



Digital Skills and Business School Curriculum

Wendy Cukier, Shelley Smarz, Ken Grant

wcukier@ryerson.ca, shelley.smarz@ryerson.ca, kagrants@ryerson.ca

Ryerson University (Canada)

Abstract

Digital skills are a critical part of any national digital strategy to promote economic and social development and are profoundly changing educational requirements and modes of delivery in many countries around the world. Yet many nations have developed strategies which focus on promoting the development of technological infrastructure without considering the skills needed to use, build and manage it. Even when countries do reference digital skills, the definitions are seldom consistent and the ways in which they are assessed differ significantly. This review of international literature in English and French on digital skills explores the role of digital skills in national strategies, the definitions of digital skills, the assessment of digital skills and strategies to advance them. Using textual analysis tools and well-established approaches to meta-analysis, we used a set of standardized search terms in both academic and general search engines to identify 19,528 unique academic articles and grey literature related to digital skills in both English and French. These results were then systematically reviewed and reduced, based on recency and relevancy, to 3,017 results. Our results indicate that a hybrid set of business and technology skills is becoming increasingly sought after by organizations due to the benefits ascribed to this skill set, including increases in levels of innovation and productivity, competitive advantage, as well as, growth and profitability. Furthermore, we reviewed a number of metrics to assess digital skills in the business environment and observed that, in a knowledge-based economy, every employee must have the skills to generate, critically analyse, and disseminate knowledge. We conclude that, in order to continue to develop business-ready graduates, general business management programs must begin to integrate the development of this hybrid skill set into their current curriculum.

Introduction

For more than two decades there has been a great deal of discussion of critical skills shortage, skill mismatches, and the digital divide on a global basis. Many countries have formulated national digital strategies aimed at positioning them to compete globally. Often these strategies have focused on building high speed broadband infrastructure, providing access to the infrastructure and promoting growth of the information communications technology (ICT) sector. However, these strategies are often silent on the need to develop digital skills even though these are, arguably, the foundation upon which the other pillars of a national digital strategy are built. While the development of physical infrastructure is an important priority, advanced countries also recognize the need to develop their human skills infrastructure. This ensures the population is able to take full advantage of the physical infrastructure, access the government services and consume digital products and services. Digital skills are critical to companies developing infrastructure, having a skilled workforce, creating new products and services, and helping small companies rise to the next level. Research and innovation, fundamental to the growth of a world-class digital economy, are dependent on a skilled workforce.

Methodology and Approach

We approached this literature review using well-established methods of meta-analysis as well as textual analysis tools. We developed and used a Boolean string “(digital or ICT or “information technology”) AND (skill* or literac* or e-Skill*)” we searched four databases – Academic Search Premier, CBCA Complete, ProQuest Research Library, and Web of Science – for English language documents. These searches produced 18,452 non-unique documents. We used a similar Boolean



search string – “(numérique or TIC or “technologies numériques” or technologies or “fracture numérique” or “didactique l’Information”) AND (alphabétisation or compétence or habileté - to identify 1,892 unique French language results. These results were scrubbed to remove duplicate results, leaving us with 17,488 unique results in both English and French. From this, we reviewed eliminating all non-relevant documents, and were left with 2,829 academic articles in both French (1,892) and English (937) addressing digital skills (See table 1 below).

Table 1: Search Results by Year and Relevance

	1980-1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010-2011	Total
Relevant	312	88	97	113	112	180	208	324	244	426	387	238	2,829
Non-Relevant	3,399	706	837	823	838	1,046	1,177	1,338	1,446	1,681	1,378	887	17,448

We then searched grey literature for relevant documents identifying digital economy strategies from over 100 countries of which 81 international, national, and regional reports were used in our analysis. Similarly, we also mined the submissions to the Government of Canada’s Digital Economy adding 107 to the database. In total, we systemically reviewed 3,017 documents in both French and English from both academic and non-academic sources.

Digital Business and Technology Skills: The Hybrid Skill Set

The international academic and grey literature reveals that there is little consistency in the ways in which digital skills are defined. Most frequently, digital skills are conceptualized as little more than access to digital technologies, but the availability of technology does not determine use [1]. On the other end of the spectrum, some definitions focus only on “deep” technology skills, those highly specialized skills associated with advanced training in science, technology, engineering, and mathematics (STEM) disciplines [2]. Our research indicated that the most useful definitions of digital skills were those that defined digital skills as a continuum, moving from a basic to a more complex set of skills [3] [4][5][6][7].

There is evidence that even the skill sets required for Information and Communications Technology (ICT) professionals are changing, becoming more complex, sophisticated, and specialized. There is an increasing demand for ICT professionals who have the both “deep” technology skills for programming or application development, technical support, security and networking as well as the business skills necessary to use digital technologies to increase innovation and levels of productivity within the organization [8][9][10]. For example, in Canada, the Information and Communication Technology Council (ICTC) estimates that 65,000 new hires with hybrid skills will be needed by 2018 [11]. As a result of this demand, the curriculum of business skills must adapt and integrate the knowledge and training necessary to create career-ready graduates.

Beyond basic digital literacy, digital business skills include “the knowledge, skills, and personal qualities to lead and support the effective, competitive use of information technologies” [6]. Research has demonstrated that organizations that invest in developing business and technology skills at the same time they invest in new technology have greater productivity gains than those who do not [12]. In other words, digital business skills, also called the hybrid skill set, can be conceptualized as those skills needed to facilitate and support the use of ICT effectively in business, successfully leveraging the benefits of integrating technology with business practices. For example, research has demonstrated that this integration gives a more in-depth understanding of business management, such as the performance of vertical markets or business functions within the organization.

Britain’s digital economy strategy describes professionals in possession of this skill set as “Technology-capable business people, who understand the strategic implications of technology and have the ability to realise its potential for business innovation, productivity, and competitiveness” [8]. The Canadian Government identifies the adoption of new digital technologies as key to increasing levels of innovation, which, in turn, fosters higher levels of productivity and increases an organization’s competitive advantage [14]. Highly sought after, this hybrid skill set can increase an



organization's competitive advantage as it enables the organization to effectively invest in technology, increase levels of innovation, productivity, and, eventually, spur growth [6][15].

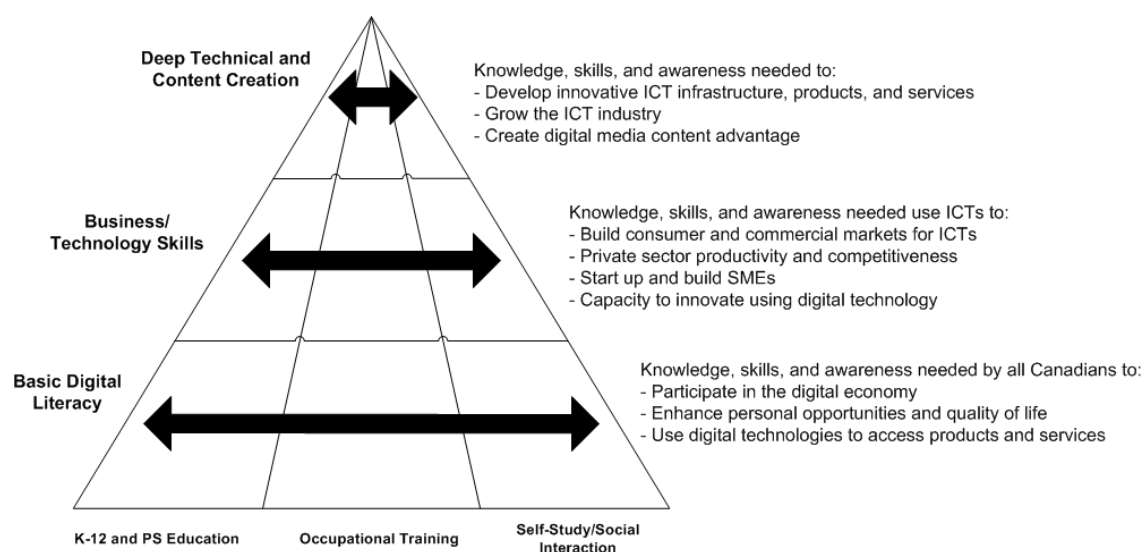
Benchmarks to Assess Business/Technology Skills

Some benchmarking studies have focused on basic skills needed to access the internet or on user-oriented business ICT skills required to participate in the workforce [16][17][18]. In contrast, the Skills Framework for the Information Age (SFIA) measures the skills needed to develop Information Systems (IS) that make use of ICTs [19]. In addition a "hybrid" skill set has also been associated with "innovation management, rather than technology-management" [20]. Among these are the ability to apply analytical techniques; theoretical knowledge; effective communication skills; problem-solving on a timely basis; managing risk and uncertainty, handling data gaps and conflict; facility in human relations; achieving implementation; identification of new technological opportunity; and the ability to integrate ICT with the organization's overall business strategy [21]. The variance among approaches to benchmarking tools is, in part, a result of lack of consistent definitions of business/technology skills.

Implications for Post-Secondary Institutions

More work needs to be done to consider the benchmarks and workforce projections associated with this multi-layered model of business and technology skills, but it would seem to also have implications for defining learning outcomes in post-secondary education. Close collaboration between post-secondary institutions and key stakeholders in the ICT sector must engage in a close and continuous collaboration in order to ensure that graduates have both the "deep" technological skills and the ability to create digital content. But beyond technology and content developers, organizations also need graduates with the ability to match technology solutions to business needs [22] and the entrepreneurial attitudes and skills needed to create and develop new businesses. Finally, regardless of their discipline, all graduates need the skills to work in technology-enabled workplaces [4] and to continuously learn. As technology rapidly changes, lifelong skills development and training opportunities need to be created and disseminated [23]. In an effort to conceptualize the different levels of digital skills, we have adapted a model first proposed by the Media Awareness Network (2010) to differentiate between basic digital literacy, business related digital literacy and finally "deep" technical and content creation skills (see Figure 1)

Figure 1: An integrated approach to digital literacy



At each level there is a need to develop clearer definitions, to create appropriate benchmarks and standards and to link with stakeholders across sectors – education, government, employers, non-governmental organizations and others – in order to develop a strategy to ensure that the population



has not only conventional literacy and numeracy but also the digital literacy skills needed to fully engage in and contribute to social and economic development.

References:

- [1] Brandtweinter, R., Donat, E. & Kerschbaum, J. (2010). "How to become a sophisticated user", *New Media & Society*. 12 (5), 813-833.
- [2] Danish Technological Institute (DTI). (2009). Supporting digital literacy: Public policies and stakeholder initiatives. Topic report 4. Retrieved from: http://ec.europa.eu/information_society/eeurope/i2010/docs/benchmarking/dl_topic_report_4.pdf
- [3] Ala-Mutka, K. (2009). Fostering ICT Professionalism, European e-Skills 2009 Conference., Brussels.
- [4] Bancino, R., & Zevalkink, C. (2007). Soft Skills: The new curriculum for hard-core technical professionals. *Techniques*, 82(5), 20.
- [5] Bresnahan, T., Brynjolfsson, E., & Hitt, L. (2002) Information technology, workplace organization and the demand for skilled labour. *Quarterly Journal of Economics*, 117(1), 339-376.
- [6] Canadian Coalition for Tomorrow's ICT Skills (CCICT). (2010). Canada: The go-to country for brainpower resources in the global digital economy. Retrieved from: http://ccict.ca/wp-content/uploads/2010/11/CCICT_Digital_Economy_Strategy.pdf
- [7] Sambell, M. (2009). Strategic skills assessment for the digital economy. Retrieved from: http://www.skillset.org/uploads/pdf/asset_14618.pdf?1
- [8] Galt, V. (2007, May 16). IT pros in demand for more than tech skills. *The Globe and Mail (Index-Only)*, pp. C.2.
- [9] Gantz, J. (2000). E-business skills shortage will eclipse IT gap. *Computerworld*, 34(23), 36.
- [10] Eckhardt, A. & Rosenkranz, C. (2010). Lost in translation?! - The need for a boundary spanner between business and IT.
- [11] Information and Communications Technology Council (ICTC). (2010). Digital economy strategy consultation submission. Retrieved from: http://de-en.gc.ca/wp-content/themes/clf3/upload/1583/ICTC_Digital_Economy_Strategy_Submission_100708.pdf
- [12] Boothby, D., Dufour, A., & Tang, J. (2010). Technology adoption, training and productivity performance. *Research Policy*, 39(5), 650-661.
- [13] e-Skills UK. (2009). Technology for growth IT & telecoms insights, 2010. London, UK.
- [14] Government of Canada. (2010). Improving Canada's digital advantage: Strategies for sustainable prosperity. Retrieved from: http://de-en.gc.ca/wp-content/uploads/2010/05/Consultation_Paper.pdf
- [15] Information Technology Association of Canada (ITAC). (2010). ITAC's response to the consultation paper on a digital economy strategy for Canada. Retrieved from: <http://de-en.gc.ca/wp-content/themes/clf3/upload/1871/ITAC%27s%20Response%20to%20Digital%20Economy%20Strategy%20Consultation%20Paper%20-%20July%209,%202010%20FINAL.doc>
- [16] Heinrichs, J., & Lim, J. (2010). Information literacy and office tool competencies: A benchmark study. *Journal of Education for Business*, 85(3), 153.
- [17] Hohlfeld, T. N., Ritzhaupt, A. D., & Barron, A. E. (2010). Development and validation of the student tool for technology literacy (ST²L). *Journal of Research on Technology in Education*, 42(4), 361-389.
- [18] Huang, C., Liu, M., Chang, K., Sung, Y., Huang, T., Chen, C., Shen, H., Huang, K., Liao, J., Hu, K., Luo, Y., & Chang, T. (2010). A learning assistance tool for enhancing ICT literacy of elementary school students. *Educational Technology & Society*, 13(3), 126-138.
- [19] Skills Framework for the Information Age (SIFA). (2010) Retrieved from: <http://www.sfia.org.uk/cgi-bin/wms.pl/296>
- [20] Korte, W. B., Braun, N., & Gareis, K. (2007). Benchmarking policies on multi-stakeholder partnerships for e-skills in Europe. Retrieved from: <http://www.eskillspolicy-europe.org/downloads/documents/Benchmarking>
- [21] Mallick, D. N. & Chaudhury, A. (2000). Technology management education in MBA programs: A comparative study of knowledge and skill requirements. *Journal of Engineering and technology management*, 17(2), 153-173.
- [22] Ali, R. & Katz, I. R. (2010). Information and communication technology literacy: What do businesses expect and what do business schools teach? [ETS RR-10-17]. Retrieved from: <http://www.ets.org/Media/Research/pdf/RR-10-17.pdf>



[23] Kolding, M., Robinson, C., & Ahorlu, M. (2009). Post-crisis: e-Skills are needed to drive Europe's innovation society [White paper sponsored by Microsoft]. Retrieved from:

<http://www.microsoft.eu/LinkClick.aspx?fileticket=bQQeH2nAaF8%3D&tabid=60>

[24] Media Awareness Network. (2010). Digital literacy in Canada: From inclusion to transformation.

Retrieved from: <http://de-en.gc.ca/wp-content/themes/clf3/upload/896/DigitalLiteracyPaper.pdf>