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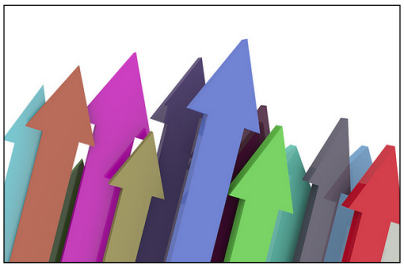
September 2013



Managing Innovation for Tangible Performance

Welcome to the September 2013 issue of the *Technology Innovation Management Review*. This month's editorial theme is Managing Innovation for Tangible Performance. We welcome your comments on the articles in this issue as well as suggestions for future article topics and issue themes.

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Overview

The *Technology Innovation Management Review* (TIM Review) provides insights about the issues and emerging trends relevant to launching and growing technology businesses. The TIM Review focuses on the theories, strategies, and tools that help small and large technology companies succeed.

Our readers are looking for practical ideas they can apply within their own organizations. The TIM Review brings together diverse viewpoints – from academics, entrepreneurs, companies of all sizes, the public sector, the community sector, and others – to bridge the gap between theory and practice. In particular, we focus on the topics of technology and global entrepreneurship in small and large companies.

We welcome input from readers into upcoming themes. Please visit timreview.ca to suggest themes and nominate authors and guest editors.

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Editorial:
Managing Innovation for Tangible Performance

Chris McPhee, Editor-in-Chief
Sorin Cohn, Guest Editor

From the Editor-in-Chief

Welcome to the September 2013 issue of the *Technology Innovation Management Review*. For this issue and the one that follows it in October, the editorial theme is Managing Innovation for Tangible Performance, and I am pleased to introduce our guest editor, **Sorin Cohn**, President of BD *Cohn*sulting Inc. in Ottawa, Canada.

In November, we welcome back **Seppo Leminen**, Principal Lecturer at the Laurea University of Applied Sciences, Finland, and **Mika Westerlund**, Assistant Professor at Carleton University's Sprott School of Business, as guest editors to reprise the theme of Living Labs. Leminen and Westerlund were the guest editors when we covered this theme in our September 2012 issue (timreview.ca/issue/2012/september), and we are looking forward to exploring this theme in even greater depth.

Also note that we are continuing our annual tradition of focusing our January issue on the theme of Open Source Business. Please get in touch if you are interested in contributing an article on this topic.

We hope you enjoy this issue of the TIM Review and share your comments online. Please contact us (timreview.ca/contact) with article topics and submissions, suggestions for future themes, and any other feedback.

Chris McPhee
Editor-in-Chief

From the Guest Editor

Can one *innovate* innovation? Our answer is an unqualified "yes". Firms of all sizes and in all sectors can use the knowledge of innovation management. Firms can benefit from the most up-to-date techniques and tools to direct and drive their innovation activities to where and how the greatest value can be reaped in support of their own business goals and innovation strategies.

Although innovation in firms has been the key contributor to enhanced competitiveness and economic growth, lately it has become a buzzword. Its indiscriminate use has created a fog that hides confusion and inaction behind all the talk about innovation. Too many people still think of innovation narrowly in terms of R&D or have not yet grasped the fact that services represent now a large part of industry revenues, including within manufacturing companies.

Firms face the relentless stream of disruptions in their operational environment because of evolving technologies, new customer demands, shorter product lifecycles, geopolitical instabilities, and competitive threats. They must develop their innovative capabilities and exploit them to maintain their competitive positions. Some companies reach the top of their industries thanks to innovation, but few stay there year after year due to their incapacity to sustain innovation at the level required.

Innovation should not be considered and treated as a goal in itself, but as the *means* to the organization's goals of relevance, competitiveness, and financial success. Sound decision making is critical because resources are limited and opportunities for innovation may be numerous. First, it is necessary for managers to decide *where* to innovate and then to select *what* to innovate. Then, they need to decide *who* will pursue the innovation and *how*. There is also the necessity to evaluate the progress of innovation, which implies a further decision regarding *what* to measure and *how* to measure it. There are also decisions on *who* and *how* to reward, as well as *where* and *when* to go next.

Editorial: Managing Innovation for Tangible Performance

Chris McPhee and Sorin Cohn

This issue of the *Technology Innovation Management Review* deals with the technology of firm-level innovation management – the practices, methodologies, and tools for managing innovation activities to enhance competitive performance in the market.

In the first article, **Harold Schroeder**, President of Schroeder & Schroeder Inc., describes the "art and science of transformation" approach, which is designed to help companies improve their innovation performance through effective organizational change. Science includes the key factors of strategy and systems, while art plays a complementary and inter-related role through the key factors of organizational culture and collaboration. Schroeder focuses on these four key factors of the approach, highlights examples that illustrate the benefits to organizations, and provides recommendations to help organizations implement the approach.

Next, **Robert Crawhall**, Principal Consultant at Innoxec Innovation Executive Services, reflects upon the importance of time management for innovation managers. He considers the corporate implications of innovation, including the development process, supply management, and manufacturing considerations, to show how they may affect the time required to commercialize an innovation. The article concludes with practical recommendations to help innovation managers better manage the indeterminate time factors associated with innovation.

Claude Legrand and **Rob LaJoie**, Managing Partners of Staples Innovation, argue that service innovation holds great potential for increasing the competitiveness and growth of individual businesses and for boosting overall productivity in Canada. They provide recommendations to help public and private sector leaders take advantage of this "under-valued, high-potential innovation opportunity", and they call for the creation of a national service innovation resource to support enterprises of all sizes as a means to improve Canadian productivity.

Stephen Hurwitz, a partner at the Boston-based law firm of Choate, Hall & Stewart LLP, examines the current shortage of venture capital in Canada and its role in creating a "commercialization crisis". In particular, Hurwitz examines the federal government's 2013 Venture Capital Action Plan, which is designed to address this shortage of venture capital in Canada. Although Hurwitz applauds the innovativeness of this plan, he highlights key problems that must be addressed for it to stand a chance of delivering on its potential of regenerating Canada's venture capital industry.

Frédérick Brousseau-Gauthier, a student at Université du Québec à Montréal, and **Yvon Brousseau**, CEO of the Centre of Excellence in Energy Efficiency, explore the ramifications of a paradigm shift from managing capital to managing heritage. They underline the need to create a series of pioneering business models for enterprises to adapt and profit from a new, heritage economy. In support of this need, their article introduces the Hub for Business Model Innovation (Hub-BMI), a research centre that is being developed in Montréal, Canada, to enable the development, testing, and validation of pioneering business models for a heritage economy.

Finally, **David Watters**, President and CEO of the Global Advantage Consulting Group, answers the question: "What are the components of Canada's innovation ecosystem and how well is it performing?" Watters describes types of organizations in the public sector, the private sector, and academia that assist firms in developing innovative products or services to sell in domestic and global markets. Although he highlights Canada's recent poor performance on innovation report cards, he argues that the country's commercialization capability would be enhanced if the supporting organizations within the innovation ecosystem were better able to "segment the marketplace of firms", which would allow them to tailor their services to match the key characteristics of the firms they serve.

We hope that you will benefit from the insights the authors have shared in this issue of the TIM Review. We consider the dissemination of up-to-date information on advanced methods and technologies for more effective firm-level innovation management to be a mission of importance. This information serves you, your colleagues, and your organizations with the knowledge and tools required to raise the performance of your companies where it counts: in the market.

Sorin Cohn
Guest Editor

Editorial: Managing Innovation for Tangible Performance

Chris McPhee and Sorin Cohn

About the Editors

Chris McPhee is Editor-in-Chief of the *Technology Innovation Management Review*. Chris holds an MASc degree in Technology Innovation Management from Carleton University in Ottawa and BScH and MSc degrees in Biology from Queen's University in Kingston. He has over 15 years of management, design, and content-development experience in Canada and Scotland, primarily in the science, health, and education sectors. As an advisor and editor, he helps entrepreneurs, executives, and researchers develop and express their ideas.

Sorin Cohn has 35 years of international business and technology experience, having been involved in most facets of innovation development: from idea to research and lab prototype, from technology to product, and then to market success on the global stage. He has developed new technologies, created R&D laboratories, started new product lines, and initiated and managed new business units. Sorin has several essential patents in web services, wireless, and digital signal processing, as well as over 70 publications and presentations. He has also been Adjunct Professor at the University of Ottawa. He is a Killam Scholar, and he holds a PhD in Electrical Engineering, an MSc in Physics, and an MEng in Engineering Physics. Sorin is President of BD *Cohn*sulting Inc. As well, he acts as Leader of Innovation Metrics at The Conference Board of Canada and as Chief Program Officer of i-CANADA. He is also Member of the Board of Startup Canada as well as the Board of the Centre for Energy Efficiency.

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Strategic Innovation for Business Performance: The Art and Science of Transformation

Harold Schroeder

> *"If you want something new, you have to stop doing something old."*
>
> Peter F. Drucker (1909–2005)
> Author and management consultant

Despite the well-documented association between innovation and business performance, many organizations struggle in their attempts to become successful innovators. This article discusses a recommended "art and science of transformation" approach to help companies improve their innovation performance through effective organizational change. The approach is focused on four key factors: culture, collaboration, strategy, and systems. Examples are drawn from a review of previous research to demonstrate successful innovation practice using similar approaches, and examples of less successful practice are included to highlight ways in which an "art and science" approach can help overcome the difficulties often faced. The article concludes with some practical, step-by-step guidance based on the art and science of transformation framework.

Introduction

Numerous studies have highlighted the importance of innovation as a critical success factor in business performance (e.g., Baker and Sinkula, 2002: tinyurl.com/qb9ht7l; Damanpour et al., 1989: tinyurl.com/plm9gp2; Hult et al., 2004: tinyurl.com/nyns9qa; Jiménez-Jimenez et al., 2008: tinyurl.com/khxlmjl; Roberts, 1999: tinyurl.com/ksapsre). Leading global corporation such as Apple Inc., 3G, and Proctor & Gamble largely owe their outstanding business success to a sustained record of successful innovation. Yet, despite the well-documented association between innovation and business performance, many companies struggle in their attempts to become successful innovators.

The available evidence shows that the companies that are most successful at innovation approach it in a holistic and systematic way, developing an innovation strategy that is fully integrated with their business mission and goals, and aligning their organizational culture and organizational systems with the strategy. Relatively few organizations take this approach; however, if innovation occurs at all, it is more often in an ad hoc fashion that has little connection to core business goals (De Souza et al., 2009: tinyurl.com/mzxbdj5; Jaruzelski et al., 2011: tinyurl.com/lysol6j). In the PricewaterhouseCoopers global survey of CEOs (2011; tinyurl.com/4dboztd), fewer than 10% of respondents described their organization as an "active innovator".

Developing a business environment that supports and promotes innovation often requires extensive changes in organizational culture and systems, which can be difficult to achieve, not to mention disruptive, costly, and time-consuming. Though the potential long-term benefits are considerable, firms are often focused on short-term gains and cost reductions and are unwilling to invest time and resources into organizational transformation efforts. The high risks of failure associated with major organizational change projects may also be a deterrent.

This article discusses an "art and science" approach to help companies improve their innovation performance through effective organizational transformation. First, the article describes the overall approach, and then it discusses of each of its four key factors: culture, collaboration, strategy, and systems. Next, examples of less successful attempts to innovate are provided to illus-

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trate the risks of not paying sufficient attention to these factors. Finally, the article concludes with recommendations for organizations wishing to improve their innovation performance using the art and science of transformation framework.

The Art and Science of Transformation

The approach described in this article is based on growing evidence that successful organizational change needs a combination of art and science, with science comprising specialist expertise and techniques and art comprising the more intangible and intuitive types of skills that are at least as important. In general, the art of transformation focuses mainly on the cultural and people-related aspects of change, and the science focuses on the strategic and systems-related aspects, but with considerable overlaps. The research evidence shows that organizational transformation projects often fail because of a lack of attention to the people-related aspects of change (Economist Intelligence Unit, 2009: tinyurl.com/lmwyevv; IBM Corporation, 2008: tinyurl.com/ob8nvym; Bisson et al., 2010: tinyurl.com/oqegoyf) rather than inadequate project planning and management.

Building on this art and science perspective, we can identify from previous research four main factors that are especially important in improving innovation performance: culture, collaboration, strategy, and systems. Loosely, two of these fall in the realm of art and two in the realm of science (Table 1), but they are closely interrelated. For example, a desired cultural change can be accomplished by disseminating new ideas and involving employees in the application of these ideas in their own areas of work, eventually resulting in changes in the underlying norms that direct day-to-day behaviour. However, the success of this effort also requires organizational *systems* – such as the rewards and recognition system, the performance management system, and leadership models – to be re-aligned with the desired new cultural norms. Attempts to persuade employees to become more innovative are unlikely to succeed within a strongly hierarchical organizational structure that inhibits them from putting forward their own ideas, or if the performance evaluation system does not reward creativity.

Table 1. Key factors in the "art and science of transformation" approach to innovation

The Art	The Science
Organizational Culture	Strategy
Collaboration	Systems

An "art and science" approach to transformation is also required *within* each of these areas. For example, specialist human resources knowledge and skills are needed to redesign performance-management systems in ways that promote innovative behaviour, but this redesign also requires the intuitive ability to understand what will motivate different groups of employees and effectively communicate the changes to them. Cultural changes require the ability to influence the attitudes of employees towards the newly redesigned organizational systems and to encourage behavioural changes, but this cannot take place in an ad hoc manner; like any other transformation initiative, effective cultural change requires the application of systematic project planning and management techniques and the ability to monitor and report on progress. Art and science can also be conceptualized as "right brain" and "left brain" thinking, respectively, with the former being more intuitive, holistic, and subjective, and the latter more logical, analytical and objective – both are needed to gain full understanding of an issue and develop the most appropriate solution.

The following sections discuss the role of each of these factors in contributing to innovation performance, and explain how art and science are important in each area, highlighting also the inter-relationships between them.

Organizational Culture

Organizational culture consists of values, norms, and behaviours, which collectively define and comprise acceptable and "normal" ways of getting things done within an organization. Research has consistently shown organizational culture to be strongly associated with successful innovation. For example, a 2007 global survey of more than 700 public companies from 17 developed and developing economies revealed culture as the single most important driver of innovation, exceeding even R&D spending in its influence (Tellis et al., 2007; tinyurl.com/lgfxmlp). Similarly, Booz & Company's Global Innovation 1000 study found organizational culture and strategic alignment to be the critical success factors in innovation (Jaruzelski et al., 2011; tinyurl.com/lysol6j). In their research with companies in the San Francisco Bay Area, Jaruzelski, Merle, and Randolph (2012; tinyurl.com/m9o65uo) found evidence of a "distinct

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culture of innovation" that helps to align an organization's innovation approach with their business strategy.

Having a future-market orientation and a learning culture are the cultural attributes most strongly linked with the ability to innovate (Hult et al., 2004: tinyurl.com/nyns9qa; Hurley and Hult, 1998: tinyurl.com/k358et9; Jiménez-Jimenez et al., 2008: tinyurl.com/khxlmjl; Nonaka and Takeuchi, 1995: tinyurl.com/qjjkltz). A market orientation requires that executives and other key employees have an astute "market sense" or understanding of evolving market needs and preferences. It also requires the ability to determine the right time to introduce a new product to the market – which may not necessarily be when it has been perfected in the laboratory. For example, Microsoft reportedly operate a practice of putting new products on the market before all the kinks have been ironed out, and subsequently improving them based on customer feedback. However, a science-based approach is also important to underpin and strengthen a firm's market orientation, including, for example, the use of market intelligence and analytics.

An organizational-learning orientation requires the presence of organizational norms and values that support experimentation and risk-taking. Tolerance of failure is an important aspect of a culture that supports organizational learning: from this perspective all experiments generate useful knowledge, even if they do not result in a concrete positive outcome. This attitude is reflected in the approach taken by Walmart, which views each of its stores as a mini-laboratory in which employees experiment with different pricing, product selection, and display options, and the most successful ideas are rolled out to the whole company (Leavy, 2005; tinyurl.com/oww5fdv).

Other cultural factors known to be associated with successful innovation include "a willingness to cannibalize"; risk tolerance; openness to ideas from external stakeholders; good collaboration; employee pride in the company's products and services; and respect for technical expertise (Jaruzelski et al., 2012: tinyurl.com/m9o65uo; Tellis et al., 2007; tinyurl.com/lgfxmlp).

Leaders and managers play a pivotal role in determining the culture of an organization by acting as role models or communicators of desirable norms and behaviour, and also in the ways they react to employee creativity. De Souza and colleagues (2009; tinyurl.com/mzxbdj5) highlight the case of Whirlpool, in which the solid support of organizational leadership for the company's innovation strategy and infrastructure, including the allocation of seed funding for pilot projects and the communication of slogans promoting the importance of innovation to the organization, contributed significantly to the development of a highly innovative culture.

Organizational structures and systems are also especially important in supporting a learning culture. Examples include a structure that promotes team-working as well as collaboration between different areas of the organization; information sharing and knowledge transfer facilities or mechanisms; and performance-management systems and career paths that reward experimentation and knowledge generation (Nonaka and Takeuchi, 1995; tinyurl.com/qjjkltz). Efforts to encourage a more innovative culture can also be formalized in company rules and regulations: Google, for example, allows its employees to work on innovative ideas for 20% of their working time (Phillips, 2012; tinyurl.com/nykto5z).

Collaboration

The second major factor strongly associated with successful innovation is the ability to form relationships with internal and external stakeholders for the purpose of collaborating with or engaging them in the innovation process. Indeed, innovation performance has been shown to be correlated with the strength of a firm's network (Chetty and Stangl, 2010: tinyurl.com/kwng23o; Mohannak, 2007: tinyurl.com/l9uflzh; Vithessonthi, 2010: tinyurl.com/mkco7t6).

Collaboration takes place in the innovation process for two main reasons: i) to understand and incorporate the needs and perspectives of stakeholders when developing new products and services, and ii) to fill gaps in skills and expertise. Both require the ability to engage with – and form various types of relationships with – individuals and groups, drawing on a range of art skills and attributes such as communications and inter-personal skills; negotiation and influencing skills; and the intuitive ability to identify a suitable business partner.

Companies known for their successful record of innovation have often institutionalized collaboration within organizational systems and processes. For example, Buckley (2005; tinyurl.com/nykdaz3) report the implementation by Procter & Gamble of a "connect and develop" program to promote open collaboration and idea-shar-

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ing between employees in different areas of the organization and with external stakeholders. Similarly, Jaruzelski, Loehr, and Holman (2011; tinyurl.com/lysol6j) attribute the innovation success of the Visteon Corporation, a leading U.S.-based supplier of electronic products for automobiles, to the company's proactive efforts to formally increase collaboration between employees in different locations and with its joint venture partners. In many organizations, collaboration, jointworking, and knowledge-sharing are being facilitated by the use of Web 2.0 software (tinyurl.com/dqt86) such as "wikis" on company intranets (Bennett et al., 2010: tinyurl.com/mexxnk9; Fraser and Dutta, 2008: tinyurl.com/m64vgsd; Bughin et al., 2010: tinyurl.com/lvo8etp).

The Internet and Web 2.0 technologies have revolutionized the ways in which businesses can now engage their customers in the innovation process, as well as providing a wealth of market intelligence about their preferences and characteristics. Companies that are making full use of their potential include Dell, which invites customers to submit their own suggestions for innovative products via the company's Direct2Dell blog (tinyurl.com/n8krna9), and Levi Strauss, which uses Facebook "likes" to generate information on consumer style preferences, thus providing a ready arena for the experimentation and commercialization stages of innovation.

The second common form of collaboration in the innovation process has evolved in response to the recognition that organizations often lack expertise in some stages of the innovation process, which prevents them from turning good ideas into value-generating products, services, or business models. In particular, innovative ideas generated by entrepreneurial firms are often stunted due to a lack of commercialization talent or funding. This problem has been considered particularly acute in Canada, where the Government has taken the initiative of establishing organizations such the Health Technology Exchange (htx.ca) and MaRS Innovation (marsinnovation.com) to promote collaboration and partnerships between entrepreneurs, venture capitalists, and others in Ontario's medical and assistive technologies sector, and to facilitate stakeholder input into the innovation process.

Major corporations that have traditionally been competitors also sometimes form partnerships in order to pool their expertise in developing new products and services. For example, SAP and RIM (now BlackBerry) reportedly worked collaboratively to provide access to SAP applications via the BlackBerry platform (IT Online, 2008; tinyurl.com/n3yqww3). More commonly perhaps, firms may outsource their innovation processes to reduce risk and provide more favourable conditions for innovation (Chesbrough, 2003; tinyurl.com/aqkav9t), or they may acquire startups for the purpose of boosting innovation performance. This is a practice used by GE, for example (cited in De Souza et al., 2009; tinyurl.com/mzxbdj5). The trend of "open collaboration" involving sharing of ideas and joint experimentation between organizations within a network has been reported to contribute significantly to more rapid implementation, at lower cost, and reduced risk for the firms involved (Chesbrough and Appleyard, 2007: tinyurl.com/3ne6xts; Creamer and Amaria, 2012: tinyurl.com/m6ftjgd).

Strategy

It is clear from previous research that following a clearly-defined innovation strategy rather than an ad hoc approach is one of the preconditions for success in innovation. In a way, this seems counterintuitive: strategy implies constraints, and it might be argued that creativity should not be stifled in this way. But, most businesses cannot afford to waste time and resources in the development of ideas that are at a tangent to their organizational mission or core objectives. Having a strategy defines the broad scope within which innovations likely to deliver business value can be developed; as Favaro (2012; tinyurl.com/mqx8slf) points out, strategy is "the series of choices you make on where to play and how to win to maximize long-term value".

The innovation strategy should therefore be based on the organizational mission, core values, and business goals. It will define the goals and objectives of innovation and acceptable ways of meeting them (Anthony et al., 2008; tinyurl.com/l3fbhxl) and perhaps identify responsibilities for developing solutions within specified areas (De Souza et al., 2009; tinyurl.com/mzxbdj5). This strategy will not only help to ensure that value-generating innovations are developed, but also help motivate employees to come up with innovative solutions to specific organizational problems and issues (De Souza et al., 2009; tinyurl.com/mzxbdj5). The innovation goals can also be used to develop quantifiable metrics for the purpose of measuring innovation performance and reporting back to organizational leaders.

The science of innovation strategy development and implementation thus involves the systematic identification of problems or areas of interest, based on core business goals and techniques such as environmental

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scans and market analyses. It also involves the ability to translate these problems into specific innovation objectives, goals, and metrics, while ensuring that targets and measurement activities do not stifle creativity and "out of the box" thinking. But, art is also fundamental to strategy formulation, especially in the context of innovation. As highlighted by the example of Steve Jobs at Apple Inc., understanding the market and emerging business opportunities requires not only the ability to understand facts and figures but it is also largely a personal, intuitive skill. Moreover, strategy deployment requires the ability to effectively communicate effectively with a range of stakeholders, including employees, suppliers, customers, and others, convincing them of the need for innovation and the importance of thinking and behaving in new ways to achieve the defined goals. This deployment involves understanding the perspectives and likely concerns of these stakeholder groups, translating the innovation strategy and goals into appropriate language, and developing incentives that act as drivers of change.

Infrastructure

Researchers are also increasingly flagging up the need to "institutionalize" (Anthony et al., 2008; tinyurl.com/l3fbhxl) innovation by establishing organizational systems and structures to support various stages of the process. There is a common tendency to think of innovation in terms of the generation of new ideas for products and services, but this is only the starting point of innovation. Successful innovations are those that are actually implemented and deliver value to the organization and its customers and, as such, involve many stages of work and different functional areas. For example, De Souza and colleagues (2009; tinyurl.com/mzxbdj5) identified five key stages in the innovation process: i) idea generation and mobilization; ii) screening and advocacy; iii) experimentation or prototype building; iv) commercialization; and v) diffusion and implementation.

Innovation therefore requires structures and systems to support each stage of the innovation process, helping to ensure that adequate resources and facilities are allocated to each phase of work, and that responsibilities and accountabilities are clearly defined. After an innovative idea has been generated, for example, it needs to be evaluated and prioritized within the overall innovation strategy and in relation to immediate and longer-term business needs. This process ideally involves screening by a dedicated innovation strategy team with oversight of the whole business, to ensure that the interests of individual areas do not bias the outcomes. Such a team can also act as an advocate of innovation when the organization is making decisions and allocating resources.

Many successful innovators also establish other new structures or organizations with responsibility for specific stages or aspects of innovation. Anthony, Johnson, and Sinfield (2008; tinyurl.com/l3fbhxl) cite the examples of incubators or independent working groups to launch or accelerate the development of innovative ideas and training units that provide managers and employees with the skills and knowledge needed to become more innovative. Some organizations have chosen to minimize the risk and disruption of innovation to the core business by establishing spin-off organizations for the sole purpose of innovation, or by completely outsourcing this function (De Souza et al., 2009; tinyurl.com/mzxbdj5).

The innovation infrastructure includes the organizational systems that must be realigned to support an innovative culture. Especially important are those systems that shape the ways that employees think and behave at work, including recruitment and selection, training and development, performance management, and reward and recognition systems. Modifying these systems to promote innovation may involve the use of extrinsic rewards such as career-progression opportunities, salary increases, and other forms of recognition, as well as the more intrinsic rewards of interesting work and opportunities for self-achievement. Developing appropriate systems requires knowledge and expertise in human resources, but it also requires an astute ability to understand what motivates different groups of employees to be more innovative. For example, researchers may be attracted more by opportunities for interesting work, whereas sales and marketing specialists might be encouraged by external targets and associated rewards. There is evidence of both approaches being used by successful innovators: within IBM, the intrinsic reward of being associated with a prestigious organization has been used to attract managers to its emerging business organization, and Google offers employees stock options when their innovative ideas are successfully developed into new products (Philips, 2012; tinyurl.com/nykto5z).

When Art and Science Are Ignored

Though the above sections have highlighted good practice in innovation among well-known organizations, the literature also reveals many examples of less suc-

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cessful attempts to innovate, even among major global firms. These examples can be linked in many cases to a lack of attention to the art and science of transformation.

For example, according to White and Farwell (2012; tinyurl.com/mnqstss), it has been the superior ability of Apple Inc. to establish a strong "culture of innovation", along with a more systematic approach to the innovation process, that has given it the edge over BlackBerry Ltd. (formerly Research In Motion Ltd.) in the smartphone market in recent years. The leadership skills of Steve Jobs, such as an ability to intuitively understand the market and anticipate future demands, are highlighted as having been major contributors to Apple's past record of successful innovation, with BlackBerry lacking such a strong leadership figure in its history. Moreover, despite some poor management practices in both firms, Apple successfully used its human-resources systems to encourage high performers to remain in the company and to ease weak performers out, while BlackBerry demonstrated no such ability to manage its performance through organizational systems in this way, and has shown a tendency to "grow like topsy" in a seemingly unplanned manner (White and Farwell, 2012; tinyurl.com/mnqstss).

Innovation efforts are also often hindered by a narrow-sighted and risk-averse approach. This approach often occurs in larger, more successful companies that have invested heavily in the production of particular products and services and are almost exclusively focused on maximizing profits and increasing efficiencies within these same product lines rather than exploring new possibilities. The approach becomes ingrained in organizational cultures and operating practices and hinders innovation and flexibility even when market conditions change.

Kodak is an example of a company that experienced tremendous success in the film photography market, but has failed so far to adapt adequately to the digital photography market, in contrast to its more agile competitor Fujifilm. Contributing factors reportedly include a traditionally autocratic leadership style that has historically stifled innovation, and a failure to look holistically at the organization's whole business model and the need to adapt it to changing technologies (The Economist, 2012; tinyurl.com/7e5p6sf). It remains to be seen whether recent attempts to adopt a new business model – focused on the delivery of products and services for managing digital image libraries – will be adequately supported by a transformation of company culture and operating systems (Hamm and Symonds, 2006: tinyurl.com/m2gm4k2; The Economist, 2012: tinyurl.com/7e5p6sf). Another example from the literature of a firm that failed to adopt a sufficiently holistic approach to innovation is the baby food producer Gerber Foods. As Wessell (2012; tinyurl.com/ogat6w3) explains, this company recently tried to break into the adult food market simply by repackaging some of its existing products, a strategy focused on maximizing existing efficiencies and reducing costs, but which lacked creativity and was poorly aligned with the demands of the target market, resulting in the failure of the rebranded product line.

Conclusion and Recommendations

For organizations wishing to improve their innovation performance, this article highlights the need to focus on strategy, systems, culture, and collaboration, and to recognize the inter-relationships between them. Thus, organizations need to apply both art and science in a holistic process of transformation. What needs to be done in practice will vary between organizations, depending on their existing state of innovation-readiness and the nature of their corporate culture and organizational systems. However, a number of general recommendations relating to transformation for improved innovation performance can be made:

1. Develop a formal innovation strategy that identifies priority areas linked to the organization's mission and business goals, and is aligned with its core purpose and values. If these elements have not been formally articulated, this gap should be addressed before the innovation strategy is developed in order to avoid wasting time and resources.

2. Allocate dedicated resources and formal responsibilities for each stage of the innovation process, and ensure that the necessary infrastructure, skills, and expertise are made available, either within the organization or through collaboration with external bodies.

3. Conduct a review of organizational culture, structure, and systems – using an approach based on both art and science – to identify ways in which these aspects are likely to promote or hinder innovation, and identify the changes necessary to establish an innovation-conducive organizational environment. Culture can be investigated using methods such as surveys, interviews, and focus groups to explore the attitudes of employees and managers. Human-resource man-

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agement systems in particular should be systematically examined to identify ways in which they are currently rewarding or penalizing innovative thinking and behaviour.

4. Implement a cultural transformation strategy that is targeted at both individual employees and organizational systems. Ways of thinking and behaving at work can be influenced over time by a process of communicating the desired new norms and involving employees in discussions about how to apply these norms to their own areas of work. Organizational systems should be modified as necessary to ensure these systems are aligned with the new norms, including recruitment of managers with appropriate attitudes and management styles, and ensuring that innovative approaches and achievements are acknowledged and rewarded in the performance-management system and the compensation system.

5. Establish systems and tools for the purpose of measure and monitoring innovation performance against the strategy, including detailed plans, performance metrics, and reporting methods such as balanced scorecards. These systems and tools will keep innovation in the minds of organizational executives, managers, and employees; ensure that achievements are acknowledged; and help highlight remaining innovation barriers.

Trends in open collaboration and new opportunities to engage stakeholders through social media are improving the prospects for successful innovation on the part of all organizations. Applying the "art and science of transformation" approach to organizational culture and systems can help ensure that the potential benefits of these developments can be secured.

About the Author

Harold Schroeder is President of Schroeder & Schroeder Inc., a Toronto-based firm of senior program managers and project managers, management consultants, and corporate managers. By focusing on both the art and science of transformation, the firm assists organizations who are planning and implementing major transformation initiatives and who have had, or currently are experiencing, sub-optimal business results through their strategic or operational transformation projects. Having worked many years in politically challenging and complex environments with demanding timelines and deliverables, Mr. Schroeder is recognized by clients for his superior relationship-management, problem-solving, communication, and negotiation skills. He has led various management consulting practices in large consulting firms and has acted as a consultant and project manager on over 150 consulting engagements for clients throughout North America and Europe. Most recently, Mr. Schroeder has been involved in significant projects in the areas of innovation and entrepreneurship, including projects for both private sector clients and government ministries. He has also published and presented on the topic of innovation and entrepreneurship.

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Time to Innovate: Reflections and Recommendations on Time Management for Innovation Managers

Robert J. Crawhall

> *"Don't let the fear of the time it will take to accomplish something stand in the way of your doing it. The time will pass anyway; we might just as well put that passing time to the best possible use."*
>
> Earl Nightingale (1921–1989)
> Entrepreneur, speaker, and author

Effective time management is a critical success factor for most projects; however, it is particularly challenging for projects involving substantial innovation. For most projects, time (i.e., the schedule) becomes a management "red flag" that signals when something goes wrong or gets out of control. The challenge for projects involving significant innovation is that one or more critical activities may be of an unknown duration or involve factors outside the normal design process and require "red flagging" from the outset. Managers of innovation projects have to distinguish between those activities or work packets that are a part of "business as usual" and those that involve innovation. They must identify and quantify the schedule risks and develop strategies to mitigate them. For example, one strategy to manage time-related risk is to decouple the innovation value as perceived by the customer (innovation output) from the technology innovation that is needed to deliver the product value in a cost-effective manner (innovation input). This strategy should take into account the likely consequences of longer-than-anticipated innovation time. Two common risks associated with poor time management for innovation are running out of financial runway to reach sustainable revenue and missing a critical market window. In this article, the author reflects on almost 30 years of experience in the Canadian innovation system across several industry sectors and provides some practical recommendations on time management for innovation managers.

Introduction

To say that *time* is not on the side of *innovation* is an understatement. Although time management is a challenge in any commercially competitive situation, it seems to be particularly pernicious in an innovation environment. Most projects run into scheduling issues and unexpected events. Experienced project managers develop strategies to deal with these problems. Projects involving significant innovation have proven to be particularly risky; startups have a high failure rate and new initiatives in small- and medium-size enterprises often stumble. Is this just the nature of innovation or are there ways to shorten the odds and improve innovation performance? The intent of this article is to help the project manager to identify activities or work packets with a significant innovation time risk; to devise a time management plan that will increase the likelihood of success; and to mitigate the consequences of schedule slippage.

Early in my career, I was project manager for a sub-system for CANDU nuclear reactors (tinyurl.com/yzze2f8). The patented technology allowed this sub-system to be

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built for less than half the cost of a conventional solution. The two-year project had good margin, the client saved a lot of money, and, despite a number of unanticipated delays such as a key supplier declaring bankruptcy and components requiring requalification to nuclear code, good project management practice ensured that the project arrived on time and on budget. It was a textbook case of high-tech, win-win innovation.

Jump forward a couple of years to one of Canada's flagship telecommunications companies in the ramp up to the "tech boom". I was involved in technology development on projects in several different lines of business. Initially I was perplexed at the frequency of significant schedule slippage. The details differed in each case but the outcome was quite consistent. Some blamed it on "scope creep" from customers (a valid project management issue). Some claimed that "senior management" always doubled the estimate so, if they were honest, the project would never be approved (a management culture issue). Finally, one insightful project manager admitted that, although the project seemed to be a standard software release, the critical components had never been developed before, implementation just turned out to be harder than the architects had anticipated, and activities outside the normal design process had to be added to the schedule. I will return to these issues shortly, but for the moment it is sufficient to say that this insight helped me to deliver innovative technology capability more effectively to product development teams and later to help a number of small companies in their innovation processes.

In this article, I clarify what I mean by "innovation" and its relationship to product development and to new technology development before moving on to a discussion of time management for innovation. Some examples are presented that illustrate how innovation may affect common trade-offs in product development and the consequences for time management. I then look at some of the broader corporate implications of innovation, including the development process, supply management, and manufacturing considerations and show how they may affect the time required to commercialize an innovation, particularly if they are not taken into account up front. I make some observations regarding culture and behaviour and touch on the issue of innovation collaborations with outside organizations. Finally, I conclude with four simple recommendations that should apply to most innovation projects.

Innovation Output vs. Innovation Input

Innovation is a word that is frequently used by people for whom it is a rather abstract concept. The definition for "TPP Innovations", developed by the Organization of Economic Cooperation and Development (OECD, 2005; tinyurl.com/l433u9z), is one of the more practical:

> *"Technological product and process (TPP) innovations comprise implemented technologically new products and processes and significant technological improvements in products and processes. A TPP innovation has been implemented if it has been introduced on the market (product innovation) or used within a production process (process innovation). TPP innovations involve a series of scientific, technological, organizational, financial, and commercial activities."*

This definition works in many situations and draws a clear distinction between innovation, invention, and research (concepts that are frequently confused); however, it does not help the project manager improve their innovation performance in terms of time management. In this article, the term "innovation" will be used in two different ways: i) for the "wow factor" experienced by the customer of a product that they see as innovative; and ii) for the (few) activities or work packets within an overall product development schedule that deal directly with the incorporation of new technology. For example, when my children said the iPhone 5 was innovative, they were referring to a perceived user "wow factor", not to the innovative technology that had gone into the smartphone.

In this article, I will refer to the customer "wow factor" experience as "innovation output". Innovation output may be thought of as a new design concept that meets a latent market need. Productizing that design concept may be enabled or facilitated by new technology (an innovation input) or it may be achieved using a conventional design "toolbox" employed in new and different ways. In the former case, significant schedule risk may be incurred due to new, unfamiliar, and immature technology. In the latter case, the implementation and execution should proceed according to a standard design process following good project management practice.

The biggest time risk related to innovation output is missing the market window; either someone else gets there first and steals your "wow" or the product arrives

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before a substantial portion of the market is ready for it. There are many great ideas that arrive before their time. The Apple Newton (tinyurl.com/cd4sg3) jumps to mind or, for fans of Canadian innovation trivia, the Archie search engine (tinyurl.com/lr5ru55) – the *first* Internet search engine – is another example. Hitting the innovation market window is an art beyond the scope of this article; however, the risk of missing the window is clearly exacerbated if the development schedule contains substantial uncertainty due to innovation.

In this article, I refer to the incorporation of a new piece of technology into a product as "innovation input". This technology may come from an in-house R&D effort or from external sources such as a supplier or a university/college innovation program. An innovation input may be linked to an innovation output or it may be completely transparent to the end customer. In the latter case, it may give a designer the opportunity to provide the same functionality at a much better cost than the competition or to improve profit margin over the product lifetime. I was involved with the packaging of optical communications modules in the 1990s; innovation inputs allowed year-over-year footprint shrinkage and functional integration of devices that resulted in substantial cost savings and reliability improvements. From the customer perspective, it was fundamentally the same box with the same optical communications interface, although new features were added to reduce the cost of ownership and ease of management.

There Is a First Time for Everything

Time risk related to innovation input comes because managers do not know how long something is going to take the first time it is done. They can infer how long it might take from previous experience, but the more innovative the technology, the more likely something unexpected will arise. For example, when signal speeds on backplanes started to approach one gigabit per second, there were a number of useful design techniques that could be borrowed from microwave engineering. Capacitive coupling of signals across connectors was one of these techniques. The technique worked well in terms of signal integrity, particularly when hot-swapping printed circuit packs, but functionality was impossible to test using standard test methods. As a result, debugging became very difficult and this one work packet held up the entire development effort.

Time management risks for innovation inputs and innovation outputs are different and require different mitigation strategies. The first step for the project manager is to clearly identify and understand them.

Decoupling Innovation Output from Innovation Input

An important question for the innovation project manager is whether the innovation inputs and innovation outputs are tightly coupled. If they are, then the time management risks are also intertwined and harder to manage. Sometimes, there are alternative ways of delivering the innovation output that are disassociated from the technology risk of innovation input. These ways may be less attractive as a long-term solution for reasons such as cost but can provide a short-term de-risking strategy or a fallback plan.

For example, in the case of a wireless system that I was contributing to, the internal development using innovative technology from a university program got "bogged down". In order to meet delivery dates, an early version was built largely from off-the-shelf components and with technology licensed from another supplier. The margins were not great and the form factor was not ideal but the product achieved the desired foothold in the market. The new technology was introduced as a product enhancement when the design team was comfortable with its level of maturity. In a contrary example, a major electronics company introduced several products that exploited the performance characteristics of carbon nanotubes to establish a market leadership position. I followed up to see whether the technology could have other applications only to discover that, with more work, they had found that they could achieve the same performance characteristics (innovation output) at a lower overall cost through different processing of more conventional materials. The market window was seized using the more exotic solution but then the innovation input was engineered out for long-term profitability.

Technology Development vs. Product Development

Technology is another of those words that means many different things to different people. As a technology development manager in a large R&D organization, I saw my role as providing the product development community in the company with proven, proprietary "tools and techniques" that the competition did not have. When time permitted, these new technologies would be fully vetted and trialled in prototypes before they were transferred into the product development process.

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Ideally, device technologies would be available from more than one source and would be fully compatible with standard manufacturing capabilities. NASA pioneered the useful concept of technology readiness levels (TRLs; tinyurl.com/39256on). In this methodology, a technology has to meet a certain maturity level (TRL9) before it can be used in a product. In many industries, an attractive new technology and a "hot market" can drive the decision to use the technology before it is fully mature, that is to say at a lower TRL. Jumping the gun on technology maturity transfers time management risk from the technology development process to the product development process. This business decision is valid in a highly competitive environment so long as management is fully aware of the context and consequences and modifies their development schedule accordingly.

In another example, a variant on this scenario occurred when the product development team believed it could meet the performance targets of the product using proven design methods only to find out late in the process that they were going to fall short. The response was to seek a solution based on an untried technology, despite the low odds of this approach being successful in the available time. The resulting time that was spent on this search for a technological solution was much longer than if the technology development team had been brought in early in the process. On the plus side, the development team had someone to share the blame for the slippage, and for the next time, they had learned to start the dialogue earlier.

The discipline of separating invention/creation/discovery and maturation risks associated with technology development from the execution/delivery risks of product development is becoming harder to maintain in large corporations and is, for the most part, absent within smaller organizations. It is, however, a useful concept to retain when it comes to understanding time management risk in innovation due to technology maturity issues.

Product Development Process vs. the Development Environment

Product developers hopefully work within a clearly defined corporate development process defined by a suite of tools and a comprehensive set of rules. At the beginning of this article, I referred to design problems that were simply harder than anticipated. These types of innovation challenges will stretch the development process but generally they will not break it. Unfortunately, some innovations violate rules that the product developer was not even aware existed or may have completely unanticipated consequences that severely disrupt the schedule. The former is more common in a larger corporation with a long product development history, whereas the latter tends to be the case in smaller, younger companies.

As an example, in one project that I was managing, thermal modeling showed that better heat transfer was required between the chip and the printed circuit board to meet temperature limits for reliability. A new epoxy underfill was developed with a resin and a hardener in time to go to production. Manufacturing rejected it because the two components did not mix in exactly equal quantities. Based on past experience, they were convinced that eventually there would be a mistake on the floor, the two components would be reversed and a recall would happen. We definitely did not anticipate that response. The lesson is: talk to manufacturing early in the process to see if there are any unwritten rules that will stop a great idea dead in its tracks.

Three questions I have learned to ask early in an innovation development activity are:

1. Is the innovation supported by the tools suite being used by my developers?

2. Do I have the means to test the innovation to confirm it is working or debug it if it is not?

3. Does the innovation meet the needs of supply management?

Hardware, software, and system designers are increasingly dependent on sophisticated tool suites that prevent many errors, speed up development, increase manufacturing and production yields, etc. However, new and innovative technologies may require updates to the tools in order to integrate them with the rest of the design activity. One early example of this challenge that I ran into in the late 1980s involved trying to include devices with a metric footprint in a North American printed circuit layout tool that used imperial units. You could "kludge" it in using inelegant work-arounds, but that approach had all sorts of downstream implications. At the time, it required extensive negotiation with the tool vendor to add an adjustable grid-size feature and database modification, which added weeks to the development schedule. As a general rule, an innovation that cannot be incorporated into the tool suite is not going to make it into the product.

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Testing is an essential step in the product development process. Test equipment or test programs can have a great deal of functional flexibility; however, they often have significant constraints in terms of interfacing with the product. Several times, I have seen excellent innovations hit a major roadblock because the test vectors could not observe internal error states or because the failure modes of the new technology were not well enough understood to test for them efficiently, effectively, or to the satisfaction of the client.

Then there is the relationship between the innovator and supply management. As a technology developer, I was frequently frustrated by the number of arcane rules that needed to be followed to bring a new technology into manufacturing, ensure ongoing security of supply, meet all the regulatory requirements, and avoid licensing problems relating to issues such as software re-use. When digital speeds first started to get up into the hundreds of megahertz, the signal quality deteriorated quite rapidly unless expensive radio frequency substrates were used. Layout rules were soon developed that could circumvent these problems, but the material characteristics that determined propagation speeds on low-cost commodity substrates were only specified by the manufacturer for signal speeds up to 20 megahertz. Not only would electrical properties above these frequencies vary significantly from vendor to vendor but also from batch to batch and with changing humidity without any indication in the specification sheet.

Working with supply management, we found a single vendor whose material could be purchased using a different specification code. The performance was not particularly better than any of the other materials, but it was always the same, so we could tune our solutions for that specific material and save the company significant cost across a wide range of designs. This strategy worked until the company went on one of its periodic housecleaning exercises to reduce the number of parts codes in the stock room and reduce the number of vendors for similar items. I eventually concluded that your "best buddy" and first go-to person for a new technology innovation should be in supply management. Once they get over the surprise of being brought in early in the process and start to collaborate, your success rate at introducing new technology to product will go up significantly. Do you need at least two sources of supply for your parts? What is the cost of bringing your wonderful widget into the company inventory and keeping it there? Is there a spec sheet that actually allows you to achieve repeatable performance out of your innovation? Has a key supplier for your great innovation just been blacklisted for failure to deliver on another project? The questions seem mundane, but without answers the chance of innovation success drops significantly.

Software Innovation

In the opening examples, I compared the CANDU project, which was essentially a construction project, with a series of software projects. Is this a fair comparison or are software (virtual) and hardware (physical) innovation risks fundamentally different? It helps to be clear about what "software innovation" means. The last few decades have seen a number of important innovations in software languages and processes. A recent programming language innovation is Scala (tinyurl.com/6etjds). Some say that Agile software development (tinyurl.com/ddd3m) is an innovative process. Great software innovations such as Java (tinyurl.com/bc98k) or the lesser known Protel (tinyurl.com/q2b4j8z), which were both developed by Canadians, can completely revolutionize a market or a generation of programmers and products.

On the other hand, many different things are created using these software languages and processes including user interfaces, databases, real-time operating systems, cloud services, and social media applications. To say that these are all software innovations is the same as saying that any innovation in the physical world is a molecular innovation. Software is what you build virtual things out of. A database innovation does not have much in common with a real-time operating system innovation.

Introducing a new language or software development process into your product development process involves very different time risks than innovating around different types of applications. I have found that the term software innovation is often misleading. When appropriate, it is a good practice to be more precise about what you are developing in software and what aspect of that design is truly innovative.

Over my career, I have been privileged to work on innovation projects in energy systems, manufacturing robotics, telecommunications equipment, semiconductors, eCommerce, and a range of nanotechnologies. At a technical level, I have found each innovation challenge to be unique almost by definition; however, there are some common behaviour and process risks that I have encountered in a variety of circumstances, and I found that those lessons are quite transferable.

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Culture and Behaviour

One of the most common time challenges is related to human factors associated with innovation culture. Why is it that people of otherwise unimpeachable character seem to value hopefulness and wishful thinking over honesty and skepticism when it comes to communicating innovation risk to management? I have heard the mantra that "it is better to ask for forgiveness than to ask for permission" in several organizations I have worked in. Perhaps it is the belief, referred to in the introduction, that senior management will double the time estimate you give them and not approve the project. Perhaps the innovator, much like the entrepreneur, is genetically wired to be blindly optimistic. Whatever the reason, I have found that it is a good idea to have several independent time estimates for activities flagged as innovative.

I have already touched on the issue of keeping the invention/creation/discovery activities separate from execution/delivery activities. This need for separation is not simply a question of technology maturity. Appropriate human resource allocation is an important consideration for the innovation project manager. As a way to highlight the cultural and communications differences between the two phases, I refer to this as the "artists and artisans dilemma". In this mental model, artists see what others do not and have the potential to provide you with a masterpiece. You just are not sure when. Artisans will provide you with 300 hand-painted mugs by five o'clock on Friday but may not deal well with the uncertainty of a new design or material. These two personalities are seldom in the same body. When work packets involving invention/creation/discovery end up as part of your execution/delivery plan do you resource it with artists or with artisans? Resourcing is a topic for a different article; however, there are significant time and schedule risk factors associated with the answer.

Internal vs. External Innovation

In a large corporation with a substantial R&D department, new technologies often have a long gestation period before being successfully introduced into a product development process. In my experience, innovative technologies are seldom commercialized in the application that first inspired them. Today, many large corporations are moving away from this type of internal development and are working with a number of external partners to see which one comes up with the best solution, thereby reducing their financial risk associated with technology development. This change in approach requires a different set of risk management tools both on the part of the technology supplier and the customer.

Innovations coming from universities and colleges have their own special time management risks. A large company dedicates considerable resources to working with academic institutions. In the case I am most familiar with, university interaction was to a significant degree a recruitment tool for highly qualified personnel. New employees who had done graduate work on projects sponsored by the company typically reached a level of full performance in half the time that other new graduates would. In those cases where the technology was the principal objective of the engagement, either key personnel from technology development groups were trained to work with universities or, in the case of the more obscure or abstract projects, the technology was first transferred to internal R&D groups. These groups would then bring them to a point where a product or technology group could usefully use them. The iceberg analogy was quite appropriate; the vast majority of the effort expended on bringing the technology to product happened after it was "transferred" to the company even though the university often reported it as "commercialized".

Today, most companies working with universities and colleges do not have the same internal support system, so it is important to understand where the risks are and what resources are necessary to mitigate them. It is important to expose the academic research groups to your designers, test engineers, and purchasing department early on in the project so that they have some idea of what a final technology outcome will have to look like before it is fit for product. It can also be helpful to establish a personal services contract with the professor to help address a long list of technical issues that are not strictly part of the academic activity.

Conclusion

In summary, to better manage the indeterminate time factors associated with innovation, managers should:

1. Be clear about the difference between your customer's innovation experience with your product and the technology innovation that your designers are using to create it.

2. Identify the specific innovation activities and work packets in your overall product schedule that are new to your organization and flag them for special at-

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tention. Ensure that all the stakeholders understand the plan to manage the risks.

3. To the extent possible, de-risk your innovation inputs before inserting them into your product development schedule. If you cannot do that, ensure you have a contingency plan that will still meet your customer's expectations.

4. When evaluating the effort required for innovation input activities involving new technology, make sure you take a broader view of risk evaluation than you do for activities that are part of a well understood process.

Innovation will always entail a certain level of market risk and technical risk; however, good innovation time management practices can significantly improve the probability of success.

About the Author

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How Service Innovation Boosts Bottom Lines

Claude Legrand and Rob LaJoie

> *"The greatest obstacle to discovery is not ignorance; it is the illusion of knowledge."*
>
> Daniel J. Boorstin (1914–2004)
> Historian, professor, attorney, and writer

In the national quest for ground-breaking R&D discoveries and inventions, service innovation is frequently ignored at considerable cost to an organization's bottom line and a nation's productivity. For the fact is that innovation applied systematically to all activities outside of R&D can make the difference between uninspiring results and substantial growth in every sector.

Many countries, in particular in Europe, have recognized the importance of service innovation and are devoting considerable resources to research, the capture of best practices, and the measurement of progress and success. Given the physiognomy of the modern economy, it does not make sense for leaders in the Canadian public sector to devote all available innovation investment dollars to science and technology R&D.

This article explores why service innovation is not yet a priority on the innovation agenda in Canada and why we should correct the dangerous misconception that there is just one "innovation gap" that needs to be addressed. It provides practical recommendations that public and private sector leaders can use to take advantage of this under-valued, high-potential innovation opportunity and calls for the creation of a national service innovation resource to support enterprises of all sizes as a means to improve Canadian productivity.

Introduction

Breakthrough new products are every company's dream, but today they represent a fraction of the achievable innovation opportunities *hiding* in plain sight in every organization. For example, organizations frequently ignore the wide variety of opportunities for service innovation, which represent an untapped source of potentially substantial growth.

And, although the service sector is an obvious place for service innovation, it is definitely not the only one. Service innovation applies directly to service functions such as human resources, finance, information technology, or sales, and also to the world of manufacturing through the "servitization" of products (i.e., selling services that are complementary to a product). In fact, service innovation can benefit every sector of our new economy, from high technology to public service, and from retail to manufacturing.

But, if service innovation is so important, why is it not a priority in every organization? The answer is that, since 1776 when Adam Smith discussed the "unproductive" work of services (tinyurl.com/8yptxdo), the service sector and service activities have never been considered serious. The attitude was: "They don't create anything tangible, therefore they don't count."

Service today is still considered an add-on to the core economy that was initially dominated by agriculture, and then industry starting at the end of the 19th Century. The minister in charge of "business" in Canada is still the Minister of Industry and close to 100% of the

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funding for research and innovation still goes to science and technology, which are primarily supposed to feed the manufacturing sector. This is despite the fact that the service sector represents over 70% of gross domestic product (Statistics Canada, 2013; tinyurl.com/k2lbpzn) and 77% of employment in Canada today (Statistics Canada, 2013; tinyurl.com/m9qs2an), and service jobs account for as much as half of all the positions in any modern manufacturing organization (US Bureau of Labor Statistics, cited in McKinsey & Company, 2012; tinyurl.com/kphm7zb).

In addition, the service sector is "messy" because of the way it was created, as a catch-all for "minor" economic activities outside of agriculture, resources, and manufacturing. It is a heterogeneous amalgam of sectors that have little in common, from investment banking to a convenience store, from healthcare to transportation. Service also includes internal activities that are fundamentally different such as finance, information technology, or sales. In the authors' view, this complexity explains in great part why it is poorly researched by organizations such as Statistics Canada (statcan.gc.ca) and why service innovation is barely a blip on the research radar in Canadian universities. In Europe, however, the service sector, service functions, and service innovation are now a critical focus of governments and corporations with major investments in fundamental and applied research.

As a result of this long-term neglect, innovation in services has been seen, at best, as an art not a science. This view has serious consequences. It means that every time an organization wants to innovate in services, and many know they must, it needs to start from scratch. There is limited, if any, opportunity to share and build on the experiences of others. As a result, service innovation processes often cannot be improved, let alone optimized. For small- and medium-sized enterprises that do not have the resources to develop their own processes, the challenge is even greater: either they "get lucky" or, more often, they try, fail, and close the book on innovation outside of R&D.

In this article, we explore the multiple innovation gaps and then focus on the importance of service innovation, including how it can improve performance in the manufacturing sector. We then identify how innovation happens in service and how organizations can implement innovation in everything they do by focusing on innovative thinking and a supportive organization.

The Innovation Gaps

When the topic of why Canada lags in innovation is discussed, the problem is often described as an "innovation gap" as if only one gap exists. In practice there are several, depending on the context and how the term "innovation" is defined.

Scientists and governments, as well as the mainstream media, tend to define innovation as inventions, discoveries, or R&D innovation in science and technology. In this context, there appears to be consensus that the gap in Canada is more of a "commercialization gap" or a "private sector funding gap" than a "discovery gap" or a "government funding gap".

Outside of R&D, business leaders use the term innovation to describe the very genuine need for their organizations to do things better at every level and in every area, including operations or sales. In this context, our view is that the real innovation gap is a "knowledge gap". This gap arises because most leaders, however experienced and competent, often have never learned how innovation happens and what prevents it, and, more critically, what their role is in improving innovation in their organization (Legrand, 2008; tinyurl.com/m5jues2).

As a result of this knowledge gap, leaders often default to making bold statements and may implement initiatives that appear simple and controllable such as an "innovation management system", which is simply an automated version of the old suggestion box. Sometimes, they invest in training in creativity or design thinking. The problem is that these initiatives never create sustainable change. A few isolated efforts can never identify and address the real obstacles to change and will always fail to create the impact necessary to shake up an organization's comfortable status quo. The desired results do not happen, employees become skeptical, and time needs to elapse before they can start again.

Closing the Innovation Gaps

There will always be a need for science and technology R&D but, given the physiognomy of the modern economy, it does not make sense to devote 100% of available innovation investment dollars in this one area. According to Nesta (nesta.org.uk), an organization funded by the government of the United Kingdom and dedicated to understanding the role and impact of innova-

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tion in modern economies, traditional R&D represents less than 20% of the total innovativeness of a country (Nesta, 2009; tinyurl.com/mus8sw4).

Based on the current trends towards services in gross domestic product and employment, innovating in the service sector and service functions such as human resources or sales will make a much bigger difference to Canada's productivity and standard of living than only investing in science and technology R&D. Canada has tried the exclusive R&D investment approach for over 30 years and it still has not delivered the needed results. Continuing to follow the same path yet expect different results simply is not logical.

To address the knowledge gap and fuel greater innovation progress, Canada needs to start funding its own research in the processes and tools that allow organizations to innovate in all areas outside of the R&D department. It also needs to develop a measurement of the impact of innovation that is not solely reliant on R&D, discoveries, and inventions metrics such as patents or academic papers.

This recommendation follows a logic developed in particular by Vargo and Lusch (2008; tinyurl.com/mqt67yt), who use the field of marketing to describe the necessary transition from a goods-dominant logic to a service-dominant logic to develop processes and measure economic activities. Goods-dominant logic emerged during the industrial economy. In this logic, goods are the only focus and services are simply an add-on to goods and can be treated in the same way as goods. Service-dominant logic emerged over the past 20 years because of the growth of services in the economy. In this logic, services are considered intrinsically different from goods and require entirely different processes to understand and measure them.

If we apply the Vargo and Lusch theory to innovation, we can quickly identify that, in goods-dominant logic, an organization's proprietary knowledge and expertise form the start and the core of its innovation process. Researchers are usually located in a dark and secret corner of the organization, and the R&D department regularly produces new inventions or discoveries that are then produced and "pushed" to consumers, whether they want them or not. The growing field of open innovation is only an improvement of the old model where science still drives the innovation process and a few leaders make the product decisions, although it has opened the doors to external ideas. In service-dominant logic, the customer or user is at both the start and the centre of the innovation process. This approach requires that every part of the organization works to satisfy the customers, one customer at a time. Current tensions between long-established organizational silos underscore how this logic stretches the industrial model of organization.

The most practical and promising advance in the area of innovation measurement is the "Innovation Index", which was developed by Nesta in 2009 and is currently in its third iteration. This index identifies seven factors that contribute to real innovation and identifies the current level of investment in each activity in the United Kingdom, as shown below (Nesta, 2012; tinyurl.com/krmh49l):

1. R&D: 13%

2. Design of products and services: 12%

3. Organizational improvement: 21%

4. Training and skills development: 21%

5. Software development: 18%

6. Market research & advertising: 10%

7. Other (copyright development, natural resources exploration, etc.): 5%

Why service innovation matters more now

Over the past 25 years, the focus on productivity and analytical thinking tools such as Six Sigma or Lean has undoubtedly made Canadian organizations more efficient, but Canada continues to lag behind other developed countries. These productivity tools have improved the industrial model and made it very efficient, but the problem is that the competitive environment has changed, and even the most efficient industrial organizations are struggling with the current speed of change. The most effective Six Sigma program is no longer the solution to reach the next level of productivity.

To improve overall productivity in Canada, and therefore the standard of living of Canadians, there is no alternative but to focus where it really matters: in the service sector and the service functions that represent more than 70% of the Canadian economy (Statistics Canada, 2013; tinyurl.com/k2lbpzn) There is little point in

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continuing to pretend that investments in R&D to support manufacturing, a sector that represents less than 10.5% of the country's economic output (Statistics Canada, 2013; tinyurl.com/k2lbpzn) will directly and substantially impact overall productivity.

To save and grow what is left of the Canadian manufacturing industry, the need must be addressed for innovation in all areas that can quickly improve the sector's performance, and not only in R&D. To improve the productivity of the service sector, which is necessary to improving overall productivity and the standard of living in Canada, the focus must be on service innovation because it is one of the most effective tools.

In addition, to improve the commercialization of Canadian inventions, commercialization must not be thought of as simply an adjunct to scientific discovery; it should be treated as what it really is, a complex problem that needs innovative thinking, not analytical or R&D thinking.

How innovation happens

Because there are no real scientific-based standards for innovation outside of R&D, solutions have proliferated. The problem is that concepts such as serendipity, chaos, design thinking, or creativity, despite all the ink spent to describe and promote them, are not sustainable innovation strategies in modern organizations. Innovation can only happen when individuals and teams apply an innovative-thinking process to a problem or an opportunity rather than the analytical-thinking process that has been most people's default because it is the only problem-solving process they learned in school. Individuals need to learn what innovative thinking is and how to apply it.

That said, it is also important to understand that organizational factors usually trump individual skills. The organization's environment has to be conducive to the success of innovation. Its leadership, culture, and organization practices must support individuals and teams in their efforts to innovate even if, in and of themselves, leadership, culture, and organizational practices alone do not make innovation happen. Without the right level of support from leaders as well as from the organization's culture, practices, and processes, even the most innovative individuals are not able to survive and help the organization.

Once an organization has both an innovation-conducive environment and individuals who can apply innovative thinking, where and how does it begin to innovate? Organizations need to apply innovation in multiple areas (often simultaneously), not only in R&D. In a high-tech company, for example, there are opportunities to innovate in the business model, sales, human resources, information technology, customer experience, and in services that complement the company's products. A small startup company can innovate in its business model and can also innovate how to bring structure and rigour to the organization without killing its foundational innovation skills.

Recommendations

Organizations that genuinely want innovation must ask for it, create the right conditions, and identify and remove any obstacles. The first step is to ensure that all leaders understand how innovation really happens and can initiate and support it over the long run. The second step is to train individuals and managers in the rigorous methodology of innovative thinking. The third step is to focus on the culture. Contrary to popular belief, an innovative culture is not required; in fact, an "innovative culture" is an oxymoron given that the role of a culture is to defend the status quo. What is needed is a culture that supports innovation by offering the right level of changeability, risk-tolerance, diversity, learning, and openness.

Organizations must ensure that practices in areas such as information technology, human resources, or finance are not quietly killing innovation but instead support and encourage individuals and teams when they innovate. This is the hardest task because it asks professionals to change how they operate their area for the greater good of the organization. Why ask for cross-functional innovation if human resources processes and evaluation systems in effect prevent it? Why ask for "new ideas that create value" if the budget process does not facilitate moving budgets from poorly performing projects to new and promising projects? Why generate great ideas if information technology is always going to be the all-powerful obstacle by asking for full specifications upfront?

It is important to understand how innovating works, how it differs from what was done in the past, and how it can be implemented.

Identify and address complex problems

Service problems and opportunities are complex. With complex problems, uncertainties and ambiguities are an integral part of the issue and cannot be eliminated to reach an effective solution.

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The opposite of a complex problem is a complicated problem, where all ambiguities and uncertainties can be removed, and logic, experience, and expertise are usually enough to find a solution. In the industrial economy, most problems were complicated, except possibly those dealt with by the most senior leaders. It could be argued that today, most of our children have only been taught how to solve complicated problems, not complex problems. Most problems or opportunities are a combination of complex and complicated in various proportions. The ability to separately address the complex and the complicated parts of an issue is the key to effective performance today.

When an organization needs to solve a complex problem, it should accept the problem's inherent uncertainties and ambiguities and – before looking for solutions – identify the root causes and all the components of the problem. This is how innovative thinking works. It focuses on the problem until it is well understood, and only then looks for solutions. It is not uncommon when dealing with complex problems to spend up to 70% of the allotted time to understand the real issue. As shown in Table 1, innovative thinking is different from analytical thinking where the first, and often the only, focus is on developing a single solution as quickly as possible, as is usually taught in school.

Table 1. Analytical thinking vs. innovative thinking

Analytical thinking	Innovative thinking
Focus on the *answer*	Focus on the *question*
One best question	More than one possible question
"Just do it"	Stop and think
Eliminate ambiguity	Accept ambiguity and uncertainty
Jump to conclusions	Divergent and convergent thinking
A *or* B	A *and* B

A second way to innovate in service is to change the business or organization model. Many business models today, especially in traditional businesses or industries, were inherited from the industrial economy but can no longer keep pace with the rate of change required in the knowledge and information economy. The elements defining each approach are identified in Table 2. The key is not to completely replace the organization's old model but to add new elements that allow the organization to address complex problems.

Table 2. Solving complex problems in the industrial economy vs. the knowledge economy

Industrial economy	Knowledge economy
Hierarchy	Top down and bottom up
Focus on execution	Focus on thinking, then execution
Value within functions	Value within and across functions
Task driven	Outcome driven
Standardization	Customization
Consistent output	Consistent outcome
TQM and Six Sigma work best	Innovation works best

Finally, here are some practical steps that organization leaders can take to innovate more effectively (Legrand and Weiss, 2011; tinyurl.com/mj3agf3):

1. Understand the rigorous process of innovating in service
2. Ensure the key people in the organization, from the leaders down, understand and apply the innovating process
3. Align the culture by correcting elements that stifle innovation
4. Align the internal processes to your innovating objectives
5. Always start and end innovating with the customer
6. Keep working on the organization until innovating is "the way we work"

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Conclusion

Considering that service accounts for over 70% of Canada's economy today, innovating in service is a logical way to boost innovation performance. Leaders from all sectors need to become better informed about how to lead innovation successfully.

The time has come for governments, universities, and large organizations to acknowledge the value that service innovation can add to the competitiveness and growth of individual businesses and to Canada's overall productivity. Only when its importance is fully understood and leaders are prepared to invest in developing the knowledge and supporting resources required to encourage service innovation, will genuine increases in productivity be realized, thereby making Canada the competitive economy it needs to be, to sustain its enviable standard of living.

About the Authors

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Addressing Canada's Commercialization Crisis and Shortage of Venture Capital: Will the Federal Government's Solution Work?

Stephen A. Hurwitz

> *"Being a philosopher, I have a problem for every solution."*
>
> Robert Zend (1929–1985)
> Poet, fiction writer, and multi-media artist

Lack of funding is a major challenge to innovation in Canada's emerging technology industry. This article will focus on this supply-side challenge within the complex venture capital ecosystem and discuss: i) the current shortage of venture capital available to commercialize Canada's R&D; ii) the causes and consequences of that venture capital shortage; iii) how the federal government will address this shortage through its innovative 2013 Venture Capital Action Plan, which commits $400 million and seeks to raise at least another $800 million from outside investors; and iv) how a separate decision in the federal 2013 budget to phase out federal tax credits for labour-sponsored venture capital funds could imperil the 2013 Venture Capital Action Plan.

Introduction

Canada has an abundance of great ideas and the world-class R&D to develop them. This abundance is hardly surprising given Canada's outstanding institutions of higher learning, exceptional research centres, and highly educated population. It is also a result of federal and provincial governments' R&D funding programs that are among the most generous and progressive anywhere, and, as a percentage of Canada's GDP, which is among the highest in the world. However, Canada has a serious shortage of that specialized funding source – venture capital – that is essential to commercializing that world-class R&D into products, jobs, and exports. This is Canada's commercialization crisis.

Because of the critical role venture capital plays in commercializing a country's R&D, this article will focus on the supply-side challenge within the complex venture capital ecosystem. Simply put, traditional sources of institutional financing such as banks are largely unavailable to emerging technology companies because they typically have few bankable hard assets such as equipment, inventory, and buildings; no positive cash flow; little, if any, operational history; and profits, and sometimes even revenues, that may be many years away.

Venture capital is pretty much the only institutional private financing available to assume the risks of funding the commercialization of unproven technologies. That is why it is called risk capital. But, in addition to capital, top-tier venture capitalists also bring specialized capabilities that even the most gifted young entrepreneur often lacks but are essential for successfully commercializing R&D. These capabilities include entrepreneurial experience in operating companies, domain industry expertise, and extensive networks in global customer and capital markets.

This article focuses on Canada's shortage of venture capital and how it limits the commercialization of the country's technology innovations. The next section highlights the extent of this shortage and examines its underlying causes. Then, an overview is provided of the

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federal government's 2013 Venture Capital Action Plan, which is designed to address this shortage. This is followed by a discussion of the impact of a separate decision in the federal 2013 budget to phase out federal tax credits for labour-sponsored venture capital funds. Finally, conclusions are offered.

How Serious is Canada's Venture Capital Shortage?

Like venture capital industries in many places in the world, including the United States and Europe, Canada's venture capital industry in recent years has faced challenging times. Statistics from Canada's Venture Capital & Private Equity Association (CVCA; cvca.ca) reveal that, in 2010 and 2011, the Canadian venture capital industry experienced its worst fundraising in more than 16 years. Although there was a significant uptick in *fundraising* from $1.0 billion in 2011 to $1.8 billion in 2012 (CVCA, 2012; tinyurl.com/kddkw2k), it was still well below the $3.9 billion achieved in Canadian fundraising in 2001 (BDC, 2010; tinyurl.com/7wg7ouw), with little assurance that the improved 2012 levels will recur in 2013. The levels of venture capital *investment* in Canada in both 2011 and 2012 were $1.5 billion (CVCA, 2012; tinyurl.com/kddkw2k); these levels are a far cry from the $3.7 billion investment level in 2001 (BDC, 2010; tinyurl.com/7wg7ouw).

Even when Canadian companies do obtain venture capital financing, it is often in amounts insufficient to meet their capital needs. In 2011 and 2012, Canadian companies backed by venture capital received on average only 44 cents in funding for every dollar of such funding received by US companies (CVCA, 2012; tinyurl.com/kddkw2k). Yet, these undercapitalized Canadian companies must compete in the same global market as their far-better financed US competitors, not to mention those from other countries. And, Canadian companies that do get funded encounter formidable difficulty in achieving venture capital follow-on financing, which is in especially short supply in Canada.

As a result, rather than blossoming into industry leaders, the author has witnessed many of these promising capital-starved but R&D-rich companies being sold early in their lifecycles – and at low prices – and being then moved, along with the future jobs they will create, to the United States.

Understanding the shortage

No viable solution to the shortage of venture capital can be devised without understanding its underlying causes. In the author's view, the following conditions and actions have limited the currently availability of venture capital in Canada:

1. During roughly the past decade, the Canadian venture capital industry has performed poorly. It did not help that, during this period, there was a burst technology bubble, a serious recession, and insufficient liquidity opportunities (i.e., initial public offerings, mergers, or acquisitions).

2. Because of this poor performance, large Canadian institutional investors that had funded Canadian venture capital firms withdrew from the venture capital asset class.

3. At the same time, venture capital firms in the United States, which in prior years had accounted for as much as 40% of all venture capital funding in Canada, greatly reduced their investments in Canada because of their own fundraising and portfolio company troubles in the United States.

4. Unlike the US venture capital industry, with its long-standing investment experience developed over 60 years, Canada's venture capital industry is relatively young and less experienced, with more than 92% of its venture capital firms formed after 1994 (CVCA, 2009; tinyurl.com/cba2fw).

5. The vast majority of Canadian venture capital firms are sub-scale in size (i.e., well below $100 million) with inadequate funds to fully participate in the major investments needed to grow and scale production of their portfolio companies and to accelerate their sales to enter world markets. These sub-scale venture capital firms are inadequately integrated into the global venture capital ecosystem and do not have the funds to systematically invest large amounts over time in potential big winners through investment networks with other venture capital fund co-investors to fund all the stages of their growth through industry leadership.

6. A significant portion of the Canadian venture capital industry, particularly in its early years, has been composed of government or quasi-government and government-sponsored funds, often with severe constraints limiting their investments to the geography of the funding jurisdictions. These restrictions, in turn, limited the deal flow and investment choices essential for funds to optimize investment performance and returns. In addition, misalign-

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ments of interest often arose between the government funds' investment managers and the companies they invested in, because government fund-compensation structures often did not include the private-industry management performance upside benefits needed to strongly incentivize their investment managers to achieve the liquidity events (i.e., initial public offerings, mergers, or acquisitions) desired by the companies' management and private-sector investors.

No recovery can occur in the Canadian venture capital industry without solving, in particular, problems 2 and 5. Without institutional investors, there is no sustainable solution to the capital shortage in the Canadian venture capital industry. Although individuals and corporate investors play an important role in funding Canadian venture capital firms, the return to the market of giant institutional investors collectively possessing hundreds of billions of dollars available for investment in venture capital funds is key to a successful Canadian venture capital industry. Without large-scale funds, Canadian technology companies will have insufficient investor capital to participate in funding all the stages of their growth through industry leadership.

Canada's 2013 Venture Capital Action Plan

The federal government's solution to the shortage of venture capital is the 2013 Venture Capital Action Plan (tinyurl.com/obstvtw), which commits $400 million and seeks to raise at least another $800 million from outside investors. Of the $400 million in federal funding committed under the plan, the federal government will put a total of $350 million into four funds of funds, each of which is intended to be led by highly experienced private-sector investment managers, and $50 million will be reinvested directly into venture capital firms. More specifically, that $400 million financing will comprise:

- $250 million for two new national funds of funds in the amount of $125 million each
- $100 million for recapitalizing two existing Canadian funds of funds in the amount of $50 million each
- $50 million for investment into three to five high-performing existing Canadian venture capital firms

The four funds of funds collectively will seek to raise at least an additional $800 million from outside investors (especially institutional ones) for a total of $1.2 billion, to be deployed over seven to ten years. The exact incentives the government will offer for other investors to invest $800 million in the new funds of funds are expected to include creative ones such as the right of such investors to fulfill their capital commitments after the government fulfills its capital commitments and to receive returns on investment in advance of the government receiving its returns. To enhance the chances of success with the new funds of funds, the chosen investment managers are expected to be highly experienced and successful in their prior investments, and they are expected to commit their own capital. The funds of funds will focus primarily on early-stage investment (e.g., series A or B), with some growth equity and expansion capital investments throughout the lifecycle of their portfolio companies. See the later sub-section "Perpetuation of sub-scale venture capital funds" for a discussion of why this primary focus on early-stage investing will perpetuate Canada's late-stage financing problem *if the new funds of funds do not invest primarily in large-scale venture capital funds*. The exact investment strategies and the size and number of the funds of funds will depend on discussions with private-sector investors, and the investment strategies selected will be those that are expected to maximize participation from institutional and corporate strategic investors.

Investment managers of the new funds of funds, and of the venture capital firms they invest in, will be required to have a "substantial presence" in Canada, including a principal office engaged in active investing, with senior professionals meeting residency and other requirements. These conditions would allow foreign investment managers to open offices in Canada and partner with local ones in the new funds of funds and in the venture capital firms in which they invest. Foreign top-tier investment managers who are selected would bring to Canada their network of significant relationships in major global customer and capital markets. They would also be bridges to the large higher-priced exits available in the United States and other foreign jurisdictions that have major capital markets.

Venture capital firms receiving capital from the new funds of funds will be required to invest at least a third of their total capital in Canadian-domiciled companies, with the remaining two-thirds investable anywhere in the world. This flexibility to invest outside of Canada will enable relationships with other foreign global investors and markets. These cross-border relationships, in turn, are expected to lead to those same foreign global investors co-investing in Canadian companies with the Canadian venture capital firms.

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Thus, in the author's view, the Canadian government has developed the right plan to address Canada's venture capital shortage by:

1. Building a self-sustaining industry that will be led and funded by the private sector and will be market- and return-driven in its investment strategies.

2. Putting up substantial public funding to kick-start the venture capital industry, but playing no role in its investment management.

3. Selecting highly-experienced investment managers from the private sector with a history of successful investment performance.

4. Incentivizing the private sector with special incentives to fund the new fund of funds program in an amount greater than that provided by the government.

5. Structuring the new program so that well-connected, top-tier foreign investment managers can partner with Canadian ones in the new funds of funds.

6. Enabling broad latitude to invest outside of Canada to forge relationships with global investors and markets.

Potential Peril for the 2013 Venture Capital Action Plan

Phase out of federal tax credits for labour-sponsored venture capital funds

In its 2013 budget (tinyurl.com/paqlyqb), the federal government announced that, by 2017, it would phase out all federal tax credits that currently incentivize individual investors to invest in labour-sponsored venture capital corporations (LSVCCs). The timing of this phase-out decision could not be worse. Although it is unclear to what extent various provinces will follow the federal government's lead and abandon their own LSVCC tax credits, or to what extent individual investors in the absence of tax incentives will cease investing in LSVCCs, the outcome for the Canadian venture capital industry is likely to be unfavourable. The federal government's decision could potentially result over time in a drop in available venture capital funding in Canada that exceeds the entire amount expected to be deployed under the 2013 Venture Capital Action Plan. This means that the plan could result in *a net decrease* in venture capital funds available to fund Canadian innovation.

More specifically, according to leading independent venture capital consultant Gilles Duruflé (2013; tinyurl.com/lbw5y6c), Quebec LSVCCs, currently representing over 75 percent of all funding by Canadian LSVCCs, on average invested per year over the 2006–2012 period: i) $69 million in VC funding directly in technology companies and ii) $74 million in private independent VC funds. This total of $143 million per year invested from Quebec LSVCCs alone could by itself be roughly in the range of the amount per year ultimately to be deployed under the government's 2013 Venture Capital Action Plan (assuming it achieves the expected minimum $800 million in outside investor funding). And, this $143 million figure does not even take into account an additional $58 million per year from Quebec LSVCCs in venture capital investments in traditional sectors over the same 2006–2012 period, bringing the total per year to $201 million.

LSVCCs have been major players in Canada in funding companies backed by venture capital and private-sector venture capital funds (Duruflé, 2013; tinyurl.com/lbw5y6c):

1. Beginning in 2004, there was a major shift of Quebec-based LSVCCs and certain Quebec-based institutional investors from investing directly in companies to investing in venture capital funds. For a significant number of Canadian private independent funds raised in the last decade, LSVCC funding directly or indirectly played a critical role without which it would have been very difficult for these private funds to have achieved a first closing.

2. From 2004 to 2012, $5.7 billion was raised by Canadian private independent funds, of which $2.5 billion (45%) included a contribution from LSVCCs.

3. Quebec LSVCCs have committed $830 million to 59 private independent funds within Quebec and across and outside of Canada.

Although LSVCCs, particularly in their early years, have been justifiably criticized for various structural, management, and performance deficiencies (some of which have since been ameliorated), their diminished presence in the marketplace by 2017 could imperil the success of the 2013 Venture Capital Action Plan by depriving the four funds of funds, and the venture capital firms in which they invest, of critically needed LSVCC co-investment capital.

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This problem is further compounded by the possibility that the $1.2 billion to be deployed under the 2013 Venture Capital Action Plan over seven to ten years may itself be insufficient even if LSVCC tax credits were not being phased out. Because it can often take at least two successive successful fundings to ensure future self-sustaining fundings for a venture capital firm's management team, another significant federal financial commitment beyond that in the 2013 Venture Capital Action Plan might still be needed toward the end of the initial ten-year deployment period. On a positive note, the government could always add additional funds at that time if deemed appropriate.

Perpetuation of sub-scale venture capital funds

Another challenge facing the 2013 Venture Capital Action Plan is the sub-scale size of most existing Canadian venture capital firms. If the 2013 Venture Capital Action Plan does not result in a substantial increase in the average size of venture capital firms to be funded in the future, the Canadian venture capital industry may not recover.

In its 2012 Economic Action Plan (tinyurl.com/8a55cu4), the Canadian government highlighted the need to support the creation of "large-scale venture capital funds", meaning in the $200 to $300 million range. However, when the government further detailed this goal in its 2013 Venture Capital Action Plan, it instead referred to large-scale funds of funds. Most observers missed this critical distinction. In addition, because of the significant anticipated reduction in LSVCC investment capital as a result of phased out federal tax credits, the four funds of funds may not have the direct and indirect LSVCC co-investment funding needed to finance large-scale venture capital funds and the technology companies in which they invest. This means that one of the most serious existing flaws in the Canadian venture capital industry – the preponderance of sub-scale venture capital funds – not to mention the shortage of venture capital generally, may be perpetuated.

Why are large-scale venture capital funds so critical for investment success? Studies have shown that VC firms in the $200 to $300 million range have the strongest performance over time, and those that are smaller are less successful (BDC, 2010; tinyurl.com/7wg7ouw). In Canada, the average venture capital fund is well below $100 million; however, for Canada, approximately $200 million is the right size for its venture capital funds, for the following reasons. Large-scale venture capital funds of this size possess:

1. The capital necessary to finance promising technology companies through all the stages of their growth through industry leadership. They are lifecycle investors.

2. The financial heft to provide the competitive compensation needed to attract and retain highly experienced professional venture capital managers with proven records of performance.

3. The financial resilience to weather the economic downturns and droughts in initial public offerings, mergers, and acquisitions that are certain to occur over a venture capital firm's 10 to 12 year life. Without financial strength, small venture capital firms will often fail because they have insufficient funds to provide extended financing during protracted economic downturns.

4. The ability to attract investment from institutional investors, which are unlikely to invest in sub-scale funds.

5. The ability to attract deep-pocket US co-investors and thus can leverage their existing funding on a significant scale. They can assuage the concerns of US venture capitalists who are often reluctant to co-invest with Canada's small sub-scale funds. US venture capitalists justifiably worry that, although Canada's small funds may have capital for early-stage investing, when it comes time for critical late-stage financing infusions, they often fall short.

6. The financial strength to reduce the vulnerability of many small Canadian venture capital funds stemming from their over-dependence on large US venture capitalists, who cherry-pick many of Canada's large-dollar, late-stage financings. US venture capitalists generally invest in at least 10% of Canadian venture capital deals by Canadian companies comprising 31% of exits and 44% of exit proceeds (BDC, 2010; tinyurl.com/7wg7ouw). That harmful over-dependency reflects the financial inability of small Canadian venture capital funds to participate in these late-stage financings and results in devastating dilution of their early investments.

7. The potential to spur angel and early-stage investing by giving these investors confidence that significant venture capital follow-on funding would be available for their companies.

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Conclusion

Canada's 2013 Venture Capital Action Plan is both bold and innovative. However, two dark clouds loom: i) the detrimental timing of the government's phase out of federal LSVCC tax credits (at least as relating to direct or indirect VC investments by LSVCCs) and ii) the related uncertainty as to whether the underlying Canadian venture capital firms financed under the 2013 Venture Capital Action Plan will be large enough to successfully regenerate Canada's venture capital industry.

The success of the 2013 Venture Capital Action Plan could well hinge on whether the government can solve these problems. The government should rescind its phase out of LSVCC tax credits and not revisit that issue until its 2013 Venture Capital Action Plan has succeeded in jump-starting a robust, self-sustaining, private-sector venture capital industry. In addition, the investment managers selected by the government for the funds of funds need to understand in developing their investment strategies the importance of large-scale venture capital funds for a successful venture capital ecosystem.

If these problems are addressed, the 2013 Venture Capital Action Plan will offer a promising, albeit still challenging, path to achieving a critical missing requirement for a successful Canadian innovation ecosystem: a venture capital industry led and funded by the private-sector with the capital and investment expertise to successfully commercialize Canada's outstanding R&D into world-class products, high-quality jobs, and robust exports.

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A Heritage Economy: Business Model Innovation for Economic Wealth, Social Well-Being, and Environmental Health

Frédérick Brousseau-Gauthier and Yvon Brousseau

> *"You don't change a company by giving them ideas. You change them by training them to think a different way."*
>
> Clayton Christensen
> Professor of Business Administration,
> author, and consultant

Faced with the inherent unsustainability of infinite growth in a world of finite resources, the neoclassical economy is running towards a cliff. In order to avoid a hard landing, enterprises need to broaden their definitions of value and wealth to include parameters that are not currently in the economic lexicon, but are still of paramount importance in our lives. Taken from that angle, heritage can be seen as a perfect replacement for capital, because its multidimensional and complex nature opens up numerous possibilities for the creation of shared economic, social, and environmental value; the designing of value chains; and the direction of technological innovation. This article explores the various ramifications of a paradigm shift from managing capital to managing heritage, and it underlines the need to create a series of pioneering business models for enterprises to adapt and profit from a new, heritage economy.

Introduction

Today's market, as conceived by neoclassical economists, is ongoing a triple crisis that severely circumscribes the growth prospects for companies and jeopardizes their mid-term and long-term profitability. On one side, enterprises must address growing political and social pressure to act as corporate citizens, namely by taking on greater responsibility regarding the impacts of their operations on the communities living in the area where they are established, and by acknowledging that social acceptance is an essential criteria for their projects to be achieved. On another side, population growth, resource scarcity, problematic access to energy, and the deterioration of the environment by pollution create instability in the supply of raw materials, extra costs due to the need for decontamination, and productivity losses for companies. Lastly, whereas the world's population will rise above 9 billion by 2050, the increasing complexity of the global market is already problematic. In particular, marketing and financing processes have grown to a scale that most business models are unsuited for, causing multiple difficulties for the commercialization of innovations.

For enterprises, addressing this triple crisis is proving to be as much of a necessity as it is a challenge. It is a *necessity* because the crisis has its roots in a fundamental flaw in the neoclassical conception of the economy: whereas the sum of all human and natural resources is finite – and is therefore convergent – the market operates as if growth was to be infinite – and is therefore divergent. In the long run, this situation is obviously unsustainable. It is a *challenge* because, to establish and maintain their competitiveness in uncertain market conditions, multinationals and small- and medium-

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sized enterprises alike must re-examine their relationship with wealth and reconcile their operations with the real economic space that is available to them. Companies must broaden the parameters of corporate decision making to exceed the scope of capital management and adopt a paradigm more suited to the analysis of multiple interdependent parameters. In this article, we argue that this paradigm centers on "heritage".

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Heritage can be defined as an intertwinement of being and having that derives its sense and value from continuous relationships between it and a human community (Vivien, 2009; tinyurl.com/nj4jvqu). It is therefore a set of essentially complex elements, whose worth is embedded in a specific culture and thus cannot be entirely marketed. Heritage can be tangible – like water, locations, buildings, etc. – or intangible – like knowledge, art, and energy. However, given that discussions on the heritage-management approach have been centered so far on heritage objects, this article will concentrate on the tangible forms of heritage.

Thus, for example, a fresh water source is at the same time providing natural services and helping to define a community's identity; as the settling of a group of humans near a river or a lake helped to shape this group's history and culture over time, the geographical feature became a part of the community's heritage.

It follows that managing a fresh water source strictly as a provider of natural services that can be monetized – and therefore sold to the highest bidder – is both disrespectful of its heritage nature and cannot ensure that its use is going to be in agreement with the long-term interests of the community. Therefore, companies that wish to access a specific heritage element need to move away from the maximization of short-term profits derived from its exploitation and refocus on the creation of a sustainable appropriation structure that guarantees its long-term preservation and florescence – in the sense that heritage is to be seen as a vital organism that grows in the social ecosystem that is a community. This change of focus will enable firms choosing a heritage-based approach to establish themselves as channels of economic wealth, social well-being, and environmental health for the community whose valued heritage is used for commercial purposes, thereby creating a context of stability and durability for businesses to thrive in. Thus, to fully enroll in the new heritage-management paradigm, companies must broaden the parameters of corporate decision making to include what they consider to be externalities, but truly are effects of their appropriation of the natural, human, and financial resources that sustain them. Henceforth, the social and environmental impacts of their operations must be given the same weight as their economic impacts. The adoption of this global approach alters the cost-benefit analysis parameters to the point that it necessitates the inclusion of all individuals, groups, and other stakeholders that are affected by this appropriation of a part of their heritage.

The appropriation process for a heritage object, location, work of art, and so forth establishes a relationship that goes beyond the concept of property. It involves, for example, putting forward: i) a specific portrayal of a heritage object (e.g., how the company views it, namely as a revenue source); a precise use for this object (e.g., its exploitation for business ends); policies for access and the transfer of access rights; and an allotment structure for revenues derived from this appropriation (e.g., profits distributed among the shareholders, taxes, and other dues paid to the state) (Weber and Reveret, 1993; tinyurl.com/ozolqdq).

Although from a strict capital-management standpoint being the owner of the access rights to an object gives companies full discretion to maximize their profits, heritage management requires them to take all facets of the appropriation process into account. Indeed, the heritage nature of said object requires enterprises that hold rights to it to establish a decision-making process that considers the multiple representations and uses that this object already has, and that are valued by the community that has had a continuous relationship with this part of their heritage (Weber and Reveret, 1993: tinyurl.com/ozolqdq; Vivien, 2009: tinyurl.com/nj4jvqu). The acknowledgement of this non-marketable value must fuel negotiations that will in turn lead to the recognition of all representations associated with the heritage object – including those of the enterprises – in order to establish the architecture of the appropriation process. These negotiations, together with an evolving decision-making process – as opposed to a static and conclusive one – will allow the founding of a heritage-appropriation structure that will ensure the economic, social, and environmental profitability of its use, and thus its social acceptability.

However, seeking an optimal state in the management of heritage will require companies to reach a new level of efficiency in the setup of their operations in order to

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reach that objective. This task will be highly complex because the internalization of externalities will force organizations to restructure all facets of their business – from their core structure to how decisions are made (Willard, 2013; tinyurl.com/lw6m67q). Hence, it will be necessary to create new business models that take those externalities into account in the design of value chains – the structure underlining production, distribution, sale, and profit. In this context, firms that create business models that integrate, promote, and distribute shared economic, social, and environmental value will be best equipped to address these new market conditions and will achieve strategic advantage, in the same way that developing a new technology provides such an advantage.

Business Model Innovation

Business models articulate the logic, the data, and other evidence that support a value proposition for the customer, and a viable structure to manage revenues and costs for the company delivering that value in order to make profit (Teece, 2010; tinyurl.com/oduv9wl). Enabling greater productivity, efficiency, and inimitability are the positive attributes that raise a business model to the status of strategic and competitive advantage for an enterprise. The heritage economy explicitly entails the long-term preservation and florescence of heritage rather than its short-term exploitation, the transcending of property as the sole justification for appropriation, together with the broadening of the decision-making power to include stakeholders and the changing of its process (Vivien, 2009; tinyurl.com/nj4jvqu). Therefore, 21st century business models need to include the following three major notions:

1. *Revenue interdependency* is a state of symbiosis between companies, customers, and heritage that involves a shift from the exploitation of both heritage's natural services and customers' paying ability, to the creation of shared value. When a company appropriates a heritage object for business purposes, it creates a relationship where the company benefits from the preservation of said heritage object because: i) it makes possible the continuous harvesting of value from it; ii) it ensures the livelihood of the community to which the company sells its value propositions; and iii) it secures long-term social acceptability for the company's operations. From a heritage standpoint, a company that creates economic wealth, social well-being, and environmental health from its appropriation of a heritage object – through both sustainable harvesting and the nature of its value propositions – contributes to an increase in the worth of the object and therefore creates shared value for the community. Thus, awareness of the interdependency between companies, customers, and heritage (as seen in Figure 1) urges the former to develop business practices that are beneficial for all stakeholders: practices that create shared value, whose growth then enables the long-term florescence of heritage.

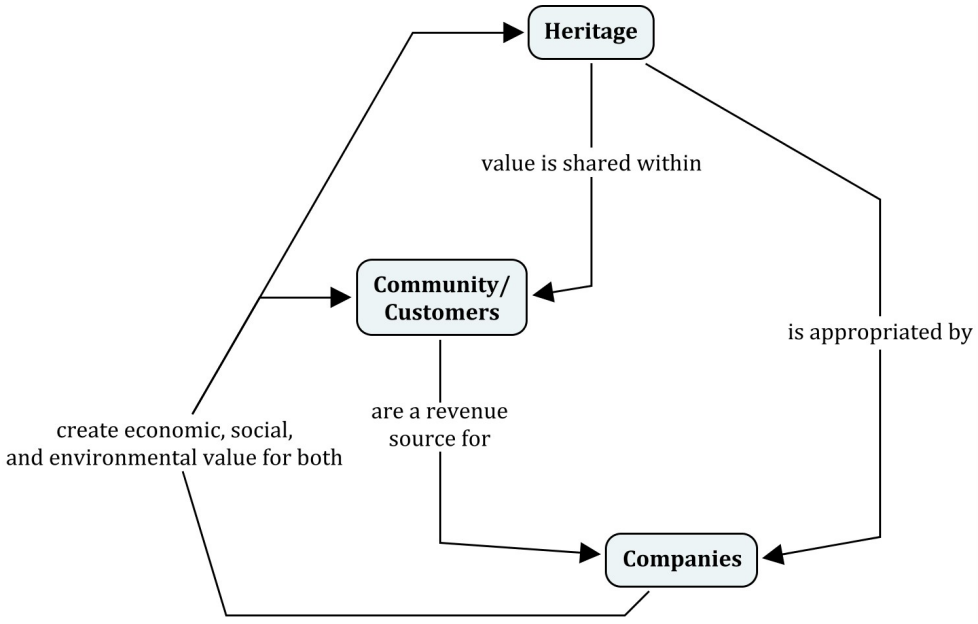

Figure 1. The interdependency between companies, customers, and heritage

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2. *Free access* removes limitations on access to all goods, services, and technologies created by humans to allow the greatest possible circulation of their benefits across society. However, free access is not free use, quite the contrary; it leads to a change to the way corporations capture value, from benefitting from selling property or an access to property to benefitting from selling the use of goods or services. Thus, free access naturally thrives in the context of a shift from the selling of goods to the provision of services. Free access also moves the setting of wealth creation outside the scope of property to place it in the perspective of heritage management, which further upholds the importance of stakeholder involvement in the decision-making process (Weber and Reveret, 1993; tinyurl.com/ozolqdq).

3. *Knowledge sharing* refers to the opening of data and the increased exchange of information. This opening will be made necessary by the level of complexity required for enterprises to maximize the creation of economic wealth, social well-being, and environmental health. To achieve this objective in an optimal way, companies must adopt policies of acute transparency regarding their operations and business practices. It is only the automatic sharing of data that will enable all stakeholders to gather the knowledge required to design suitable solutions for companies, so the latter can successfully address the complex issues of heritage management and gain public acceptance.

It will take ample research and creativity to embed these three notions into highly effective business models that address the needs of companies. This need has brought forth the idea of the Hub for Business Model Innovation (Hub-BMI), a research centre that will enable the development, testing, and validation of pioneering business models. Founded by the Centre of Excellence in Energy Efficiency (C3E; c3e.ca), which is the architect of the project, the Hub-BMI is based in Montréal and is now at the development and fund-raising stage. It has already started to draw on the expertise of highly skilled professionals who hail from a large network of multinationals, small- and medium-sized businesses, governments, cities, and financial and academic institutions. An interdisciplinary approach that brings together economic, artistic, and intellectual ecosystems will allow the Hub-BMI to gather the creative power needed to design quality tools that will enable enterprises to adapt to changing market conditions.

For example, although promising, the transition from capital management to heritage management is constrained by an outdated legal framework that is not equipped to accommodate for-profit entities whose social and environmental benefits purposes are central to their existence (Clark and Vranka, 2013; tinyurl.com/lampp6b). The establishment of an economy based upon heritage management therefore requires a new type of corporate legal entity – the benefit corporation (Clark and Vranka, 2013; tinyurl.com/lampp6b) – that will in turn enable the internalization of social and environmental externalities in the decision-making process. As a result, benefit corporations that join in the heritage economy will distinguish themselves as leaders of this new paradigm and achieve strategic positioning in their field by establishing enduring relationships with stakeholders of their economic, environmental, and social ecosystem. Furthermore, the adoption of a heritage-management approach – as opposed to a sole focus on capital management – will facilitate compliance with impact investment standards (Willard, 2013; tinyurl.com/lw6m67q) and will contribute greatly to the singling out of these enterprises by investors looking for such opportunities (Unsworth, 2012: tinyurl.com/n9mhtf5; Canadian Task Force on Social Finance, 2011: tinyurl.com/phmmx6s).

Natural Capitalism

The goal we hope to achieve by moving to a heritage economy is to close the gap between economic activity and the activities of humans and ecosystems. In itself, it means reconciling capitalism with the human, social, and environmental planet on which it evolves, to naturalize it in a way that the market integrates the whole instead of distancing itself from it, severed from the complex and multidimensional reality of the world. This naturalization – based upon a threefold approach that measures the economic, social, and environmental impacts of using heritage to business ends – should produce two kinds of major repercussions in how economic activities are designed and managed: i) it will aim technological innovation towards a greater integration with the environment and ii) it will reorganize the structure of value chains in order to eliminate all forms of *muda* (Hawken et al., 1999; tinyurl.com/lzzxegy).

Muda is Japanese for "waste", "futility", or "purposelessness". Within the context of economics, any human activity that absorbs resources but creates no value classifies as muda (Hawken et al., 1999; tinyurl.com/lzzxegy). Understandably desirable, muda's systematic elimina-

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tion was theorized then applied to industrial manufacturing processes and framework by Taiichi Ohno (tinyurl.com/mkykkra). Within such an optimized system, the value chain is designed to be a continuous flow of value, as defined by the customer, at the pull of the customer, and in search of perfection – which is in the end the elimination of muda (Womack and Jones, 2003; tinyurl.com/kw9v74h).

There are many different ways that companies can optimize their value chains in order to eliminate muda, leading to increased profitability. The following concepts, presented as complementary strategic axes in the book *Natural Capitalism* (Hawken et al., 1999; tinyurl.com/lzzxegy), represent some of the most promising approaches:

1. The first axis is the radical improvement of natural and human resource productivity. Given that, within this context, the term "productivity" refers to the amount of output a process provides by unit of input, increased resource productivity means obtaining the same amount of utility or work from a product or process while using less material and energy (Hawken et al., 1999; tinyurl.com/lzzxegy). Just as the industrial revolution allowed a phenomenal increase in the productivity of workers, which resulted in the expansion of production by the means of energy access, mechanization, the assembly line, and so on, a revolution in resource productivity would allow the intensification of production and would have numerous positive impacts. For example, the reorganization of value chains and the integrated use of new technologies that use less energy or raw materials could slow resource depletion upstream, reduce pollution downstream, and increase the profitability of enterprises, thereby creating incentives for job creation. Given that an alternative to traditional industrial development is needed to provide growth possibilities to an increasing global population, specifically in the case of the emerging markets, revolutionary leaps in resource productivity will provide an opportunity for corporations to save money, as well as a sustainable way to increase the quality of life of people around the world. Examples of technologies that could help to achieve such revolutionary leaps – such as zero-energy buildings, super-refrigerators, biointensive minifarming, perennial polyculture, etc. – are elaborated in *Factor Four: Doubling Wealth, Halving Resource Use: The New Report to the Club of Rome* (Weizsäcker et al., 1998; tinyurl.com/m69yd9s).

2. The second axis is biomimicry in the design of production processes and flow of materials. Indeed, biological systems naturally tend to optimize the use of inputs in order to minimize waste, because, by contrast with mechanical systems, they are not artificially maintained by a constant supply of resources and power. Biological assembly techniques are thus optimized to occur in low-temperature, low-pressure environments, and to require minimal energy. Therefore, replicating nature's assembly techniques opens the door to reaching extraordinary levels of resource productivity. The goal of biomimicry ultimately is to structure the production processes so that they imitate biological cycles, which work in closed cycles where every species' waste is another's sustenance. Given that, in economic terms, waste is a loss of capital, its elimination – by the company finding another use for the waste within its operations, by selling the waste to another firm which has a use for it, or by other means – constitutes a new appreciation of this capital as well as a revenue source for enterprises.

3. The third axis is a fundamental shift from the selling of goods to the provision of services in the customer-producer relationship. This change is based on the idea that customers want solutions to their real and perceived needs and not the possibility of owning goods that are supposed to meet their requirements. For enterprises, this means moving to the licensing of goods of which they will effectively retain the ownership, and, consequently, be responsible for their maintenance. The main effect of this change will be an alignment of interests by enterprises and customers as to the durability of the object providing services: by contrast with a ownership approach – where it is in the interest of companies to design products that require frequent replacement, enabling them to repeatedly sell the same product to a group of customers – an approach based on the provision of services drives enterprises to design their products so that they will be as durable as possible. In the same line of thought, choosing to provide services instead of selling goods provides enterprises further incentives to improve their resource productivity and to implement biomimetic production processes, thereby reducing the cost of product maintenance and protecting their investment.

The integration of these three strategic axes in the architecture of value chains will form the cornerstone of a new generation of business models. These new busi-

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ness models will in turn define strategies of distribution, highlighting, and profitability that will support the commercialization process of technological innovations. The heritage approach, and the new paradigm that will follow its spread, will provide incentives for companies to become benefit corporations: the type of firms that are destined to become the primary focus of impact investors (Unsworth, 2012: tinyurl.com/n9mhtf5; Canadian Task Force on Social Finance, 2011: tinyurl.com/phmmx6s).

Conclusion

In a world of increasing interconnection, enterprises' responsibility in the management and preservation of natural, human, physical, and cultural heritage will continue to grow with the capacity of enterprises to affect the condition of this heritage. The need to broaden economic considerations to a larger scope, that of the heritage economy, will only be made more obvious by the increasingly spectacular impacts of economic activity on social well-being and environmental health.

Although the awareness of this necessity spread across business and political circles, the creation of the Hub-BMI introduced above will institute a gathering of creative power capable of tackling the first step towards a heritage economy: the design of a series of business models that will act as instruction manuals for the conversion of enterprises to this new economy.

Nevertheless, it will be quite a challenge for humanity to move to a heritage economy. Beyond fundamental and applied research, it will take a paradigm shift that will transform our elementary notions about commerce to successfully face the neoclassical economy's triple crisis. In that regard, the state of the world today acts as a powerful incentive to achieving this new Renaissance, so as to reconcile economic activity with the preservation and florescence of heritage. Above all, it will take ample courage and determination to stir the rise of humanity as a growing and stability-inducing species on this planet.

About the Authors

Frédérick Brousseau-Gauthier is a creative writing student at Université du Québec à Montréal (UQÀM), with a strong interest in the relationships between politics, the economy, and the environment. Between 2006 and 2008, he took part as speaker in several seminars in France and Canada on the topic of information technologies and their role in education. He also worked as columnist and investigative reporter in various student media outlets, covering matters from citizens' engagement in their democracy to the management of collective property. He is currently writing a novel.

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Q&A

David B. Watters

Q. What are the components of Canada's innovation ecosystem and how well is it performing?

A. Unfortunately, Canada's innovation ecosystem performs poorly. The Conference Board of Canada (2013; tinyurl.com/cjovnnj) recently gave Canada an overall "D" grade on its Innovation Report Card, ranking it 13th among 16 peer countries. This performance is generally characterized as being excellent at producing academic research on the one hand, but on the other hand is noted as being poor at commercializing knowledge.

So, what accounts for Canada's relatively poor performance? To answer this question, it is worth examining the organizations that offer innovation support services to Canadian firms, the characteristics of these firms, and the challenges they face.

Components of Canada's Innovation Ecosystem

Canada's innovation ecosystem consists of the public sector institutions, private sector businesses, and academic organizations that offer business resources and support services to Canadian firms. These resources and services assist firms in developing innovative products or services to sell in domestic and global markets.

In the *public sector*, all three levels of government (i.e., federal, provincial, and municipal) offer a variety of innovation support services to firms, as shown by the examples listed in Table 1.

The *private sector* itself offers a range of support services to firms. For example, private sector investors offer risk capital (i.e., angel capital or venture capital funding) to finance startups or early-stage companies. Other business service providers offer services relating to, for example, intellectual property, accounting, marketing, and business management. Frequently, these business service providers are clustered around firms in specific technology subject areas, such as wireless technologies, medical devices, or "cleantech".

Academic institutions (e.g., universities and colleges) also provide a variety of important services to firms. Their most important contribution is a constant supply of trained undergraduate, graduate, and post-graduate talent in all disciplines that can be accessed by innovative firms. They also provide firms with access to new research knowledge via technology transfer offices or with access to skilled researchers themselves. Finally, they can provide specialized technology and business knowledge through access to academic staff, as well as customized workplace training.

In summary, an effective innovation ecosystem offers firms a comprehensive suite of innovation support services, provided from collaboration among the public sector, private sector, and academic institutions. Unfortunately, in Canada, coordination and collaboration on innovation opportunities between the federal and provincial governments, between universities and the private sector, and between governments and the private sector remain underdeveloped.

Key Characteristics of Firms within an Innovation Ecosystem

Variation in the characteristics of firms will have a significant effect both on the kinds of innovation support services a group of firms would need and on the ways the firms would access these support services. In effect, the public, private, and academic innovation service providers need to "segment" the marketplace of firms that will access their services. As a result, to improve performance of Canada's innovation ecosystem, the nature of the services provided to firms would need to be adjusted to match several basic firm characteristics, including:

- the *number* of firms
- the *size* of firms
- the *industry sector* the firm operate in (e.g., ICT, cleantech, biopharmaceutical)
- whether the firm produces a *product* or a *service (*over 75% of all Canadian firms produce services)
- the *age* of firms (startups face unique sets of challenges)
- whether the firms are *publicly* or *privately* owned
- the *region* of Canada or *regional cluster* within which the firms are embedded

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Table 1. Examples of innovation support services from the public sector

Type	Description	Examples
Basic research	Research funded primarily through universities to produce talent and new research-based knowledge for access by firms	• Natural Sciences and Engineering Research Council (NSERC; nserc-crsng.gc.ca) • Social Sciences and Humanities Research Council (SSHRC; sshrc-crsh.gc.ca) • Canadian Institute for Health Research (CIHR; cihr-irsc.gc.ca) • Genome Canada (genomecanada.ca) • Canada Research Chairs (chairs-chaires.gc.ca)
Research infrastructure	Programs to fund research infrastructure or funding for incubators or accelerators to assist the growth of technology-based firms	• Canada Foundation for Innovation (CFI; innovation.ca) • Indirect Costs of Research Program (ICP; indirectcosts.gc.ca)
Applied R&D	Programs that fund applied research	• National Research Council (NRC; nrc-cnrc.gc.ca) • National Centres of Excellence (nce-rce.gc.ca) • Centres of Excellence for Commercialization of Research (CECR; tinyurl.com/k29r3ut) • Business-Led National Centres of Excellence (BL-NCE; tinyurl.com/jw68etc)
Tax support	Tax credits or deductions	• Scientific Research and Experimental Development Tax Incentive Program (SR&ED; tinyurl.com/bxzvg2h) • Specialized rates for the Capital Cost Allowance (tinyurl.com/mgpqn7y)
Direct support	Funding and other support provided directly to businesses	• Industrial Research Assistance Program (IRAP; nrc-cnrc.gc.ca/eng/irap/) • Sustainable Development Technology Canada (SDTC; sdtc.ca) • Business Development Bank of Canada (BDC; bdc.ca) • Innovation support programs through regional development agencies: Atlantic Canada Opportunities Agency (ACOA; acoa-apeca.gc.ca), Canada Economic Development for Quebec Regions (CED; dec-ced.gc.ca), Federal Economic Development Agency for Southern Ontario (FedDev; feddevontario.gc.ca), Western Economic Diversification Canada (WD; wd-deo.gc.ca/eng/)
Framework legislation or regulation	Programs to support innovation activity	• Competition law, patent law, environmental regulation, procurement programs such as the Canada Innovation Commercialization Program (CICP; tinyurl.com/lvfj29n) • New approaches to defence procurement, new international free trade agreements and corresponding trade missions, and revised immigration programs, etc
Regional business support	Economic development organizations and partners	• Invest Ottawa (investottawa.ca) • Communitech (communitech.ca) • MaRS (marsdd.com) • TEC Edmonton (tecedmonton.com)

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All these characteristics may influence the effectiveness of firm-level innovation. For example, consider *firm size*: Canada has 1,122,306 businesses that have employees (StatsCan, 2012; tinyurl.com/noauuap). Of these:

- 2,528 (0.3%) are large sized (500+ employees) with an average of 1,550 employees
- 18,999 (1.7%) are medium sized (100-499 employees) with an average of 90 employees
- 1,100,779 (98%) are small sized (<100 employees) with an average of 4.7 employees

It is very likely that the way in which a small firm of only five employees manages innovation will be *significantly different* from the way in which a large firm of 1,500 employees manages innovation.

Unfortunately, despite the fact that 98% of all firms in Canada are small, many government policies and programs are designed primarily for larger firms and do not fully recognize the challenges facing the average small firm of five people. For example, such small firms are simultaneously trying to build a sustainable business, conduct research, develop technology, maintain adequate cash flow, and access global markets. As a result, the way in which such small firms access innovation resources from the innovation ecosystem and the kinds of assistance they require will be different from larger firms, as will be the challenges for governments in designing scalable and easily accessible support programs to assist them.

In summary, the function of an innovation ecosystem is to provide firms with efficient and effective access to innovation resources (e.g., access to talent, risk capital, new knowledge, technology intelligence, business mentoring, market intelligence) as well as to establish a supportive regulatory framework (i.e., marketplace rules) for all firms. The function of the firm within this ecosystem is to innovate new products and services for global markets.

The Challenges Facing Firms within Canada's Innovation Ecosystem

There are many challenges within Canada's innovation ecosystem that contribute to its lacklustre performance. Most critiques focus correctly on its poor commercialization performance. For example, while Canadian institutions are good at producing new knowledge, we are not good at supporting firms in integrating that knowledge into innovative goods and services for sale in global markets.

Unfortunately, Canadian governments have focussed too much attention on investment in basic research on the expectation that these investments in new knowledge would trickle down to firms. They have not invested enough in supporting firms to access the services they need to both make innovative goods and sell them in global markets. Furthermore, government policy makers have not fully recognized the structure of Canadian industry – for example, that 98% of Canadian firms have an average of five employees – nor have they identified and provided the resulting kinds of particular support these smaller companies need (e.g., access to risk capital, access to market intelligence, access to business mentorship, access to global business networks) in order to penetrate restrictive and complex emerging markets in China, India, and Brazil.

As a result, governments need to focus more policy attention on routinely surveying and talking to firms, and finding out the real challenges they are facing in trying to innovate new products and services for these global markets. Furthermore, these discussion need to be segmented by industry *sector*, by firm *age*, by firm *size*, etc., as outlined here. Only then should policy makers consider how to adjust the components of Canada's innovation ecosystem, to permit these firms easier access to the innovation services they need so that they may enhance their chances of being successful in global markets.

Q&A. What Are the Components of Canada's Innovation Ecosystem?

David B. Watters

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Topic

Start by asking yourself:

- Does my research or experience provide any new insights or perspectives?
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- Do I believe that I could have saved myself time, money, and frustration if someone had explained to me the issues surrounding this topic?
- Am I constantly correcting misconceptions regarding this topic?
- Am I considered to be an expert in this field? For example, do I present my research or experience at conferences?

If your answer is "yes" to any of these questions, your topic is likely of interest to readers of the TIM Review.

When writing your article, keep the following points in mind:

- Emphasize the practical application of your insights or research.
- Thoroughly examine the topic; don't leave the reader wishing for more.
- Know your central theme and stick to it.
- Demonstrate your depth of understanding for the topic, and that you have considered its benefits, possible outcomes, and applicability.
- Write in a formal, analytical style. Third-person voice is recommended; first-person voice may also be acceptable depending on the perspective of your article.

Format

1. Use an article template: .doc .odt
2. Indicate if your submission has been previously published elsewhere. This is to ensure that we don't infringe upon another publisher's copyright policy.
3. Do not send articles shorter than 1500 words or longer than 3000 words.
4. Begin with a thought-provoking quotation that matches the spirit of the article. Research the source of your quotation in order to provide proper attribution.
5. Include a 2-3 paragraph abstract that provides the key messages you will be presenting in the article.
6. Only the essential references should be included. The URL to an online reference is preferred; where no online reference exists, include the name of the person and the full title of the article or book containing the referenced text. If the reference is from a personal communication, ensure that you have permission to use the quote and include a comment to that effect.
7. Provide a 2-3 paragraph conclusion that summarizes the article's main points and leaves the reader with the most important messages.
8. Include a 75-150 word biography.
9. If there are any additional texts that would be of interest to readers, include their full title and location URL.
10. Include 5 keywords for the article's metadata to assist search engines in finding your article.
11. Include any figures at the appropriate locations in the article, but also send separate graphic files at maximum resolution available for each figure.

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