# Enhancing Canada's Performance in the Digital Media Economy: Response by the GRAND NCE

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## *Executive Summary*

The recent Industry Canada consultation paper: *Improving Canada's Digital Advantage,* asks stakeholders to help shape a plan for Canada's digital economy to ensure our future prosperity. The GRAND network of centres of excellence is pleased to contribute to Industry Canada's request. In the material that follows, we focus on five key drivers that are critical for achieving success in the digital economy.

1. A two-fold focus on (a) leap-frogging other nations in developing new industries that apply digital media know-how to innovations (e.g., in health care, health records, smart grids for consumer control of energy consumption and transportation systems), and (b) maintaining our existing lead in developing tools for digital content creation and leveraging that lead to further development of robust cultural industries that embrace digital media for content creation and distribution.

2. The creation of a well-trained digital workforce of innovative technology specialists, social media experts, digitally-aware artists and experts in international culture and economics who have the understanding and appreciation of digital media required to create world-leading sustainable innovations and business models.

3. A national consensus on goals for developing Canada's digital advantage that will enable companies to work together synergistically to participate in all aspects of the new digital media economy, encourage and unleash investment in innovation by providing a stable environment where companies can benefit financially from providing content and services the "new way" while smoothly transitioning from the "old way".

4. The practice of innovation by researchers, experimenters, entrepreneurs and companies that adopts ideas and transforms them into world-class content, products and services for the global market place.

5. A culture of strong and vibrant collaboration between content creators and technology developers to create and provide new technology-based products and services faster and better than is possible in countries where cross-disciplinary teams are not the norm.

Government must increase the investment of attention and effort, not just funding, to ensure these success factors are present to promote Canada's digital economy. Research and innovation networks, such as GRAND, must then work closely with companies to leverage these government investments into world-leading and long-term digital economic benefits for Canada.

## *Background*

GRAND NCE is a federally-funded network of 85 university researchers, plus their graduate students, at 20 Canadian universities, drawing together an interdisciplinary mix of computer science researchers, social scientists, humanities experts, artists and designers to collaborate with industry partners and create innovations in digital media. GRAND is addressing most of the success factors above, by creating a partnership of content creators and technology experts, collaborating with companies to transfer innovations and train students in areas including health, smart grids and transportation, new games for single- and multi-player environments, novel social media such as a next-generation privacy-aware social networks, e-learning and edutainment environments for personalized learning in schools and corporate environments that enhance knowledge acquisition and skill development, information appliances that support a range of information-intensive applications for delivery of news and social commentary, new forms of narrative adapted to new media systems for consumption and co-production, digital books, and virtual museums and galleries. As a result of these partnerships and collaborations, we have identified a number of challenges and hurdles that Canada must overcome if it is to lead the world in digital media innovation.

In spite of Canada's slipping rank in the global digital economy, we have had a long history of successes and near successes that provide a lens for understanding the key factors needed for Canada's digital media success in the future. In the 1980s, Canada was an early leader in office automation systems with specific devices that pre-dated the personal computer, created and sold by AES and Micom. Telidon was the leading videotext standard proposed for providing information to set-top boxes. Canadian companies led the computer graphics animation industry and their successors still dominate in Hollywood today. Nortel was a world leader in telephone switching systems, based on a gutsy decision in the 70s to bet heavily on creating stored program digital switching technology. Later, Newbridge achieved worldwide success in ATM switching. Canada led the world in rapid deployment and adoption of cable TV and residential Internet. In the early days of cell phones, Bell Mobility was internationally recognized as a tech-savvy, well run cellular operating company. RIM has a huge share of the smart phone market. More recently, Chapters-Indigo has created Kobo, whose e-reader is redefining the pricing and marketing of e-readers in North America – Amazon had to drop the price of the Kindle 2 substantially in order to compete with the Kobo.

Several Canadian digital media companies with a global presence are also partners in GRAND. Side Effects Software's Houdini system is used in films worldwide for animation and digital effects. Autodesk is collaborating with GRAND researchers not just in animation, but more broadly in areas that will incorporate virtual humans and sustainability into its industrial design and architecture products. Deluxe Postproduction in Toronto is moving aggressively into 3D film production and sells watermarking and digital forensics to the big film studios to deter theft. Electronic Arts and Ubisoft are important games producers with major multiple Canadian studios. Rogers is moving into innovative digital media services and has recently launched ZooCasa for real estate and Thoora to provide high-value information from the blogosphere. Open Text, Canada's largest software company, is the engine behind several companies' web content. Smaller companies such as Bardel Entertainment, Metaverse, PostRank and Metranome are innovative providers of virtual worlds, mobile connection to information and people, and social network-based intelligence, to give people rich experiences and help companies build brands.

Canada also has a history of success in providing academic research and education to provide the experts to drive the digital media economy. University of Toronto, UBC and McGill are all internationally recognized research powerhouses with strengths in information science, computer science, and social sciences and humanities related to the digital economy. The University of Waterloo's computer science undergraduates are sought be Amazon, Microsoft, Facebook and Google as one of their top few schools for new hires. Ryerson has long been a leader in integrating communications and the arts with digital technology. Ryerson launched Canada's first Internet radio station and is at the forefront of production technology for digital film, and 3-D television. Several schools are creating new media programs, such as BC's Great Northern Way Campus's Masters in Digital Media, Waterloo's soon-to-be-launched digital media undergraduate degree in Stratford, and Ryerson's Digital Media Zone, which provides expertise and collaboration for senior undergraduates and graduate students to innovate in new media.

It's clear to see that Canada has companies, both large and SMEs with the know-how, experience, and expertise to push the boundaries in digital media innovation. As well, Canada has exhibited strength in academic research and education in the sector. The challenges facing Canada's digital media economy are not a lack of having the right people, right desire or right institutions and organizations to lead the global digital economy. The challenges today are about how to translate our digital media expertise to key sectors, to bring cutting edge digital media tools and practices into everything we do, and to foster cross disciplinary, cross industry, cross institutional collaboration so that Canada can become the most highly digitized country in the world and lead in key digital media products and services globally.

## *Capacity to Innovate, Digital Strategies and Barriers to Success*

Canada must ensure it creates a policy framework that forms a broad foundation for innovation across the entire economy to incent businesses and private sectors to adopt digital ICT more fully, and encourage them to train their staff to demand, use and capitalize on these tools to enhance productivity and dynamicism. On a sector by sector basis, it may be necessary to

provide financial assistance to drive this adoption and training. Researchers, such as social scientists and economics experts, should be funded to study the relationships between improvements in business performance and management and the adoption of ICT. If this results in faster, more effective and more transparent decision-making, these findings should be communicated to corporations, trade associations and industry stakeholders.

While a broad foundation is necessary to drive adoption in larger companies, several specific steps are needed to encourage the growth of smaller companies to achieve the critical mass to succeed globally and become sustainable. These strategies must create faster growth, with less tentative introduction of new services/media/devices, to enable Canadian firms to compete internationally through exports. An excellent example is Kitchener-based Christie Digital's MicroTiles product, which is very innovative and has the potential to create a new subsector in the architectural deployment of displays in public spaces everywhere. Initially, the manufacturing cost of the individual tile is rather expensive but will plummet as the product succeeds. This kind of product would benefit greatly from government-organized procurement as part of new projects in Canada, encouragement for faster Canadian adoption and perhaps even some subsidies for export sales. These strategies will address the Canadian lament about products or services initially created here that were abandoned only to become significant businesses in other countries.

One concern surrounding the adoption of digital media, e-commerce and online applications (including social media) is the potential for breaches in privacy by data mining searches, social network information, lists of friends and geo-location information. Added to this list of concerns should be theft of information from cloud computing network applications and misuse of household behaviour gleaned from smart meter data. GRAND has several researchers working on ways to enhance privacy while still ensuring the benefits of mobile location services, web services and cloud computing. Governments should declare this a priority for Canada to create a world-leading expertise, focused particularly on mobile location-based services, health records and services, and smart meters.

## *Growing the Canadian Digital Media Industry*

From GRAND's viewpoint of research leading to innovation and the training of new media experts, there are several important steps Canada can take to improve its performance in growing the digital media industry. To turn ideas into businesses that create wealth requires a mix of innovations by research institutions, SMEs and larger companies. Innovation among researchers, experts who experiment with the research ideas and strong receptors at companies are needed to succeed.

Usually, the people best able to start a new company around the research outcomes are the inventors themselves. University of Waterloo has examples such as Slipstream Data, which created the Internet high-speed dialup marketplace when U.S.-based Net Zero became a customer. It was founded by the two professors who created their compression and content management technology. Slipstream has been bought by RIM to accelerate their wireless data

throughput. Another startup, RapidMind, founded by Prof. Michael McCool and his graduate student, exploited their technology for better game engine programming to create tools for software on multi-core processors. They have been bought by Intel.

What would enable more professors to start businesses to exploit their ideas is more flexibility at universities to enable a professor to step out of his or her teaching and research role at the university for perhaps up to five years, without fear of losing the faculty position, in a way where the university can temporarily replace them without losing the faculty slot. Typically, professors are afraid to "step out" for longer than a one-year sabbatical and their departments require resignations after two years at the most. This creates a risk-averse atmosphere on both sides that limits Canada's ability to capitalize on potential innovation.

In some ways, this is an easy time to start a new business. ICT services are available in the cloud at no cost (at least while an SME is getting started). Access to markets and delivery are accelerated by the Internet. However, venture capital financing is very difficult to arrange in Canada, and the patience of VCs is low for technology-based businesses that have to redefine themselves to connect with market. Government should bolster SME finance in at least some targeted digital media areas.

Large companies are big R&D performers and can drive the success of a technology, service or content if they adopt it. Programs to encourage larger companies to adopt new innovations, collaborate with university or SME innovators and invest in new innovations at SMEs or universities would accelerate the growth of Canada's digital media industry.

Although it is relatively easy to trial a new business in the digital media area, it is more difficult to choose a suitable target market for the business and sustain it through the growth phase. To propel Canada globally in the digital economy, we must ensure that programming and policy fosters investment and innovation in key strategic areas across all industry sectors. The digital media environment is fast-moving and often requires cooperation among the stakeholders for each company to succeed. For example, the government regulatory context must align with the network producers and carrier delivery environment for certain kinds of digital service innovations, perhaps produced by an SME, to succeed.

Canada needs to set some target goals in key strategic areas, to drive research, innovation and investment by companies. Canada should form strategies to attain world leadership in the following technologies and services:

- Privacy-based mobile services on smart phones using location

- Unobtrusive approaches to preserving digital rights that don't limit functionality or interoperability

- Innovative ways to retrieve and watch television and film content that go beyond Hulu, to let viewers retrieve parts of shows and keep track of personal viewing as a service to the viewer

- Games to improve health and fitness, accomplish rehabilitation and engage people with others

- Systems to support peoples' choices to inform themselves about news and other current events in a more participatory, more narrowcast, international and culturally-sensitive way – perhaps with a role for citizen journalists

- Large displays in public areas networked to smart phones and other mobile devices

- Smart grid and buildings, to provide control of appliances and HVAC from mobiles

- Chronic disease management and network-based approaches to providing health care and prevention at a distance, to help people stay in their homes

- Transportation systems including smart systems to guide cars, traffic and route systems, and back seat entertainment systems

- Digitize Canada's cultural heritage

In these topic areas, we need to work together to increase the sense of "what is possible" among our leaders, policy makers, entrepreneurs and researchers. Digital media content and delivery systems are large, fast-paced and require the alignment of several inter-related factors to succeed. It's hard to create a new business by the old adage of "find a need and fill it". By creating some agreement on opportunities and goals, we can sustain collaborative efforts to achieve worldwide prominence and leadership in some of these areas. This will enable our companies to determine areas worthy of investment, providing enough stability to achieve the targets, instead of playing international catch-up after a phase of analysis-paralysis. Companies need synergistic connection with their partners and an encouraging signal from government to invest heavily in creating a disruptive new technology or content while simultaneously benefiting from the revenue provided by the old technology or content.

## *Creating Canada's Digital Content Advantage*

New digital technologies are putting control of the media experience in the hands of the consumer; consumers can control where, when and on what platform they will consume media. They have more options to discuss, mash-up and create related content than ever before. Social networks are changing the way people share this content, organize their free time, educate and entertain themselves, and conduct their work. There are huge opportunities for Canada to create new kinds of digital content, and to create fundamentally new ways of using it, that can propel us into leadership internationally, with commensurate economic benefits.

To succeed at creating digital content, we require a strong partnership among content experts, social scientists and technical experts. Gone are the days when an engineer's insight into the features users need in a product is sufficient. The digital content and delivery systems that are successful will not only be designed by experts who understand user needs and desires, but to the extent possible will have adaptable interfaces that automatically respond to users' desires, rather than their literal interactions. Moreover, the design of new content and new technologies to provide access to content, must have an aesthetic focus that provides appealing and affective experience for the consumer.

The National Film Board, CBC and other networks, Canadian game companies and other entertainment software producers and other creators already provide world-class content. However, when creators, applications, services and even consumers converge, yet explode across multiple platforms, what insights will determine new offerings that achieve business success? The usability of digital content and the systems that deliver digital content are inextricably intertwined with the content itself. Naturalness, and matching the users' needs and affective desires, are necessary to drive adoption. An example is the Apple iPad commercial that says, "You already know how to use it."

Canada needs to create more collaboration among content creators, designers, social scientists and technology experts. Unfortunately, there are few funding opportunities specifically targeted towards fostering cross-disciplinary collaborations. GRAND proposes to augment the existing tri-agency funding system in order to provide support for research that crosses these formal disciplinary boundaries and brings together academic experts, members of the business community, political leaders, and other stakeholders to devise solutions to contemporary social and technological issues in the digital media realm.

Canada should also fund more entrepreneurs in residence, or executives in residence, with experience in new media and ICT to guide students who are eager to form new businesses. Their insight into the critical success factors and networks of people who could potential help are invaluable to our next generation of innovators.

While some computer science and computer engineering programs are undersubscribed, there is increasing interest from students in new cross-disciplinary programs that allow them to merge computer science, new media content development, and the social sciences. In response, there are several new programs popping up to prepare graduates for digital media innovation, by teaching a blend of cultural, business and technical skills. Examples include the Masters in Digital Media at Great Northern Way Campus in BC, Ontario's UW@Stratford undergraduate program, Ontario's mobile wireless experience design programs at OCAD, Ryerson's DMZ, and Canada-wide graduate research opportunities available through the GRAND NCE. Additional funds to sustain these and grow new programs will enhance Canada's ability to create a new breed of worker that will be highly valued and unique in the world.

In the longer term investment in education, Canada should communicate the workings of digital media content creation and delivery systems, along with curricula in new/digital media literacy at

an abstract level, to grade 7 and 8 students, along with information about the careers and types of education they should consider to follow their aspirations in creating social media and other new media applications and content.

## *Conclusion*

GRAND NCE is a microcosm of the application of key success factors needed for Canada's digital media success as a whole, including collaboration between content creators and technology experts resulting in innovations created in collaboration with companies. Canada must increase its investment and attention to these key success factors to succeed internationally and create wealth.

The principal change we recommend is to focus a portion of the funding activities of Canada's three main federal research evaluation and support organizations (SSHRC, NSERC, CIHR) along with the Canada Council, Heritage Canada and Industry Canada to accelerate research and development involving digital media innovation and commercialization.

We strongly urge the government of Canada to promote the uptake of ICT for productivity gains in key sectors by promulgating exemplary tools and practices, tying credits and grants to their uptake, and by optimizing procurement practices.

Finally, we urge the government of Canada to convene a national discussion to identify key industry sectors where Canada is well positioned and accelerate research and development of digital media technologies, content, and services in these key sectors.