pioneering role in the use of mobile technology for patient engagement. He has a unique perspective in the area of engagement, having previously been a prominent figure in the North American entertainment industry, and having played a leadership role in the strategic, development and management aspects of the sector in both the traditional and digital media environments. Rosen was recently selected by the mHealth Alliance (hosted by the UN Foundation) as one of the Top 30 m-health Innovators in 2011 and LifeWIRE has had recently been selected as a Computerworld Honors Laureate 2011 for use of technology for the benefit and betterment of society.

**Gary Schwartz** has played a leadership role in the mobile industry. He is the CEO of Impact Mobile, Inc., Chair of MEF North America and the author of The Impulse Economy, published by Simon & Schuster. In 2002, he ran the first cross-carrier short-code campaign in North America. In 2006, Schwartz founded the mobile committee for the Interactive Advertising Bureau and has worked to publish literature such as the *Mobile Buyer's Guide*, which helps extend the digital buy into mobile (and for which he received an IAB award for industry excellence in 2009). In 2010, he was elected as the Chair of MEF North America with a remit to develop a mobile commerce practice to service brands, retailers and content owners (for which he received a MEF award for industry excellence). In 2011, in partnership with MEF and a number of industry groups including the X9 security standards body, Schwartz is working to develop m-commerce security and privacy guidelines. He is the recipient of the Macromedia People Choice Award, the Dodge Foundation Award for Innovation and the Retail Touchpoints Award for Customer Engagement. He is an Asia and Japan Foundation Fellow.

**The Toronto Region Research Alliance (TRRA)** is a regional economic-development organization supported by government, the private sector, universities and colleges. TRRA's mandate is to promote increased investment in research and innovation to further economic prosperity. The TRRA research team was led by Pat Draper and included Juan Morales, Jennifer Chan and Odila Duru.

**Jutta Treviranus** is the Director of the Inclusive Design Research Centre (IDRC) and a professor at OCAD University in Toronto. The IDRC conducts proactive research and development in the inclusive design of emerging information and communication technology and practices. Treviranus also heads the Inclusive Design Institute, a multi-university regional centre of expertise on inclusive design. She has led many international multi-partner research networks that have created broadly implemented technical innovations that support inclusion, including the Fluid Project, Fluid Engage, CulturAll, Stretch, FLOE and many others. Treviranus and her team have pioneered personalization as an approach to accessibility in the digital domain. She has played a leading role in developing accessibility legislation, standards and specifications internationally (including WAI ATAG, IMS AccessForAll, ISO 24751 and AODA Information and Communication).

**Kathleen Webb** is the Director of the Mobile Experience Innovation Centre (MEIC) located at OCAD University, where she is responsible for building private-public partnerships in support of mobile-industry development, creating programming that addresses talent and training issues, and growing the association's membership base of stakeholders in the mobile-media ecosystem. Through her company CRS Technology Corp., which she established in 1989, Webb has led numerous information and communications technology and digital media initiatives. Her client roster includes multinational organizations such a Deutsche Telekom, public-private organizations such as CANARIE and the Greater Toronto Marketing Alliance, and academic institutions such as Ryerson University. She is a member of the Project Management Institute and a long-time volunteer in Toronto's digital-media community.

**Dr. Gary Woodill** is CEO and Senior Analyst for i5 Research, of Cobourg, Ontario. He helps a variety of clients in researching and planning their use of new learning tools. He has been involved with computers in education since 1974, when he was introduced to the PLATO system for computer-assisted instruction while completing his M.A. in educational psychology. He helped develop educational materials for a Canadian videotext system in the late 1970s, and in 1985 started a course for teachers on computers in education at Ryerson University in Toronto. In 1984, Woodill received a Ph.D. in applied psychology from the Ontario Institute for Studies in Education at the University of Toronto, and in 1993 he co-founded an educational multimedia company that developed educational CD-ROMs for children. In 1998, he designed an adaptable learning management system and has developed more than 60 online courses for various corporate clients. Woodill is co-author of *Training and Collaboration with Virtual Worlds and author of The Mobile Learning Edge*, both published by McGraw-Hill in 2010. He is also the author of numerous articles, research reports, and white papers on emerging learning technologies.


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# 18. Mobile Devices Currently Available in Ontario

Contributed by Rachel Crowe and Catherine Middleton

| Devices | Portability | Usability | Frequency with which people will carry their devices |
|---|---|---|---|
| **Feature phones** | *Size:* From 93 mm x 42 mm x 20 mm to 112 mm x 52 mm x 17 mm<br><br>*Weight:* From 78 g to 125 g<br><br>*Battery life:* Talk time: From 4 to 5 hrs.; Standby time: From 13 to 23 days | *All feature phones:*<br>• Phone calls<br>• SMS<br><br>*Some feature phones:*<br>• Camera and video recording<br>• MP3 player<br>• Bluetooth<br>• Web-browsing capabilities or embedded social media applications (i.e., Facebook), but Internet sites are not always compatible or easily navigated using a feature phone<br>• Games<br>• Email<br>• Slide-out QWERTY keyboard<br>• FM radio<br>• Mobile TV (not ideal due to small screen)<br>• Picture messaging<br>• Video messaging | High |
| **Smartphones** | *Size:* From 109 mm x 6 0mm x 14 mm to 119 mm × 63 mm × 13 mm<br><br>*Weight:* From 122 g to 137 g<br><br>*Battery life:*<br>Talk time: From 6 to 7 hrs. on 3G (14 hrs. on 2G);<br>Standby: From 12.5 to 17.8 days on 3G (up to 29.7 on 2G)<br><br>One product, the iPhone 4, also listed:<br>Internet: 6 hrs. on 3G, 10 hrs. on Wi-Fi;<br>Video playback: up to 10 hrs.;<br>Audio playback: up to 40 hrs. | *All smartphones:*<br>• Phone calls<br>• SMS<br>• Email<br>• Web browsing<br>• Camera and video recording<br>• Bluetooth<br>• Wi-Fi<br>• Video viewing (not ideal due to small screen)<br>• E-book and document viewing (not ideal due to small screen)<br>• Document creation and modification, such as word processing (not ideal due to small screen)<br>• Applications<br>• Video games<br>• Touchscreen and/or QWERTY keyboard<br>• Picture and video messaging<br><br>*Some smartphones:*<br>• 4G capacity<br>• GPS<br>• Video chat<br>• FM radio transmitter<br>• Tethering to laptops an option | High |

| Devices | Portability | Usability | Frequency with which people will carry their devices |
|---|---|---|---|
| | | *Pending and potential additions:*<br>• Near-field communication (NFC)*<br>• Mobile TV tuner*<br>*See Glossary for details | |
| **Media players (i.e., iPod Touch)** | *Size:* From 105 mm x 55 mm x 9 mm to 111 mm x 58.9 mm x 7.2 mm<br><br>*Weight:* From 72 g to 101 g<br><br>*Battery life:* Audio: From 24 to 40 hrs., Video: From 6 to 7 hrs. | *All media players:*<br>• MP3<br>• Video player (not ideal due to small screen)<br>• Photo display<br>• E-book (not ideal due to small screen)<br><br>*Some media players:*<br>• Camera and video recording<br>• Audio recording<br>• Video chat<br>• Wi-Fi<br>• 3G<br>• Bluetooth<br>• Games<br>• Applications<br>• Document creation and modification, such as word processing (not ideal due to small screen)<br>• GPS | Moderate to high |
| **E-book Readers** | *Size:* From 168 mm x 119 mm x 9.7 mm to 184 mm x 120 mm x 10 mm<br><br>*Weight:* From 215 g to 221 g<br><br>*Battery life:* From 7,500 page turns to 10,000 page turns | *All e-book readers:*<br>• View text (including ePub and PDF documents)<br><br>*Some e-book readers:*<br>• Wi-Fi<br>• 3G<br>• Bluetooth<br>• Display more document types (i.e., Doc, JPEG)<br>• Note taking, highlighting<br>• MP3<br>• Touchscreen or physical QWERTY keyboard (some can be connected to a keyboard using a USB port) | Moderate |
| **Tablets** | *Size:*<br>From 194 mm x 130 mm x 10 mm to 241 mm x 186 mm x 8.8 mm<br><br>*Weight:* From 425 g to 613 g<br><br>*Battery Life:* Up to 10 hrs. of Wi-Fi Internet use, watching video, or listening to music, or up to 9 hrs. of 3G | *All tablets:*<br>• MP3<br>• Video player<br>• Photo display<br>• E-book<br>• Wi-Fi<br>• Touchscreen QWERTY keyboard | Moderate |

| Devices | Portability | Usability | Frequency with which people will carry their devices |
|---|---|---|---|
| | Internet use | *Some tablets:*<br>• Camera and video recording<br>• Audio recording<br>• Video chat<br>• Wi-Fi<br>• 3G<br>• Games<br>• Applications<br>• Document creation and modification, such as word processing (although not ideal for documents that require extensive typing due to restrictions of keypad)<br>• GPS | |
| **Netbooks** | *Size:* From 259 mm x 185 mm x 24 mm to 262 mm x 179 mm x 22 mm<br><br>*Weight:* From 1,100 g to 1,250 g<br><br>*Battery life:* From 4 to 10 hrs. | *All netbooks:*<br>• Webcam<br>• Wi-Fi<br>• Video and audio players (not ideal due to small screen)<br>• Document viewing (not ideal due to small screen)<br>• Document creation and modification, such as word processing (although not ideal for documents that require extensive typing due to small keyboard)<br>• Games<br><br>*Some netbooks:*<br>• 3G<br>• Bluetooth | Moderate |
| **Laptops** | **For 13" Laptops:**<br><br>*Size:* From 322 mm x 223 mm x 26 mm to 325 mm x 227 mm x 17 mm<br><br>*Weight*: From 1,320g to 1750g<br><br>*Battery Life:* From 5 to 7 hrs.<br><br>**For 17" Laptops:**<br><br>*Size:* From 393 mm x 267 mm x 25 mm to 414 mm x 270 mm x 38 mm<br><br>*Weight:* From 2,800 g to 3,000 g<br><br>*Battery life:* From 5 to 7 hrs. | *All laptops:*<br>• Wi-Fi<br>• Document viewing<br>• Document creation (i.e., word processing)<br>• Video and audio players<br>• Webcam<br>• Games<br><br>*Some laptops:*<br>• Bluetooth | Low to Moderate |

Information for all devices listed above was taken from the websites for Bell Canada, Best Buy, Chapters Indigo, Future Shop, Rogers and TELUS.


Appen

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# 19. Ontario Mobile Asset Map

# Companies

## Global

The telecommunications industry in Canada is consolidated in few companies compared to other OECD members

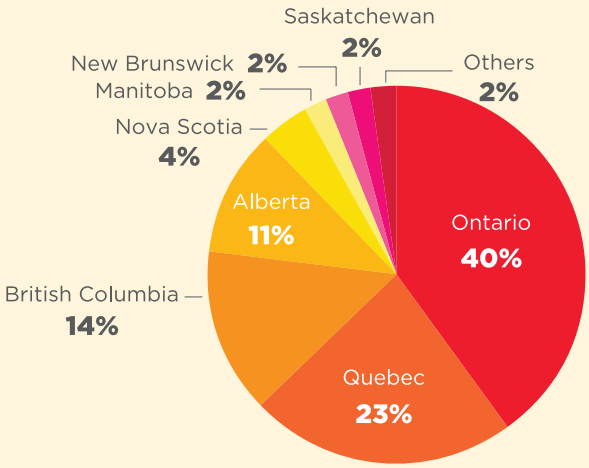
## Canada

There are over 1,800 telecommunication companies in Canada, and 40% of these are located in Ontario.

Industry Canada's "Canadian Company Capabilities" lists 304 companies under the "Wireless Communication" category. 48% of these are in Ontario.

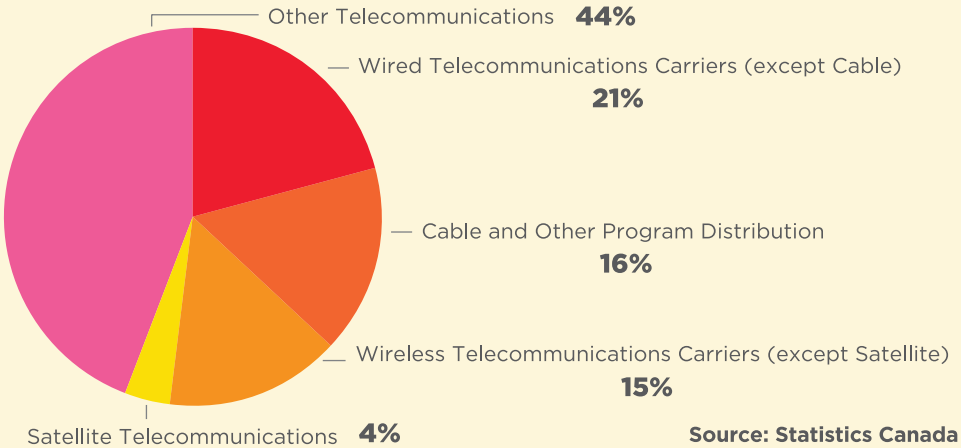
With an estimated 200 companies, Toronto has been named a "hotbed" for mobile app development. [1]

**Distribution of Telecommunication companies in Canada**



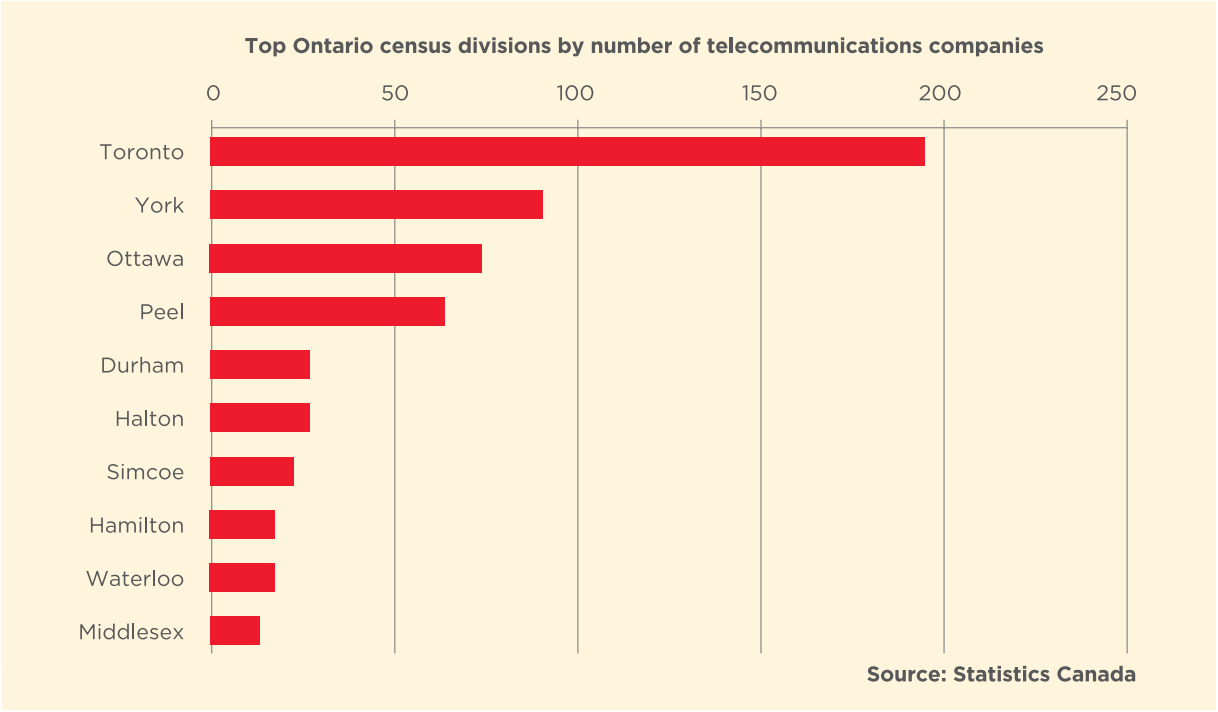

## Canadian Business Patterns (Statistics Canada)

**Ontario Telecommunications companies by segment**

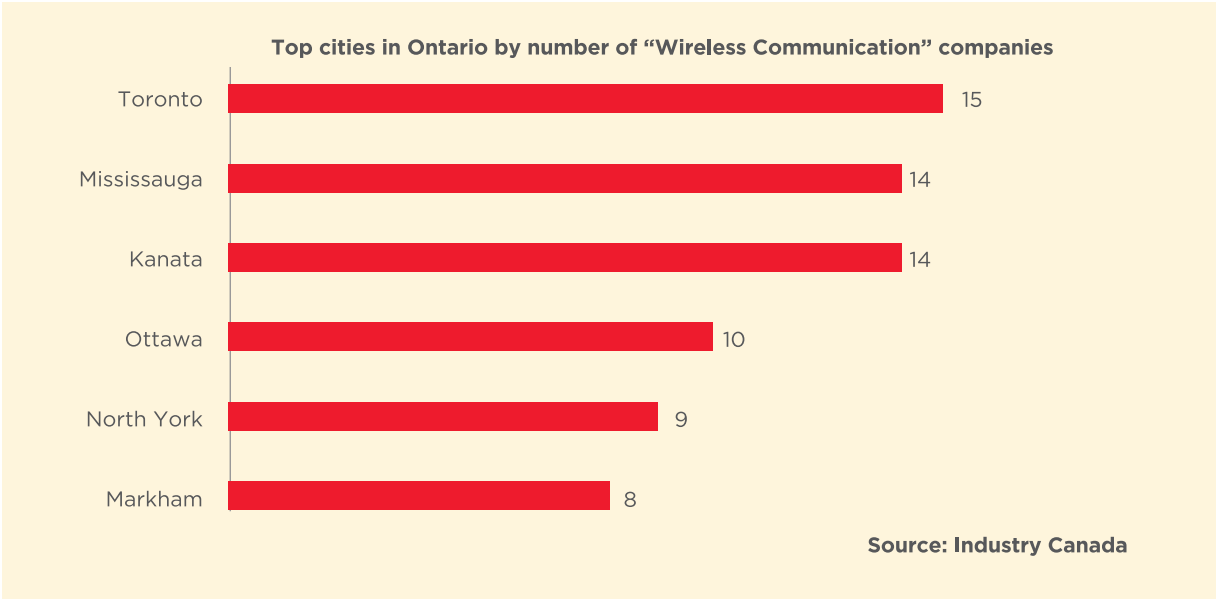


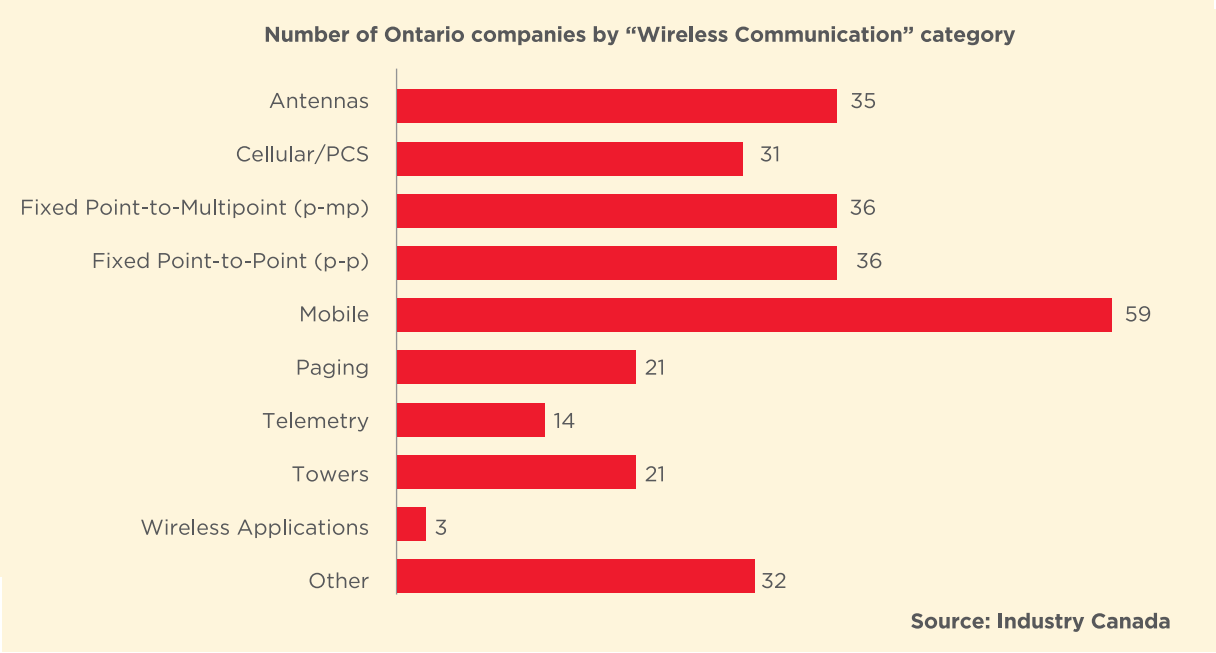

**Source: Statistics Canada**

[1] http://www.xmgstudio.com/wp-content/uploads/2010/11/Toronto-Becoming-A-Hub-For-Mobile-Apps-Companies-WSJ.com_.pdf



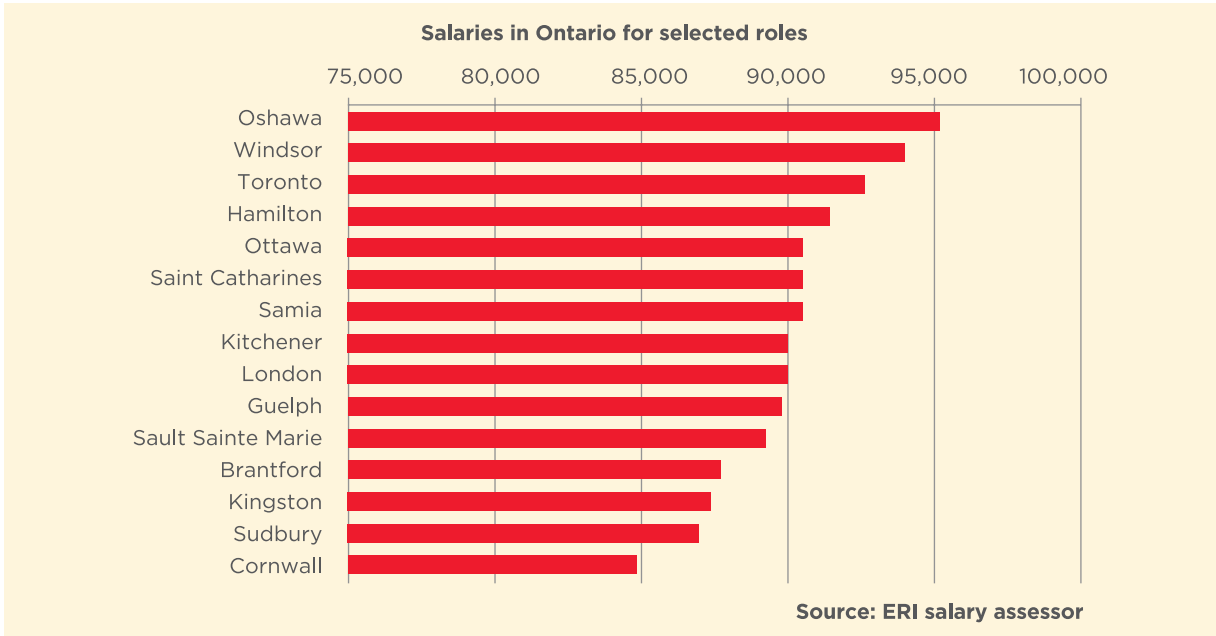

## Canadian Company Capabilities (Industry Canada)

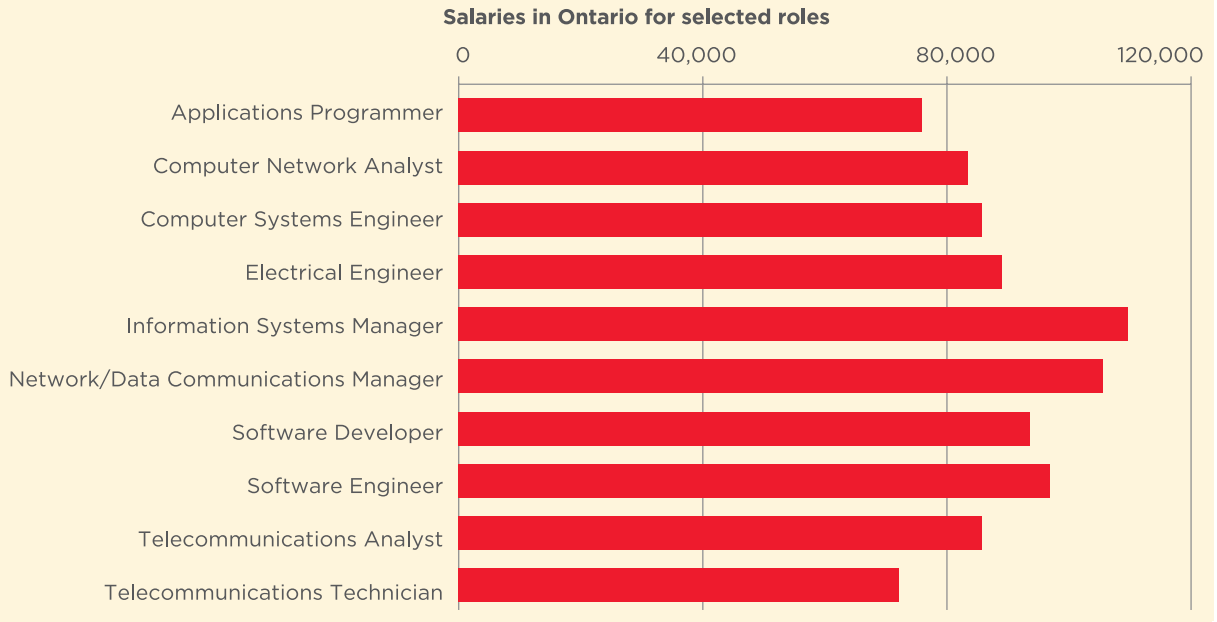





# Labour Force

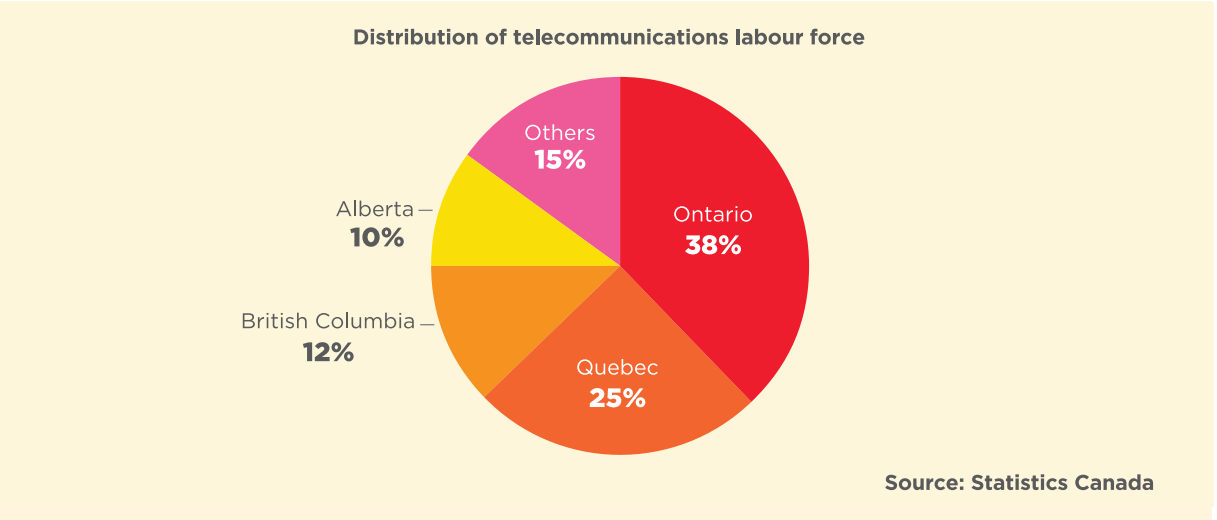
## Global



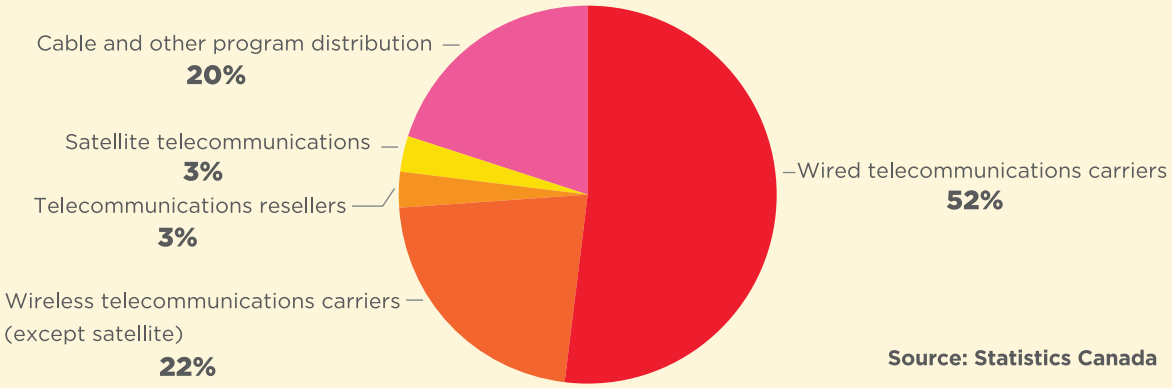



## by Industry Codes (NAICS)

There are over 135,000 people employed in the telecommunications industry in Canada, 38% of whom are employed in Ontario (in line with population).



**Ontario telecommunications labour force by category (53,000 employees)**

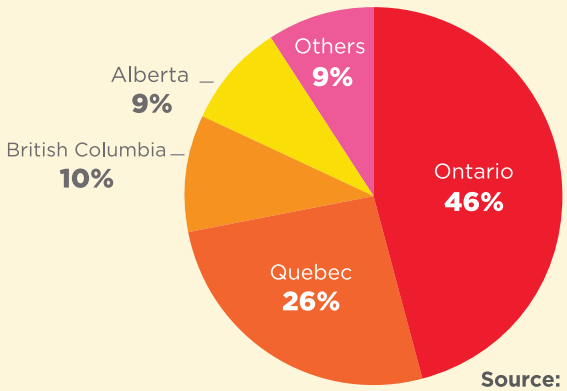



Source: Statistics Canada

## by Occupational Codes

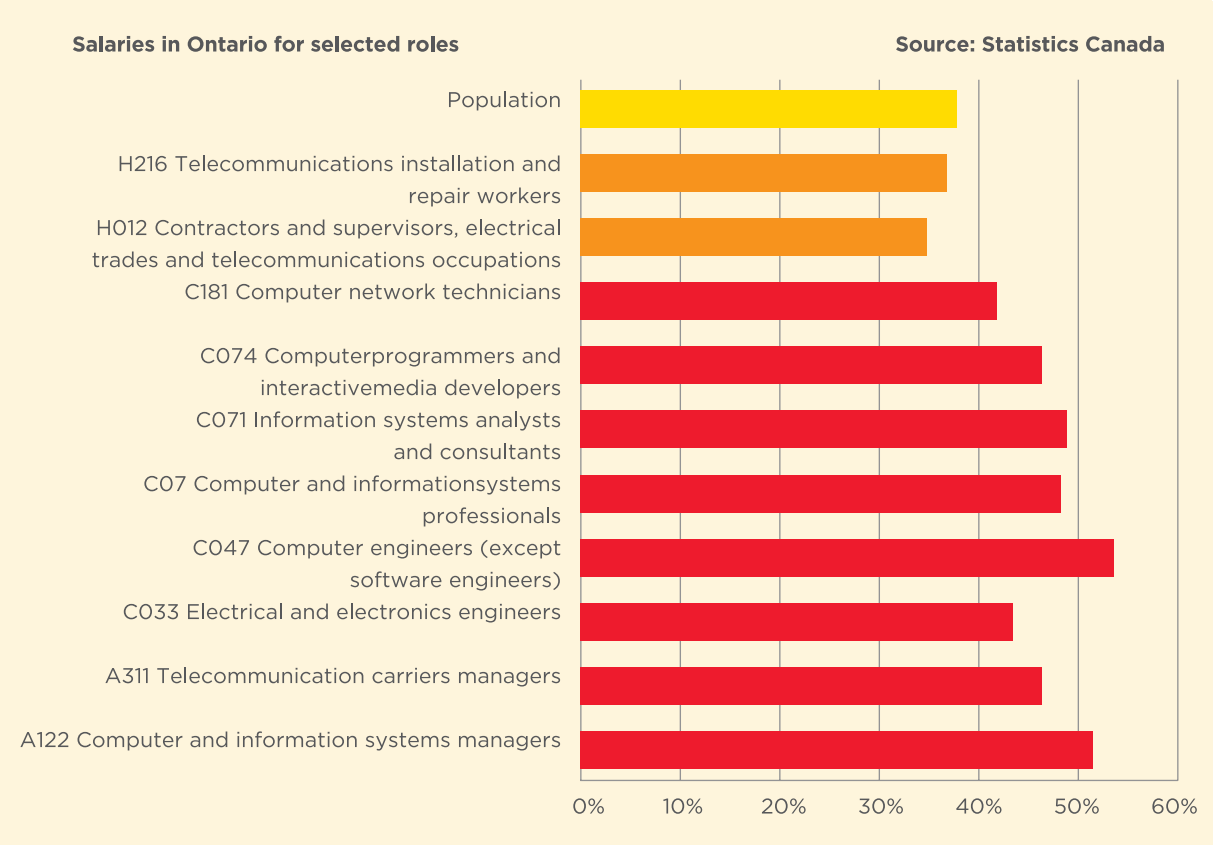
Of 10,400 telecommunications managers in Canada, 46% are employed in the province (higher proportion relative to population).

**Distribution of telecommunications managers in Canada**




Source: Statistics Canada

The percentage of labour force in selected mobile related occupations in Ontario, and compared to population, is displayed below:

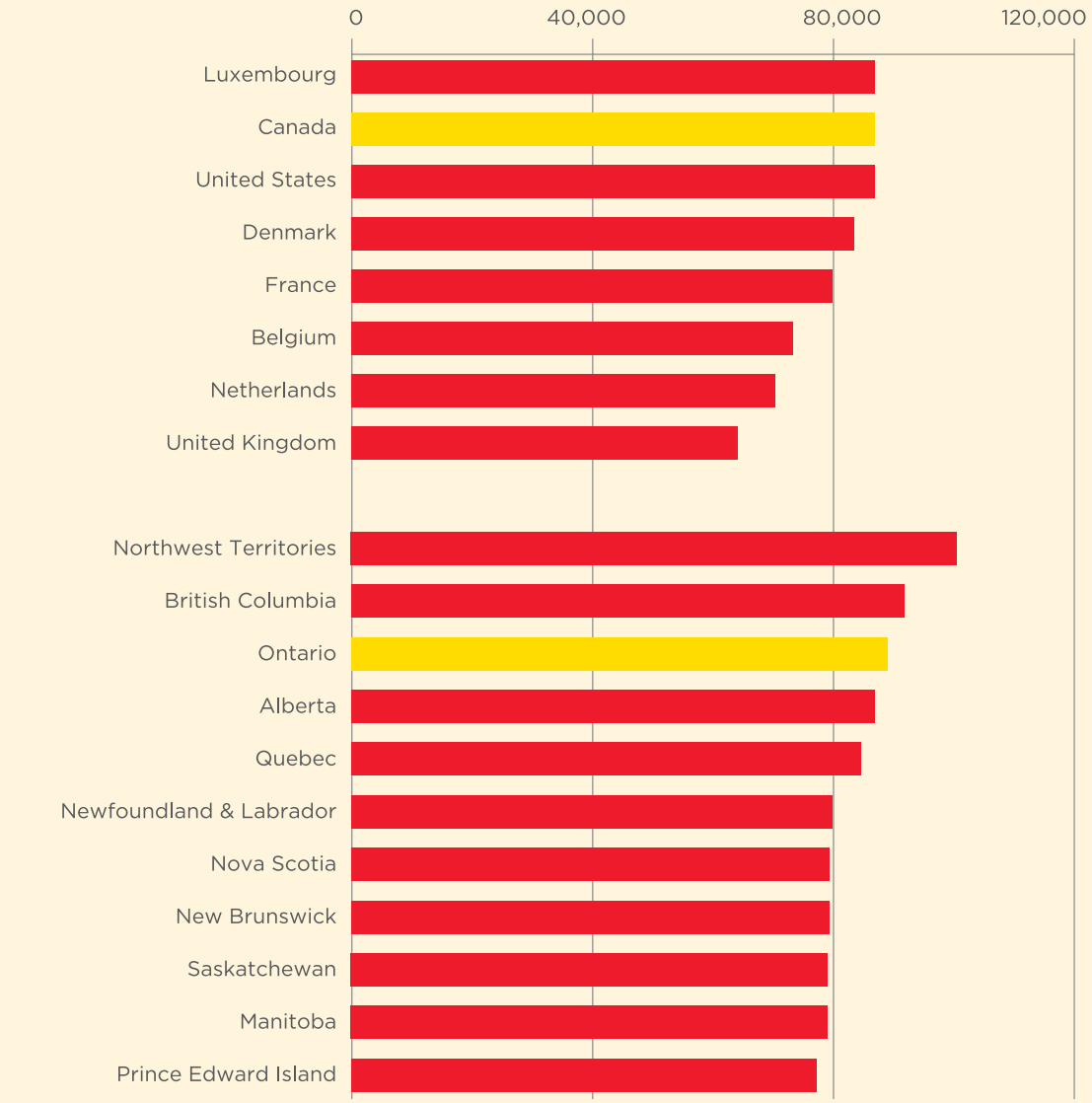



## Salaries

Salaries in the industry are higher than average in Canada and Ontario (based on ten selected roles).

This could signal higher productivity or could be a consequence of the high proftability of the industry.

**Salaries for selected mobile related roles (average)** **Source: ERI salary assessor**



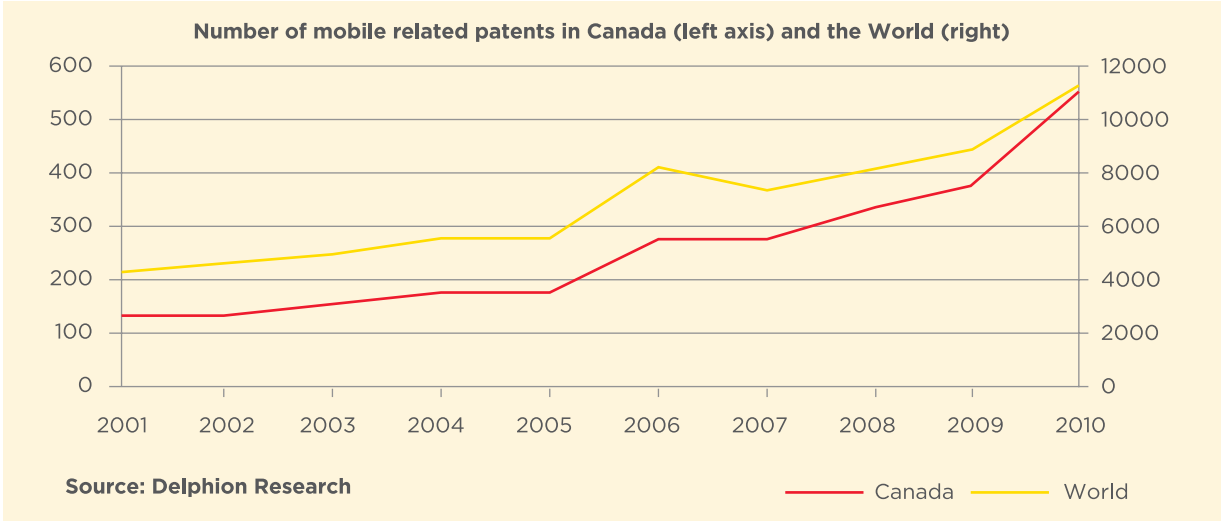
# Patents

## Global

Since 2001, Canada has had the 3rd fastest growth of mobile related patents among the top ten countries, behind South Korea and Taiwan.

Canada is 4th in the world in number of mobile related patents.

| | Number of patents 2001 | Number of patents 2010 | Change % | Total Patents (2001-2010) |
|---|---|---|---|---|
| **United States** | 2760 | 6874 | 249.06% | 42404 |
| **Japan** | 835 | 1643 | 196.77% | 11944 |
| **South Korea** | 145 | 951 | 655.86% | 4196 |
| **Canada** | 131 | 549 | 419.08% | 2578 |
| **United Kingdom** | 126 | 313 | 248.41% | 2007 |
| **Germany** | 106 | 361 | 340.57% | 1964 |
| **Finland** | 99 | 255 | 257.58% | 1792 |
| **Taiwan** | 47 | 250 | 531.91% | 1499 |
| **France** | 86 | 199 | 231.40% | 1301 |
| **Sweden** | 126 | 143 | 113.49% | 1063 |

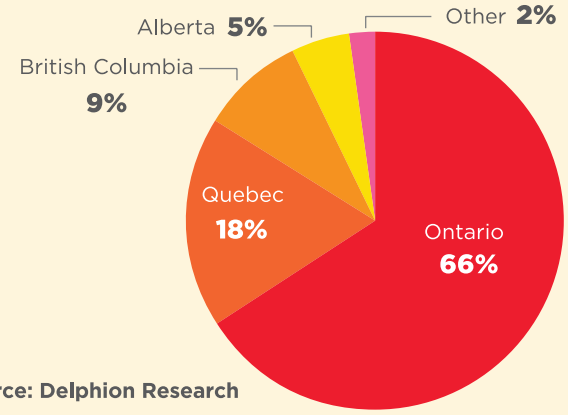


## Canada

From 2001 to 2010, over 2,500 mobile related patents were granted to Canadian inventors, 66% of these had inventors in Ontario.

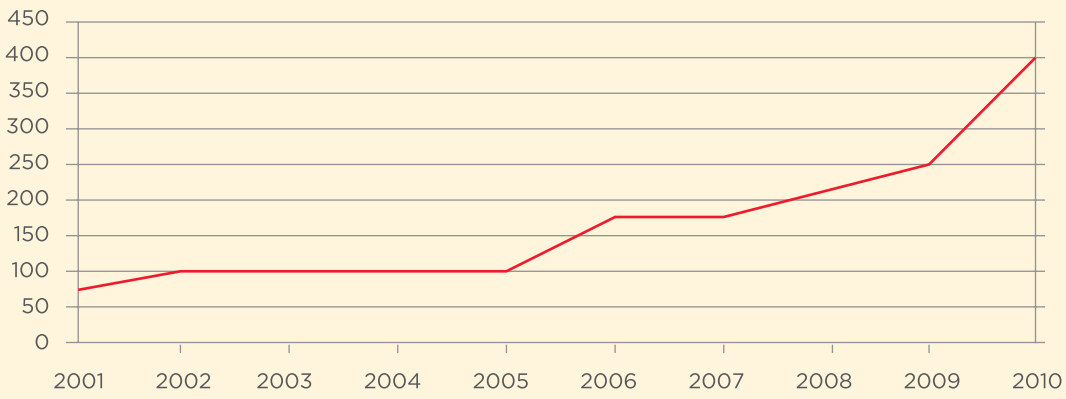
The number of patents in Ontario for mobile technologies has grown rapidly.

**Distribution of mobile related patents in Canada (2001-2010)**




**Source: Delphion Research**

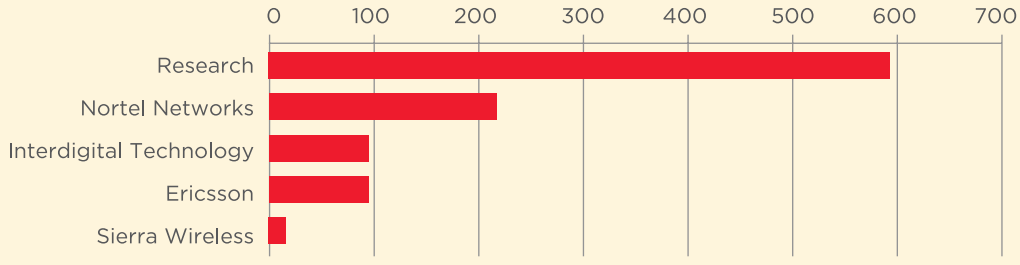
**Mobile related patents in Ontario**




**Source: Delphion Research**

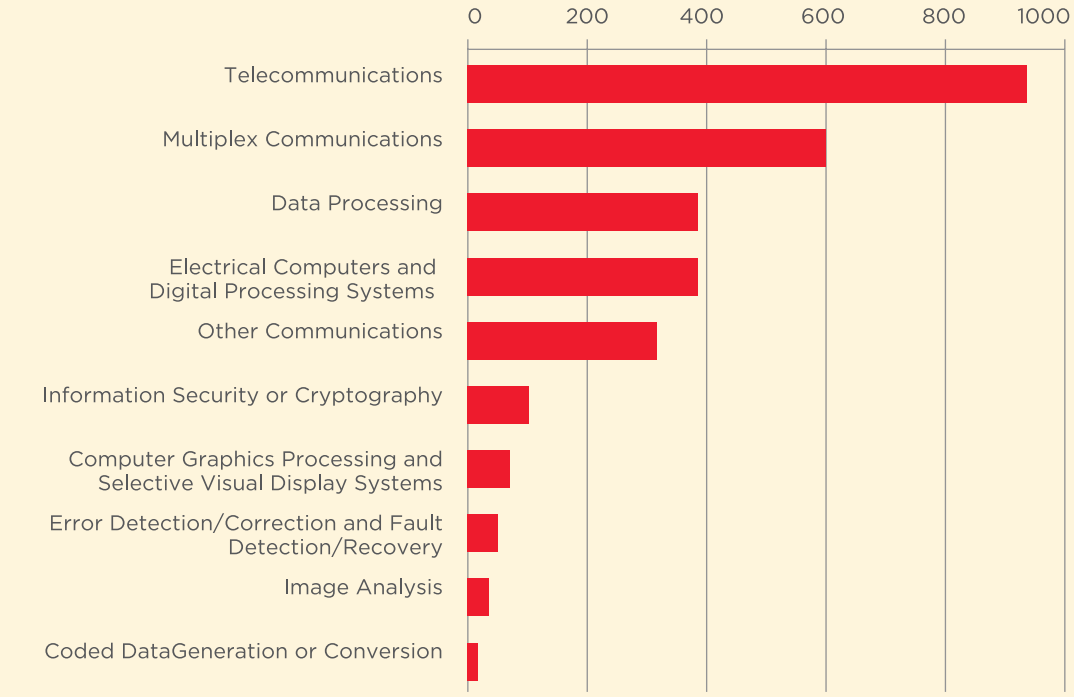
The top assignee in the province (and in Canada) in Research In Motion

**Top mobile related patents assignees in Canada** **Source: Delphion Research**



The top areas for patents are Telecommunications, Multiplex Communications and Data processing.

**Top mobile related patenting areas in Canada (by US patent class)** **Source: Delphion Research**



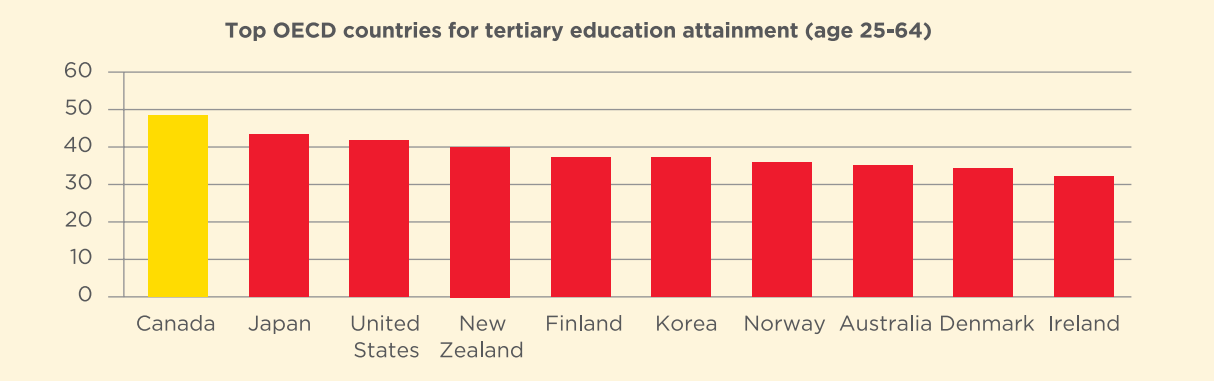

## Academia


**Source: Wordle.com, NSERC titles for mobile related projects (2001-2010)**

# Education

## Global

Canada is the top OECD country for tertiary education attainment.




Two of Ontario's universities are ranked among the top in the world for Engineering and IT (US News):

- University of Toronto: 14th
- University of Waterloo: 39th

| Rank | Institution |
|---|---|
| 1 | Massachusetts Institute of Technology |
| 2 | Stanford University |
| 3 | University of California, Berkeley (UCB) |
| 4 | University of Cambridge |
| 5 | California Institute of Technology (Caltech) |
| 6 | Imperial College London |
| 7 | The University of Tokyo |
| 8 | ETH Zurich (Swiss Federal Institute of Technology) |
| 9 | University of Oxford |
| 9 | National University of Singapore (NUS) |
| 11 | Tsinghua University |
| 12 | Carnegie Mellon University (CMU) |
| 13 | Georgia Institute of Technology |
| 14 | University of Toronto |
| 15 | University of California, Los Angeles (UCLA) |
| ... | --- |
| 38 | Seoul National University (SNU) |
| 39 | University of Waterloo |
| 39 | RWTH Aachen |
| 41 | National Taiwan University (NTU) |
| 42 | University of New South Wales (UNSW) |

## Ontario

There are a few specifically mobile related programs at Ontario colleges, such as "Wireless Telecommunications" at Humber College and "Wireless Networking" at George Brown.

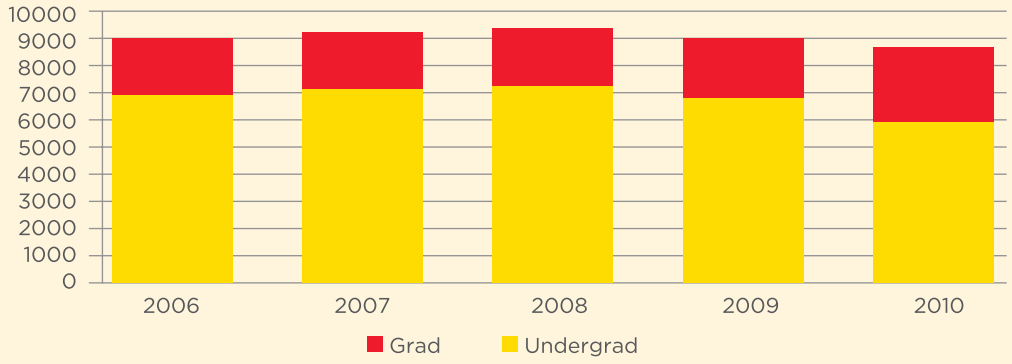
In addition, there are hundreds of Information and Communications Technology related programs at colleges and universities that could lead to a career in the mobile industry. These include Computer Science and Engineering programs.

| | Universities | Colleges |
|---|---|---|
| **Number of ICT related programs** | 34 | 162 |
| **Students graduated (undergrad/grad)** | 5912 / 2716 | 2376 |

**Source: Ontario Universities and Colleges**

The number of Computer Science and Engineering graduates at Ontario universities had declined slightly in recent years. However, the number of post-graduates (Masters or PhD) has increased.

**Number of graduates from Computer Science and Engineering at Ontario Universities**

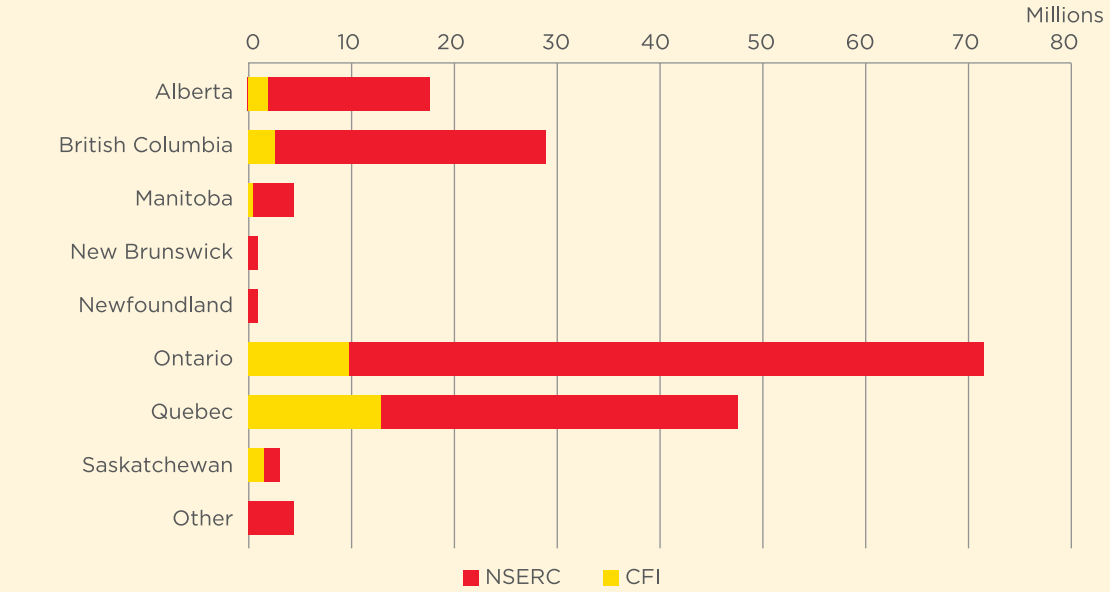



**Source: Ontario Universities and Colleges**

## Funding

The province of Ontario receives over $70 million in funding for mobile related research from NSERC and CFI. This represents 43% of the country's total.

**CFI and NSERC Funding for mobile related projects** **Source: NSERC and CFI**



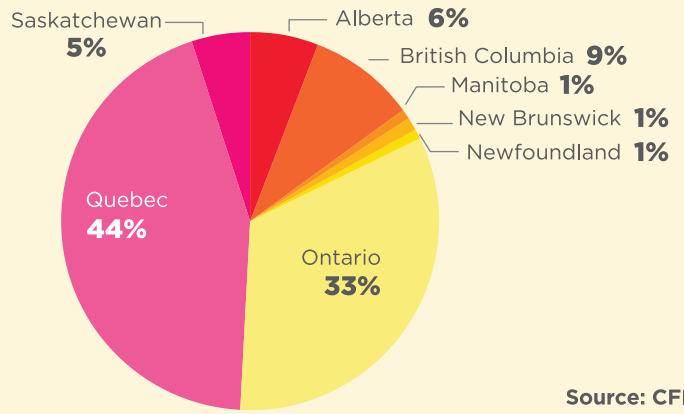

## CFI

The Canada Foundation for Innovation (CFI) funded 80 mobile related research projects valued at $29 million (2001-2010).

Ontario received funding for more projects than any other province (34), valued at $9.7 million.

Quebec received the most funding ($12.7 million) for 17 projects. These projects included large initiatives such as the Laboratories for Broadband Optical and Wireless Systems at McGill University ($5.5 million) in 2009.

**Distribution of CFI funding for mobile related projects ($29 million)**



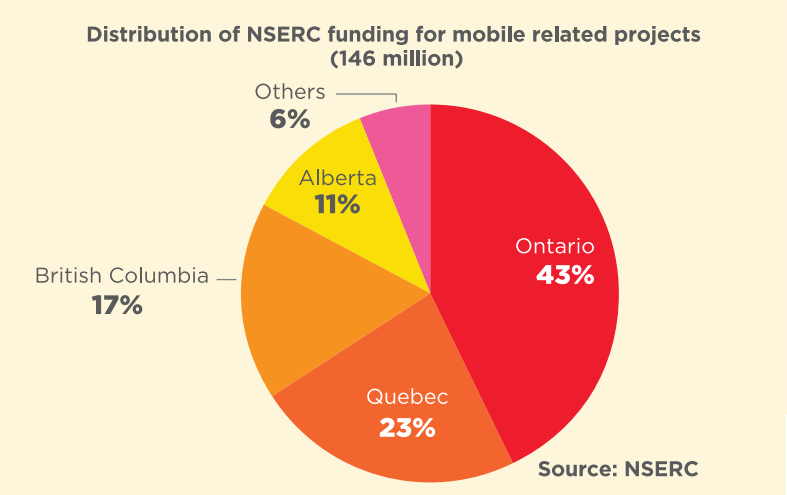

**Source: CFI**

## NSERC

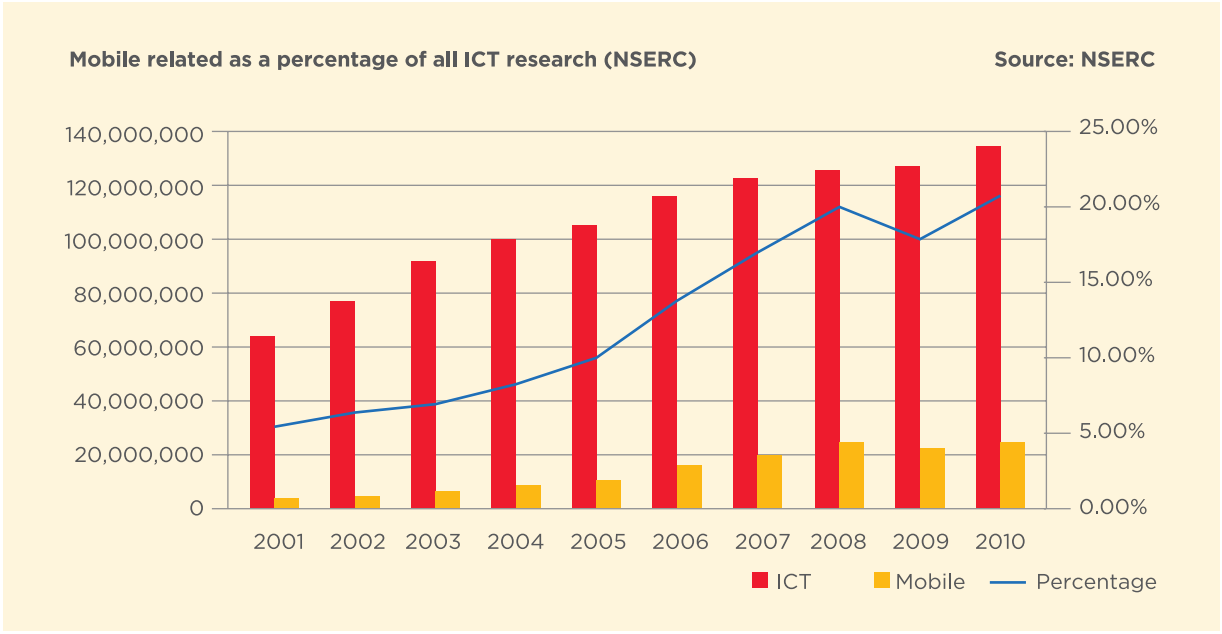
The National Science and Engineering Research Council (NSERC) funded over 3,000 mobile related research projects valued at $146 million (2001-2010).

Ontario received the most funding ($62 million) for the largest number of mobile related projects (1,490).

Together, the provinces of Ontario, Quebec, British Columbia and Alberta accounted for almost 94% of all NSERC funding for mobile research.




Interest in mobile related research has grown rapidly over the past decade. In 2001, mobile related research received about 5.5% of all Information and Communications Technology (ICT) research funding provided by NSERC, in 2010, the share had grown to over 20%.



## Experts

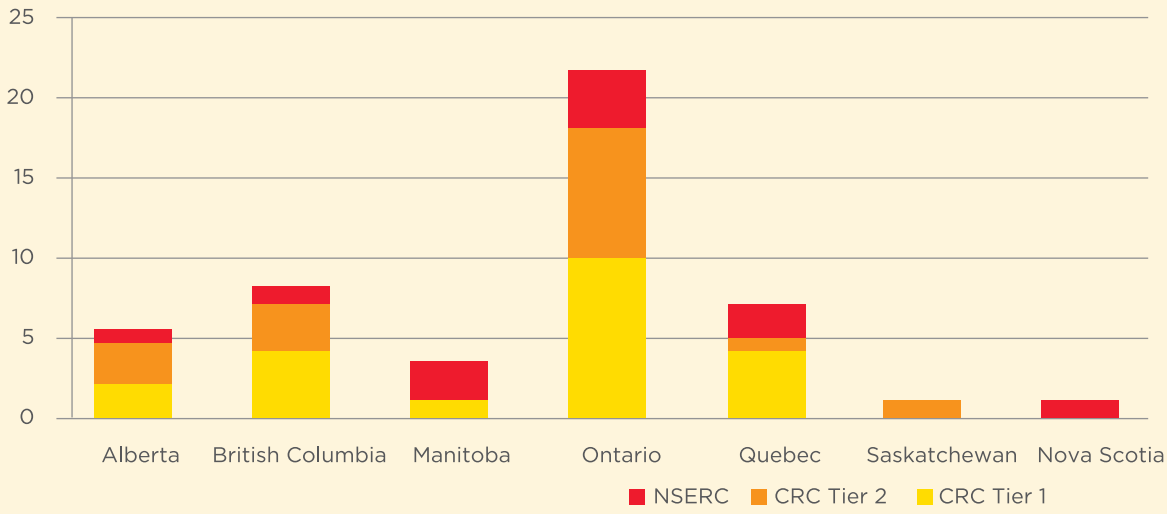
There are 37 Canada Research Chairs in areas related to mobile technologies. Of these, 21 are Tier 1 and 16 are Tier 2.

Ontario is the province with the most Canada Research Chairs for mobile related research, 18 of them are located in the province.

The University of Waterloo holds the most CRC seats in the field with 5 appointed experts.

There are 11 NSERC industrial chairs in related areas, 4 of them in Ontario.

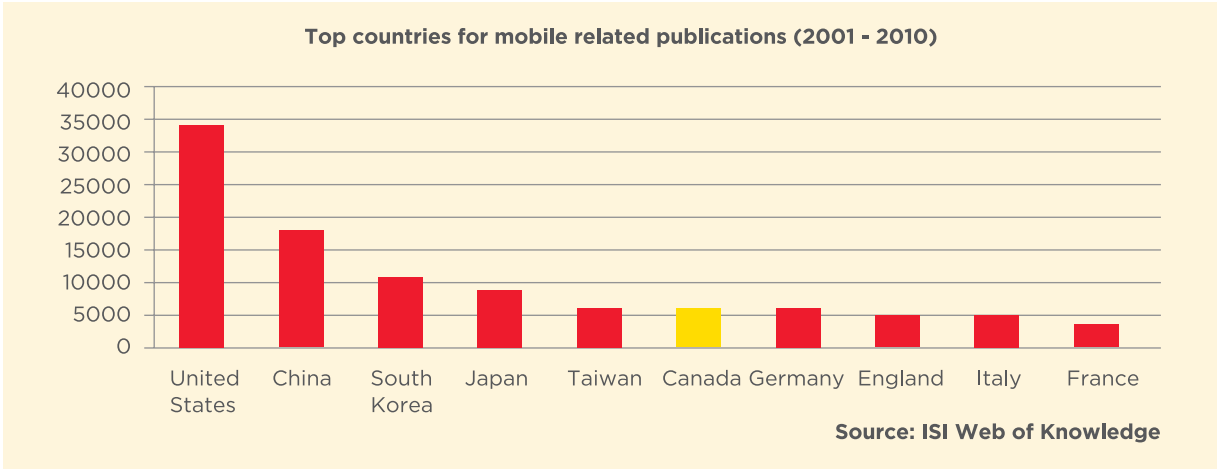
**Distribution of Research Chairs in mobile related research** **Source: CRC, NSERC**



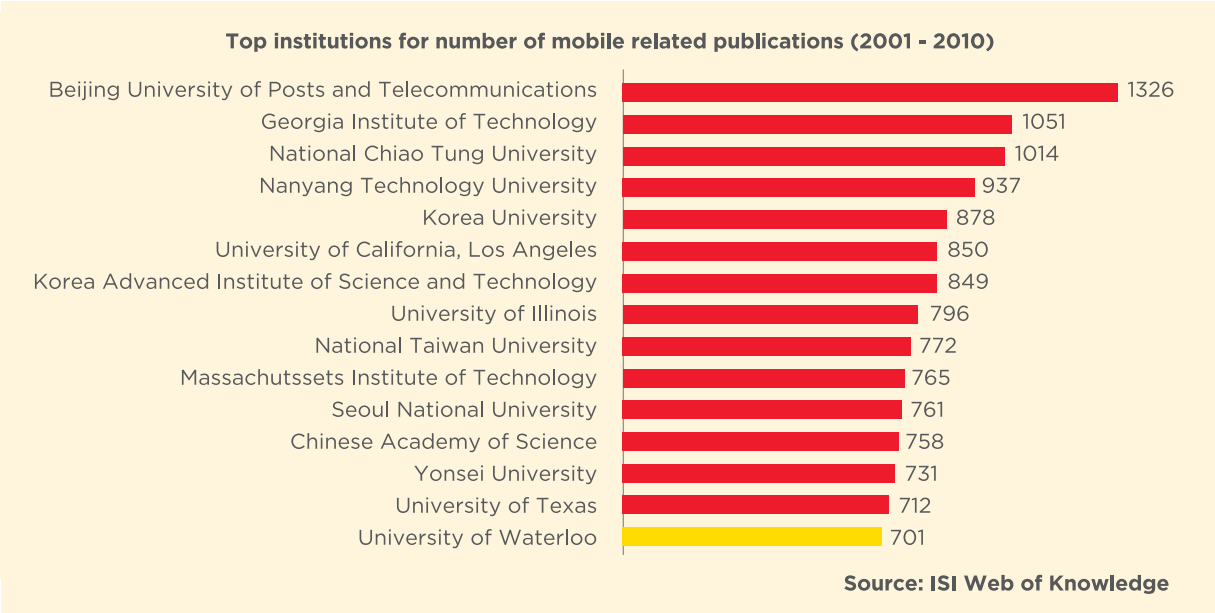
# Publications

## Global

Canada is 6th globally in number of mobile related publications.



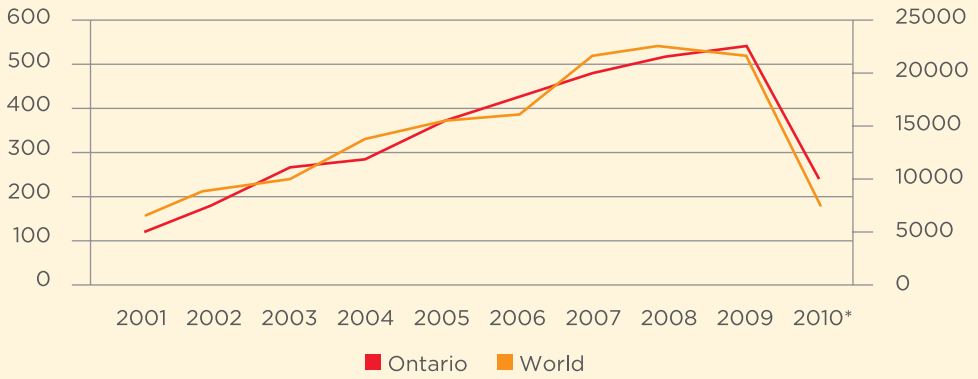

The University of Waterloo is among the top institutions in the world for mobile related publications.



The number of related publications has grown consistently over the last decade. It has more than quadrupled since 2001.

Ontario represents about 3% of all mobile related publications in the world.

**Number of mobile related publications in Ontario (left) and the world (right)**



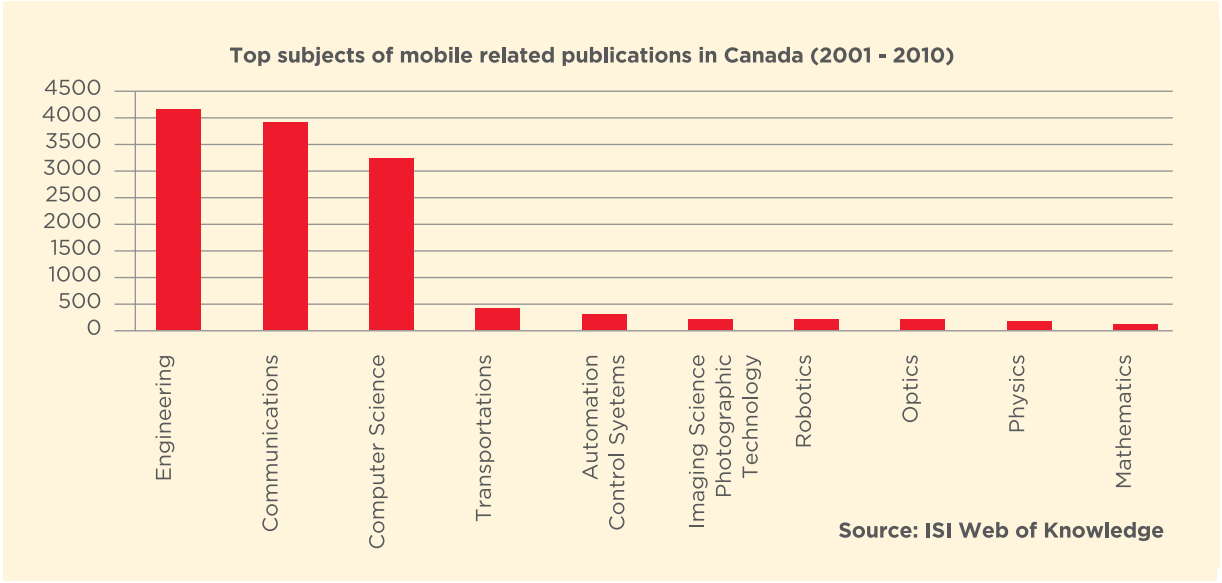

***Note: Not all 2010 publications may have been indexed**

**Source: ISI Web of Knowledge**

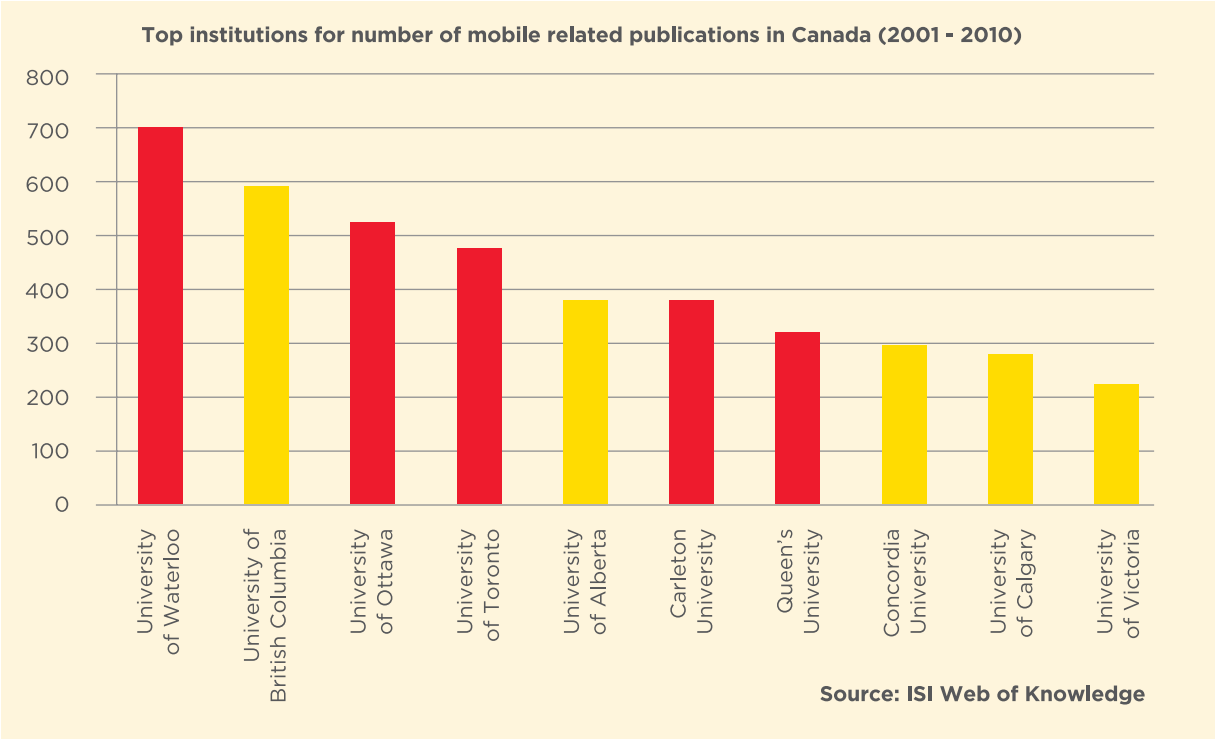
## Canada

From 2001 to 2010, over 6,700 mobile related academic articles were published in Canada, 50% of these had researchers in Ontario.

The top subjects under which these publications are listed are Engineering, Telecommunications and Computer Science.




Five of the top ten institutions for mobile research in the country are located in Ontario.




Appen

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# 20. Full Jurisdictional Review

We undertook a study of six jurisdictions based on the criteria of: similar demographics, inspirational markets and rapidly growing markets. Two jurisdictions were selected for each of the three categories deemed relevant by the research team:

- Similar demographics:
  - Sweden
  - Illinois (USA)
- Inspirational markets:
  - Finland
  - South Korea
- Rapidly growing:
  - Brazil
  - Russia

The main objectives of this study are: 1) to benchmark Ontario against the selected jurisdictions, and 2) to better understand the developments that are shaping each of these mobile ecosystems, in the hope of drawing conclusions applicable to Ontario.

## 20.1 Sweden

Sweden's population and GDP are just over 70 per cent of Ontario's, and therefore the country has a very similar GDP per capita and a similar level of urbanization. In addition, a relatively large surface area and a comparable proportion of urban population make Sweden an excellent jurisdiction to analyze against Ontario. Unlike Ontario, which has at 78 per cent mobile penetration, Sweden has a 113.5 per cent mobile penetration, with 125.8 per cent mobile bandwidth compared to Ontario's 17 per cent.

### 20.1.1 Statistics

| Demographics | Sweden | Ontario |
|---|---|---|
| GDP (mil)—nominal | $337,893 | $612,993 |
| Population | 9,354,462 | 13,210,667 |
| GDP per capita | $47,939 | $46,401 |
| Area (sq. km) | 443,718 | 1,076,395 |
| Population density (people per sq. km) | 20.79 | 12.27 |
| Urban population (%) | 84.5 | 85 |
| Median age | 41.7 | 37.6 |

| Penetration (%) | Sweden | Ontario |
|---|---|---|
| Mobile penetration | 113.5 | 78 |
| Mobile broadband (2009) | 125.8 | 17 |
| Fixed telephone | 53.5 | 50 |
| Internet users | 90 | 81.6 |
| Fixed broadband | 31.6 | 29.8 |

### 20.1.2 Regulatory Environment

Instituted in 2003 as a result of the Electronics Communications Act of 2003, the Swedish Post and Telecom Agency (PTS) is the regulatory body in charge of electronic communications and the postal sectors in the country. The act represented the transposition of the European Union New Regulatory Framework (NRF), and it intended to ensure affordable access to telecommunications by promoting competition. The PTS is responsible for telecommunication networks and services, including the issuing of permissions and licenses, and for the monitoring of competition in the market. The four areas of focus of the PTS are: consumer interests, efficient competition, efficient use of resources, and safe communication.

The PTS is also in charge of radio-frequency (RF) spectrum allocation. If demand exceeds availability, auctions or comparative selection of candidates are used to distribute spectrum licenses. There are no foreign ownership restrictions in Sweden.

### 20.1.3 Infrastructure Development

Sweden has consistently been at the forefront of the development of wireless technologies, partly thanks to the presence of Ericsson, one of the main global vendors of telecommunication systems—and particularly of mobile networks—in the world. In contrast to other European nations, the Swedish incumbent, Telia (now TeliaSonera), did not get a spectrum permit when 3G licenses were initially distributed in the country in December 2000. The four winners of licenses were Hi3G, Orange, Tele2 and Vodafone; Telia entered the 3G market through network agreements with Tele2.

Hi3G launched its 3G services in 2003 and was followed in 2004 by Tele2 and TeliaSonera. 3G had slow initial uptake and delays due to operators' concerns regarding insufficient demand and availability of handsets. However, demand has increased rapidly since 2007 and Sweden now has one of the highest 3G penetration rates in Europe.

Though Sweden was going to be one of the first countries to deploy wide 4G coverage through WiMAX

technology, health concerns brought the development of networks to a standstill and caused operators to commit to the Long Term Evolution (LTE) standard instead. The first commercial LTE mobile network in the world was launched in Stockholm and Oslo at the end of 2009 by TeliaSonera. Throughout 2010, the coverage was extended to other regions in the country.

### 20.1.4 Competition

The four main operators in Sweden (and their corresponding market shares) are: TeliaSonera (40.6 per cent), Tele2 (31.6 per cent), Telenor (16.6 per cent) and Hi3G (8.8 per cent), which provides service under the "3" brand. Competition among these operators is very strong, partly due to the lack of foreign-ownership restrictions. In 2002, Telia merged with Finnish mobile provider Sonera to form TeliaSonera; it is headquartered in Stockholm. Tele2 is also Swedish and operates in 11 countries across Europe. Telenor is a Norwegian company and the sixth largest mobile phone operator in the world, with more than 200 million subscribers in Europe and Asia. Hi3G is 60 per cent owned by Hutchison 3G, a Hong Kong operator that provides mobile services under the "3" brand in 10 countries around the world.

In addition, there are currently 10 mobile virtual network operators (MVNOs; operators that buy wholesale service from wireless network providers and resell it to the public under their own brand) with a small share of the market. Restrictive contracts and unfavourable terms from network providers have limited the success of MVNOs in the country.

### 20.1.5 User Characteristics

Mobile operators in Sweden have been leaders in infrastructure development, and have developed business models to encourage consumers to make use of their advanced networks. Wide adoption of mobile voice, messaging and data services in Sweden represents a relatively high average revenue per user (ARPU) of $32. In addition, 65 per cent of phones sold in Sweden are smartphones, one of the highest proportions in the world. The average minutes of use (MOU) for a Swedish user are 248 per month. Swedes are also heavy text (SMS) users, sending an average of 150 messages every month.

### 20.1.6 Service Prices

Strong competition in Sweden has led the country to enjoy some of the lowest prices in the world for services. Sweden prices were third cheapest in all of the usage baskets (low, medium, high) analyzed by an OECD study on member countries. A Telia subscription with unlimited calling to Telia's numbers, 5GB data, 200 min and unlimited text messaging would cost about $50 a month.

### 20.1.7 Mobile Services and Applications Initiatives

In 2005, TeliaSonera launched the BodyKom system, developed in partnership with Hewlett-Packard

and Swedish company Kiwok. BodyKom monitors patients' vital signs, and connects to a mobile phone through Bluetooth to transmit the data to be analyzed by health professionals remotely. The system can alert nurses or doctors about critical changes in the patient's body, and provides the location using GPS technology.

In 2009, the city of Västerås implemented a mobile parking solution which allows drivers to pay for public parking through SMS. The system, provided by Danish company Unwire, has had strong adoption with over 20% of mobile parking done through SMS. Similar mobile parking services are being implemented in other cities across Europe and North America.

M-ticketing for Sweden's rail network was launched in 2010 and by the end of the year, 40% of tickets purchased were acquired through this system. Passengers receive their tickets via SMS, which is scanned by the inspector on the train using a mobile computer.

### 20.1.8 Research Capacity

Sweden produced more than 1,000 patents in mobile technologies in the past decade. Ericsson, one of the main global providers of mobile network equipment, is the research leader in Sweden's industry and has historically been a global telecommunications pioneer. Some of Ericsson's inventions include the first fully automatic mobile telephone system (MTA) in 1956 and the Bluetooth technology standard in 1994.

In academic research, Sweden produced around 1,400 publications. The Royal Institute of Technology (KTH)—ranked 60th in the world for Engineering and Information and Communications Technology (ICT) universities—is the leader in the country. KTH offers a Master's degree program in Wireless Systems that includes courses in communication theory, signal processing and communication networks.

One of KTH's initiatives is Excitera, a technology-driven student incubator that helps students commercialize their products and ideas. Excitera organizes the Mobile Cup competition, in which teams from around the world compete to create a mobile service that "helps solving a tough problem that humanity faces." [1] Fund Friends, a KTH spinoff company, was the 2011 winner.

### 20.1.9 Mobile-Device Development

Ericsson was one of the leading manufacturers of cell phones in the 1990s. Popular models included the T28, launched in 1999, which was the slimmest and lightest phone of the time. In 2001, Ericsson

[1] See http://studentcompetitions.com/competitions/excitera-mobile-cup-2010 for competition details.

announced a partnership with Sony to produce mobile phones; this venture is based in the UK. While Sony-Ericsson continues to produce devices today, Ericsson in Sweden focuses on mobile network equipment. Sony-Ericsson sold more than 100 million devices in 2007, but its sales have declined significantly since then.

### 20.1.10 Mobile-Content Development

Sweden has active business-development initiatives that are helping create new companies in the mobile sector. In Stockholm, there are 12 incubators and science parks that specialize in sectors such as ICT, clean-tech and life sciences. Companies developing mobile solutions in Sweden include Visiarc, AlcoSystems, Appello, Bambuser, Idevio, IKIVO, Mobenga, Mobile Labs, mobiZoft, MyWidz, Neava and Lociloci, among others.

### 20.1.11 Other Interesting Points

The PTS encourages strong competition among network providers. Its "Telepriskollen" web tool allows for easy comparison of price plans, aiming to keep consumers well-informed and putting pressure on operators to provide competitive pricing.

Stockholm has built a municipal fibre network that leases infrastructure to service providers. This has been an effective way to deploy broadband services to its population, and Stockholm has one of the fastest and cheapest Internet services in the world.

## 20.2 Illinois

Illinois closely resembles Ontario in GDP, population and percentage of urban population. In addition, it competes with other North American jurisdictions for research and development (R&D) investment. Illinois is also home to Motorola, an active player in the mobile-devices industry. Illinois boasts nine per cent mobile penetration compared to Ontario's 78 per cent, with 39 per cent mobile bandwidth compared to our 17 percent.

### 20.2.1 Statistics

All figures are in US Dollars.

| Demographics | Illinois (USA) | Ontario |
|---|---|---|
| GDP (million)—nominal | $644,200 | $612,993 |
| Population | 12,830,632 | 13,210,667 |
| GDP per capita | $50,328 | $46,401 |
| Area (sq. km) | 149,998 | 1,076,395 |
| Population density (people per sq. km) | 85.54 | 12.27 |
| Urban population (%) | 88 | 85 |
| Median age | 34.7 | 37.6 |
| Penetration (%) | | |
| Mobile | 90 | 78 |
| Mobile broadband (2009) | 39 | 17 |
| Fixed telephone | 52 | 50 |
| Internet users | 72 | 81.6 |
| Fixed broadband | 25 | 29.8 |

### 20.2.2 Regulatory Environment

Illinois wireless regulations are covered by the United States Federal Communications Commission (FCC). In addition, the Illinois Commerce Commission provides policy and technical support. The main objective of the FCC, as stated by the Federal Communications Act of 1934, is "to make available, so far as possible, to all the people of the United States...a rapid, efficient, nation-wide, and world-wide wire and radio communication service with adequate facilities at reasonable charges." [2]

The FCC awards RF spectrum licences by auction or through the evaluation of an application specifying the spectrum and facilities to be used. Although retail prices are not regulated, some billing practices are.

There are some foreign-ownership rules for telecommunication companies. In general, the FCC be-

[2] United States. Congress. House. Committee on Interstate and Foreign Commerce., *Communications act 1934* (Washington,: U. S. Govt. Print. Off., 1954). 47 USC § 151

lieves the public interest will be served by foreign investment if the entity is located in a country member of the World Trade Organization (WTO). These entities must often reach an agreement in regards to the access of data if requested by government agencies such as the Federal Bureau of Investigation (FBI) or the Department of Homeland Security.

### 20.2.3 Infrastructure Development

Verizon's 3G network was first available in Chicago and other parts of the United States in 2002. It was the second 3G network deployed in the US. Verizon was also the first network to launch LTE services in Illinois at the end of 2010 with the launch of the largest LTE network in the world, which included 38 cities.

### 20.2.4 Competition

There are about 15 different wireless service providers in Illinois. These include Verizon, AT&T, T-Mobile, Sprint, and U.S. Cellular (headquartered in Chicago), among others. Competition is generally strong and foreign investment also plays a role. T-Mobile is from Germany and 45 per cent of Verizon Wireless is owned by Vodafone (UK).

### 20.2.5 User Characteristics

ARPU in the Unites States is one of the highest in the world at around $50; however, users in the country are also the heaviest mobile phone users, with average MOU of 812 minutes per month.

### 20.2.6 Service Prices

According to the Organization for Economic Co-operation and Development (OECD), service prices in the US are among the highest in the world. Out of 30 OECD members, the US ranked 30th in the low- and medium-usage baskets and 25th in the high-usage basket. Sprint offers 450 minutes and unlimited text and data for $70.

### 20.2.7 Mobile Services and Applications Initiatives

This year, the City of Chicago announced its Mobile Electronic Ticketing System (MET) for owners of vacant lots. Using the application on BlackBerry devices, field staff reports lots that are not properly maintained and are in violation of city bylaws. Other solutions that have been piloted in the city include the ParkMagic pay-by-cell-phone service for parking meters.

The United States Government has also implemented applications at the federal level, with 17 mobile apps launched last year, including NASA, FBI and White House apps.

### 20.2.8 Research Capacity

Illinois has strong research assets for mobile technologies. The state produced more than 2,000 patents in the past decade, with the two main players being Motorola and Lucent (now Alcatel-Lucent). Google, maker of the Android operating system (OS) for mobile devices, recently announced its planned acquisition of Motorola Mobility. Google is playing a growing role in the mobile industry; having access to Motorola's patents is expected to strengthen its capacity to compete in the mobile space. It will be interesting to see how the acquisition will affect Illinois's research capacity.

The University of Illinois is a global leader in mobile research. The university is among the top 10 universities for mobile-related publications with around 800 in the past decade, and is ranked 16th in the world for Engineering and ICT studies. The state produced more than 1,700 related publications in 2010.

The University of Illinois Research Park is a technology park where more than 80 companies take advantage of collaborative research opportunities with faculty and students while having access to university labs and other services. In addition to housing multinational corporations such as Qualcomm, Yahoo and Sony, the park is also home to more than 40 start-ups.

### 20.2.9 Mobile-Device Development

Motorola has been an important player in the mobile device industry. In 1991, it introduced the first cell phone prototype using Global System for Mobile Communication (GSM) technology. Motorola was the largest manufacturer of cell phones until 1998, when it was overtaken by Nokia. The company remained an important player, with the Motorola RAZR enjoying strong commercial success in the mid-2000s. However, Motorola has lost significant market share since the introduction of smartphones, forcing the company to spin off its device manufacturing business into "Motorola Mobility" in January 2011. Google recently announced its plans to acquire Motorola Mobility for $12.5 billion. Motorola's strong patent portfolio was a key asset for Google in this acquisition, as the Android OS faces increasing legal pressure from Apple and other competitors.

### 20.2.10 Mobile-Content Development

Illinois has an active technology community, with players that include Motorola, Groupon, comScore, Orbitz and RedBox. There are 13 incubators and VC firms in Chicago helping to fuel growth in the technology sectors. Some mobile development companies in Illinois include Ora Interactive, RedPoint Technologies, Pathfinder, Lextech, NewDog Technologies, Thought Matrix, Vokal, SoftWeb Solutions, doejo, Punchkick Interactive, Mobionics, Renkara, Eight Bit Studios and Ethervision, among others.

### 20.2.11 Other Interesting Points

An average state local tax of 15.85 per cent, in addition to the federal tax of 5.05 per cent, makes Illinois's tax rates of mobile services fifth in the US.

In May 2011, the government of Illinois announced a $100 million tax-credit incentive package for Motorola, which was considering moving some of its R&D work to California or Texas. Motorola has agreed to retain 3,000 jobs as a result of the deal, a significant outcome for the jurisdiction, which, like many others, is competing for high-tech jobs and research investment. In 1994, the state gave Motorola a $35 million incentive to build a research centre.

## 20.3 Finland

Finland has a similar GDP per capita to Ontario, and lower urbanization (63.4 per cent to Ontario's 85 per cent). It has a 156.4 per cent mobile penetration to Ontario's 78 per cent and 144.6 per cent mobile broadband to our 17 per cent. Finland is a leader in many aspects of the mobile industry. In 1998, the country became the first in which mobile subscriptions exceeded fixed-line subscriptions, and it is now the top country in the world for mobile-broadband penetration and one of the top countries in the world for mobile services in general. Finland has a low penetration of fixed-line subscriptions, which have been substituted by mobile services; fixed-line penetration has gone from 55 per cent in 2000 to 23 per cent in 2010; people have abandoned fixed-line services more rapidly in Finland than in any other country.

Finland is also a leader in mobile-technology R&D. Both regulators and operators in the country are open to testing new wireless technologies. The country is home to Nokia, one of the largest device manufacturers in the world. In addition, Nokia Siemens Networks (a partnership between Nokia and Siemens) is one of the top providers of mobile infrastructure for network operators.

### 20.3.1 Statistics

All figures are in US Dollars.

| Demographics | Finland | Ontario |
|---|---|---|
| GDP (million)—nominal | $239,232 | $612,993 |
| Population | 5,374,781 | 13,210,667 |
| GDP per capita | $44,488 | $46,401 |
| Area (sq. km) | 338,424 | 1,076,395 |
| Population density (people per sq. km) | 15.88 | 12.27 |
| Urban population (%) | 63.3 | 85 |
| Median age | 42.3 | 37.6 |

| Penetration (%) | Finland | Ontario |
|---|---|---|
| Mobile | 156.4 | 78 |
| Mobile broadband (2009) | 144.6 | 17 |
| Fixed telephone | 23.3 | 50 |
| Internet users | 86.9 | 81.6 |
| Fixed broadband | 29.1 | 29.8 |

### 20.3.2 Regulatory Environment

The main regulator is the Finnish Communications Regulatory Authority (FICORA). The Ministry of Transport and Communications and the Council of State also play a role in the regulation of the telecommunications market. The Communications Market Act in 2003 implemented the EU's New Regulatory Framework.

In order to supervise markets, FICORA may impose an obligation on operators deemed to have "significant market power." The agency closely monitors pricing and service provision. FICORA is in charge of planning the use of RF spectrum. The allocation is decided through evaluation of the applicants or through auctions. FICORA's decisions need to be approved by the Council of State, which is in charge of granting licenses to service providers. There are no foreign-ownership restrictions for telecommunication companies.

### 20.3.3 Infrastructure Development

Finland was the first country to issue 3G licenses. Using the Universal Mobile Telecommunications System Standard (UMTS), the ministry awarded four national licenses in 1999 at a very low cost (an administration fee of €1,000/25KHz). However, the first 3G network was not available until 2004, when TeliaSonera launched services, quickly followed by Elisa. Once services were available, Finnish subscribers quickly migrated to the new technology. Finland allocated both 1.8GHz and 2.6 GHz spectrum for LTE. 4G networks can provide wider coverage at lower cost in the 1.8GhZ spectrum, and Finland was the first country in Europe to allow the use of these low frequencies for LTE technology. In 2010, TeliaSonera launched Finland's first LTE service, and Elisa followed in early 2011.

### 20.3.4 Competition

Although there are 10 different service providers in Finland, three of them control 98 per cent of the market. These are Elisa, TeliaSonera and DNA, with shares of 39 per cent, 36 per cent and 23 per cent, respectively. Both Elisa and DNA are Finnish companies, and TeliaSonera is the merger of Telia (Sweden) and Sonera (Finland). Strong regulation in Finland has maintained a high level of competition

despite the "triopoly." Handset subsidies were banned in Finland up until 2006 and the proportion of contract subscribers is only 10 per cent, which promotes strong competition.

### 20.3.5 User Characteristics

Advanced voice and data services have strong adoption in Finland. The country has an ARPU of around $31 and average MOU of 227 minutes per month. SMS services are also regularly used, with about 40 messages sent per person per month. In addition, premium SMS, is a popular service through which subscribers can buy products from vending machines, subway passes and movie tickets; it is used by 30 per cent of mobile subscribers.

### 20.3.6 Service Prices

Service prices in Finland are among the cheapest in the world. OECD found Finland ranked second in the low- and medium-usage baskets, and fourth in the high-usage basket, making its mobile services some of the most affordable among OECD members. Sonera offers 350 minutes, 500 text messages and 3GB of data for $50 per month.

### 20.3.7 Mobile Services and Applications Initiatives

Finland has been a leader not only in infrastructure and devices but also in services and content. The first mobile-enabled vending machine was installed in Helsinki in 1997; through SMS, subscribers could purchase Coca-Cola products.

In 2001, Helsinki City Transport introduced SMS tickets for public transportation within the district. By texting a keyword to a specified number, a customer can buy a ticket and receive confirmation by phone, which can then be presented to the driver. The cost of the ticket is charged to the mobile phone account. The system has been very successful: by 2007, more than 10 million SMS tickets had been sold.

In June 2011, Elisa and the Finnish company ePygg launched their SEPA-payment service. By equipping phones with mobile certificates for user identification, users can easily make payments using their devices' near-field communication (NFC) chips.

In July 2011, Elisa and TeliaSonera announced the launch of the Valimo Mobile ID solution. As with ePygg's solution, users can generate an electronic signature that allows secure access to Internet banking, e-commerce and e-government applications. Valimo is also a Finnish company.

Although mobile TV has been available in Finland since 2008, it has had limited adoption.

### 20.3.8 Research Capacity

Finland is an important player in mobile R&D. In particular, Nokia has been a global leader in R&D expenditure, and until recently had been the number-one manufacturer of mobile devices. The country produced around 1,800 patents in the past decade, a vast majority from Nokia.

Finland also has strong institutions that have produced almost 2,200 mobile-related publications. The top two institutions for mobile research are the Helsinki University of Technology (now part of Aalto University) and the Tampere University of Technology (TUT). Finnish research centres include the Centre of Excellence in Smart Radios and Wireless Research at Aalto University and the Signal Processing Laboratory at TUT.

### 20.3.9 Mobile-Device Development

In 1991, the first commercial GSM cell phone call was placed on a Nokia prototype handset. The first GSM commercial phone, the Nokia 1011, was launched in 1992. Since 1998, Nokia has been the top manufacturer of mobile phones in the world. Popular models have included the Nokia 2100, launched in 1994, and the Nokia 3310-series, which sold 126 million units from its release in 2000 until its retirement in 2005.

Although Nokia's market share is almost a quarter of all handsets sold, it is down sharply from 2009, when it was approximately 40 per cent. Facing strong competition at both the high end (from Apple and Android smartphone manufacturers) and at the low end (from Chinese manufacturers like Huawei and TLC Corp), Nokia announced a new partnership with Microsoft in February 2011. The company plans to replace its own Symbian OS (and abandon Meego OS development) with Windows Phone 7; as a result, 1,400 jobs were cut in Finland.

### 20.3.10 Mobile-Content Development

From an environment that was strongly anchored around Nokia's Symbian operating system a few years ago, the mobile-application development community in Finland has had to adapt to Apple's disruptive "app" ecosystem, the emergence of Android, and Nokia's abandonment of the Symbian platform for Microsoft's Windows Phone 7. Some companies developing mobile content in Finland include Rovio (developers of the popular Angry Birds game), Digia, JoikuSoft, Offscreen Technologies, Sports-Tracker, Qvik, Grey Area, Rightware, Linkotec and Tieto, among others.

### 20.3.11 Other Interesting Points

Finland was the one of the first countries to entirely switch its broadcasting infrastructure to digital in 2008, allowing more efficient use of RF spectrum. In 2008, the government also announced plans to cover a third of the estimated EU€200 million necessary for building a fibre national network. These

forward-looking steps have characterized the jurisdiction, defining it as an inspirational market not just for mobile but for telecommunications in general.
Like Motorola in Illinois, Nokia plays a pivotal role in the research and innovation ecosystem of Finland. The company has significant power and has lobbied in the past for law and tax reforms. Nokia's job cuts in Finland represent a challenge for the Finnish government. According to a Finnish newspaper, "the government must assess the efficiency of the innovation chain, reflect on new tax incentives for research and development and introduce measures to increase risk capital. All these steps are urgently needed." [3]

## 20.4 South Korea

South Korea falls well within the category of an "inspirational market" for mobile technologies. Known as one of the "Asian tigers," the country has shown outstanding growth and progress since the 1960s. The country has become a technology leader in various industries, including mobile. Two of the largest manufacturers of mobile devices in the world—Samsung and LG—are headquartered in South Korea. The country is third in the world for mobile-related patents and publications, and has been a leader in the adoption of mobile technologies and applications.

### 20.4.1 Statistics

All figures are in US Dollars.

| Demographics | South Korea | Ontario |
|---|---|---|
| GDP (million)—nominal | $1,007,000 | $612,993 |
| Population | 48,875,000 | 13,210,667 |
| GDP per capita | $20,590 | $46,401 |
| Area (sq. km) | 100,210 | 1,076,395 |
| Population density (people per sq. km) | 487.73 | 12.27 |
| Urban population (%) | 81.5 | 85 |
| Median age | 38.4 | 37.6 |
| **Penetration (%)** | | |
| Mobile | 105.4 | 78 |
| Mobile broadband (2009) | 83.6 | 17 |
| Fixed telephone | 59.2 | 50 |
| Internet users | 83.7 | 81.6 |
| Fixed broadband | 36.6 | 29.8 |

### 20.4.2 Regulatory Environment

The Korea Communications Commission (KCC) is the agency in charge of telecommunications and broadcasting policy; as established in the country's Telecommunications Business Act (TBA), its fundamental goal is the "promotion of convenience for service users and public welfare through sound development of telecom service business." [4]

In 2009, after OECD reports that wireless service prices in South Korea were above the OECD average, new KCC policy sought to reduce prices by cutting handset subsidies, reducing charges, expanding prepaid services and promoting the introduction of MVNOs. The new policy achieved a price reduction of more than 20 per cent.

Service providers can apply for a license to operate to the KCC by submitting an application and business plan. No license or approval is necessary for the installation of networks. Until recently, RF spectrum was allocated to service providers by the KCC based on their technical and financial capabilities. Two types of allocation methods—either for a usage fee or for no usage fee—exist. A spectrum-auction system has been in place since January 2011. The auction for 800MHz, 1.8GHz and 2.1GHz took place in August 2011. The 2.1GHz auction excluded SK Telecom and KT Corp, the country's two largest service providers, hoping to level the field for LG U+, the country's third provider.

South Korea is one of only three OECD members to restrict foreign investment in the telecommunications market (the other two being Canada and Mexico). The total foreign equity in a facilities-based service provider must not exceed 49 per cent of shares. In addition, a company will be deemed foreign by the KCC if the largest shareholder is a foreigner with more than 15 per cent of shares.

### 20.4.3 Infrastructure Development

Through a progressive approach to deregulation, liberalization and privatization, the government has fostered a leading telecommunications market in South Korea. In addition, high population density has allowed the quick development and deployment of mobile networks, allowing the country to stay on the cutting edge of wireless technologies.

South Korea was the second country to launch 3G services in the world. In 2002, SK and KT launched services under the 1xEV-DO technology. In 2003, they launched 3G under the Wideband Code Divi-

[3] "Nokia's job cuts a challenge for Finland," in *Kauppalehti* (Finland: Kauppalehti, 2011)., http://www.eurotopics.net/en/home/presseschau/archiv/results/archiv_article/ARTICLE86591-Nokia-s-job-cuts-a-challenge-for-Finland.

[4] *Telecommunications Business Act,* (August 28, 1997).

sion Multiple Access (WCDMA) technology, the predicted world standard. 3G is now used by more than 50 per cent of South Korean mobile subscribers.

The first commercial network using the mobile WiMAX standard (sometimes branded as 4G and known in South Korea as WiBro) was launched in 2006. In addition, both SK Telecom and LG U+ launched their LTE networks for data services in July 2011. LTE enabled phones were available in the fall of 2011.

### 20.4.4 Competition

There are three mobile service providers in South Korea: SK Telecom, KT Corp and LG U+; their market shares in 2010 were 50.7 per cent, 31.4 per cent and 17.9 per cent, respectively. Market share has remained relatively unchanged in the last decade, only shifting slightly from SK to LG (about 4 per cent). However, the KCC approved the deployment of MVNOs in September of 2010. The first MVNO, Korea Cable Telecom, started service in October of 2010; since then, 10 more MVNOs have been announced, and the KCC, which is keen to see them succeed, has announced various support measures in early 2011.

### 20.4.5 User Characteristics

Progressive government policies have fostered a very technologically savvy society. South Koreans are among the top users of SMS in the world, averaging more than 200 messages per month. They are also heavy mobile phone users with average MOU of 295 minutes per month. Wide adoption of mobile voice, messaging and data services represent an ARPU for network operators of around $32.

### 20.4.6 Service Prices

South Korea ranked 18th out of 29 countries in a 2009 analysis for the mobile medium-use basket. KT Corp offers a plan with 300 minutes, 300 text messages and unlimited data for $60 per month.

### 20.4.7 Mobile Services and Applications Initiatives

Mobile TV, sent through a special frequency known as Digital Multimedia Broadcasting (DMB), is widely adopted in South Korea. DMB-enabled devices have been available in the country since 2005, and viewers are commonly seen in buses and subways. On-demand mobile video available through 3G and 4G co-exists with DMB broadcasts, which are mainly ad-supported.

Mobile commerce initiatives have been very common in South Korea, although with mixed results. Moneta cash was launched by SK Telecom in 2001, combining debit card and credit card functionality. LG Telecom mobile phone credit card payment was launched in 2002. Banks began issuing circuit chips for mobile phones with credit card information as far back as 2004. Since 2008, T-money—elec-

tronic cash stored and refilled in SIM cards—has been available to South Koreans. There are also more than 10 million subscribers to mobile banking services.

The local government of the Gyeonggi Province launched its Net Mobile Service in partnership with SK Telecom in 2004. Through the service, citizens receive information on civil application procedures, traffic and education programs. By 2010, more than 50 per cent of electronic government services were also available on mobile phones in South Korea, and most government agencies also feature a mobile website.

### 20.4.8 Research Capacity

South Korea is one of the top producers of patents and publications for mobile technologies in the world. The country has produced over 4,200 mobile-related patents in the past decade, with Samsung and LG being clear leaders.

South Korean universities have produced more than 10,900 publications related to mobile technologies in the past decade. Four of these universities are among the top 15 schools for mobile research in the world: Korea University, the Korea Advanced Institute of Science and Technology (KAIST), Seoul National University (SNU) and Yonsei University. Two of these, KAIST and SNU, are also ranked among the top global universities for Engineering and ICT, at 24th and 38th, respectively.

### 20.4.9 Mobile-Device Development

Samsung and LG, in addition to being global multinational corporations that produce a wide range of electronics goods, are the second and third largest manufacturers of mobile phones in the world, respectively. Although the outlook has been bleak for the device manufacturers in other jurisdictions (Sony-Ericsson, Motorola and Nokia), South Korea's electronics pioneers have been more successful in their recent mobile-device efforts. Both manufacturers chose the Android OS, which has quickly grown in terms of adoption and has led to gains in market share. In addition, Samsung's Bada operating system has been very successful in lower-range non-smartphones. While patent conflicts are common in the mobile industry, Samsung is facing increasing legal pressure from Apple in Europe, where regulators may ban Samsung Galaxy phones and tablets imports due to patent infringement.

### 20.4.10 Mobile-Content Development

It is common for Korean network operators to partner with local content developers to create applications and services that are uniquely tailored to Korean culture and sensibilities. Some mobile content creators in South Korea include Gamevil, Infobank Corp, Com2us, Sonftmax and Dosirak, among others.

### 20.4.11 Other Interesting Points

Regulations in South Korea had made the sale of foreign manufactured phones particularly expensive, which allowed local manufacturers to gain significant market share. These regulations were modified in 2008, at which point Samsung and LG controlled over 80 per cent of the local handset market.

The government has placed a high priority on the development of its technological capabilities and remains committed to the high-tech industry through various policy measures including: legislative measures, such as low-interest loans and tax incentives; direct financial support for education and R&D; infrastructure development, such as broadband networks and science parks; and active collaboration with industry, educational establishments and media to promote Korea's "technoculture."

## 20.5 Brazil

Brazil is a rapidly growing nation, with the largest economy in Latin America and seventh largest in the world. In 2010, Brazil's economy grew by 7.5 per cent (the 30th fastest-growing economy in the world), and it is expected to become the fourth largest economy in the world by 2040. Brazil's economic growth and its large potential market for mobile services have rapidly pushed the development and deployment of mobile services in the country.

### 20.5.1 Statistics All figures are US Dollars.

| Demographics | Brazil | Ontario |
|---|---|---|
| GDP (million)—nominal | $2,090,000 | $612,993 |
| Population | 190,732,694 | 13,210,667 |
| GDP per capita | $10,900 | $46,401 |
| Area (sq. km) | 8,514,877 | 1,076,395 |
| Population density (people per sq. km) | 22.40 | 12.27 |
| Urban population (%) | 85.6 | 85 |
| Median age | 29.3 | 37.6 |
| **Penetration (%)** | | |
| Mobile | 104.1 | 78 |
| Mobile broadband (2009) | 4.5 | 17 |
| Fixed telephone | 21.6 | 50 |
| Internet users | 40.6 | 81.6 |
| Fixed broadband | 7.2 | 29.8 |

### 20.5.2 Regulatory Environment

The two main targets of Brazil's telecommunications policy are outlined by the General Telecommunications Law as universal access and competition. An independent regulatory agency, the Agência Nacional de Telecomunicações (Anatel), implements the principles and guidelines for regulation established by the federal law.

Licensing from Anatel is required for the provision of any telecommunication service. Service-specific licenses are called "authorizations," for which Anatel charges a licensing fee. The agency is also in charge of RF regulation and supervision. Limited mobile spectrum is allocated through the auctioning of permits.

Although foreign ownership of operators is not prohibited (though restrictions apply to TV and radio broadcasters), telecom license holders must be companies formed and headquartered in Brazil whose majority of voting capital must be controlled by another company in Brazil or Brazilians. [5]

### 20.5.3 Infrastructure Development

3G was first launched in Belo Horizonte by Telemig using WCDMA technology at the end of 2007, using previously acquired licenses. Other service providers launched 3G services in selected cities shortly thereafter. Furthermore, Anatel held a 3G auction around the same time, and contracts were signed in April of 2008. The service is now available to more than 75 per cent of the population and penetration for 2010 was more than 9 per cent.

Consistent with the International Telecommunication Union (ITU)'s recommendations, Anatel decided to reallocate the 2.6MHz spectrum for next-generation mobile (4G/LTE). The agency plans to auction 120MHz of spectrum in 2012, hoping to see LTE rolled out in 2013. The government wants deployment of 4G to occur before the Brazil 2014 FIFA World Cup. Brazil will also be hosting the 2016 Summer Olympics in Rio de Janeiro.

### 20.5.4 Competition

Four companies control 98 per cent of the mobile market: Vivo (29 per cent), Claro (25 per cent), TIM (25 per cent) and Oi (19 per cent). Strong competition between these has led to wide adoption of mobile services in the country.

[5] Orgnisation for Economic Cooperation and Development, "National Treatment for Foreign-Controlled Enterprises Including Adhering Country Exceptions to National Treatments.," (2012), p. 20.

Recent approval of MVNOs is expected to further increase competition and availability of services. Interest in offering such services comes from recognized brands such as banks and supermarkets.

### 20.5.5 User Characteristics

The country has a relatively low ARPU at $13, with 81 per cent of all mobile subscriptions being prepaid, and many users having more than one SIM card. The prepaid-service model has contributed greatly to the wide adoption of mobile technologies in the country. Brazil also has one of the lowest adoption rates of SMS in Latin America. The average number of SMSs sent is 11 per month (in Venezuela, the region's SMS leader, the average is 182). High SMS prices in the country, especially for the popular prepaid services, help explain this phenomenon. Average MOU is 106 minutes per month.

### 20.5.6 Service Prices

Vivo offers 200 minutes, 250 mb and 200 text messages for $80 per month—more expensive than all of the other jurisdictions analyzed.

### 20.5.7 Mobile Services and Applications Initiatives

Brazil's telecommunication policies stress the search for universal access to basic telecommunication services. As in other countries, Brazil has a Universal Services Fund in place that helps poor communities gain access to mobile and telecommunication services.

Many government initiatives take advantage of the use of mobile devices to divulge information to citizens. Some of these initiatives include: SMS service for agribusiness, which informs farmers of daily prices for products they grow; job-seeker SMS service, which informs job seekers of arising opportunities that match their profiles; and the State of Piaui's Information Service, through which the state delivers car registry information and utility bills to mobile devices.

### 20.5.8 Mobile-Content Development

Mobile development—in particular, games—is a growing industry in Brazil. The country's low labour costs give it a comparative advantage in the industry and it is able to reach the same global market through the iOS and Android platforms. Some companies developing mobile applications in Brazil include Decadium, Movile, DayDreamLab, NanoGames, Meantime, ActMinds, Ludens Artis, OverPlay and MyPlay Mobile.

### 20.5.9 Research Capacity

Brazil's universities produced more than 1,100 publications related to mobile technologies over the past decade. Although the output is small in per-capita terms, it still reveals some research potential

in the country. The top schools for mobile research are the Federal University of Minas Gerais and the University of São Paulo.

### 20.5.10 Other Interesting Points

Research In Motion (RIM) is the number-one seller of smartphones in Brazil. In 2010, the company announced that it would start manufacturing its "Curve" model in the country, which has lowered prices in the region. However, smartphone penetration is still low, representing only 3.4 per cent of devices sold in 2010. Other companies that have done mobile-related R&D work in Brazil include Motorola and Siemens.

## 20.6 Russia

Russia is a rapidly developing economy and the largest mobile market in Europe by number of subscribers. It is currently the 11th largest economy in the world and it's expected to be the fifth largest by 2030. In addition, a large area and low population density—properties similar to those in Canada and Ontario—make it a good jurisdiction to examine.

### 20.6.1 Statistics All figures are US Dollars

| Demographics | Russia | Ontario |
|---|---|---|
| GDP (million)—nominal | $1,465,000 | $612,993 |
| Population | 142,905,200 | 13,210,667 |
| GDP per capita | $10,437 | $46,401 |
| Area (sq. km) | 17,075,400 | 1,076,395 |
| Population density (people per sq. km) | 8.37 | 12.27 |
| Urban population (%) | 72.8 | 85 |
| Median age | 38.7 | 37.6 |
| **Penetration (%)** | | |
| Mobile | 166.3 | 78 |
| Mobile broadband (2009) | 32.9 | 17 |
| Fixed telephone | 31.5 | 50 |
| Internet users | 43 | 81.6 |
| Fixed broadband | 11 | 29.8 |

### 20.6.2 Regulatory Environment

The Ministry of Communications and Mass Media is in charge of policy and regulation in the Russian telecommunications industry. In 2003, a new telecommunications law mandated "maintenance of effective and fair competition, establishment of conditions for developing Russian infrastructure and their integration with international networks, and attainment of the centralized control over Russian RF spectrum and numbering resources." [6] The ministry consists of various agencies and commissions, which regulate different aspects of the industry.

The State Commission for Radio Frequencies is in charge of RF spectrum allocation, mainly through the distribution of licenses and permits, for which it charges a nominal fee. The commission has also recently introduced annual fees for the use of spectrum, which will come into place in 2012.

Telecommunications is one of 42 sectors established by the Strategic Investments Law to require approval of an authorized government body for substantial foreign investments or change of control.

### 20.6.3 Infrastructure Development

3G licenses were distributed in 2007 on the basis of established criteria that included experience in the telecom sector, financial capability and ability to launch services, and required license holders to deploy services within two years of receiving the licenses. These licenses, which cost $100,000 each, were awarded to Mobile TeleSystems (MTS), MegaFon and VimpelCom, along with permits for the use of RF spectrum. The first 3G services were launched in St. Petersburg by MegaFon at the end of 2007. MTS and VimpelCom launched their 3G services in 2008 (initially available in St. Petersburg and other selected cities). The three major networks use WCDMA technology.

Yota, the brand used by telecommunications company Scartel, launched its WiMAX network for mobile broadband at the end of 2008. Having the largest WiMAX network in the world, the company announced in 2010 that it would abandon the development of its WiMAX network for LTE technology, and it launched LTE modem services in April 2011. Yota had migrated all WiMAX customers to LTE by the end of 2011.

In March 2011, Yota announced that it would partner with four of the main telecom providers in the country—MTS, MegaFon, VimpelCom and Rostelecom (wireline)—to develop a nationwide LTE network. Yota will become the 4G network provider for the Russian telecoms, and hopes to cover 180 cities by 2014. By separating network development from service provision, the deal endeavours to reach the Russian population more efficiently, avoiding the duplication of expensive infrastructure invest-

[6] Budde Comm, "Russia-Key Statistics and Telecommunications Market," (2012).

ment. Yota's CEO stated that "this deal is an endorsement of our vision for the future of the telecoms industry. We firmly believe in the separation of network ownership and service provision and believe that this ground-breaking agreement will drive innovation and benefit Russian consumers." [7] It will be interesting to follow the development of this strategic approach to 4G.

### 20.6.4 Competition

The four largest mobile service providers in Russia (and their market share) are MTS (32.6 per cent), Megafon (25.6 per cent), Vimpelcom (23.9 per cent) and Tele2 (8.5 per cent). Other various regional providers also exist, but many have been acquired by the large operators. Due to a high concentration of wealth, competition is strong in urban areas—especially in Moscow and St. Petersburg, where all the major providers have a presence. However, many rural areas are only served by at most two competitors, and service prices are higher.

The lack of MVNO regulation as well as resistance from the major operators to provide network capacity has hindered the development of MVNOs in Russia.

### 20.6.5 User Characteristics

Although mobile SIM card penetration is above 150 per cent, many users have more than one SIM card. In fact, 90 per cent of subscriptions are prepaid, leading to a low ARPU, estimated around $9. SMS is also widely adopted and generated over $1.2 billion revenue in 2010. Average MOUS is 187 minutes per month.

### 20.6.6 Service Prices

Megafon offers 500 minutes (and unlimited calls to other Megafon numbers), 250 SMS and unlimited data within Moscow (1GB in Russia), for $67 per month.

### 20.6.7 Mobile Services and Applications Initiatives

The major operators have tried to focus on mobile content and applications. MTS launched a branded mobile-search solution in 2007, which increased queries by 60 per cent and boosted mobile traffic. MTS offers location-finder services aimed at small and medium enterprises, through which they can track people or vehicles. In addition, it offers music, video, gaming and social networking content

[7] Ashley Norris, "Russia takes the lead in 4G mobile broadband," TechDigest, http://www.techdigest.tv/2011/03/russia_takes_th.html.

through the Omlet.ru portal. MegaFon launched its own content portal, trava.ru, in 2010. VimpelCom has offered mobile commerce services since 2005, allowing users to pay for Internet services, utilities and products at vending machines using their mobile phones.

Since last fall, the Commission for Modernization and Technological Development of Russia's Economy has been deploying initiatives to engage citizens and encourage them to participate in government discussions; these initiatives include the iRussia.ru website and mobile application, new websites, and Twitter and Facebook accounts for various government agencies and departments.

### 20.6.8 Research Capacity

Russian universities produced almost 300 publications related to mobile technologies. The Russian Academy of Sciences, a network of various research institutes, is the top publisher of mobile research.

### 20.6.9 Mobile-Content Development

Russia has a growing entrepreneurial culture that has led to the spur of start-ups in the mobile space. In addition, many established software companies in Russia have seen opportunity in mobile and have started developing applications for iOS and Android. Altergeo, Reksoft, DataArt, Yumasoft, Game Insight, JoyBits, i-Free and Toozla are some of the companies developing mobile solutions in Russia.

### 20.6.10 Other Interesting Points

Due to security concerns, the Russian government has announced that it is considering a ban of Apple's iPad for official use. Instead, it is considering the Playbook and other Android tablets as more suitable alternatives.

## 20.7 Conclusions for Ontario

In this concluding section we review our key findings by relating them to the province of Ontario.

### 20.7.1 Regulatory Environment

As observed, most jurisdictions have an independent regulatory agency in charge of policy implementation, and the main goals of policy include the promotion of competition and the efficient provision of services. Much like in Canada, the allocation of RF spectrum is usually done through auctions and/or evaluation of capabilities. Spectrum auctions in Canada are done by Industry Canada, as opposed to the regulatory agency, the Canadian Radio-television and Telecommunications Commission (CRTC). It is interesting to note that in Finland, where fees for RF spectrum use are much lower than in Europe or North America, the regulatory agency is inclined to monitor prices and competition much more closely. The KCC in South Korea has also enforced measures to reduce service prices.

Five of the jurisdictions we studied were countries that have sole control of policy regulations; in contrast, Illinois and Ontario are bound by regulations set at the federal level. Although Ontario and Illinois are similar in terms of GDP and population, Ontario's size relative to Canada means that it has more influence in federal decisions than Illinois does in the US.

Canada, South Korea, Brazil and Russia have foreign-ownership barriers for mobile telecommunications companies, Finland and Sweden do not, and the US has some limited restrictions.

### 20.7.2 Infrastructure Development

Ontario has been relatively slow at adopting new wireless infrastructure, with 3G first launched in 2005 and 4G in 2011. Small and densely populated countries such as South Korea have incredible ease in deploying new technology, keeping the country at the leading edge of mobile innovation. Although it is the case that Ontario's vast area makes deployment of infrastructure much more expensive in comparison to other jurisdictions, the province should continuously promote the adoption of new wireless technologies within densely populated areas if it is to fully take advantage of the latest mobile applications and services.

The deal for separation of network ownership and service provision that has occurred in Russia is an excellent case study to follow and analyze. Given Russia's vast territory, the agreement reached promises to be an efficient way of deploying 4G services in the country, similar to how broadband services are delivered in Stockholm. Ontario and Canada should consider evaluating analogous approaches, in particular for isolated rural areas.

### 20.7.3 Competition

As is the case in all of the jurisdictions we examined, market share in Ontario is dominated by a few big players. Rogers, Bell and TELUS control 97 per cent of the market, with shares of 47 per cent, 30 per cent and 20 per cent, respectively. Countries with only a few players may reach strong competition through effective regulation and price monitoring, as we have seen in the jurisdictions we examined. The KCC has achieved price reductions in South Korea and Finland offers some of the most competitive rates in the world despite its "triopoly."

Rogers, Bell and TELUS are some of the most profitable mobile providers in the world. New entrants like Wind Mobile and Mobilicity gained about 2 per cent of market share in Ontario; a relatively small coverage area and long contracts, which are common in the industry, may have impeded them from gaining a larger number of subscribers. Despite this, their entrance seems to have had a positive effect on competition in the province; in 2010, ARPU went down for the first time in five years, to $59 from $63 in 2009. Continuing to relax Canada's foreign-ownership restrictions (as it has been done in the recent past with Wind Mobile), could lead to further increases in competition. Sweden and Finland, where no restrictions exist, are among the top countries in the world for cheap mobile services.

In addition to evaluating policy regulations at the federal level, other approaches to encourage competition at the provincial level may also be examined. Developing and promoting a consumer-oriented guide such as the "Telepriskollen" web portal that is used in Sweden, where service prices are easily and clearly compared, could further encourage service providers to lower their prices and provide better services.

### 20.7.4 User Characteristics

Although Canada has very active users of mobile services, with an average MOU of 388 minutes per month, Ontario also has the smallest mobile penetration rate (78 per cent) and the largest ARPU ($59) from the jurisdictions examined.

An aging population may be a barrier to increased adoption of mobile services; however, the jurisdictions of Sweden, Finland, Russia and South Korea have older populations than Ontario and have some of the highest penetration rates in the world.

A great majority of mobile users in Brazil and Russia use prepaid subscriptions; this has led to rapid and widespread adoption of services (although ARPU is small). Encouraging service providers in Ontario to promote and make prepaid SIM cards more easily available may help reduce the mobile penetration gap.

### 20.7.5 Service Prices

The OECD ranked Canada 20th, 28th and19th for prices for low-, medium- and high-usage mobile baskets. This is better than the US but still above OECD average. Rogers offers a plan with 200 minutes, unlimited messaging and 1GB of data for $55 per month. Although different characteristics and bundles make the plans difficult to compare, this seems higher than most of the jurisdictions we analyzed (with the exception of Brazil). In particular, rates for data services in Ontario seem substantially higher than those in South Korea, Finland, Sweden, Russia and the United States.

### 20.7.6 Mobile Services and Applications Initiatives

The jurisdictions studied are all taking different approaches to the deployment of mobile services and applications. It is important to note that a country's approaches are often specific to characteristics of its citizens and the demand that exists for each service. It could also be noted that some jurisdictions, like South Korea and Finland, are more aggressive and willing to lead in terms of deploying mobile services and applications than others. However, this may also be a result of native characteristics within society, such as risk aversion or technological savvy. The *Taking Ontario Mobile* project aims to uncover what these particular needs are for Ontario, and where opportunities lie in the different sectors.

### 20.7.7 Research Capacity

Ontario has very competitive research and innovation assets. Four of the jurisdictions we selected—South Korea, Finland, Illinois and Sweden—are global leaders for the development of mobile technologies, both in infrastructure, with Ericsson and Nokia Siemens Networks, and in devices, with Nokia, Samsung, LG and Motorola. Patent output for mobile technologies at each of these jurisdictions is heavily dominated by these industry leaders. This is no different in Ontario, where a majority of patents have come from RIM and Nortel. Ontario has produced almost 1,700 related patents in the past decade.

Ontario is also a leader for academic research. The province produced more than 3,400 publications related to mobile technology in the past decade. The University of Waterloo and the University of Ottawa were the top publishers of mobile-related research. In addition, the University of Toronto and the University of Waterloo are ranked among the top schools for Engineering and ICT in the world, at 14th and 39th, respectively.

Public universities and government funding play important roles in the development of mobile technology; only three of the fourteen universities identified in the jurisdictions reviewed are private institutions.

In per-capita terms, Ontario ranks third in patents and second in publications among the studied jurisdictions. This represents great potential for further adoption of mobile technologies in the province and for the development of innovative services and solutions.

### 20.7.8 Mobile-Device Development

As demonstrated by the way market power has shifted in recent years, the mobile industry is rapidly evolving. RIM, like Nokia, Motorola and Sony-Ericsson, is facing strong competitive pressure from Apple and Android manufacturers such as Samsung and HTC. RIM's smartphone market share has gone from a peak of 21 per cent in 2009 to 12 per cent in the second quarter of 2011, and its stock fell more than 50 per cent in 2011. RIM's patent portfolio remains a strong asset for the company, especially in an industry in which "patent wars" are frequent.

### 20.7.9 Mobile-Content Development

Similar to how Finnish mobile developers strongly supported the Symbian platform, Ontario has a strong BlackBerry development community that has had to adapt rapidly to changes in the marketplace. Toronto has been named a hotbed for mobile development, but, as we have seen, there are many companies in each of the jurisdictions developing mobile content. Ottawa and Waterloo also have strong mobile-development initiatives. While many companies compete locally, creating solutions tailored to their specific cultures, others try to reach a wider audience through popular platforms like

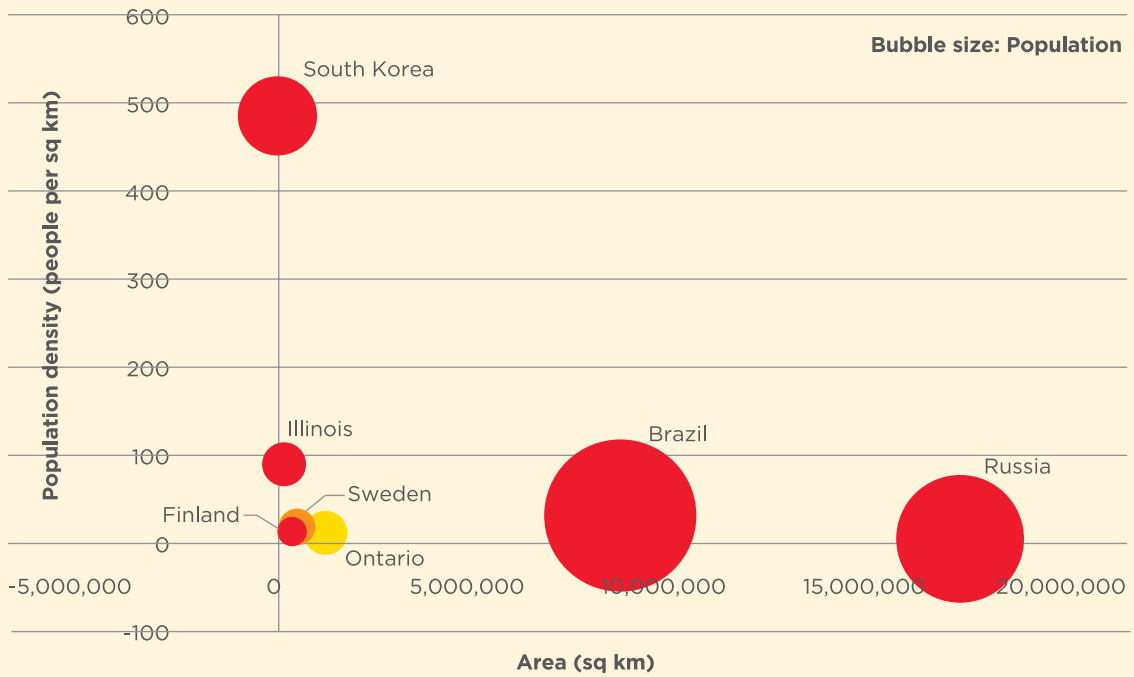
Android or iOS. Ontario can drive its mobile industry forward by fostering partnerships between development companies, network carriers and device manufacturers like RIM.

### 20.7.10 Other Interesting Points

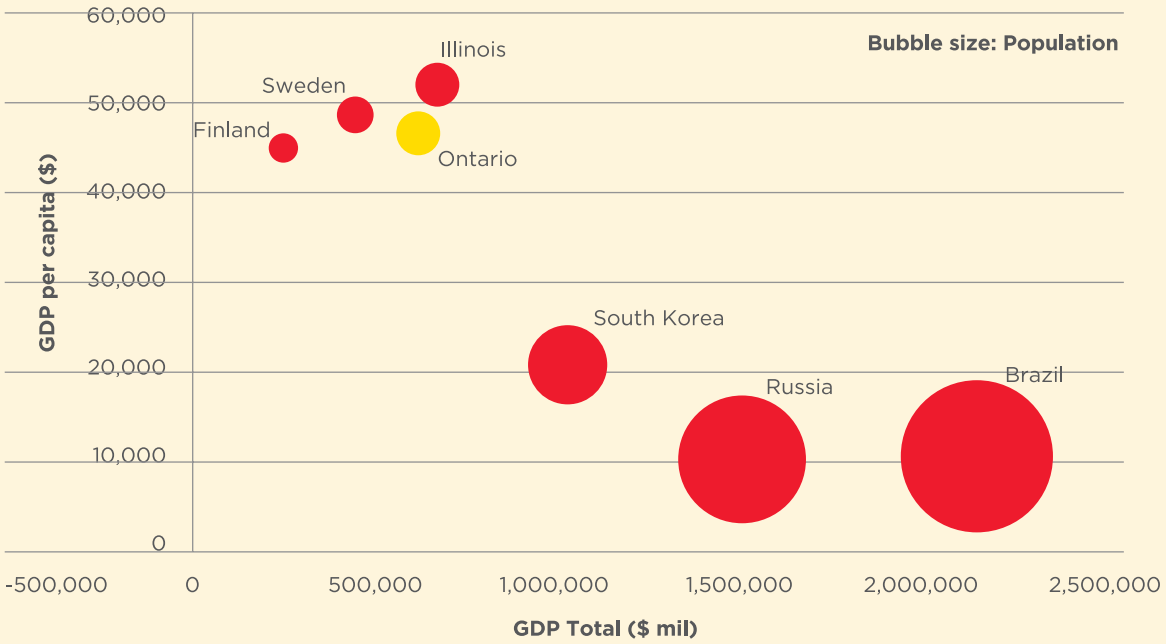
Like other native players in each jurisdiction, RIM has the largest share of smartphones in Canada and plays an important role in Ontario's high-tech economy. As mentioned, recent circumstances have seen RIM's share lose more than half its value. The province must pay close attention to these developments and consider providing support to the company if necessary, similar to what Illinois and Finland have done with Motorola and Nokia, respectively. The province should also continue to promote research and small- and medium-business development so that its high-tech economy relies less on the fate of a single large player. Adopting innovative mobile solutions provided by local entrepreneurs could help support the high-tech economy while being a step toward "taking Ontario mobile."

## 20.8 Jurisdictional Review – Visualization of Findings

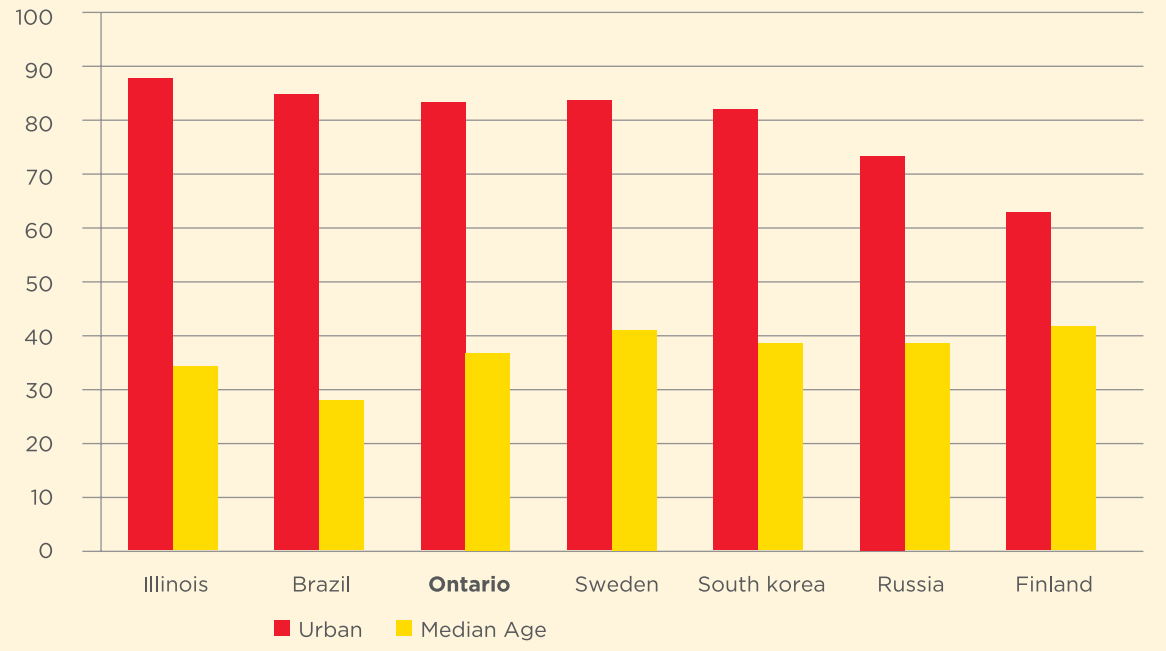
### Area and Population Density



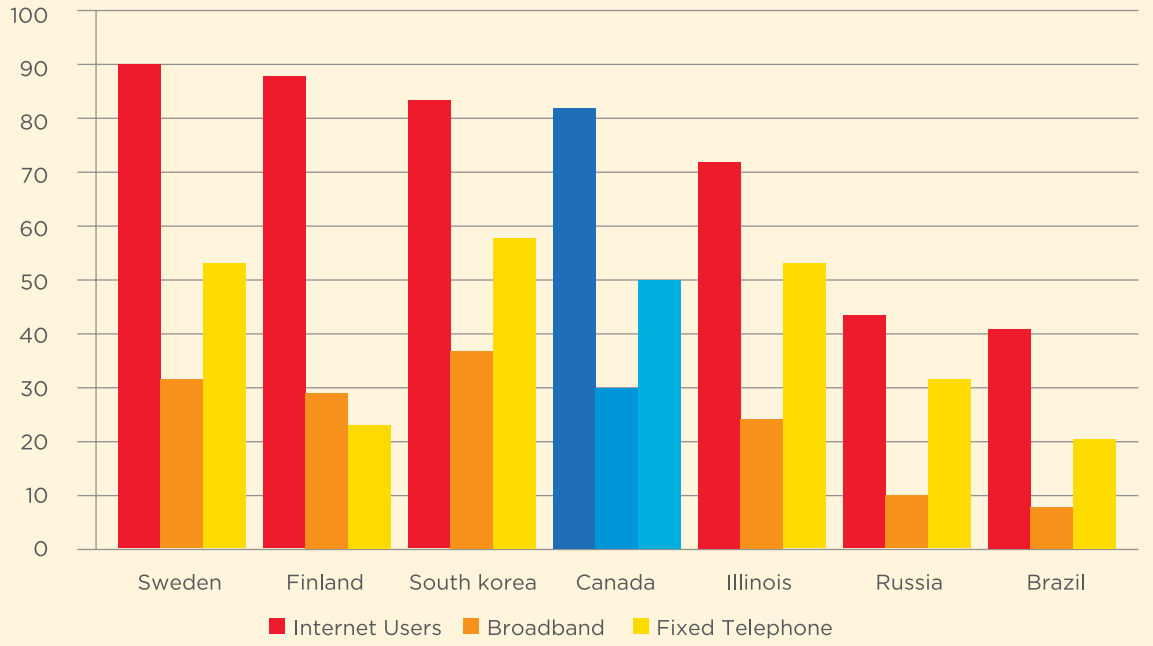
## GDP and GDP per Capita



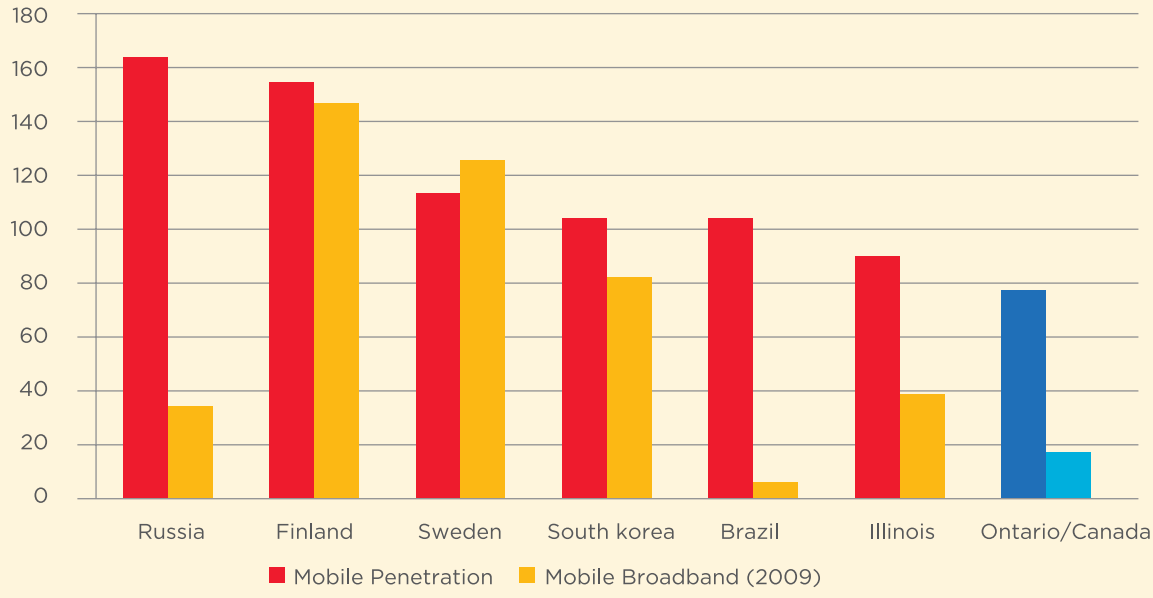

## Median Age and Percentage of Urban Population



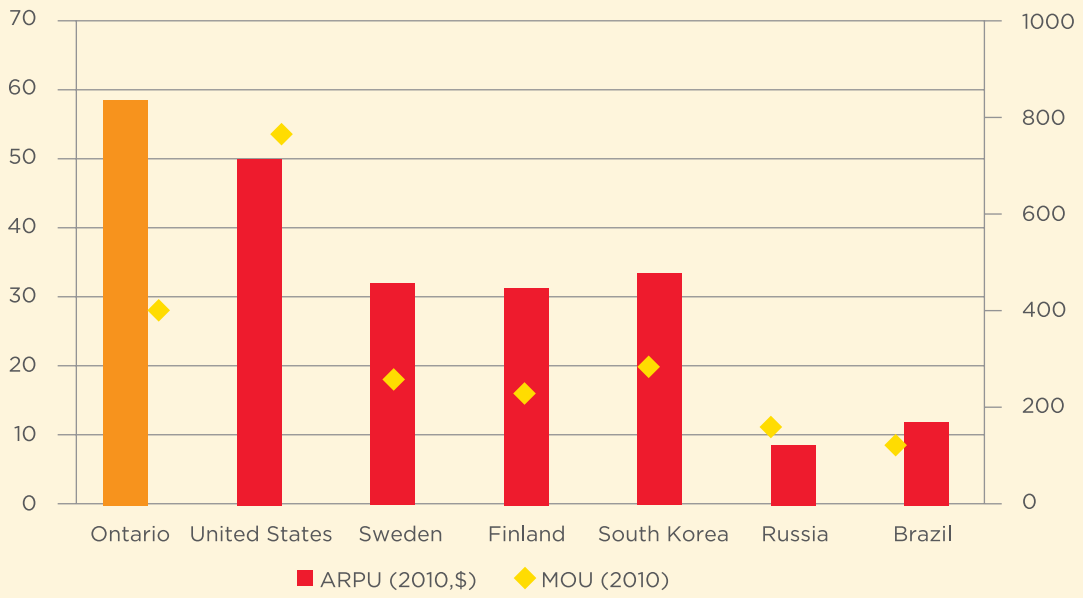
## **ICTs Adoption (2010)** Users/subscriptions per 100 people



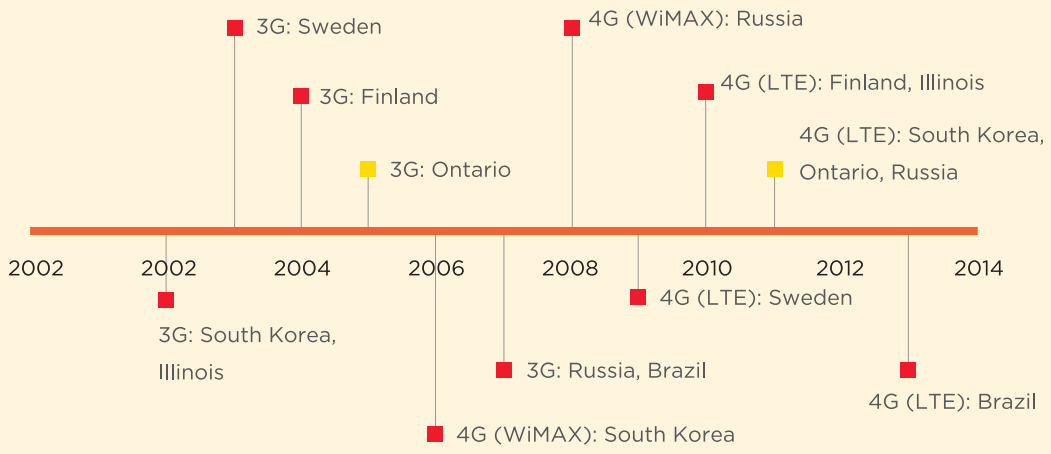

## **Mobile Penetration** Subscriptions per 100 people



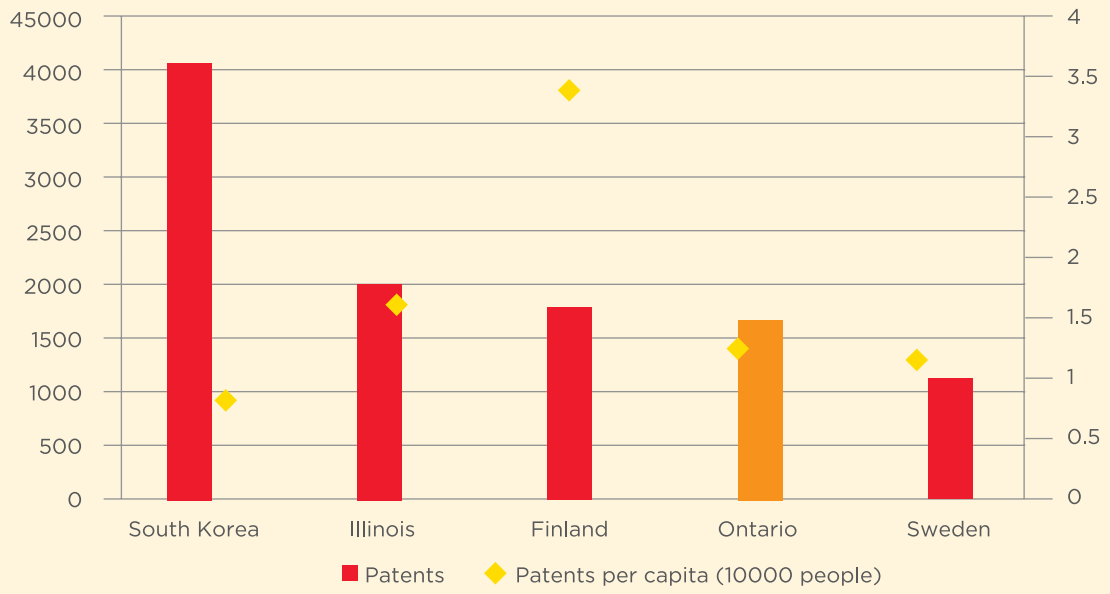
## **Average Revenue per User (ARPU) and Minutes of Use (MOU)** (Monthly data)



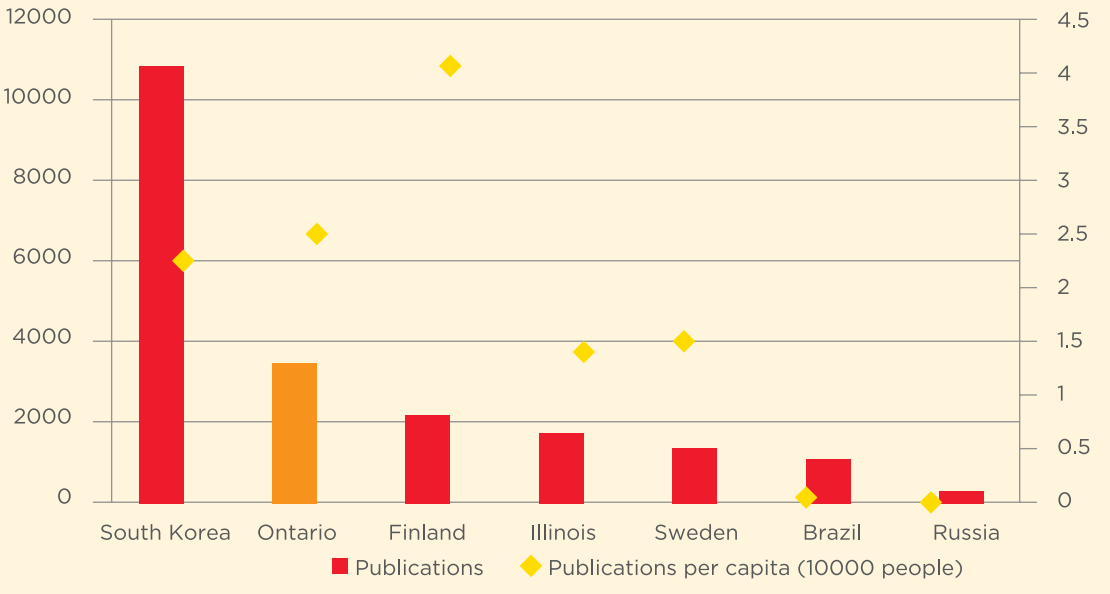

## **Infrastructure Development:** Launch of Wireless Technologies



## **Research Capacity:** Number of patents (2001 - 2010)




## **Research Capacity:** Number of publications (2001 - 2010)

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# 21. The Accessibility for Ontarians with Disabilities Act and Mobile Inclusion: Assessing Barriers to Inclusion in the Mobile Ecosystem

While there are opportunities for mobile inclusion in Ontario, we must address the systemic barriers prohibiting full mobile participation. This section looks more broadly at the mobile ecosystem in order to assess where the barriers lie and, consequently, how to address them. According to the 2005 Accessibility for Ontarians with Disabilities Act (AODA), a barrier is "anything that prevents a person with a disability from fully participating in all aspects of society because of his or her disability, including a physical barrier, an architectural barrier, information or communications barrier, an attitudinal barrier, a technological barrier, a policy or a practice." [8] To these qualities, we also add economic and sociocultural aspects as overall barriers to inclusion within the broader population.

One overarching concern across these spheres is the conceptualization of the ideal mobile user. The rapid turnover of mobile technologies makes conceptualizing ideal users—physically, demographically, psychologically—an essential and structuring component in producing, distributing and consuming mobile devices and services. Consequently, these ideals are reflected, for good or ill, in regulatory policies. The ideal user is often depicted in advertising as an individual who is young, upwardly mobile, relatively wealthy, disability-free, English-speaking and technologically savvy; this is an individual who is well adapted to the era of ubiquitous connectivity that mobile devices engender, much like a fish is adapted to life in the water. [9] This ideal mobile user stands in stark contrast to the often-excluded groups of Ontarians described above. Moreover, this ideal user is generally conceptualized as a consumer rather than a citizen, thereby reinforcing the perception that mobile users constitute a rather elite, privileged group as opposed to a democratic citizenry.

We will now systematically examine the various spheres that comprise the mobile ecosystem, identifying potential barriers to inclusion.

## 21.1 Production

The production of mobile devices and services—from hardware to software—evidences significant barriers. Perhaps the most important consideration is the variability in the technical composition of devices. This poses problems for trying to design strategies, policies and programs meant for inclusive purposes since ensuring a universal user experience is made more complicated by the diversity of

[8] *Accessibility for Ontarians with Disabilities Act*, 2005, SO 2005, c 11, <http://canlii.ca/t/kpnx> retrieved on 2012-03-26.

[9] James E. Katz, *Mobile communication: Dimensions of social policy*, vol. b (Piscataway, N.J.: Transaction Publishers, 2011); R. Ling, *The Mobile Connection: The Cell Phone's Impact on Society* (San Francisco: Elsevier/Morgan Kaufmann, 2004).; Leslie Regan Shade, "Feminizing the Mobile: Gender Scripting of Mobiles in North America," in *Mobile Phone Cultures,* ed. Gerard Goggin (New York: Routledge, 2009).

mobile device capabilities. Taking this variability into consideration will help avoid privileging one device type or brand over another. Moreover, these considerations will help develop a mobile strategy implementing the information and communication standards outlined by the Accessible Information and Communications Standards Development Committee: "It is the Committee's vision that by 2025, all information and methods of communication to and from an individual will be designed to be accessible to persons with disabilities consistent with human rights law, the French Language Services Act (1990) (where applicable) and inclusive design principles. "The Committee intends for the requirements to build upon the principle of providing accommodation to persons with disabilities to preserve and enhance dignity and independence" (2009). Implementing the requirements of the Integrated Accessibility Standards developed under the AODA depends on institutional size, and whether the institution is public or private. For example, all Ontario government institutions are required to make available accessible formats and communication supports by 2016. Similar requirements will apply to websites and intranet access conforming to the World Wide Web Consortium Web Content Accessibility Guidelines (WCAG) 2.0 beginning in 2012 (Ontario, 2011c).

To do this, we will briefly review seven important design categories contributing to this diversity: enclosure or casing design, screen resolution, interface, processing power, operating system (OS), connectivity, and software (applications).

## 21.2 Enclosure/Casing Design and Dimensions

There are several ways of designing the physical enclosure of a mobile device. The physical design and dimensions impacts on how a user holds and interacts with a mobile device Traditional cell phones optimized for voice usually have a "candy bar" shape, mirroring the design of fixed line telephone receivers and generally only require one free hand to use. Smartphones, beginning largely with the BlackBerry, have a much boxier design emphasizing either the use of thumbs (or multiple digits) for data input and interaction. The latter require greater hand-eye coordination to use effectively. More recent smartphones known as "sliders" often maintain the candy bar shape while hiding a slide out keyboard under the screen and/or dialing pad.

## 21.3 Screen Resolution

Screen resolution can vary widely between phones. Unsurprisingly, more recent phones have much higher resolution than phones released even a year ago. This has great impact on the use of rich-media content, video playback, and software development (apps). With the introduction of HTML 5 a relatively high baseline resolution will be required to make use of its new rich media capabilities. The continued expansion of applications as a driving part of the mobile ecosystem will require increasingly more detailed screen resolution.

## 21.4 Interface

Smartphones offer three predominant interface approaches: scroll pad with a tactile QWERTY keyboard (e.g. BlackBerry Curve/Bold) or in some cases a compressed QWERTY (e.g. BlackBerry Pearl/Style), touchscreen with virtual QWERTY (Apple iPhone, or Samsung Galaxy), or a hybrid of these two (BlackBerry Torch). A tactile QWERTY keyboard is often preferred for heavy texting or script-based mobile usage. Moreover, it offers haptic feedback that allows users to type much faster and comfortably than a touchscreen/virtual keyboard which requires comparatively more adjustment time for new users. Tactile keyboards, however, require incredibly nimble fingers and digital dexterity to use effectively. Since the keyboard is fixed there is no flexibility in how it can be configured; virtual keyboards, however, offer the opportunity to customize the size and quality of the virtual buttons. While the scroll pad of devices like the BlackBerry Curve mirror the usability of a laptop's touchpad or desktop mouse, a touchscreen interface like those offered on the iPhone offer an incredible versatility in how users can interact with information on the mobile screen. For application and software developers, touchscreens are a central part of design functionality because they offer up many novel ways to easily navigate graphical information on mobile devices. In the long run all devices will have a touch interface, with only some of those devices maintaining a physical QWERTY keyboard. Though touchscreens are becoming the norm for smartphones, it is a comparatively new interface approach, and may require some adjustment for users familiar or used to tactile feedback. That being said, the nature of touchscreens arguably allows for a more intuitive and interactive experience once users have adapted.

## 21.5 Processing Power

There is no doubt that mobile devices are increasingly more mobile computer than phone; the success of the iPhone is clear evidence of this. Processing power is a central element shaping the ability of smartphones to access web-based data, process graphics, multi-task, and use application smoothly. Moore's law [10] suggests a continued increase in the processing power available to computing devices, meaning that each new generation of mobile devices will be significantly more powerful than the last. Any forward-looking strategy will require sensitivity to the fact that many users may be using devices with processing power significantly lower than the most current devices.

### 21.5.1 Connectivity

There are a number of different connectivity options available to mobile users. In addition to the basic wireless connectivity standards like 2G (GSM, CDMA), 2.5G (Edge, GPRS, EVDO), 3G (CDMA2000,

[10] See http://download.intel.com/museum/Moores_Law/Printed_Materials/Moores_Law_Backgrounder.pdf.

UTMS, HSPA) and 4G (LTE, WiMAX), a mobile device often includes Wi-Fi (IEEE 802.11b/g/n), Bluetooth (1.0, 2.0, 2.1, 3.0) and GPS, in addition to wired connectivity provided over USB connections (1.0, 2.0). Depending on the model, some devices may not offer all forms of connectivity, in order to save on battery power, component space or cost. For example, while widely used, not all devices offer all versions of Wi-Fi.

### 21.5.2 Operating System

One of the central barriers to address is the substantive difference in the operating systems (OSs) used in smartphones. Moreover, each OS represents a separate programming environment offering its own software development kit (SDK). Because of the differences in OSs and SDKs, creating an inclusive strategy means addressing and overcoming differences in each OS platform.

### 21.5.3 Applications: App Stores vs. Web Apps

Application development is, for the most part, highly profitable for both developers and handset manufacturers. The latter are, in many respects, the gatekeepers when it comes to the availability of applications. Apple, BlackBerry, Google and Microsoft operate "app stores" that make available "approved" applications, from which those companies draw royalties or a percentage of each sale. Another consideration is to what extent mobile applications should be "web-based," allowing applications to be used through a browser rather than through a particular OS-based app store. [11] Arguably, the latter offers a greater audience and overcomes some of the aforementioned "gatekeeping" barriers, but is highly dependent on mobile web browsers, which have quite diverse and uneven capabilities. With the rollout of HTML 5, web-based applications for mobile will become more versatile but will also require mobile web browsers to keep apace.

### 21.5.4 Tablets

Though a relatively new market, tablets are growing in popularity. Despite their current status as luxury items, tablets hold great promise, particularly for engaging with seniors and people with disabilities, since their size and relative ease of use offer great flexibility in how information and services can be accessed and used.

[11] Christopher Mims, "Why mobile apps will soon be dead," *Technology Review* 2011., http://www.technologyreview.com/view/424042/why-mobile-apps-will-soon-be-dead/.

### 21.5.5 Overcoming Mobile-Device Diversity

An inclusive strategy will have to take into account not only the different OSs and application-development regimes, but also the specific dimensions and technical compositions of each device. For example, while the Apple iPhone offers a relatively consistent screen size, touch interface and processing power, BlackBerrys and many Android-based devices vary widely.

There are also some disparities in the accessibility features and applications available on each device. For example, the Apple iPhone is largely compliant with Section 508 of the Rehabilitation Act of 1973, offering built-in or free-for-download applications that address a wide variety of impairments, [12] while devices running BlackBerry or Windows Mobile often require users to buy applications to provide such features. Each device type has its own set of accessibility options addressing questions of impairment in different ways.

The diversity of devices and user capabilities suggests the need to develop applications that can adapt to specific devices and users. For example, the Imhotep framework described by Almeida et al. [13] outlines the development of user- and device-conscious applications—a possible way to overcome differences in user and device capabilities. This approach seems a necessary step in ensuring a consistent mobile experience across devices and users.

## 21.6 Distribution

Mobile broadband coverage is fairly comprehensive in Ontario: wireless users are able to access 2.5G or 3G services in most areas. [14] Access, however, does not necessarily mean that uplink and downlink rates are consistent. Quality of service is not only based on the availability of the network, but also, crucially, on the strength, bandwidth and number of users in a given area. Monitoring telecom providers and holding them to the wireless data rates they advertise is important to ensure mobile broadband consistency across Ontario and Canada.

As discussed earlier, one way to overcome some of these barriers is to focus on Wi-Fi access and hotspots to develop mobile services, in part because this is a way to overcome high data costs. Many smartphones allow seamless switching between wireless networks and Wi-Fi; designated hotspots could thus be important tools for overcoming costs associated with mobile data, although this places limitations on the overall mobility of such services.

[12] See: http://www.apple.com/iphone/features/accessibility.html for a review of Apple's accessibility features.

[13] Aitor Almeida, "Imhotep: An Approach to User and Device Conscious Applications," *Personal Ubiquitous Computing* 15, no. 4 (2011).

[14] Catherine Middleton, "Structural and Functional Separation in Broadband Networks: An Insufficient Remedy to Competitive Woes in the Canadian Broadband Market," in *The Internet Tree: The State of Telecom Policy in Canada 3.0*., ed. Marita Moll and Leslie Regan Shade (Ottawa: Canadian Centre for Policy Alternatives, 2011).

## 21.7 Consumption

### 21.7.1 Income

Canada's relatively high prices for mobile services can deter or unduly price out of the market those users unable to dedicate a comparatively large proportion of the their income to mobile use. [15] High costs for long-distance and wireless data will deter these groups from using mobile beyond just voice and text.

### 21.7.2 Marketing and Advertising

The representation of ideal users in marketing and advertising also influences how "needs" are communicated to potential consumers. [16] The use of mobile for the delivery of public services and information is largely absent in marketing and advertising efforts. In the mobile imaginary, users are treated as consumers, not citizens, and as such mobile usage is often depicted as both a social necessity and a luxury generally reserved for the young. The latter point symbolically reinforces the relatively high cost of services in Canada. Because of the symbolic and economic barriers that many potential mobile users confront in everyday life, the question of socialization is of paramount importance: that is, how to teach people to use mobile to maximize their access to public services and information.

From the perspective of the aforementioned marginalized groups, there is a disparate range of capabilities that need to be taken into account, such as vision, hearing, cognition, mobility and agility. These impact how consumers use mobile devices and services. Similarly, demographic and generational factors also shape how consumers use devices, since there are major differences in how different demographic groups use and engage with mobile. [17]

To deal effectively with these consumption barriers, it is also important to understand mobile as one component (albeit a ubiquitous and personalized one) of a broader media ecology that comprises several different networked devices and contexts. [18] Clearly articulating the context of consumption will help maximize users' ability to access the information and services they need in an efficient and timely manner.

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[15] Kim Sawchuk and Barbara Crow, "Talking 'costs': Seniors, Cell Phones and the Personal and Political Economies of Telecommunications in Canada," *Telecommunications Journal of Australia* 80, no. 4 (2010).

[16] Juan Migueal Aguado and Immaculada J. Martinez, "The Construction of the Mobile Experience: The Role of Advertising Campaigns in the Appropriation of Mobile Phone Technologies," *Mobile Phone Cultures*, no. Journal Article (2008).

[17] See: Kathryn Zickuhr, "Generations 2010," in *Pew Internet and American Life Project* (Washington, D.C.: Pew Research Center, 2010).; Kathryn Zickuhr, "Generations and their gadgets," Pew Internet and American Life Project, no. Journal Article (2011).

[18] Casey Man Kong Lum, *Perspectives on Culture, Technology and Communication : The Media Ecology Tradition* (Cresskill, NJ: Hampton Press, 2006).


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# 22. International and Provincial Consumer-Protection Policies

## 22.1 Canada

Canada's Competition Bureau is currently responsible for overseeing and enforcing the protection of consumers under the Canadian Competition Act. Under the act, businesses are legally required to accurately represent the product or service they provide to customers; the act is also intended to ensure that customers have competitive prices and choices within the marketplace. Since these laws are generalized to a large range of products and services, individual provinces have started to implement provincial acts that specifically address the unique issues that have arisen with the growth of the cell phone and Internet service industries. Some of general concerns pertain to cell phone contracts, data usage, Internet services and data speeds.

At present, Canadians who have been unable to resolve problems with their cell phones or Internet service providers (ISPs) are able to submit their complaints to the Commissioner for Complaints for Telecommunication Services (CCTS), an independent organization. The CCTS essentially works as a mediator, working with the consumer and the company in question to resolve the issue to the satisfaction of both parties.

### 22.1.1 Ontario

The Ontario Ministry of Consumer Services also provides some protection for consumers, but not with legislation specific enough to address the concerns of many of Ontario's cell phone and Internet users. For this reason, a proposal to amend Ontario's Consumer Protection Act was put forward in November 2010 as Bill 133 and reintroduced in November 2011 as Bill 5, the Wireless Phone, Smart Phone and Data Service Transparency Act, 2011. The bill has passed first and second readings and awaits a final review by the Standing Committee on General Government. A summary of the main points of the bill are as follows (from the website for the Legislative Assembly of Ontario):

1. An agreement for wireless telephone service or data service must be expressed in plain language.
2. An agreement must contain certain information with respect to descriptions of services and goods to be provided under the agreement, and statements of all associated costs.
3. A supplier must agree to remove any technological or physical feature that restricts the functioning of the goods to a particular service provider when a consumer pays full price for the goods or when the agreement expires.
4. A supplier must agree to notify a consumer when the consumer has reached 90 per cent of the limit of any particular service under the agreement, as well as when the consumer is about to incur charges for attempting to use a service that is subject to geographical limits outside those limits.
5. No agreement may be amended or renewed without the express consent of the consumer.
6. A consumer may at any time, without any reason, cancel an agreement on giving 30 days notice, and cancellation fees are limited.
7. Rules are established with respect to advertising prices for wireless telephone, smart phone and data service.

8. Pre-paid cards for a fixed amount of service may not be sold if they have an expiry date.
9. The enforcement provisions of the Consumer Protection Act, 2002 apply to this Act, with necessary modifications.

### 22.1.2 Quebec

Quebec was the first province or territory in Canada to successfully amend its provincial Consumer Protection Act in order to better protect cell phone users. In December 2009, the Québec legislature officially passed Bill 60, the Act to Amend the Consumer Protection Act and Other Legislative Provisions, which now requires those who provide cell phone and Internet services to allow for consumers to terminate contracts without harsh penalties, to communicate the details of contracts in plain language, and to be more transparent in describing the terms, services and cost of such services. These companies are also prohibited from renewing a customer's contract without written approval or from suddenly increasing fees during the lifetime of a contract.

### 22.1.3 Manitoba

On June 15, 2011, the Manitoba government passed Bill 35, the Consumer Protection Amendment Act (Cell Phone Contracts), in order to more specifically address the issues encountered by cell phone consumers in its Consumer Protection Act. Based on Quebec's Bill 60, Manitoba's Bill 35 addresses the length and cost of cell phone contracts, the need for clear language and full descriptions of services and costs, one-time fees, and the cancellation of contracts. The policy changes were intended to help consumers better understand their agreements with cell phone companies and to provide them with more flexibility and fewer costly penalties.

### 22.1.4 Going Forward

The concerns about cell phone and Internet-service provision that are starting to be addressed in Canada have already been considered in other countries around the world; in fact, there are a number of examples in which the legislation has been taken much further, particularly with regard to the use of wireless Internet.

## 22.2 United States

At a national level, the US currently relies on its general consumer-protection laws to address broadband and cell phone consumer use. The Telecommunications Act of 1996 primarily outlines how the telecommunications market, including the broadband market, ought to be regulated. Although the act states that universal telephone service ought to be affordable, the newer Internet and cell phone technologies are not mentioned in relation to consumer protection or rights. While some attempts—such as the Internet Freedom, Broadband Promotion, and Consumer Protection Act, proposed in 2011—have been made to create Internet-specific regulations, they have not generated enough support to

amend or add to existing legislation.

However, in its national broadband plan, Connecting America, released in 2010, the Federal Communications Commission (FCC) states its intention to improve consumer welfare by working toward implementing changes such as the creation of disclosure requirements for ISPs; this would enable potential customers to be better informed about service quality, such as actual broadband speeds, and thus allow customers make better informed decisions when signing contracts. Since releasing Connecting America, the FCC has made progress in having some of the outlined changes approved and implemented as official regulations. In December 2010, the FCC put forward the Open Internet Order, which addressed a variety of issues including disclosure requirements and net neutrality. In this highly controversial document, the FCC amended its initial proposal with one that was more lenient with regards to net neutrality, particularly with respect to wireless broadband. While both wired and wireless broadband are prohibited from blocking lawful websites and applications, only fixed-line ISPs are required not to discriminate (within reason) when transmitting lawful network traffic. These net-neutrality rules are currently being appealed by various parties within the US.

Issues pertaining to Internet and cell phone use in relation to consumer protection are also being discussed at the state level. In the state of Massachusetts, for example, the Department of Telecommunications and Cable is currently requesting input from its citizens regarding a pending overhaul of its current legislation; topics being debated include the fees for early termination of service contracts, the range of plans and payment options for services, and whether a single set of integrated rules should be created to be applied to all voice and cable services.

## 22.3 Australia

In January 2011, the Australian government replaced the Trade and Practices Act 1974 with the Competition and Consumer Act 2010. This new legislation does not target cell phone or Internet-service provision specifically, but it does require certain guarantees for consumers such as the requirement that products sold, such as cell phones, must be of sufficient quality and suitability for the task claimed by the provider, and that services such as Internet provision must reasonably fit the description given by the provider.

Consumers are further protected in their dealings with the telecommunications industry by the Telecommunications Consumer Protections Code, which works in conjunction with the Competition and Consumer Act 2010. Industry bodies register industry codes with the Australian Communication and Media Authority (ACMA), a branch of the federal government, and the ACMA directs participants in the telecommunications industry to the codes for compliance (whether that participant is a voluntary signatory of the code or not). Should consumers be unable to resolve disputes with their cell phone or ISP, they can contact the Telecommunication Industry Ombudsman (TIO), an independent official appointed to investigate consumer complaints. The TIO uses the industry codes approved by the ACMA as well as the Competition and Consumer Act 2010 to investigate and address customer complaints.

Through the Act and the Protections Code, the Australian government and the telecommunications industry have been tackling and clarifying issues that have yet to be addressed in Canada, such as the requirement for telecommunications companies to accurately represent their Internet speeds to their customers; advertised speeds must reflect the service that customers will regularly be able to access, as opposed to maximum or theoretical speeds that may rarely or never be available. Other industry requirements include the necessity for telecommunications companies to use plain language in communicating with customers, to be clear in communicating the cost of product or service—including activation and termination fees—and to define clearly terms such as "unlimited" access or use.

## 22.4 European Union

Although differences do exist between EU countries with regard to the implementation and cost of telecommunication services, the EU created overarching policies for the telecommunications industry that apply to all member countries. These policies have been amended over the years to address the changing realities of the telecommunications industry, such as the introduction of the Internet. In 2009, the EU approved reforms to these policies; these updates paid particular regard to broadband technology and a requirement for telecommunications companies to clearly and fully explain the terms and conditions of broadband service and contract agreements—they must, for example, explicitly state the minimum service levels customers can expect. Other existing customer-protection laws include a seven-day "cooling off" period in which a consumer could choose to cancel a broadband service contract after signing it without a penalty. In terms of cell phones, a number of regulations pertaining to roaming have been implemented, such as a limit on the maximum charge-per-minute for calls outside of the service provider's zone, as well as an automatic cut-off at €50 for roaming usage, unless otherwise arranged by the consumer, so as to prevent "bill shock."

In publishing the 2009 reforms, the EU emphasized that the reform rules pertaining to competition and improved fibre and wireless infrastructure would serve to encourage competition and investment in next-generation access networks, thus supporting future growth. It emphasized the EU's view that competition within a liberalized market is important but must be balanced with regulation, to ensure that customers are protected and have universal access to service and to counterbalance the power of former industry monopolies. The reforms also included an emphasis on overcoming the digital divide that exists between rural and urban areas by better managing the radio spectrum and by making wireless Internet available in areas where building fibre networks is too costly.

### 22.4.1 Future EU Policies

The EU is continuing to develop its policies with regard to the future of its telecommunications industry through a current project called the Digital Agenda for Europe. Through this endeavour, the EU is aiming to further improve areas such as Internet speed, citizen e-skills and research and innovation, as well as the use of information-communications technology for social challenges (such as secured online access for citizens' medical records). These policies tie in with current strategies as well as with

the Europe 2020 Strategy for economic growth, which targets employment, innovation, education, social inclusion and climate/energy. Strategic targets for Internet technology include ensuring that all citizens have Internet access by 2013, that there is a minimum Internet speed of 30 mbps by 2020, and that 50 per cent of all European households have Internet speeds of 100 mbps or higher by 2020. Wireless Internet is seen as critical to the success of this project, particularly in regions where wired access is seen as "impractical"; thus, the EU is aiming to increase mobile broadband access and speeds. The EU is calling for national broadband plans to reduce the cost of setting up wireless Internet infrastructure by removing administrative obstacles, such as the difficulties companies face in being approved for installing new base stations, and to ensure sufficient spectrum availability and band size.

The Digital Agenda is promoting the reduction of costs for broadband deployment and trying to guarantee the effective use of government money, by, for example, ensuring that funds set aside for the building of infrastructure through the EU's Structural and Rural Development Funds are used for that purpose and are not allocated to other government projects. The project will be funded by private and public investors—both by the EU and by individual national governments. In order to coordinate the implementation of current broadband projects and the sharing of relevant information and guidelines, the European Broadband Portal was created. It also acts as a meeting place for various levels of government, community broadband champions and industry providers.

### 22.4.2 United Kingdom

While the UK is required as a member of the EU to follow the telecommunications policies set forth by the EU, as an independent nation it has also created and implemented its own broadband plan, Digital Britain. In this plan, the UK has determined policies and goals specific to its own context, telecommunications industries and economic realities. The regulations put into place for Internet and cell phones are primarily the ones outlined by the EU, but the British government has made decisions about how these regulations will be implemented and overseen. For example, the Office of Communications (Ofcom), the telecommunications industry regulatory authority approved by the British government, has created a Voluntary Code of Practice that encourages the transparency of actual broadband speeds by ISPs. While public commitment to the code by Internet service providers is voluntary, the names of the companies who do sign are made public on the Ofcom website and are thus, in theory, more likely to gain the trust of potential customers. Although Ofcom states that it will continue to monitor customers' experiences with the ISPs and the transparency with which they disclose actual broadband speeds to their customers, the signing of the agreement by ISPs is regarded as a commitment to and thus an assurance of service quality.

Most recently, Ofcom has announced that as of December 31, 2011, broadband and landline phone providers will no longer be able to sell automatically renewable contracts (ARCs) to residential and small-business customers. Previously, individuals locked into ARCs who wished to change their contracts were obligated to contact their service providers before their contracts ended in order to opt out of renewal, or they faced penalty fees. The UK has moved toward eliminating ARCs since research by

Ofcom revealed that ARCs reduce market competition and provide little benefit to consumers. Service providers have until December 31, 2012, to move customers currently locked into ARCs into alternative forms of service contracts.

### 22.4.3 Finland

According to the information provided by the Finnish Communications Regulatory Authority (FICORA), the regulations pertaining to cell phone and Internet use closely follow those outlined by the EU. However, Finland is different in one respect: it was the first country in the world to make Internet access a legal right.

As of July 1, 2011, every citizen in Finland has the right to connect to the Internet with a minimum 1 mbps connection either through fixed-line or wireless broadband; by 2015 minimum speed will have increased to 100 mbps. In outlining the details of its plan, the Finnish government states its perspective on the importance of upgrading broadband infrastructure and ensuring affordable prices for Internet services for its citizens; it also emphasizes the critical role of public funding in addition to private-sector investment in making affordable broadband available to all. According to Finland's Ubiquitous Information Society Advisory Board's *Action Programme for 2008–2011*, as this infrastructure is put into place the Finnish government will implement a variety of online services for its citizens, including support services for the elderly and a citizens' web portal for accessing government services.

### 22.4.4 Spain

Echoing Finland, Spain announced in 2009 that in 2011 it would officially declare broadband access a citizen right. The Spanish government's interpretation of this is that all citizens should be given the opportunity to connect to a basic level of Internet access (1 mbps) at a regulated price. This goal is one part of Spain's revised broadband plan, Plan Avanza 2, which also includes measures to free up spectrum for mobile Internet use and to improve infrastructure to increase broadband speeds. While Spain lags behind many other EU countries with respect to its broadband services, experts in the field view Spain's recent efforts as important for closing this gap.

Aside from this unique legislation, Spain's policies regarding consumer rights closely follow those laid out by the EU, as can be seen on the government website for the Instituto Nacional del Consumo (INC).

## 22.5 South Korea

Internet and cell phone users in South Korea are protected by several government regulation acts. These general consumer protection acts, which can be found on the government's Korean Consumer Agency website, pertain to the wide range of goods and services available to Korean consumers. The Enforcement Decree of the Fair Labelling and Advertising Act, for example, states that product labels

and ads for goods and services must not be misleading or false. Broadband- and cell phone–specific regulations for consumer rights, however, are in the process of being addressed by the Comprehensive Consumer Protection Plan, due to be completed in 2012. As outlined in a presentation given by a member of the Consumer Protection Division of the Korea Communications Commission (KCC) to ACMA, the Plan will aim to address a variety of concerns within the telecommunications industry in Korea, such as unfair subscription terms, efforts to improve the systems for quality assessment and assurance for telecommunications services.

In its plan for 2011, specifically, the KCC indicates its intention to review the measures for network neutrality, [19] looking at ways to improve the cost rates for smartphone use (with particular attention paid to special rates for youth and the elderly), to improve the quality of voice calls made on cell phones and smartphones, [20] and to educate the public on smartphone usage—particularly the more vulnerable members of Korean society. [21]

## 22.6 China

The China Consumers' Association indicated on its website that currently, only general laws exist to protect consumers using Internet and cell phone services, such as the right to reasonable prices and the assurance of quality for the products and services they purchase, as outlined in Law of the People's Republic of China on Protecting Consumers' Rights and Interests. Precedents in applying these laws to cell phone and Internet services continue to be made, as demonstrated by the problems of mass text-message spam and the government's efforts to stop it.

Following recent controversies within the Chinese broadband industry, the Ministry of Industry and Information Technology (MIIT) has been in the process of drafting policies and regulations. Initially releasing the Interim *Rules for Supervision and Management of Internet Information Service Market* on January 12, 2011, and then releasing the revised draft, entitled *Provisions on Administration of Internet Information Services*, on July 27, 2011, for public feedback, the Chinese government is working toward both ensuring that the Internet market and the consumer are protected. With respect to consumers specifically, the draft rules state that consumers must receive Internet service at the standards promised by the provider, that the service agreements cannot be changed by the provider in a way that decreases the quality of service or increases the responsibility of the consumer, that ISPs cannot deceive or mislead consumers when offering information services to them, and that ISPs cannot refuse or delay services to a customer without a valid reason.

[19] Korea Communications Commission, "KCC Plan for 2011," (Korea Communications Commission, 2011), 23.

[20] Ibid., 31.

[21] Ibid., 33.


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# 23. Sector Research Reports Excerpts

## 23.1 Mobile Government (M-government)

### 23.1.1 Mobile Channels

As outlined by the International Telecommunication Union (ITU) and the Organization for Economic Co-operation and Development (OECD) (2011), there are three basic mobile channels: voice, signalling (SMS, Wireless Access Protocol) and data (application-to-person, person-to-application, person-to-person, machine-to-machine). In the data channel, there are three different types of messaging user experiences: push (data is pushed to the user's handset), pull (the user accesses information) and session (a connection is established between user and server for a "near-real-time exchange of messages"). [22] Data applications and mobile web approaches will capitalize on the rapid evolution of smartphones and related infrastructure as 4G LTE networks increase their penetration of national and global mobile markets.

Several examples demonstrate mobile devices' unique ability to accomplish m-government goals. These include relatively straightforward applications that use voice or SMS texting to communicate with citizens; both voice and SMS functionality are available on most (if not all) mobile devices in Canada, and use relatively minimal capacity to deploy m-government initiatives. Other emerging applications—particularly in the "data" channel—are promising but not yet universal. One of the most basic applications is a mobile-optimized website or portal, from which a mobile user can access a range of information, services or applications. Other potential innovations include near-field communication (NFC), augmented reality (AR) and location-based services applications. While these possibilities hold great promise for m-government initiatives, each still presents significant barriers to inclusion, such as cost, complexity and lack of available handsets.

### 23.1.2 M-government and M-governance

With respect to m-government, Hellstrom writes,

> The term m-government and m-governance often refers to the same kind of applications. However, governance is wider than government: m-government applications can be seen as a tool for more efficient administration and flows of information mainly within government at all levels. Mobile phone applications for good governance is more about using the mobile technology to make government ministries "even more accessible and citizen-centric by extending the benefits

[22] International Telecommunication Union, "World Telecommunication/ICT Indicators Database," (Geneva: International Telecommunication Union, 2010), 84-85.

of remote delivery of government services and information to those who are unable or unwilling to access public services through the Internet or who simply prefer to use mobile devices. [23]

Mobile phones make it possible to create bottom-up participation and, ultimately, what m-governance is all about: empowerment.

### 23.1.3 Benefits of M-government

ITU and OECD list a number of important motivational factors for pursuing m-government strategies, including: better service accessibility, availability, responsiveness, quality and efficiency; service scalability; better stakeholder participation; reduced costs (fixed and operational); and better image and perception.[24] Benefits for governments include: wider reach, mobility and ubiquity; greater personalization of services; cost-effectiveness; faster information flow; better management; increased democracy; and enabled green government.[25] Benefits for citizens include: convenience and access; health and public safety; financial management; and education.[26] Benefits for businesses include: economic opportunity and improvement; productivity; mobile workers; customer service; and green economy.

### 23.1.4 Evaluating M-government

Tarek El-Kiki (2006) outlines four criteria that can be used to assess the efficacy of m-government initiatives. The first is the perceived value for money; that is, how the cost of a device translates into real value for the users themselves. This entails value derived from appropriate pricing, in addition to usable content and services.

The second point of evaluation is quality of service (QOS), which can be broken down into seven components: [27]

1. Awareness: users must be aware of a given service and what its benefits are for it to gain acceptance;

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[23] World Bank, "m-Government: The New Frontier in Public Service Delivery," World Bank, http://go.worldbank.org/RLCVF-90NB0.

[24] International Telecommunication Union, "World Telecommunication/ICT Indicators Database," 20-21.

[25] Ibid., 41-42.

[26] Ibid., 44.

[27] Tarek El-Kiki and Elaine Lawrence, "Mobile user needs: Efficient transactions" (paper presented at the Fifth International Conference on Information Technology : New Generations, Las Vegas, Nevada, April 2-9, 2008), 4-5.

2. Accessibility: a service must be available to as large a portion of the target population as possible, which also means dealing directly with questions of broad inclusion;
3. Availability: services are available on-demand, without interruption;
4. Reliability: "the ability to perform promised service dependably, accurately, and consistently";[28]
5. Accuracy: a strong correlation between "the offered and the promised services";[29]
6. Responsiveness: the speed with which a given m-government service operates; and
7. Courtesy and helpfulness: the affective dimensions of m-government, like "respectful, considerate, friendly, helpful, polite and efficient" services.[30]

The third point of evaluation is the degree to which an m-government strategy facilitates efficient transactions. This includes: 1) usability: the relative simplicity or complexity of the service; 2) timeliness: the speed with which a transaction can be completed; and 3) trust: an important prerequisite for an m-Government initiative to be successful is privacy and security as core values.

The fourth criterion is strategic data including both accountability and transparency.

The final component for assessing the success of a particular m-government initiative is by its usage that is maintaining a capacity to regularly and flexibly assess the quantity and quality of users and uses.[31]

### 23.1.5 Who Is Researching M-government?

There are a number of international organizations researching m-government. While the literature has been relatively sparse for the last decade, major international institutions like the OECD, the World Bank, the United Nations Department of Economic and Social Affairs (UN DESA), the EU and university-based research centres are now conducting rich, in-depth research on the topic.

The World Bank has an ongoing series of events entitled the "Mobile Transformation Series" that seeks to resolve and share issues of e-government that stem from the evolution and global uptake of mobile technologies. For the World Bank, mobile phones are seen as crucial technologies in providing e-government strategies, primarily within the context of developing countries. The World Bank website offers case studies in China, Estonia, Macedonia, Russia and South Africa, among other important m-government related resources. In 2007, the World Bank hosted a conference entitled "M-Government: Enabling Better Service Delivery with Mobile Technologies" that focused primar-

[28] Ibid., 5.

[29] Ibid., 6

[30] Ibid., 6

[31] Ibid., 7.

ily on "the role mobile services, in particular mobile government services (mGovernment), can play for World Bank operations in developing and transition countries." [32] Through its eDevelopment Thematic group, the World Bank also supports m-GovWorld, "an initiative to create an observatory for mobile government developments and developing a community of stakeholders with the aim to enable acceleration of adoption of mobile technologies by government agencies." [33] This organization offers important resources on the state of m-government strategies globally within the context and scope of the World Bank.

The OECD and ITU recently produced a comprehensive document on m-government (cited throughout this report) that outlines global examples and provides a set of clear frameworks for implementing and evaluating m-government. This report highlights the critical potential of mobile technologies for improved public governance, as well as for economic and social progress in achieving the internationally agreed-upon development goals such as the Millennium Development Goals (MDGs). The report also provides an in-depth analysis of the prerequisites for m-government, its main benefits and challenges, and the value chain and key stakeholders, as well as a checklist of concrete actions to sustain policymakers in monitoring and updating their knowledge on m-government. [34] The OECD, ITU and UN DESA are advocating for the implementation of m-government strategies on a global scale at all levels of government, and this document is a testament to the importance of m-government as a central strategy in the future:

> Recognising the ubiquity of public good governance principles, and the existence of opportunities and challenges commonly shared by governments worldwide, these three organisations aim to offer a call for action to all member countries to be strategic in moving ahead in implementing m-visions that drive public sector change and strengthen its good governance. [35]

The Global Standard for Mobile Association (GSMA), a global consortium comprising proponents of the GSM standard, has promoted m-government strategies and initiatives around the world, building on this particular standard. Events have included conferences and seminars, and the association recently put together a global search to award the title of "mobile world capital" to a city exemplify-

[32] World Bank, "M-government: Enabling Better Service Delivery with Mobile Technologies," World Bank, http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/EXTEDEVELOPMENT/0,,contentMDK:21180669~menuPK:3320268~pagePK:210058~piPK:210062~theSitePK:559460,00.html.http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/EXTEDEVELOPMENT/0,,contentMDK:21180669~menuPK:3320268~pagePK:210058~piPK:210062~theSitePK:559460,00.html).

[33] OECD/International Telecommunications Union, "M-Government: Mobile Technologies for Responsive Governments and Connected Societies," (2011)., 4.

[34] International Telecommunication Union, "World Telecommunication/ICT Indicators Database," 3.

[35] Ibid., 7.

ing the integration of mobile technologies in an urban setting. [36] As a result of their search, Barcelona was named the first "mobile world capital." The city will hold that title for the next seven years and will host a number of mobile-related initiatives, including the GSMA mobile world congress.

In 2010, the EU Regional Development Fund commissioned MobiSolutions to produce a comprehensive study entitled *Mobile Government: 2010 and Beyond*. It presents a wide-ranging analysis of m-government initiatives in order to develop a comprehensive scope for implementing m-government strategies globally. It also reiterates the importance of mobile for the internal coherence and integration of the EU and its member states. [37]

The Mobile Government Consortium International (mCGI) is perhaps one of the longest running institutions focusing on m-government research. Its researchers are widely cited in other m-government research, including the recent report by the OECD and ITU, and it maintains a website that aggregates the research of its members.[38] The MGCI's mandate is as follows:

> mGCI is a leading non-profit organisation re-inventing the ways public organizations and the society uses mobile technologies. As a consortium of institutions and professionals from public sector, private sector and research institutions, it serves to develop, promote and monitor mobile services and applications that benefit the various societies in the world. mGCI's major operations include research & development, training, conferences and educational events.[39]

The eGovernment for Development Information Exchange is a project coordinated by the Institute for Development Policy and Management at the University of Manchester that does research on m-government in the context of socioeconomic development. It offers a good resource for academic work on the subject of e-government as well as m-government. [40]

Finally, the Raising the Floor initiative—which focuses on m-government-related initiatives and research focusing on inclusion, accessibility and universality—is an international research institution affiliated with the Inclusive Design Research Centre at OCAD University. Its mandate is "To make the web and mobile technologies accessible to everyone with disability, literacy and aging-related

[36] See: http://www.mobileworldcapital.com/press/index.htm for information related to Mobile World Capital information and events.

[37] Rain Rannu, Siim Saksing, and Triin Mahlakoiv, "Mobile Government: 2010 and Beyond. White paper," ed. Bernadett Koteles (Mobi Solutions Ltd., 2010).

[38] See: http://www.mgovernment.org/.

[39] mGci, "Introducing mobile government," (Brighton: Mobile Global Consortium International, 2009).

[40] http://www.egov4dev.org/mgovernment/.

barriers, regardless of their economic status." [41] While this initiative does not deploy the term "m-government" specifically, its scope, research and purpose fall well within initiatives to use information and communications technology—and mobile, specifically—for the purpose of enhancing the principle of good governance outlined above, particularly around issues of inclusion and accessibility. One initiative worth highlighting is the Global Public Inclusive Infrastructure (GPII), which harmonizes accessibility issues across devices, settings and users. [42] This initiative holds an important key for making possible m-government strategies effective, as it creates a universal user experience that focuses on inclusion as a core principle. The research done by Raising the Floor is important for the overall adoption and success of broader m-government initiatives pursued by governments around the world, and is also a significant Canadian contribution.

## 23.2 Mobile Health (M-health)

The World Health Organization (WHO) recently released a thorough report on the state of m-health entitled *mHealth: New Horizons for Health through Mobile Technologies*. While this is a relatively narrow application of m-government, it still suggests the growing importance of mobile to overall global governance structures for international organizations. The document offers a comprehensive survey of m-health initiatives around the globe, and also stresses the importance of such initiatives within the context of e-government and m-government strategies. Moreover, the document highlights the inextricable link between mobile devices and the development of cutting-edge health information initiatives globally:

> The survey shows there is a groundswell of activity. The majority of member states (83 per cent) reported offering at least one type of m-health service. However, many countries offered four to six programs. The four most frequently reported m-health initiatives were: health call centres (59 per cent), emergency toll-free telephone services (55 per cent), managing emergencies and disasters (54 per cent) and mobile telemedicine (49 per cent). With the exception of health call centres, emergency toll-free telephone services and managing emergencies and disasters, approximately two thirds of m-health programs are in the pilot or informal stage. [43]

### 23.2.1 New Developments and Future Concerns in M-Health

The following capacities of mobile devices and systems offer both opportunities and potential

[41] Raising the Floor, "Raising the Floor," http://raisingthefloor.org/.

[42] http://gpii.net/.

[43] Organization World Health, "Mhealth: New horizons for health through mobile technologies. Based on the findings of the second global survey on eHealth. Global Observatory for eHealth series - Volume 3," (Geneva, Switzerland: World Health Organization, 2011), 2.

threats. These are:

- Mobile devices will continue to get cheaper and more powerful, and will thus be able to process and manage more complex data.
- Healthcare practitioners and patients will be able to send questions, content and pictures of visual symptoms to the nearest health centre for help and support.
- Geolocation information will pinpoint the closest available services.
- Cell phones and wireless technology will be converted into m-health tools through apps or equipment add-ons, such as phone-based microscopes, tablet-based blood-sugar analyzers, phone based-blood-pressure analyzers, and adherence reminders that enable personal health management.
- Doctors can use mobile technologies to transmit their knowledge via healthcare cloud and data services.
- Mobile will deliver expertise to users, wherever they may be, from providers, wherever they may be.
- SMS/MMS mobile (and successor technology) will help initiate preventive healthcare.

## 23.3 Mobile Learning (M-learning)

Potential educational applications are being developed for release in the near future. Some intriguing ideas include:

- *Wearable Computing:* Many concepts in this field were first developed at the University of Toronto by Dr. Steve Mann and others.
- *Mobile Medical Diagnostics and Healthcare Coaching:* A wide variety of body sensors and implants are being used to monitor health and to give advice about health improvement.
- *Thought-Controlled Computing*: Brainwave detection is developing such that thoughts will be able to control requests for information or the direction of a personal transportation device such as a wheelchair.
- *3-D Mobile Computing:* 3-D mobile devices are able to put the learner in the centre of the action in many different educational situations.
- *Surface Computing:* With micro-projectors and multi-touch gesture-recognition software, any surface can become a large interface that could be used for educational purposes.


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# 24. Aboriginal Communities and Mobility

The information about digital access or connectivity for Aboriginal communities in Canada is incomplete and at times contradictory. For example, based on the statistics provided by the Aboriginal Community Connectivity Profiles database, approximately 96.27 per cent of Aboriginal communities have access to high-speed Internet, compared to the Canadian average of close to 80 per cent. [44] This suggests very different definitions of "access" and of "high-speed Internet." It seems that most of the Internet access at the community level is based on public shared access points, but not all community administration offices and SchoolNet sites make their connections available to the general public. The penetration at the household level is also not clear. Thus, the data in the report may not show the entire picture accurately.

## 24.1 Internet Access at the Community Level

**Based on Connectivity Survey Responses, CAP and SchoolNet Sites**

| Aboriginal Community | Total Communities | Internet Access | % | No Access | % |
|---|---|---|---|---|---|
| First Nations | 634 | 625 | 98.58% | 9 | 1.42% |
| Inuit | 53 | 49 | 92.45% | 4 | 7.55% |
| Métis | 40 | 50 | 100.00% | 0 | 0.00% |
| Total | 737 | 724 | 98.24% | 13 | 1.76% |

*Source: 2004ROC Report [45]

It is broadly accepted that Internet access offers Aboriginal communities important benefits, such as:

- Access to information and services
- Education
- Entertainment
- Career enhancement
- Strengthening of the local community
- Awareness of Aboriginal culture

[44] Aboriginal Canada Portal, " 2004 Report on Aboriginal Community Connectivity Infrastructure," (Canada2004)., http://www.aboriginalcanada.gc.ca/acp/site.nsf/en/ao31317.html.

[45] Ibid., Further information can be found in the 2005 research paper by Christine Smillie-Adjarkwa titled Is *The Internet A Useful Resource For Indigenous Women Living In Remote Communities In Canada, Australia and New Zealand To Access Health Resources* and the 2004 Report on Aboriginal Community Connectivity Infrastructure report. Data on specific Aboriginal communities and their access to the Internet can be found at: http://www.aboriginalcanada.gc.ca/acp/site.nsf/eng/ao31295.html.

Since these benefits are mainly linked to general Internet connectivity rather than mobile access, it can be assumed that mobile technology could enhance and improve the reach of connectivity where physical wired infrastructure is too costly to implement. This is not a settled argument by any means. While it is well established that it is more cost-effective to roll out both wired and wireless infrastructure in urban areas than in low-density areas, it has yet to be established whether all Aboriginal communities are necessarily in such rural or remote areas.

## 24.2 Aboriginals in Urban Areas

| Group | On Reserve | Total Off Reserve | Rural + | Urban |
|---|---|---|---|---|
| Aboriginal Population (Single Responses) | 30% | 70% | 20% | 50% |
| Non-Aboriginal Population | 0% | 100% | 19% | 81% |
| Total Population | 1% | 99% | 20% | 79% |

*Source: 2004ROC Report

Thus, contrary to general perception that Aboriginal communities are spread between urban, rural and reserve areas, more than 70 per cent of Canada's Aboriginal population lives off reserves.

The availability of information and communications technology (ICT) services is a necessary but not sufficient prerequisite for ICT to generate its benefits. The available services must also be accessible (in other words, affordable). The socioeconomic status of some Aboriginal Canadians may not allow them to equally access Internet connectivity in general and mobile connectivity in particular.

> Unfortunately, the economic situation facing most urban Aboriginals severely limits their ability to subscribe to Internet services and purchase the required computer equipment. For many, the only means of accessing the Internet is through the network of 116 Native friendships centres. 87% of friendship centres are located within urban areas that have high-speed Internet available to them. 11% of friendship centres are co-located with Industry Canada's Community Access Points (CAP sites). [46]

Javier Mignone and Heather Henley of the University of Manitoba provide a more comprehensive discussion of the impact of ICT in Aboriginal/rural communities in their paper "Impact of Information and Communication Technology on Social Capital in Aboriginal Communities in Canada." [47] In

[46] Ibid.

[47] Javier Mignone and Heather Henley, "Impact of Information and Communication Technology on Social Capital in Aboriginal Communities in Canada," *Journal of Information, Information Technology, and Organizations* 4 (2009).

particular, they discuss they social-capital impact of ICT in Aboriginal communities:

> One of the most interesting insights from the examination of the ICT initiatives is that despite the *what* of connectivity mattering, it is the *how* of connectivity that can significantly make a difference in terms of community social capital. *What* refers to the content of the networks, while *how* refers to how the networks are developed and operated. In other words, the "ownership of the means of production" (in our case the ownership of the ICT networks) clearly relates to increased community social capital at the bonding, bridging and linking levels.
>
> K-Net, Ktunaxa, and Qiniq are powerful examples of Aboriginal organizations taking control over the *what* and the *how* by responding to the realities of the communities, and strengthening them in the process. K-Net started as a response to the need to maintain contact with youth that left the communities to further their education; Ktunaxa was born from concern about the loss of the traditional language; and Qiniq emerged from the vision of a practical initiative to decrease communities' isolation. These required: strong internal (bonding) investments; the well-crafted bridging of relations among the communities and other Aboriginal organizations; and the use of potential linking investments from government programs. Among the linking investments, the sometimes contentious, sometimes positive relations with private and public corporations played an important role. Aboriginal community networks were developed by local people to meet community needs, and in the process community capacity was created in the development of the business plans and in their actual implementation. The use of technology by individuals and groups and the social learning that takes place in the adoption of a new technology creates social capital. Youth are generally the first to adopt new technologies and in turn teach their parents and elders computer and Internet skills. Time spent learning new skills and connecting with people to disseminate new skills may also create social capital. For instance, when the Qiniq network was first launched in Nunavut, community service providers in each community would offer to provide information about computers and the Internet and how to use the technology and equipment. This creates connections between people who (even in small communities) may not have known one another or had a reason to connect prior to the introduction of Qiniq. It would appear that community networks have more at stake in developing active implementers of technology rather than passive consumers of connectivity.
>
> The implementation of connectivity infrastructure by private companies is essentially determined by their business cases. In other words, based on population and revenue expectations, the companies predict they can or cannot profit from establishing infrastructure and providing Internet services in a community. As well, the private-company model assumes minimal community involvement and training. This type of network is planned in such a way that the maintenance personnel come into the community, usually from larger urban centres, to perform maintenance or solve technical problems. However, it is costly to bring technicians to fly-in communities and generally this type of maintenance requires that the community pay for the transportation and accommodations of the technicians. High maintenance and infrastructure costs often results in a

network that is non-operational. In many cases, the private company may own infrastructure not far from the community and promote the service while asking the community to pay for the last mile of connectivity. On numerous occasions, a private company has sold Aboriginal communities substandard equipment that cannot be maintained, which resulted in network connections not being utilized because of equipment failures. Many private companies are "fly by night," and once the money has been collected from the community the company does not return to ensure it is operational. In cases such as these, the communities ended up feeling "burnt" and reluctant to try other avenues.

Even government ICT healthcare initiatives in Aboriginal communities were somewhat of a failure when communities and other stakeholders were not involved in their implementation. In the initial attempts to develop Telehealth in the late 1990s, the equipment would be delivered to a community without consideration for training, maintenance or the updating of software. Frequently, the equipment would remain locked in a closet in the health unit or school, as no one knew how to use it or even how to set it up. In cases where technicians were sent to set up the equipment, relevant training was not provided to community members for continued operation. Further, there was no proper training of health personnel in the community to coordinate its use, and there was no clear buy-in from health professionals in urban hospitals.

Most Aboriginal community networks are partially government subsidized. Community owned networks are run by individuals who have an understanding of the values of community members and the issues that can be addressed via the use of technology. The main problem is that the subsidies are mostly project and short-term related, creating a somewhat unstable funding environment. Qiniq was established by a non-profit organization—the Nunavut Broadband Development Corporation—and was based on a private but bandwidth-subsidized model. In other words, Internet service in Nunavut is not tied to Health Canada or other anchor tenants, and all 25 communities have residential connectivity readily available. K-Net is based on a services model, which means connectivity is initially provided to anchor tenants such as the health unit, the administration, the band office and the school. Anchor tenants require larger amounts of bandwidth and must pay a higher monthly amount, which secures the business case for the network.

This model does not initially provide residential broadband access but supplies communities with a model for the creation of a community-owned network. Both Qiniq and K-Net have received funding from the Community Access Program (CAP) to create local access points—usually in the school or band building—for the public use of computers and connectivity. Even in urban environments, where basic connectivity infrastructure is well established, the issue of accessibility related to affordability could be addressed through community initiatives using wireless modalities. The potential to develop urban Aboriginal networks would be strong. [48]

[48] Ibid., 43-45

Mignone and Henley's study suggests how ICT community networks are actually developed and implemented plays a role in strengthening a community's social capital—this was particularly evident in the cases of K-Net, Ktunaxa and Qiniq. These findings imply that power relations among Aboriginal communities and organizations, governments and private and public corporations must be taken into consideration Examples of such power relations include:

- Legislation that favours large private or public ICT corporations over community-based profit or non-profit entities.
- Project-based funding sources that leave community networks at the mercy of government bureaucratic whims.
- A lack of public connectivity infrastructure investments in rural and remote areas.


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# 25. Municipal and Provincial Challenges and Opportunities

The "mobile industry" is generally defined as:

- Hardware suppliers of mobile devices, wireless systems and related infrastructure.
- Software suppliers of mobile applications; game developers; platform developers; and suppliers of back-end systems for managing the wireless infrastructure.
- Mobile network operators, including Rogers, Bell, TELUS and, more recently, Wind Mobile and Mobilicity.

These are critical elements for creating the mobile capacity necessary for reaching the envisioned future. It is therefore important that the barriers preventing this industry from reaching its local, regional and global potential be correctly identified and removed. The good news is that this sector is relatively well organized, with a number of professional associations and other organizations articulating the needs of their constituents and advocating for them efficiently.

The supply sector includes other categories, however. The view of the supply side should therefore be expanded beyond the above categories to include other sectors and sub-sectors. One such additional category would be Internet service providers (ISPs), whose interests and challenges are not necessarily identical with those of the categories listed above, as was documented by the recent submissions of the Canadian Association of Internet Providers (CAIP) to the Canadian Radio-television and Telecommunications Commission. The broad move from wired to wireless Internet connectivity might pose significant challenges to this sub-sector, and could have destructive effects if not managed wisely.

Another important category includes non-commercial providers, such as governments. The provincial government and many of the large municipal governments provide an increasing number of online and mobile services to Ontario residents. It is therefore important that the barriers faced by these additional sectors are identified and removed. In order to understand such barriers, we have conducted expert interviews at the provincial and municipal levels. The next section describes our findings for non-commercial Internet service providers (ISPs).

## 25.1 A Provincial Perspective

In an interview with Ontario's Chief Corporate Strategist conducted August 10, 2011, we explored the Ontario Public Service (OPS)'s perspective on the barriers and opportunities that accompany the provision of mobile services.

The Ontario government is well aware of the opportunities that online services offer to citizens and residents. It considers accessibility via mobile devices an integral part of providing online services. The government is committed to online services because these services encourage a self-service mode, which has significant cost savings for the government. There are already activities in place for the mobile version of online services, especially for highly subscribed services that manage driver licenses, birth certificates, Ontario Student Assistance Program loans and so on.

A government review looking at the usage of its online information has shown that 90 per cent of that information is rarely viewed, whereas five per cent is viewed often. The high-usage area involves repeat visits to five key sites. The government strategy is to focus on these highly viewed areas and ensure that they are available across many platforms, including mobile ones.

It should be noted that the government is not currently allowed to promote or offer incentives that favour one channel over another, even when one channel may offer greater advantages to both users and government. This in itself warrants a further investigation of regulatory barriers.

Mobile payment systems are "on the radar," but no action has yet been taken, as the discussion about mobile payment platforms continues in the industry. Interestingly, within the high-transaction-volume areas of government online information, most transactions tend not to be payment related.

Supporting access from multiple platforms is not a technical issue for the government and it is also not necessarily a cost issue. The main barriers relate primarily to privacy and security issues. The challenges with personal information, personal health information and payment information are the most visible parts of the barrier. The deeper issue is the question of broader access to such information.

Currently, information collected can only be used for the purpose declared, and not for any other purpose, even if related. Each point of sharing information requires individual consent. This makes it impractical and risky to develop many applications that would simplify and improve the user's experience. For example, the government is not allowed to use driver-license information it already has on file for pre-populating a form for organ donation, and daily insulin readings provided by diabetics to the Diabetes Registry cannot be shared with healthcare providers. The Panorama Project, which aims at putting immunization information online as part of pandemic preparedness, is facing similar obstacles.

There is an urgent need to move to a consent-based environment, but obtaining consent for each individual case is not practical. Rather, classes of consent could be considered. Discussions with the Privacy Commissioner about consent issues are underway. The legislation around this topic is disconnected, because it has grown in silos. Legislation changes may be needed to address the issue.

Governments at all levels are also aware of the lack of a federated identity and authentication framework, and of the danger of an incompatible system emerging, which would make later integration extremely costly. There is already a pan-Canadian identity management body in existence, which includes privacy commissioners (federal and provincial), ICT executives of all government levels, banks and the Municipal Information System Association (MISA), and is trying to address this challenge.

## 25.2 A Toronto Perspective

On October 4, 2011, we interviewed Stephen So, the director of Voice and Wireless Systems for the City of Toronto, in order to understand the city's perspective on the barriers to mobile services.

Toronto provides communications services, including mobile services, to residents and visitors of Toronto both indirectly and directly. Indirectly, the city has 60,000 employees, many of whom need mobile devices to implement their mandates. Roughly 22,000 phones and 16,000 email accounts are deployed. Examples of indirect mobile service "clients" are: public nurses visiting nursing homes, municipal license inspectors, health inspectors and transportation workers. Direct service provision includes customer applications such as the systems provide by Key IVR (which allow residents to pay parking tickets by phone) and the 311 call centre.

Current plans include: adding capability to the 311 call centre that allows residents to receive service requests or to submit questions by email; developing an opt-in service that allows residents to receive updates on a submitted service request by SMS (this is expected for 2012); and launching a pilot project that allows nurses to use video phones to monitor patient self-injections. A few city applications reach across government levels: for example, an application that allows the payment of fines for provincial offences. Toronto's public health department also receives funding from the province.

The main barriers to the development of mobile services are Toronto's budget constraints, and its standards and regulations. Many mobile devices are not enterprise-manageable devices, which poses challenges. For example, because the iPhone is not enterprise managed, it is not a standard corporate device, but some departments are insisting on its use and forcing the issue. The public health department developed its own iPhone app for members of the LGBT community who are looking for support, and iPhones had to be issued to that department. The swelling demand for bring-your-own-device (BYOD) is creating further challenges for the city. This requires relaxing city rules and policies, and at the same time complying with privacy regulations—two requirements that are not always compatible.

Some barriers are related to the need to comply with Municipal Freedom of Information and Protection of Privacy Act (MFIPPA) and Personal Information Protection and Electronic Documents Act (PIPEDA) regulations. When a call is received at the 311 call centre, the agent's screen is automatically populated with information about prior calls received from the same number. But this information cannot be used unless the agent verifies first that it is the same person calling about the same issue. At the moment, it potentially saves agents from re-entering information.

Torontonians increasingly expect ubiquitous coverage for wireless devices across the city, but many challenges make it difficult to deliver that. In some areas, people don't want towers in their "backyards." There are also challenges in high-rise buildings, including City Hall towers. Because the city cannot be preferential to any particular provider, if it allows one provider to install repeaters in its buildings, it has to allow all providers to do so, which poses logistical and space problems. There are

high-security areas in buildings where no cellular access is allowed, and there are liability and insurance issues for third-party equipment installed on city premises. Even large service providers like Rogers find these requirements onerous. There is a need to review the real estate and legal requirements that are attached to these situations.

Despite these challenges, Toronto's efforts are continuing. The city's e-government initiative is introducing a new web portal that consolidates all city services into one access point and caters to a variety of user devices, including mobile devices. Internet voting is expected to be in place for the next city election.

It is important to remember that wireless systems still rely on large-capacity wired network for backhaul. From an infrastructure perspective, Toronto will use the infrastructure built by third parties. COGECO is implementing a major fibre-optics backbone network that will link all major buildings—including schools and hospitals—in Toronto. Bell will be used where the COGECO network is not available or not yet ready.

## 25.3 A Joint Municipal Perspective

There is a demand for community-notification programs in many municipalities, and the Municipal Information Systems Association (MISA) has an initiative for emergencies management. Its goal is to be able to notify all phones (both wired and wireless) in a specific geographical area about life-threatening events (for example, the propane gas station explosion in Toronto, or an incident at the Pickering Nuclear Generating Station). This is not an opt-in program like Amber Alert; it is more similar to the Police Services Link (PSL), but a much higher capacity is required. The implementation time horizon is about two years.

There is also an emerging need to implement municipalities' own private wireless networks using licensed spectrum for automated collection of utility-meter readings (Smart Meter program). In Toronto, this is currently limited to water meters, because water is the only utility the city is responsible for. Cellular networks will be used where private networks do not reach. There is talk about consolidating all smart meter readings for a household (water, hydro, gas) rather than maintaining three separate networks.

## 25.4 Other Supply Components

It can be argued that the "industry" in the context of this report should be defined even more broadly. As wireless connectivity becomes commoditized and as the conversion to IPv6 creates an Internet Protocol (IP) address space that is much larger than the current IPv4, many new applications will enter the mobile space, including: smart home applications, security (Rogers has recently launched a smart home–monitoring service), healthcare monitoring and compliance applications, and a variety of sensor-based applications that incorporate machine-to-machine communications using various wire-

less infrastructures.

Even education is already seeing new modes of delivery (edutainment, webucation) that take mobility into consideration and adapt learning for the mobile lifestyle.


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# 26. Survey Questions

# TOM Online Surveys

## Common Profile Questions (These questions begin each survey; response determines which survey vertical is served)

1. What sector is the focus of your business/service (please check one)? (NOTE: The answer to this question determines survey vertical)

   Commerce/Retail/Finance
   Education
   Entertainment
   Health
   Government
   Other (please state)_____<text 144 characters>_____
   Does not apply to me (NOTE: "Yes" to this does not apply, leads to Resident Survey)

2. What is your job title? _____<text 144 characters>_____

3. Where is your company located?

   Alberta
   British Columbia
   Manitoba
   New Brunswick
   Newfoundland and Labrador
   Northwest Territories
   Nova Scotia
   Nunavut
   Ontario
   Ontario Map for Region
   Prince Edward Island
   Quebec
   Saskatchewan
   Yukon
   Outside Canada (please specify) <text 144 characters>_____

4. Please indicate the location of your primary business or service market:

   Alberta
   British Columbia
   Manitoba

New Brunswick
Newfoundland and Labrador
Northwest Territories
Nova Scotia
Nunavut
Ontario
Ontario Map for Region
Prince Edward Island
Quebec
Saskatchewan
Yukon
Outside Canada (please specify) _____<text 144 characters>_

5. Please indicate your industry (select one):

   Agriculture, Forestry, Fishing and Hunting
   Mining
   Utilities Construction, Manufacturing, Wholesale Trade, Retail Trade, Transportation, Warehousing Information
   Finance and Insurance
   Real Estate and Rental and Leasing Professional, Scientific, and Technical Services
   Management of Companies and Enterprises
   Administrative and Support and Waste Management and Remediation Services
   Educational Content, Products or Services
   Healthcare and Social Assistance
   Arts, Entertainment and Recreation
   Accommodation and Food Services
   Other Services (except Public Administration)
   Public Administration

6. How many people does your company employ (0 is a sole-proprietorship)? <numeric>

7. We are interested in your company's involvement or familiarity with mobile products and services. Please choose one of the following that best describes your company:

   My company/organization builds products and services for mobile devices
   My company/organization supplies services to companies who build products and services for mobile devices
   My company/organization uses mobile services and/or devices in the everyday conduct of our business activities but we are not a mobile industry company
   My company/organization does not make significant use of mobile devices of any description in

the conduct of our everyday activities

8. Do you use mobile technology that allows you to perform some or all aspects of your job while away from your primary place of work?

   Yes
   No

   <if yes>How much time do you save, if any, in a typical work day as result of using technology that allows you to perform some or all aspects of your job while away from your primary place of work? (e.g., use of a smartphone to respond to emails or use of an iPad to review patient medical records)

   No time saved
   0 to 30 minutes
   30 to 60 minutes
   60 to 90 minutes
   over 90 minutes

9. Do you work less or more as a result of using technology that allows you to perform some or all aspects of your job while away from your primary place of work?

   Less
   More

   [If more] How much more do you work on a daily basis as a result of using technology that allows you to perform some or all aspects of your job away from your primary place of work?

   Less than 30 minutes
   30 to 60 minutes
   60 to 90 minutes
   over 90 minutes

**General/Unknown Verticals (For sectors other than the four focus sectors [health, education, entertainment, commerce] and "does not apply" response)**

Does your business/service have a web presence?

Yes
No

Does your business/service have a mobile application?

No <go to next question>
Yes: multiple applications
Yes

What is the function of the applications (check all that apply)?

Convey timely information
Entertainment
Marketing
Payment
Extend your service
Improve productivity of workforce
Other (please state) <text 144 characters>_____

Is your company planning to develop a mobile application for your business?

Not within the next two years <go to next question>
Yes, within the next three months
Yes, within the next six months
Yes, within the next year
Yes, within two years

Who is the application for? (check all that apply)

Staff
Customers/clients
Other (please state) _<text 144 characters>_____

What is the function of the applications (check all that apply)?

Convey timely information
Entertainment
Marketing
Payment
Extend your service
Improve productivity of workforce
Other (please state)_<text 144 characters>_____

## Commerce/Retail/Services Vertical

1. What do you think consumers are expecting from mobile technologies? (check all that apply)

Shopping/making purchases
Making donations
Product-rating information
Shopping apps (e.g., style guide, recipe shopping lists, availability/product stock, coupons, lowest-price location)
Express-payment options
Service-provider information (e.g., proximity to location, hours of operation)
Account information
Other (please state) _____<text 144 characters>_____

2. Do you feel that their needs and expectations are being met?

Yes
No. How can these needs and expectations be met more effectively?
<text 144 characters>_____

## Health Vertical

1. What do you think consumers in the health sector are expecting from mobile technologies? (check all that apply)

Equivalent to "in-person" service
Access to health-related information (e.g., nutrition, support groups, resources)
Access to health records
Scheduling
Prescription management
Health monitoring
Health program support
Other please state _____<text 144 characters>_____

2. Do you feel that their needs and expectations are being met?

Yes
No. How can these needs and expectations be met more effectively?
_____<text 144 characters>_____

## Lifelong Learning Vertical

1. Which of the following represents your area of focus:

Preschool

K–12
Higher education
Organizational training
General learning

2. What do you think learners in the education/learning/training sector are expecting from mobile technologies? (check all that apply)

Courses/programs of study
Access to education-related information (e.g., curriculum, IEPs, resources)
Access to education records
Enrollment
Learning management
Grades monitoring
Informal learning opportunities using just-in-time information sources
Peer-to-peer sharing, collaboration and/or crowdsourcing applications
Standalone applications ("apps") that are designed to train or teach
Augmented-reality applications that provide information based on the learner's location
Learning-oriented games and simulations
Mentoring and performance support applications
Other (please state) _____<text 144 characters>_____

Do you feel that their needs and expectations are being met?

Yes
No. How can these needs and expectations be met more effectively?
_____<text 144 characters>_____

## Entertainment Vertical

1. What do you think consumers are expecting from mobile technologies? (check all that apply)

Information (e.g., schedules, nearby venues, events of interest)
Ratings from other consumers
Ability to interact with entertainment product (e.g., vote, learn more, take a tour)
Express-payment options (e.g. datamatrix or QR code tickets, "tap and go" payment
Viewing/listening to music or shows
Playing games
Other (please state) _____<text 144 characters>_____

2. Do you feel that their needs and expectations are being met?

   Yes
   No. How can these needs and expectations be met more effectively?
   _____<text 144 characters>_____

## Common Survey Questions (these questions are at the end of all surveys except Resident Vertical)

1. Please rate your level of agreement with the following statements for organizations within your industry segment:

| | Don't Know | Strongly Agree | Agree | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| This segment utilizes mobile technology well. | ☐ | ☐ | ☐ | ☐ | ☐ |
| This segment is open to service delivery via mobile technologies. | ☐ | ☐ | ☐ | ☐ | ☐ |
| At present, mobile technologies are important to this segment. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Privacy is a major barrier to utilizing mobile technologies in this segment. | ☐ | ☐ | ☐ | ☐ | ☐ |
| It is too expensive to implement mobile services in this segment. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Users in this segment want more services available via mobile technologies. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Service providers in this segment want to provide more service via mobile technologies. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Mobile technologies are a critical means for providing services to users. | ☐ | ☐ | ☐ | ☐ | ☐ |
| The professional groups/industry associations in this segment have responded well to technological change in the past. | ☐ | ☐ | ☐ | ☐ | ☐ |
| The professional groups/industry associations in this segment are responding well to changes in mobile technology. | ☐ | ☐ | ☐ | ☐ | ☐ |
| The professional groups/industry associations in this segment have strategies in place for mobile services. | ☐ | ☐ | ☐ | ☐ | ☐ |
| I would like to see expanded use of mobility and mobile technologies in this segment. | ☐ | ☐ | ☐ | ☐ | ☐ |

| | Don't Know | Strongly Agree | Agree | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| There are regulations or legal considerations to overcome before mobile services can be provided in this segment. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Mobile technologies will improve access to our products/services for individuals with disabilities. | ☐ | ☐ | ☐ | ☐ | ☐ |
| We are more likely to invest in a downloadable application or "app" than one that has cloud-based access (an application that is used on the mobile device but is accessed from/stored on another computer/server). | ☐ | ☐ | ☐ | ☐ | ☐ |

2. What are the biggest barriers to adoption of mobile services in your industry? Rank them from 1 = most important to 11 = least important.

   There are no barriers
   Customer resistance
   Resistance of trade/professional association to unproven technologies
   Regulations or legal considerations
   Cost to your organization
   Limited service applications
   Security
   Privacy
   Potential users have limited access to mobile devices
   The cost of accessing mobile/data plans is too high
   Uneven access to mobile coverage
   Other (please state) _____<text 144 characters>_____

3. Thinking of your business today, please rate the importance of mobile technology:

| | Very important 1 | 2 | 3 | 4 | Not important 5 |
|---|---|---|---|---|---|
| For internal productivity (e.g., access to email, or connectivity on the go)? | | | | | |
| As a marketing tool for reaching customers? | | | | | |
| As a tool for customer service? | | | | | |
| As a delivery channel for services or media? | | | | | |
| As a payment mechanism or commerce platform for selling goods or services? | | | | | |

4. Thinking of your business in five years, please rate the importance of mobile technology:

| | Very important 1 | 2 | 3 | 4 | Not important 5 |
|---|---|---|---|---|---|
| For internal productivity (e.g., access to email, or connectivity on the go)? | | | | | |
| As a marketing tool for reaching customers? | | | | | |
| As a tool for customer service? | | | | | |
| As a delivery channel for services or media? | | | | | |
| As a payment mechanism or commerce platform for selling goods or services? | | | | | |

5. Compared with similar industries in the US or other parts of the world, how would you rate the current innovativeness of Canadian organizations in your segment when it comes to investing in emerging technologies like mobile?

   Very innovative and consistently willing to take risks even on unproven technology in order to remain at forefront of their industry
   Somewhat innovative: sometimes willing to be the first to invest in new ideas
   Neither especially innovative nor conservative: willing to be a "fast follower"
   Somewhat conservative: only investing when new channels or technologies once fully proven in the market
   Very conservative and unwilling to adapt to new technologies or channels even after proven in the market

6. How is your business/service using mobile technology applications and services (check all that apply)?

   For voice and email contact with employees
   Marketing your products and services to customers
   Social networking
   Product development and market research
   24/7 use of customer relationship management
   Location-based applications
   Technical documentation
   GPS mapping and directions
   On-the-go document preparation
   Replacement for desktop computing
   Payment mechanism using PayPal or credit cards
   Archiving and disaster recovery
   On-the-go advertising

7. Within your organization, what do you see as the best methods for learning about and staying on top of mobile technologies and best practices? Please rank in order where 1 is most important and 7 is least important:

   Through internal research and development
   Through outside consultants or analyst reports
   From vendors
   Through trade publications
   At local conferences or trade events
   By travelling to conferences or trade events held internationally
   Other (please state)_ <text 144 characters>_____

8. Is there anything you would like to add about mobile technologies within your industry segment/sector?

   <text 200 characters>

OPTIONAL

**If you would like to be entered in our draw for one of three smartphones,** please provide your contact information below. Please note your contact information will only be used for this purpose unless you give us permission otherwise. We will not share/sell your contact information.

Name:_____
Email:_____
Phone:_____

May we contact you to speak with you about mobile technologies in your sector/industry segment?

Yes
No

## Resident Vertical

Which of the following mobile technologies do you use?

Cell phone
Laptop computer
Portable device (e.g, iPad)
Public computer
Public Wi-Fi/Internet access

Service kiosks
None of the above

If you have a mobile phone, is it what is referred to as a "smartphone?"

I don't know
Yes
No

Please indicate if you would be interested in having any of the following services on a personal mobile device like a smartphone or iPad, even if you would not be able to use them until you have a mobile device. Please rank in order of importance to you, where one is most important and 6 is least important:

Access to all of your health records
Access to training or other educational programs
Ability to pay for products and services
Access to government services like license renewals
Legal identification
Access to extra information at historical sites or cultural venues (e.g., a historical photograph or a self-guided tour of an exhibit)

The m-wallet refers to the ability to use a mobile device to accomplish the same tasks that you would do with common wallet items such as money, credit cards, bank cards, loyalty cards, business cards and identification cards. Would you be interested in using m-wallet services?

Yes, for non-sensitive items such as loyalty cards and business cards
Yes, for non-sensitive and sensitive items such as identification and credit cards
No, not at all

Please rate your level of agreement with the following statements:

| | Don't Know | Strongly Agree | Agree | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| Mobile phone/Internet plans are priced reasonably. | ☐ | ☐ | ☐ | ☐ | ☐ |
| Mobile service coverage in my region is good. | ☐ | ☐ | ☐ | ☐ | ☐ |
| High-speed Internet service coverage in my region is good. | ☐ | ☐ | ☐ | ☐ | ☐ |
| I would like to have more services available through a mobile device. | ☐ | ☐ | ☐ | ☐ | ☐ |

| | Don't Know | Strongly Agree | Agree | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| Access to mobile technologies and services will be very important to me in the next 5 years. | ☐ | ☐ | ☐ | ☐ | ☐ |
| I have good access to public mobile services like Wi-Fi, public computers, governments kiosks. | ☐ | ☐ | ☐ | ☐ | ☐ |
| I would like to know more about how mobile technologies can augment or replace common tasks. | ☐ | ☐ | ☐ | ☐ | ☐ |

## OPTIONAL

If you would like to be entered in our draw for one of three smartphones, please provide your contact information below. Please note your contact information will only be used for this purpose unless you give us permission otherwise. We will not share/sell your contact information.

Name:_____
Email:_____
Phone:_____

May we contact you to speak with you about mobile technologies?

Yes
No


Appen

dices

# 27. Appendices Bibliography

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