Technology Innovation Management Review

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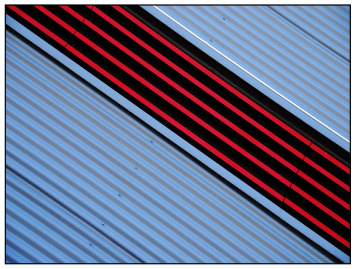

Opportunities and Capabilities

Welcome to the June 2014 issue of the *Technology Innovation Management Review*. This month's editorial theme is Opportunities and Capabilities. 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: Opportunities and Capabilities

Chris McPhee, Editor-in-Chief

Welcome to the June 2014 issue of the *Technology Innovation Management Review*. This month's editorial theme is **Opportunities and Capabilities**, and our authors present insights about patent evaluation, service innovation, technology entrepreneurship, and IT capability improvement.

In the first article, **Derek Smith**, founder and principal of Magneto Innovention Management, presents a framework to help managers and entrepreneurs evaluate patents to reveal their hidden value and improve strategic decision making. Based on a review of citation-based patent evaluation methodologies, the framework shows how categories of information can be interrelated to different strategic groups of business considerations, thereby providing a competitive advantage to the evaluating firm. The article includes recommendations for managers and entrepreneurs to help them make citation-based patent evaluation an ongoing business practice to enable strategic decision making. This article is derived from the author's recently completed thesis in the Technology Innovation Management program at Carleton University in Ottawa, Canada, for which he was awarded the university's Senate Medal for Outstanding Academic Achievement (tinyurl.com/q93sz9l).

Next, **Jeff Moretz** and **Chirag Surti**, from the University of Ontario Institute of Technology in Oshawa, Canada, examine wireless service pricing and the opportunities it presents for innovation. By analyzing the advertised pricing of voice, text, and data services from Canadian telecommunication providers, the authors demonstrate that consumers of voice and text are in effect cross-subsidizing heavy consumers of data in this market. Such cross-subsidization of data, the authors argue, has created significant opportunities for entrepreneurs to develop innovation solutions that leverage data transmission.

Jay Payette, management consultant and graduate student in Carleton University's Master of Design program, addresses a key challenge that new technology startups face: a perceived lack of organizational legitimacy simply because of the venture's young age. After reviewing literature relating to different forms of organizational legitimacy, Payette argues that startups should overcome their "liability of newness" by developing external pragmatic legitimacy (i.e., self-interested calculations of an organization's most immediate audiences) through the creation of a professional services practice.

Paul Renaud, **Sheppard Narkier**, and **Sonia Bot**, argue that a firm's dependency on its IT function is increasingly central to its ability to innovate. They demonstrate that sustained improvement in the IT function can be achieved through incremental improvement to its technology capabilities, process capabilities, and competency capabilities. The article is of primary benefit for IT executives seeking to sustain an ongoing, systematic transformation of the IT function to enable IT entrepreneurship and agility.

Finally, this issue also includes a report on a recent TIM Lecture by **Ibrahim Gedeon**, Chief Technology Officer of TELUS (telus.com), who shared insights on innovation based on his experiences as an executive in the telecommunications industry.

We hope you enjoy this issue of the TIM Review and will 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

About the Editor

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.

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A Citation-Based Patent Evaluation Framework to Reveal Hidden Value and Enable Strategic Business Decisions

Derek Smith

> *"The value of patents as competitive weapons and intelligence tools becomes most evident in the day-to-day transaction of business."*
>
> Kevin G. Rivette and David Kline
> Authors of *Rembrandts in the Attic: Unlocking the Hidden Value of Patents*

Patent evaluation methodologies enable firms to make informed strategic business decisions by associating and revealing hidden information surrounding a patent. However, the value of a patent depends on a firm's capabilities and strategic direction; therefore, a patent evaluation requires the information to be properly related and aligned with a particular business consideration. This article reviews the literature on citation-based patent evaluation methodologies and develops a framework to help managers and entrepreneurs identify strategic groups of business considerations. The framework shows how categories of information can be interrelated to different strategic groups of business considerations, thereby providing a competitive advantage to the evaluating firm. The article includes recommendations for managers and entrepreneurs to help them make citation-based patent evaluation an ongoing business practice to enable strategic decision making.

Introduction

A patent can bring several well-known forms of potential value to a firm, primarily through the option for a 20-year monopoly to a patented technology. The monopoly represents other forms of value such as exclusive usage rights, licensing opportunities (with potential royalties), and proceeds from any future sale of the patent. These and numerous other forms of patent value can be categorized as bringing defensive, offensive, strategic/business, and technology leadership value to firms (de Wilton, 2011).

However, patents are expensive, and not all patents bring value. Moreover, a given patent may not have the same value to all firms, depending on their capabilities and strategic direction. So, whether a firm is evaluating its own patent portfolio or is considering a purchase involving intellectual property, the challenge lies in identifying the potential value of a patent to the firm. Of particular importance are the hidden insights that relate to the strategic direction of the firm, because they may suggest new opportunities or business decisions, either now or in the future.

A patent evaluation allows managers or entrepreneurs to reveal insights concerning the value of a patent, or a portfolio of patents, within the context of their own firm. Patent evaluation methodologies generally assess three interrelated aspects of a patent: i) the new technology protected by a patent; ii) the old technology known before the patent; and iii) the associated commercial business information. Such an assessment ensures that other information associated with the patent, beyond the new technology solely described in the patent, is applied and considered in the assessment.

A key input to many patent evaluation methodologies examines the old technology information in the form of a prior art citations. Citations are a list of old techno-

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logy that the patent office used to ensure that only new and non-obvious inventions become a granted patent. The government patent examiner seeks to identify and apply relevant citations against the patent application to ensure that old, uninventive technology does not issue as a patent. Citations may include both patent documents and academic literature. A citation-based patent evaluation may also consider other patent-related and business-related information, which may reveal strategic considerations such as potential joint ventures, mergers, or acquisitions.

The problem is, how can an entrepreneur or manager deal with the initial complexities of a patent evaluation? What are the business issues and potential opportunities facing a firm? What type of information is required for a specific business consideration? How does a firm relate the business issues and potential opportunities with relevant information to reveal insight that leads to better decisions concerning issues and opportunities?

Previous research on citation-based patent evaluation methodologies has focused on a single business issue or opportunity that may be grouped into the categories of strategic partnerships, identifying strategic innovation, or inventions and strategic linkages between firms and people. The information required is narrowly selected for that issue or opportunity. The previous approaches result in a fragmented and narrow view of evaluation requirements, strategic business considerations, and relevant information.

Understanding a larger group of strategic business options, issues, and opportunities both for and against a firm can lead to determining the potential value on a broader scale of evaluation methodologies. Understanding the information requirements enables entrepreneurs or managers to proactively plan and gather information to evaluate strategic business issues and opportunities. For example, an entrepreneur or manager could :

- select a business issue or opportunity from the group and identify the associated relevant information
- proactively track and gather this relevant information over time on an ongoing basis as part of a strategic business practice to ensure they have the relevant information when it is needed to evaluate the issue or opportunity
- be prepared to execute a patent evaluation methodology by evaluating the strategic option as a business consideration with relevant information in a patent evaluation methodology

This article identifies and groups four broader key strategic opportunities and associated information to conduct citation-based patent evaluations. It makes four contributions. First, this article provides a citation-based patent evaluation framework synthesized from the literature. The framework provides guidance to entrepreneurs and managers and provides a framework to understand four different strategic groups of business considerations with the required interrelated categories of information. This framework enables patent evaluation from the perspectives of identifying strategic partners, strategic innovation, and inventions and strategic linkages between firms and people. Second, this article identifies and groups business considerations into the four strategic groups of business considerations. Third, this article identifies categories of prior art, patent, and business information interrelated with each strategic group of business considerations to enable the patent evaluation. Finally, it provides four recommendations to entrepreneurs and managers for identifying specific opportunities and conducting patent evaluations.

The body of this article is organized into four sections. The first section reviews the literature about citation-based patent evaluation methodologies. This section also discusses the existing citation-based patent evaluation methodologies, business opportunities, and information required to conduct an evaluation. The second section describes the proposed citation-based patent evaluation framework and provides four example scenarios where it could be applied. The third section provides recommendations for entrepreneurs and managers, and a final section concludes the article.

A Review of Citation-Based Methodologies

Patent evaluation methodologies enable the assessment of technology, patent, metadata, and business opportunities to reveal hidden details and insight. A particular type of patent evaluation methodology focuses on the prior art citations. In such evaluations, citations are used for different types of measures, depending on the business consideration.

Prior art citations identify technology that was available before the filing date of the patent application; they list what was known, or the "state of the art", prior to the invention of the new technology. These citations create a

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link between the prior art and the new patent application. When a prior art citation refers to an existing *patent*, this technology coupling or link is made explicit in the patent. The new patent application creates a formal link back in time to the prior art – this is called a "cited citation". However, the older patent also inherits a citation forward in time to the new application – this is called a "citing citation". Thus, a given patent may have cited citations (i.e., backwards in time to prior art) and the patent may also be listed in the future as a citing citation (i.e., forwards in time, meaning the older patent itself has become prior art).

The objective of this literature review is to examine the current state of knowledge in citation-based patent evaluation methodologies. The relevant literature was located using a broad keyword search of scholarly journals in the Business Source Complete database (tinyurl.com/22teqry). The keywords were a combination of: "patent", "business", "citation", "evaluation", and "valuation". This search yielded 77 potential articles published between 1993 and early 2014. The abstracts and introductions of the 77 articles were examined closely, first with a focus on prior art patent citations, and then with a narrower focus on patent evaluation methodologies that required citations, either alone or in combination with other information. This step resulted in a list of 12 relevant articles related to the topic of citation-based patent evaluation methodologies. Specifically, these articles all reported on empirical research involving a range of firms in the integrated circuit manufacturing, pharmaceutical, and patent auction industries. The list only included firms having patents in the United States and Europe, and firms having inventors in Brazil, Russia, India, and China.

The articles covered different types of citation-based patent evaluation methodologies. Bapuki, Loree, and Crossan (2011) and Deng (2008) provided an evaluation of a firm's performance based on the relationship of knowledge between the citation (old technology) and the patent (new technology). Two articles provided an evaluation of a patent portfolio: Brietzman and Thomas (2002) used patent portfolio evaluation when considering the business of mergers and acquisition targeting, and Bapuki and colleagues (2011) targeted the business consideration of joint ventures and strategic alliances between firms. Chen and Chang (2010) used patent portfolio evaluation to measure a firm's performance. Four articles provided an approach to determine patent value. Fischer and Leidinger (2014) and Nair, Mathew, and Nag (2011) evaluated the value of a patent based on a patent auction price. Hall, Jaffe, and Trajtenberg (2005) evaluated the value of a patent based on a firm's stock market price. Harhoff, Scherer, and Vopel (2002) used survey data to evaluate patent value. Hirschey and Richardson (2004) evaluated patent quality with a firm's stock market price. Reitzig (2003) provided an evaluation for the present value of a patent. Tseng (2009) provided an evaluation to compare the level of innovation between countries.

In summary, the literature review revealed the following nine types of citation-based patent evaluations:

1. Mergers and acquisition targeting

2. Joint venture targeting

3. Strategic alliance targeting

4. Firm performance based on knowledge flow or associated with a firm's patent portfolio

5. Patent value based on a sale price or a firm's stock market price and based on a portfolio of patents

6. Patent quality based on a portfolio of patents

7. Present value of a patent

8. A degree of invention based on a portfolio of patents

9. A range of comparisons based on knowledge flow

The literature was further inductively synthesized to identify trends across the body of literature from four specific perspectives, as outlined in Table 1. A first perspective is the overall business consideration, which identified a business issue or opportunity to investigate based on an evaluation of the patent, including strategic partnerships, strategic innovations, and inventions, as well as identifying potential leads to other firms and people.

A second perspective is citation information. This perspective relates to the use of prior art citations in the evaluation of a patent and includes the cited citation list of patents and the citing citation list of patents that depend on a particular evaluation need. Every one of the business considerations requires the use of citation information in the patent evaluation.

A third perspective is business information. This perspective relates to the type and makeup of business metrics required by patent evaluations in association

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with the overall business considerations. Some business considerations require the additional business metrics and others do not.

A fourth perspective is patent information, which relates to metadata associated with the patent and, again, some business considerations require the additional patent metadata and others do not.

Business Considerations

Four strategic groups of business considerations were synthesized from the literature review concerning citation-based patent evaluation methodologies. Respectively, these four groups concerned the strategies to identify: business partners, strategic innovation, strategic inventions, and strategic linkages between patents.

Table 1. Citation-based patent evaluation methodologies identified in the literature review

Perspective	Methodologies
Business Contribution	• Product portfolio management, joint ventures, and strategic alliances (Bapuki et al., 2011) • Targeting and due diligence in a mergers and acquisition process to identify key inventors, technology, higher impact patents, and technological compatibility (Brietzman & Thomas, 2002) • Measuring firm performance (Chen & Chang, 2010) • Measuring economic value of knowledge spillovers (Deng, 2008) • Identifying the geographic location of knowledge spillovers (Jaffe et al., 1993) • Determining the value or importance of a patent (Fischer & Leidinger, 2014; Hall et al., 2005) • Gauging a firm's inventive and innovative value (Hirschey & Richardson, 2004) • Determining the present value and inventiveness of a patent (Reitzig, 2003) • Comparing innovation on a country basis to identify fundamental, applied, incremental and radical innovation (Tseng, 2009)
Prior Art Information	• Knowledge flow; proxies for internal (self cited) and external (other cited) (Bapuki et al., 2011) • Patent quality (Brietzman & Thomas, 2002; Hall et al., 2005; Tseng, 2009); forward citations (Fischer & Leidinger, 2014; Hirschey & Richardson, 2004) • Patent value, forward and backward citations as a proxy (Harhoff et al., 2002) • Higher counts to other firms reveal more valuable patents (Chen & Chang, 2010) • Knowledge spillovers; cited citations from past to current technology (Deng, 2008; Jaffe et al., 1993) • Patent portfolio importance; citing citations as a proxy for importance (Deng, 2008; Jaffe et al., 1993) • Scientific advances; forward citations as a proxy (Hirschey & Richardson, 2004) • Research; non-patent citations as a proxy for research (Hirschey & Richardson, 2004) • Novelty and inventiveness; backward citations as a proxy (Reitzig, 2003) • Inventor and firm identification (Hall et al., 2005)
Patent Information	• Patent counts, patent growth, current impact, linkage to science, technology cycle time, R&D intensity, and market to book values (stock market value) (Brietzman & Thomas, 2002) • Patent share; relative patent position (Chen & Chang, 2010) • Patent family size as a proxy for economic relevance and IPC classes as a proxy for patent scope (Fischer & Leidinger, 2014) • Patent family size, opposition outcomes in Europe, and IPC classification as a proxy for scope of the patent (Harhoff et al., 2002) • Breadth of claims; degree of difficulty to design around; disclosure and position of a patent in a portfolio of patents as a proxy for patent value (Reitzig, 2003)
Economic Information	• Market value; optimal value of citations can positively increase market value (Chen & Chang, 2010) • Firm performance; sales as a proxy (Bapuji et al., 2011) • Market valuation (stock market value and book value); R&D ratio (Deng, 2008) • Stock market valuation of intangible assets (Hall et al., 2005) • Stock market prices; number of patents; value of R&D expenditures (Hirschey & Richardson, 2004) • Inventor and firm information as a proxy for geographic location (Jaffe et al., 1993)

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Identifying strategic business partners requires the application of citation information and business economic information in the evaluation and is useful in product portfolio management, finding potential partners for joint ventures and strategic alliances (Bapuki et al., 2011), and finding potential partners based on a firm's performance (Deng, 2008).

Identifying strategic innovation requires the application of citation information, business economic information, and patent information in the evaluation. It leads to an evaluation of the patent or patents from the perspectives of intellectual property and business to reveal targets for mergers and acquisition (Brietzman & Thomas, 2002) or the value or importance of a patent (Fischer & Leidinger, 2014; Hall et al., 2005).

Identifying strategic inventions requires the application of citation information with patent information and leads to an evaluation of the patent or patents from an intellectual property perspective to reveal the present value of a patent (Reitzig, 2003), the degree of innovation (Tseng, 2009), or firm performance from an inventiveness perspective (Chen & Chang, 2010).

Finally, identifying strategic linkages between patents requires citation information and leads to an evaluation of the patent or patents from a technology perspective to compare the geographic location of knowledge spillovers (Jaffe et al., 1993), country-based innovation comparisons (Tseng, 2009), the inventiveness or "simplicity" of a patent (Reitzig, 2003), or incremental versus radical innovation (Tseng, 2009).

Citation Information

Prior art citations relate to the flow or exchange of knowledge (Bapuki et al., 2011) between old technology and the new technology described in the patent. Non-patent citations relate to a flow of knowledge between research (Hirschey & Richardson, 2004) and the new technology described in the patent. Prior art citations also reveal the names of inventors, entrepreneurs, and firms associated with a patent (Hall et al., 2005). As described earlier, citation information may include both backwards citations (i.e., cited citations referring to earlier records; may be part of the original patent or added later) and forwards citations (i.e., citing citations referring to later records; added after the original patent application). Citation-based evaluations may use cited citations or citing citations in three different ways. First, the evaluation may be based on cited citations to understand the relationship with the old prior art. Second, the evaluation may be based on citing citations to understand the influence on the newer technology. Finally, the evaluation may be based on a combination of cited and citing citations. Through assignment of patent-ownership metadata associated with the patent, the citations also further identify when the citations are internal or external to the firm , which allows the evaluator to examine the citation relationships from the perspective of the firm or competitors to the firm.

Cited citations pertain to and indicate relative patent value (Chen & Chang, 2010), knowledge spillovers of old technology into a new technology (Deng, 2008; Jaffe et al., 1993) and novelty or inventiveness (Reitzig, 2003). In contrast, citing citations relate to patent quality (Fischer & Leidinger, 2004; Hirschey & Richardson, 2004), patent value (Chen & Chang, 2010), patent portfolio performance (Deng, 2008; Jaffe et al., 1993) and scientific advances (Hirschey & Richardson, 2004).

Business Information

Citation information may also be supplemented with business economic information that depends on the type of business contribution from the patent evaluation methodology. For example, business economic information is required in addition to citation information when the business consideration relates to strategic partner selection or identifying strategic innovation.

Citation information is supplemented with business economic information when the business consideration from the patent evaluation methodology relates to firm performance or economic value, joint ventures, strategic alliances, or a mergers and acquisition process. Business economic information includes sales information (Bapuki et al., 2011), market valuation information (Deng, 2008), stock market information (Hall et al., 2005; Hirschey & Richardson, 2004), and patent auction price (Fischer & Leidinger, 2014; Nair et al., 2011).

Patent Information

Citation information may also be supplemented with other patent-related information when the business contribution from the patent evaluation methodology relates to the patent or aspects surrounding the patent. Patent related-information includes:

- the number of patents, patent portfolio growth, current patent impact, linkages to science, the technology cycle time, R&D intensity (Brietzman & Thomas, 2002)

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- the share of patents, relative patent position (Chen & Chang, 2010)
- the patent family size and international patent classification codes (Fischer & Leidinger, 2014)
- opposition outcomes in Europe (Harhoff et al., 2002)
- the breadth of the patent claims, the degree and difficulty to design around a patent, the patent disclosure and position of the patent in the portfolio (Reitzig, 2003)

Citation-Based Patent Evaluation Framework

Citation-based patent evaluation methodologies require a particular strategic focus. The evaluating firm must focus on a particular business consideration and provide links to relevant information. The citation-based patent evaluation framework was created through induction and synthesis of the ideas from the literature. The framework pulls all of this together with the associated linkages between the four key categories and is illustrated in Figure 1.

The citation-based patent evaluation framework synthesized in this research includes four constructs relating to citation information, business considerations, business information, and patent information. The main focus is business considerations and it connects with a subsequent citation-based patent evaluation methodology. The business considerations are grouped into four strategic groups: strategic partners, strategic innovation, strategic inventions, and strategic linkages between patents. These four strategic groups have very specific linkages and are interrelated to the information in the other three constructs as illustrated in Figure 1.

The "strategic partners" consideration relates to targeting higher-performance firms for joint ventures and strategic alliances. The evaluation requires both citation information and economic information. The "strategic innovation" consideration relates to targeting firms for a potential merger and acquisition or firms with higher-value, higher-quality patents. This type of evaluation requires citation information, economic information, and patent information. The "strategic in-

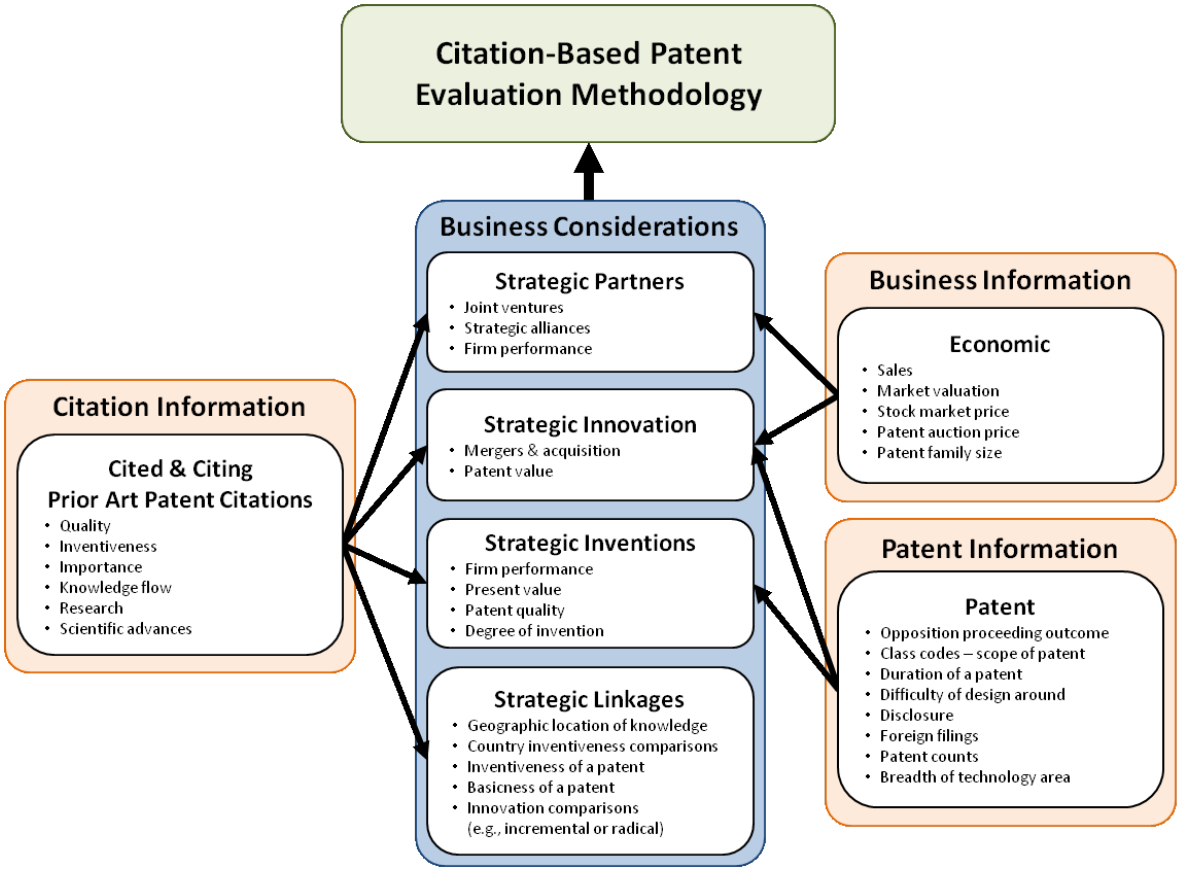

Figure 1. The citation-based patent evaluation framework

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ventions" consideration relates to identifying a firm's more inventive assets. This could be the evaluating firm or a competitive firm, and it requires both citation information and patent information. Finally, the "strategic linkages" consideration relates to tracking knowledge flow for a range of comparisons concerning inventiveness and identifying more inventive firms and actors. This evaluation requires citation information.

Table 2 summarizes guidance for entrepreneurs and managers in the form of a checklist. It associates a citation-based patent evaluation methodology with each of the four strategic options of a business consideration and the information required by each of the four strategic options to conduct the evaluation.

The first step for entrepreneurs and managers in proactively preparing for an evaluation of a strategic opportunity is to identify the strategic focus from the four strategic groups of business considerations. Then, they identify and gather related citation information, economic information, and patent information based on the links to the strategic groups of the business considerations. The checklist will assist with this activity. Gathering the relevant information becomes an ongoing process to prepare the firm for any eventual citation-based patent evaluation of strategic opportunities.

In the subsections that follow, four example scenarios illustrate how the business considerations from Figure 1 and Table 2 can be applied in a citation-based patent evaluation.

Scenario 1: Strategic partners
Consider a firm that is interested in joining a business ecosystem and is seeking to identify a strategic partner from the firms in this ecosystem. This evaluation requires both citation information and economic information. First, the evaluating firm should identify the patent or patents of the target firms. Second, the firm should acquire the citation information, including the names of the inventors and associated firms. The citation information reveals whether the patents are based on knowledge that is internal or external to the firms. A patent based primarily on internal firm citation information suggests the associated firm has a higher capability for inventiveness. Next, the evaluating firm should acquire economic information is the form of sales information for the technology associated with the patent. Finally, the information may be compared on a firm-by-firm basis to identify target firms with higher or lower capability of inventiveness and higher or lower commercial success.

Scenario 2: Strategic innovation
Or, perhaps a publically traded company is interested in identifying a strategic innovation, either one of its own or that of a competitor. This evaluation requires citation, economic, and patent information. Again, the first steps are to identify the patent or patents of interest and then acquire the citation information. In this scenario, citation information includes the list of cited citations, the list of citing citations, and the date of the citations (older vs. newer). The citation information also includes the number of cited citations that are scientific, which reveals the degree to which the patent is based on scientific research or an early-commercialized technology. The number of citing citations reveals the degree of future value where the higher the number of citing citations, the higher the future value of the patent.

Finally, the company should acquire stock market information and the expenditure of the research and development efforts and the size or number of patents in the patent portfolio. The goal is to find the patents that have the highest number of citing citations based on scientific research and that are associated with the best economic information. This combination of information can reveal the strategic innovations.

Scenario 3: Strategic inventions
Consider a firm that is interested in identifying a relatively higher present value patent from a selection of patents that has not been commercialized. This evaluation requires both citation and patent information, so the firm should start by identifying the patent or patents of interest and gather cited citation information. A high number of cited citations suggests low inventiveness. Next, the firm should review the breadth of the claims in the patent and consider how easy it would be to "design around" the patent. The patent disclosure should be reviewed from a competitive perspective to assess the learning value to competitors. Finally, the relative value of the patent in a portfolio of patents should be examined. Conducting this type of evaluation on a patent-by-patent basis provides a relative comparison of the technological present value of the patent and helps identify strategic inventions with higher present value.

Scenario 4: Strategic linkages
Finally, consider a firm that is contemplating breaking into a new technology domain. Identifying strategic linkages based on the flow of knowledge between patents can help identify actors and firms associated with particular technology groups identified in the patents. So, the first step is to identify the key patents for evaluation. Then, both the cited citation and citing citation informa-

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Table 2. Business consideration and information category checklist

Citation-Based Patent Evaluation Methodology	Business Consideration	Information		
		Prior Art Citation	Business	Patent
Breitzman and Thomas (2002) describe a method for evaluating a patent from the perspective of targeting firms for potential mergers and acquisitions. The method evaluates patent counts, patent growth, current impact, science linkages, technology cycle time, and R&D intensity with market to book values and stock market value.	Strategic Innovation	✓	✓	✓
Fischer and Leidinger (2014), Hall et al. (2005), Harhoff et al. (2002), and Nair et al. (2011) describe a method for evaluating a patent from the perspective of patent value. The methods evaluate auction data, patent quality (citing citations), economic relevance (family size), patent scope (IPC codes), stock market price, non-patent literature, outcome of opposition proceedings, and patent family size.	Strategic Innovation	✓	✓	✓
Hirschey and Richardson (2004) describe a method for evaluating patent quality. The method evaluates patent quality (citing citations) and stock market price, number of patents, and R&D expenditures.	Strategic Innovation	✓	✓	✓
Bapuki et al. (2011) describe a method for evaluating a patent from the perspective of a joint venture or strategic alliance targeting. The method evaluates internal knowledge, external knowledge, and sales information. External knowledge was found to have a negative effect on firm performance.	Strategic Partners	✓	✓	
Deng (2008) describes a method for evaluating firm performance. The method evaluates knowledge (citied citations), importance (citing citations), stock market value, and book value.	Strategic Partners	✓	✓	
Chen and Chang (2010) describe a method for evaluating firm performance. The method evaluates patent share, relative patent position, and knowledge.	Strategic Invention	✓		✓
Reitzig (2003) describes a method for evaluating a patent portfolio from the perspective of present value. The method evaluates the life of a patent, inventiveness (citied citations), breadth of claims, degree of difficulty to design around, the disclosure, position of a patent in a portfolio, and knowledge.	Strategic Invention	✓		✓
Tseng (2009) describes a method for evaluating the degree of innovation. The method evaluates quality (cited citations) and IPC codes.	Strategic Invention	✓		✓
Jaffe et al. (1993) describe a method for evaluating knowledge. The method evaluates patent citations (cited citations) from a knowledge-flow perspective in a citation network.	Strategic Linkages	✓		

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tion should be obtained, including the names of the inventors and the names of the firms. Finally, for each key patent, links between the citations should be revealed and the actors and firms associated with each key patent should be identified.

Recommendations for Entrepreneurs and Managers

From a close reading of the published research on citation-based patent evaluation methodologies, and through induction and synthesis looking closely at business considerations, related information, and linkages between the business considerations and information, four recommendations are offered for entrepreneurs and mangers seeking to be prepared for strategic opportunities and business decisions by revealing valuable hidden details and insight surrounding a patent.

1. Make citation-based patent evaluation a differentiating business practice.
Citation-based patent evaluation methodologies provide an interesting opportunity to gain strategic advantage. This strategic advantage could relate to a firm's patent or portfolio of patents, or it could be with respect to another firm's patent or portfolio of patents. This competitive aspect is not well understood or known by entrepreneurs and managers; however, it can provide a strategic advantage to firms that identify and target strategic partners, innovation, inventions, and linkages in the citation network. This competitive aspect can become a differentiating business practice, thereby bringing strategic advantage to the firm.

2. Identify, understand, and use the four strategic options for citation-based patent evaluations.
The strategic options synthesized from a review of the extant literature with respect to business considerations reveals options that may be leveraged with specific interrelated information. Seeking out strategic partners, innovation, inventions and linkages provides relevant strategic advantage to a firm. Citation-based patent evaluation provides the means to realize this competitive advantage based on the citations, business economic, and patent information.

3. Make the gathering of patent evaluation information a core patent management activity.
The citation-based patent evaluation framework and checklist help identify the strategic options and key sources of information required by each option. Gather relevant information relevant to the opportunity based on these strategic options as part of a management process or activity. This prepares the firm for the moment when a patent evaluation is required.

4. Understand how to combine strategic options with relevant information.
The citation-based patent evaluation framework reveals specific links between the strategic options and the required interrelated categories of information. First, identify the strategic option and then gather the interrelated information. Finally, conduct the citation-based patent evaluation based on the literature identified in Table 2.

In summary, a key to the firm's success is leveraging the strategic options from the business considerations and interrelated information about the citations, business, and patents to reveal the hidden details surrounding their patent, or a competitor's patent, and make better strategic business decisions.

Conclusion

The citation-based patent evaluation framework and checklist that emerged from this research provide guidance and reveal the requirements for a set of nine different patent evaluation methodologies. The requirements are based on the four static options of business considerations, the information required by each consideration, and the associated links between the options and information to prepare for an evaluation.

Entrepreneurs and managers are able to prepare for strategic opportunities that include either a firm's patent or a competitive patent against the firm. They can identify strategic options, identify relevant information interrelated to the strategic options, and proactively gather this relevant information over time. This approach provides early and ongoing insight that enables strategic opportunities and decisions.

Further research should focus on refining the current strategic options and interrelated information, and expanding the citation-based patent evaluation framework. The research should examine other citation-based patent evaluation methodologies, business considerations, the interrelated information, and specifically the links between the considerations and interrelated information.

In practice, entrepreneurs and managers should identify their strategic options and proactively gather the information required by these options to reveal the valuable hidden details that enable strategic business decisions.

A Citation-Based Patent Evaluation Framework

Derek Smith

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Mobile Convergence and Entrepreneurial Opportunities for Innovative Products and Services

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> *"Seriously, we are in the midst of the convergence of voice and data and that is challenging the infrastructure of the telephone companies. There are huge commercial interests in the basic technology, but even more so in content delivery and control of content."*
>
> Steve Crocker
> Visionary, inventor, and Internet Hall of Fame inductee

Our research on 2012 and 2013 Canadian wireless service pricing indicates that data was underpriced relative to traditional voice and text messaging services. Such a situation, while potentially disadvantaging consumers of traditional mobile services, created a market that favoured competitors pursuing innovative uses of mobile data. Although more competitive pressures in the telecommunications market would provide broader benefits to Canadian consumers and facilitate greater innovation in related services, a favorable pricing differential vis-à-vis data transmission provides useful incentives. Even with recent changes to the pricing of mobile services in Canada, we should expect continued development of services that substitute data for voice and text messaging, particularly for international communications, as well as more innovative uses of mobile data.

Introduction

The rapid expansion and improvement of digital wireless networks has created a sea change in the expectations among consumers regarding connectivity. Smartphones are becoming ubiquitous, and they are among the most rapidly adopted consumer technologies in history. DeGusta (2012) reported that smartphones were on pace to saturate North American and World markets in record time, and most US phones, including the vast majority of new phone purchases, are smartphones (Reed, 2013). Services such as Twitter and Vine were tailored for the mobile market from the start, and major industry players from Google to Facebook to Twitter have scrambled to stake their claim in the mobile space.

Yet, despite the rapid growth of this market, there is sometimes the perception that only the very large global competitors are able to compete in this new domain. However, the success of Apple's AppStore and the more recent Google Play means that developers of software and associated services that leverage mobile technologies have the opportunity to reach millions of potential customers with relatively limited marketing and distribution budgets. In fact, the digital landscape makes it more rather than less feasible for upstarts to disrupt more established players (Davis, 2014), at least in many competitive domains. The AppStore alone generated $10 billion in sales in 2013 (Apple Press Info, 2014) across more than a million different apps (148Apps.biz, 2014). Google Play passed the 25 billion app download mark more than a year ago (Webster, 2013), and although revenues still lag behind the AppStore, the gap is narrowing (Perez, 2014).

All of this begs the question: what is the impact of Canada's uncompetitive telecommunications landscape on such entrepreneurship? It is well established that telecommunications services in Canada are not

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competitive, and that Canadian consumers pay more for less (Christopher, 2013), in large part due to the lack of effective competition (Surti & Moretz, 2013). However, there are some reasons for hope when it comes to telecommunications related entrepreneurship.

In order to detail the situation that pertains in the Canadian telecommunications market and the opportunities that this market presents for innovation, we first discuss the Canadian wireless market and examine the advertised pricing data of the three major service providers to infer the marginal cost of the various services. We then examine the pricing inefficiencies that arose under the pricing plans available to Canadian consumers in 2013 and the implications of these plans regarding incentives and substitution effects. We close with discussion of innovation opportunities provided by this market situation and by the infrastructure that has developed around smartphones and other mobile devices in particular.

The Canadian Wireless Market

Based on our analysis of the pricing of Canadian telecommunications services from 2012 to 2013, mobile data has been effectively cross-subsidized by the fees for voice calls and text messaging (i.e., short messaging service [SMS]). Thus, software and services that utilize the data stream of a mobile device were making use of a cheaper service option, giving such services an advantage in the marketplace and providing a stimulus for innovation and entrepreneurship in the Canadian mobile communications space.

Though such innovations have provided some relief for consumers, the Canadian telecommunications market remains uncompetitive, in part because of the high cost of entry for carriers. Telecom carries must invest enormous amounts of capital upfront in the acquisition of spectrum and development and maintenance of networks in order to provide sufficiently broad coverage. The cost of adding one more individual to the service is negligible in comparison to the costs of creating a viable network, and any calculation of the cost of providing services would need to amortize these fixed costs for many years across all of the customers served. However, even if we were to undertake such a calculation of service costs, we do not have access to the requisite detailed cost data. The telecommunications providers do not publish such data for strategic and competitive reasons. Thus, we must approach the problem from a different angle.

Although the data on the actual costs borne by the providers themselves is not readily available, we do have extensive access to consumer pricing information. Because the telecommunications providers operate an extensive retail operation, selling services directly to both individual consumers and small businesses, they make pricing information widely available as part of their marketing efforts. Using multiple linear regression (tinyurl.com/yqxx8v), we analyse 2012 and 2013 advertised pricing information across all retail plans offered by each of the "Big 3" Canadian telecommunications companies and their subsidiaries: Rogers (rogers.com), TELUS (telus.com), and Bell (bell.ca). The advertised price data were collected during the summer of 2012 and 2013 from their respective websites. We deliberately ignored short-term "teaser rates" and promotional pricing and instead focused on the published retail pricing that most consumers end up paying in the long run.

The use of multiple linear regression to estimate implied cost is a well-established approach in economics. For businesses that have very high fixed cost and negligible marginal cost of operation, it is possible to infer the cost component of each offering using advertised rates. In economics, this is referred to as the shadow price (tinyurl.com/24k7be). Given that the underlying telecommunications infrastructures used by the different providers are quite similar within each technological generation and all providers operate well above minimum efficient scale, such costs can be discounted as a source of cost differences between service providers. Therefore, by advertising information about their offerings and announcing the prices charged for variety of bundled options, the telecommunications companies reveal useful information about their cost structure for providing each of the three services to the consumer. The cost estimates of the service components for each of the three service providers are presented in Table 1. Here, we highlight the estimated cost of voice, text, and data implied by published pricing data along with advertised overage charges. This method allows us to estimate the implied marginal costs of one minute of voice, one text message, and one GB of data with statistical confidence (the p values and the F statistics were all significant at 95% level of significance). Although these values are indirect estimates of costs, we confirm them with reference to the data equivalent of voice transmissions.

In Table 1, we resolve the bundled telecom plan into its main cost components. Our analysis shows that there is a significant fixed cost component for simply connecting a customer to the network, as implied by the base

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Table 1. Canadian mobile telecommunications main cost components (based on 2013 data)

		Voice		Text		Data	
Provider	**Base Connection Fee**	**Per minute**	**Overage**	**Per message**	**Overage**	**Per GB**	**Overage**
Rogers	$50.52	<$0.01	$0.45	$0.00	$0.20	$10.91	$21.25
TELUS	$58.95	<$0.01	$0.43	$0.00	$0.20	$9.19	$20.00
Bell	$44.86	<$0.01	$0.50	$0.00	$0.20	$10.85	$22.00

connection fee, or a monthly fee in industry parlance. Such a connection cost is to be expected in an industry with such an enormous fixed cost component. As the table shows, there are some substantial differences between the carriers in terms of the implied costs of building and maintaining the basic network infrastructure. These differences are perhaps due to historical accident, operational scale, technological sophistication, and market demographics, but they are not the focus of our discussion here. Without technological developments that radically reduce the costs associated with developing an extensive network of towers and switching equipment, this element of the pricing of service provision is unlikely to decline dramatically as a proportion of the overall cost structure, and it does little to elucidate the opportunity for mobile services innovation that we hope to see in the Canadian market.

Market Constraints, Inefficiencies, and Innovation

Because the marginal cost of voice calls and text messaging is negligible, once the consumer is connected to the network, the cost of providing additional voice and text services is negligible. The fact that voice minutes were limited by providers indicates a significant mark-up given the negligible cost of provision. In addition, consumers were heavily penalized for exceeding their allocated quota of voice and text; in our analysis, the overage charge mark-up on voice was approximately 4500% and for text it was almost 20,000%. For data however, in terms of overage charges, the mark-up on average was only 105%, substantially lower when compared to voice and text overage charge mark-ups. The fact that published prices imply limited cost for providing voice and text services coupled with the strong influence of data on plan prices indicates that the cost structure is dominated by data volume. This finding from our analysis, coupled with the prevalence of limited voice minutes and text messages and the dramatic difference between the overage mark-up for voice and text relative to data, indicates an effective subsidy on data usage in the form of disproportionate mark-ups on voice and text services. Thus, consumers of voice and text are in effect cross-subsidizing heavy consumers of data. This subsidization might be especially true for lower-tier service plans or voice-only plans for which consumers pay significantly more than the implied cost to provide voice services, as well as for consumers who feel compelled to purchase plans with features and data allowances that they do not need in order to get the voice minutes they want.

Such cross-subsidization of data has significant implications for the development of software and services that utilize mobile data transmissions. Under such pricing schemes, mobile phone users who primarily make use of voice or text messaging are disadvantaged, while those consumers who use data services pay comparatively less for that aspect of service relative to the cost of provision. It is relatively easy and quite instructive to highlight the overpricing of voice minutes in the Canadian market. Assuming that the encoding used for proprietary mobile networks is similar to the G.711 standard (tinyurl.com/yoz6q5) used in telephony DS0 channels (tinyurl.com/kwaol8v), the conversion of voice to data would be: 64 kbps x 9.5367×10^{-7} gb/kb x 60 seconds = .003662 gbpm or 273 minutes per gigabit. Whereas a voice minute transmitted as overage would cost 46 cents, that same voice transmission using data overage would cost less than 8 cents/minute, making it substantially cheaper than voice overage. In fact, most wireless carriers used codecs similar to those used for Voice over Internet Protocol (VoIP), achieving low latency,

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high-quality transmission at data rates less than 10% those required by G.711 transmission. At 6.3 kbps, the higher data rate possible using G.723.1 (tinyurl.com/33hy5s), the data equivalent of one minute of voice would cost less than $0.01, which is precisely what our analysis shows. Overpricing of voice and text transmission by service providers, both globally and in Canada, has spurred the creation of a variety of innovative solutions by third-party developers to transmit voice and text messages using data.

Thus, entrepreneurs who developed software and services that leverage data transmission should experience a comparative advantage by virtue of the effective subsidy on data rates. The advantages to innovation of what amounts to a subsidy on mobile data proposed here are compatible with arguments regarding mobile web development proposed in Ville Saarikoski's (2006) PhD dissertation at the University of Oulu in Finland, in which he characterizes email specifically, and the mobile Internet more broadly, as disruptive technologies (cf. Bower & Christensen, 1995).

Saarikoski's dissertation argues that SMS or text messaging is far less efficient than email at creating scale-free networks. In essence, email connectivity (and communications via other technologies that use similar network connectivity approaches) requires fewer steps on average to connect any given node to another node. Saarikoski extends the insights related to scale-free networks to argue that value-added services (e.g., beyond traditional voice calling) could be increased in a mobile packet-based (digital) network. For example, NTT DoCoMo's i-mode service (tinyurl.com/nlkqtq) in Japan had achieved significant market success by adopting a packet switched network that facilitated non-voice communication and enabled extensive development of third-party services from which i-mode earned a revenue-sharing percentage (Mallon, 2013). However, carriers in Europe failed to adopt similar structures, which may have played a significant role in the slow growth of mobile data networks and associated services in the European market.

More importantly for our present argument, Saarikoski's dissertation also argues that the pricing associated with the European networks inhibited adoption in multiple ways, including connection costs and usage fees. DoCoMo's success was in part attributable to its decision to focus on the consumer market, where buyers were less conservative and more willing to experiment with new technologies than were many business customers. Apple followed a similar path to market success with its line of i-products, with consumer adoption preceding eventual expansion into the business market. However, the success of i-mode is also intimately connected to its decision to leverage packet data and offer reasonable pay-per-use pricing to facilitate innovation in third-party services (Grech, 2003).

Opportunities for Innovation

Innovation is directly related to the application of ideas or methods in ways that provide greater value to society (McIntyre, 1982). Value, for both consumers and businesses, includes cost factors as well as benefits provided (Anderson & Narus, 1998; Ratchford, 1982). In the context of mobile telecommunications, applications that provide opportunities to substitute comparatively underpriced data for overpriced voice and texting services provide cost-focused value to consumers. However, the same innovations that provide those cost-saving opportunities also provide richer, more effectively integrated communications services that increase customer benefits.

Among the more famous of the app-based communications solutions are WhatsApp (whatsapp.com) and Viber (viber.com). Facebook recently acquired WhatsApp for $19 billion in cash and stock and Viber was purchased by Rakuten, a Japanese e-commerce company, for almost $1 billion. These transactions are testaments to the value of each solution's user bases, which number in the hundreds of millions. In addition to these more recent players, some of the early VoIP pioneers such as magicJack and Vonage have launched mobile apps that extend their service from simple landline telephony replacement into a mobile platform offering seamless voice communications. Such services can be very attractive to consumers because of the effective subsidization of data transmission by wireless service providers. These services also present opportunities for greater value creation through the integration of multiple forms of communication in a fashion that is not compatible with the traditional paradigm that voice communication is different than and separate from data.

Businesses may also substitute text data for voice communications when contacting customers. Businesses such as financial service providers, cable providers, water/power/gas utilities, and telecommunication service providers themselves can communicate upcoming bill payments, changes to account details, or upcoming planned outages of services via multiple channels in-

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cluding text messages. Such simple innovations with such significant potential to decrease costs, increase service quality, and dramatically improve overall profitability have remained virtually absent from Canadian marketplace, in part because of the consumer costs associated with their adoption. In India, where text messages are usually free and unlimited, most businesses, including financial services and utilities, make extensive use of SMS to communicate with customers. One substantial driver of the slower rate of adoption of such service innovations in Canada may be privacy and security concerns on the part of Canadian companies and the Canadian government, rendering such innovations infeasible. Yet, the fact remains that, from a cost-of-business point of view, such mechanisms represent significant efficiency improvement opportunities while also providing opportunities for enhanced customer service. Similarly, the success of online messaging services such as Skype, WhatsApp, and Viber bears testament to the fact that consumers have been very interested in alternatives to comparatively overpriced voice calling, text messaging (SMS), and multimedia messaging services (MMS).

Conclusion and Insights: Innovation Opportunities

The apps noted above represent but a small proportion of the explosion of apps that has arisen. The industry's shift from mobile phones with expanded capabilities to more flexibly functional mobile computing devices has changed the innovation landscape. The history of Research in Motion (RIM)/BlackBerry (blackberry.com) is informative. The Blackberry devices and their secured push-messaging service had enormous success because of their innovative solution to mobile communications problems, specifically reliable and secure transmission of email, avoiding the problems and excessive costs associated with mobile messaging (Gustin, 2013). Yet, RIM failed to expand its target market and neglected the benefits of broader innovation by third-party participants, particularly in the large consumer segment of the mobile market. As research has pointed out, Apple similarly neglected third-party developers at the initial launch of the iPhone but quickly moved to facilitate outside development when the market moved in that direction (West & Mace, 2010).

Although competition in the market for apps is fierce, particularly on Apple's closely managed AppStore (Lagorio-Chafkin, 2010), there are opportunities for smaller competitors to enter the industry. As of March 2014, there were more than 300,000 publishers of apps for Apple's products in the U.S. (148Apps.biz, 2014). In many respects, the AppStore and Google Play can be seen as a mechanism for lowering the obstacles to innovation by providing a platform that reduces the need for extensive investment in distribution and support capabilities. More broadly, the rise of the smartphone and similar mobile devices presents opportunities for substantial innovation in much more focused domains. Even where a robust market willing to purchase a tailored application is absent, businesses often find it desirable to create custom applications (cf. Apple Developer, 2014). This expansion of opportunities for customer-driven innovation is akin to the "user toolkits" concept promulgated by von Hippel (2001, von Hippel & Katz, 2002) among others. In the case of mobile telecommunications, the "smart" devices themselves may serve as the foundation for user-driven innovation with some additional support available through the distribution and support infrastructures of the device champions (e.g., Apple and Google).

Mobile commerce has also seen significant increase in interest as expanding mobile device capabilities make myriad approaches feasible (Ho & Kwok, 2003). Going forward, the growing success of phone- and text-based payment services such as mpessa in Asia and Africa, as well as increased use of virtual wallets using near field communication (NFC) technology and the rise of the "crypto currencies" may hasten the creation of more innovation in the West, which relies more extensively on data rather than voice and text.

Although the differences in pricing and the implied costs of service provision between various types of mobile telecommunications has historically presented some relative advantages for developers of digital products and services that utilize mobile data, we should note that the lack of competitiveness in the telecommunications sector still represents a significant obstacle to Canadian competitiveness in general and to innovation in the mobile space in particular. The structure of offerings in the consumer market may tend to offset such negative effects in certain domains by presenting consumers with data service at a price that is effectively subsidized by text and voice mark-ups, but innovation will still experience negative effects from the lack of a competitive market for mobile telecommunications.

Although there were potential advantages for innovators using mobile data under the pricing structures in

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place in 2012 and 2013, all innovative activities would benefit from lower prices and the spark to innovation in basic telecommunications provision that effective competition would provide. The recent simplification of mobile pricing plans (CBC News, 2014) is a small step toward a more consumer-friendly market, and to the extent that such changes encourage more extensive and intensive adoption of mobile data services, they will help foster innovation among third-party app developers and service providers. However, the fact that all plans are identical and involve substantial price increases shows that competition is lacking, with the threat of regulatory changes sparking the move to simpler pricing structures. Our analysis of the new plans reveal that in effect the data is priced at $6.21 per GB and the monthly access fee or the base fee is $60.95 and a phone subsidy of $20.00 is offered to consumers.

In fact, the revised plans, if anything, actually reduce the impetus to develop innovative products and services that utilize mobile data. If the mobile Internet is to live up to its potential as a disruptive technology, changing the nature of our interactions, we must foster the same kind of open innovation that has led to such incredible developments in the wired web. Although innovation is proceeding in mobile services, a more competitive market for basic mobile telecommunications service would greatly enhance opportunities for innovation that none of us can readily envision.

Thus, despite the lack of competitiveness of the Canadian telecommunications sector, a situation that deters innovation and the spread of potentially valuable services and capabilities, the structure of offerings may have served to counteract those negative effects for some products and services. There are many sectors of the Canadian economy that stand to benefit from more competitive pricing in mobile services in general and mobile data in particular. Mobile financial services are one area that has seen tremendous development globally, and the Canadian market now has its first open mobile wallet solution (CNW, 2013) using mobile phone data capabilities to manage payments and loyalty program points from President's Choice Financial and TD Bank Group. Mobile gaming, particularly games that require extensive data communications in order to facilitate real-time interactive gameplay, could also benefit from pricing rationalization. For example, Ingress (ingress.com) utilizes mobile data connectivity, GPS, etc. in order to create an integrated augmented-reality gaming environment. Games such as Shadow Cities (no longer available) and Parallel Kingdom (parallelkingdom.com) take a similar approach, and there are myriad other ways to enhance mobile gaming through data connectivity. Canada has a significant presence in the gaming domain, with major companies operating in Montreal, Toronto, Vancouver, and elsewhere across the country, and mobile gaming of all sorts could see more extensive adoption and development if given the opportunity to leverage cheap and reliable data connectivity.

More broadly, we should expect to see innovations in areas that are not receiving significant attention at present. The wonderful thing about market structures that foster innovation is that we all benefit from developments that few of us could predict and that many of us would discount, but that the energetic, creative, ambitious, and determined entrepreneurs among us are willing to bet on with everything they have. The best we can do for them is to provide an equable playing field.

Recommended Reading

- Global Technology, Media, Telecom Innovation Series (PricewaterhouseCoopers, 2014; tinyurl.com/pscsp2q)
- "Disruptive Technologies" (Manyika et al., 2013; tinyurl.com/nmbecug)

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Mobile Convergence and Entrepreneurial Opportunities

Jeff Moretz and Chirag Surti

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Resolving Legitimacy Deficits in Technology Startups through Professional Services Practices

Jay Payette

> *"You can't build a reputation on what you are going to do."*
>
> Henry Ford (1863–1947)
> Business magnate and founder of Ford Motor Company

As new ventures, technology startups face a key challenge that is specifically associated with their young age: a perceived lack of organizational legitimacy. Organizational legitimacy is an important factor in the growth and survival of new ventures and is therefore an important issue for managers and entrepreneurs to address. Although there are many different typologies for defining types of organizational legitimacy, this article argues that technology startups should focus on developing external pragmatic legitimacy as a means of acquiring the resources required to grow and thrive. However, despite the many ways by which an organization can develop external pragmatic legitimacy, few are well suited to technology startups. Based on a review of the different types of organizational legitimacy and an assessment of their applicability to the context of technology startups, this article recommends that technology entrepreneurs should consider the creation of professional services practices to help develop external pragmatic legitimacy and overcome the "liability of newness".

Introduction

New ventures face challenges specifically associated with their organizational age, such as a lack of management structure and specialized role definition, a small or non-existent customer base, and a considerable dependence on the decision making and performance of the founder(s) (Stinchcombe, 1965; Freeman et al., 1983; Chrisman et al., 1998). One of the dimensions of this "liability of newness" is a perceived lack of legitimacy (Freeman et al., 1983; Singh et al., 1986). Although there has been a considerable amount of research conducted in the field of organizational legitimacy over the past three decades (e.g., Singh et al. 1986; Suchman 1995; Deephouse & Carter, 2005; Diez-Martin et al. 2013), these efforts have produced precious few specific recommendations of how new ventures – particularly technology startups – can create, or develop, legitimacy. Without specific approaches to developing organizational legitimacy, entrepreneurs are left to improvise legitimacy-building tactics on their own, that is, assuming that they recognize that others may not perceive their young company as legitimate. This article outlines an implementable approach that technology startups can use to build legitimacy: building a professional services practice. This approach is proposed as an attractive method for technology startups to develop external pragmatic legitimacy, which is identified as an ideal form of legitimacy for new ventures to pursue based on an analysis of the existing literature.

The article is organized in three main sections. First, the relevant literature is reviewed to highlight the various forms of legitimacy and to explain why developing external pragmatic legitimacy was selected as the objective of the proposed solution, as opposed to developing other types of legitimacy. Second, the solution section, which represents the main contribution of this article, recommends that entrepreneurs build a professional services practice as an attractive approach to resolving the deficit of legitimacy faced by technology startups. Finally, the conclusion summarizes the findings and recommends further avenues of research.

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Why Legitimacy Is Important to Technology Startups

Legitimacy contributes to a firm's ability to acquire the resources it needs to grow (Zimmerman & Zeitz, 2002; Tornikoski & Newbert, 2005; Nagy et al., 2012; Diez-Martin et al., 2013). These legitimacy-dependent resources are particularly important for the growth and survival of *new* ventures (Starr & MacMillan, 1990; Hunt & Aldrich, 1996). The importance of legitimacy for the survival of new ventures can be partially attributed to the reluctance of others to engage in commercial relationships with organizations they deem unlikely to survive (Zimmerman & Zeitz, 2002; Tornikoski & Newbert, 2005).

There have been several efforts over the past decades to both define and construct a typology around organizational legitimacy (e.g., Deephouse & Carter, 2005; Reuf & Scott, 1998; Scott & Meyer, 1991; Aldrich & Foil, 1994). However, notable among the collection of research efforts that have made contributions to the study of organizational legitimacy is Mark Suchman's (1995) seminal paper "Managing Legitimacy: Strategic and Institutional Approaches". Suchman's definition and topology are used in this article given the considerable degree to which Suchman's work has been referenced and built-upon by subsequent research efforts.

Suchman (1995) defines organizational legitimacy as "a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions". The key to this definition is the implied roles of two entities: i) an entity who is evaluating the legitimacy of an organization, and ii) the organization whose legitimacy is being evaluated.

Although Suchman's definition of legitimacy is somewhat generalized, he also constructs a typology defining three categories of organizational legitimacy: pragmatic legitimacy, moral legitimacy, and cognitive legitimacy (Table 1). These three types of legitimacy are distinguished by defining interpretations of legitimacy via three different behavioural dynamics. Although the three types of legitimacy involve different behavioural dynamics, all three share a common characteristic in that they all involve a perception of organizational activities as conforming to some form of construct. Suchman's typology is particularly useful for analyzing the legitimacy of businesses as it allows us to focus on a single behavioural dynamic to identify acute organizational characteristics that are contributing to legitimation success or challenges.

Of the three types of legitimacy, pragmatic legitimacy was isolated in this article because it was shown to have

Table 1. Suchman's three types of organizational legitimacy (Suchman, 1995)

		Examples	
Type of Legitimacy	**Definition**	**External Evaluation**	**Internal Evaluation**
Pragmatic	"Pragmatic legitimacy rests on the self-interested calculations of an organization's most immediate audiences."	How likely am I to realize a target return on investment if I buy this startup's product?	How likely am I to achieve my career goals working at this firm?
Moral	"Moral legitimacy reflects a positive normative evaluation of an organization and its activities, and is sociotropic – resting not on judgments about whether a given activity benefits the evaluator but rather about whether the activity is 'the right thing to do'."	Does this firm use unfair labour practices?	Do all of our suppliers practice adequate environmental stewardship?
Cognitive	"Cognitive legitimacy is based on cognition or comprehensibility rather than interest or evaluation. Cognitive legitimacy stems mainly from the availability of cultural models that furnish plausible explanations for the organization and its endeavors."	Do we fully understand how this company's product works?	How does the company I work for actually make money?

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the most impact on an organization's ability to acquire resources (Diez-Martin et al., 2013). Additionally, Tornikoski and Newbert (2005) argue that new ventures are better served by focusing on demonstrating their capacity to deliver on a value proposition as opposed to demonstrating their existing resource endowments. Finally, considering only cognitive legitimacy, Shepherd and Zacharakis (2003) argue that cognitive legitimacy of a new venture's product is more important to the firm's success than the cognitive legitimacy of the organization and the cognitive legitimacy of the managers. The importance of product in cognitive legitimacy suggests that pragmatic legitimacy and cognitive legitimacy are linked given that an understanding of a new venture's product(s) is critical for establishing the self-serving value proposition that drives pragmatic legitimacy.

Additionally, an analysis of the collected literature suggests that, when deciding to provide resources to new ventures, the perceived ability of the new venture to deliver value to stakeholders (i.e., to execute their value proposition) carries more importance than the new venture's ability to operate within acceptable moral norms (i.e., demonstrate moral legitimacy) or to successfully articulate their purpose and operations (i.e., demonstrate cognitive legitimacy).

Finally, legitimacy can be evaluated by entities within and outside of the technology startup. Given that there are considerably more resources outside of a technology startup (e.g., customer payments, investments, grants, mentoring, partnership agreement, talent) as opposed to inside of it (e.g., employee funds, employee effort, patents, proprietary knowledge), this article focuses on how technology startups can develop pragmatic legitimacy externally as opposed to how to establish pragmatic legitimacy internally. This is not meant to discount the importance of establishing internal pragmatic legitimacy, but it does emphasize that the objective of a new venture – particularly a technology startup –is to acquire new resources, and therefore that organization would benefit from focusing primarily on the development of external pragmatic legitimacy.

Developing External Pragmatic Legitimacy

Fortunately, for technology startups, there are a number of specific actions they can take to develop all forms of legitimacy, including external pragmatic legitimacy (Suchman, 1995; Deephouse, 1996; Zimmerman & Zeitz, 2002). According to Suchman, nearly all efforts to build legitimacy fall into three categories: i) seeking conformity to established norms through changes in the firms' behaviour, ii) seeking out an audience that consider the firm's existing behaviours as conforming to established norms, or iii) creating new audiences that consider firm behaviours as conforming to new norms. This concept of new ventures developing legitimacy via conformity has however been challenged on the basis that new ventures by definition must avoid conformity in order to survive, because existing norms represent constraints that new ventures must overcome (Rindova et al., 2009). However, although Suchman (1995) and Rindova and colleagues (2009) both provide useful theoretical frameworks, they fall short of providing prescriptive examples of specific behaviours that firms can engage in to build and expand legitimacy. Stuart, Hoang, and Hybels (1999) and Nagy, Pollack, Rutherford, and Lohrke (2012) build on the work of Suchman by suggesting that successfully developing external legitimacy depends at least partially on building social relationships between managers inside a new venture and entities outside of it. Again, although the research conducted by Stuart and, Nagy, and their colleagues make important contributions to the field of organizational legitimacy, it falls short of providing managers with specific and actionable behaviours that can directly contribute to the development of legitimacy, and none of the research above references technology startups specifically. In the next section, a specific and actionable behaviour will be proposed, which can directly contribute to the development of external pragmatic legitimacy by new ventures.

Professional Services: A Solution for Technology Startups

Unless a new venture can inherit legitimacy from internal sources, such as the founders, it must develop external pragmatic legitimacy through specific behaviours. The types of specific behaviours that a new venture can undertake may be limited, for example, by a lack of resources (Katila and Shane, 2005). A chicken-and-egg scenario may result, where a technology startup lacks the legitimacy required to acquire resources and thus does not have adequate resources to invest in developing legitimacy. Given this constraint, an attractive approach to developing external pragmatic legitimacy would not demand significant financial expenditure on the part of the technology startup. In the author's experience as a management consultant, the creation of a small professional services practice is one such approach, and it need not represent considerable cost or effort (Weiss, 2009). Technology startups by definition employ scientific or technological knowledge in order to solve a problem. This internal knowledge

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can not only be employed for the development of the technology startup's product(s) but it can also be "rented out" to other firms who cannot meet their demand for such skills internally. Creating a professional services practice within the existing technology startup is one mechanism that can be used to make their knowledge and experience commercially available to other firms.

Based on the definition of a professional service firm by von Nordenflycht (2010), this article defines a professional services practice as a commercial offering of the time and effort of knowledgeable professionals, without substantial capital costs. A technology startup can treat their professional services practice as an auxiliary product offering, operating alongside the technology-driven core product offering(s).

A professional services offering can contribute to the development of legitimacy to a technology startup in three ways: pragmatic verification, operational validity, and impression of viability. Pragmatic validation represents the perception that a technology startup can successfully execute a realistic value proposition with one or more entities. By successfully engaging with clients in the professional services context, technology startups create examples of their ability to create value for customers or partners. These examples help external entities to verify that the technology startup is capable of creating value, even before they have gone to market with a single product. In this way, technology startups will be able to demonstrate how the knowledge and experience within the firm have already successfully generated value outside the firm.

Operational validity represents an external entity's ability to operate their business in a way that conforms to established norms. A professional services practice provides the technology startup with the managerial experiences of operating a business before any products are ready for market. The professional services practice will require the manager of the technology startup to perform common managerial tasks, which may include marketing, billing, accounting, time management, communications, and contract management. This experience can demonstrate managerial competence to external entities, helping to alleviate a perception that the technology startup's managers are untested and potentially unreliable neophytes.

Impression of viability represents the perception by external entities that a technology startup is likely to survive, which can increase the likelihood that external entities will engage in a commercial relationship with the technology startup (Zimmerman & Zeitz, 2002; Tornikoski & Newbert, 2005). The presence of both revenue and ongoing customer engagements to existing customers can contribute to the perception that a technology startup is capable and committed to maintaining itself as a going concern, even if none of the revenue or customer engagements are associated with the technology startup's core products.

Thus, technology startups can create professional services practices around the knowledge and experience of individuals already within the firm, all while reducing the cost of acquiring and compensating new employees. However, by shifting from a model where the entire technology startup team dedicates all of their time on developing the technology product(s), towards a model where some of the team member's time is split between providing professional services and developing the technology product(s),the technology startup might risk delaying the go-to-market timing of its technology products. The negative impacts of such a delay must be weighed against the benefits that are generated from having some team member time successfully engaged in professional services work such as revenue, learning, the creation of social relationships, and the development of legitimacy.

Conclusion

This article has highlighted that legitimacy is important to the growth and survival of new ventures, including technology startups. When seeking to develop legitimacy, technology startups should focus on building external pragmatic legitimacy above other types of legitimacy. One method for building external pragmatic legitimacy that should be attractive to technology startups is the establishment of a professional services practice within the existing firm. A successful professional services practice contributes to the development of external pragmatic legitimacy by providing the technology startup with pragmatic validation, operational verification, and an impression of viability.

Ultimately, a professional services practice gives a technology startup the opportunity to exist as a fully functioning business before its technology products are ready to go to market. This approach shifts narratives around a technology startup away from the newness of the firm and its managers, towards the newness of a particular product offering, making the technology startup less of a startup and more of a legitimate technology company.

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Although this article fills an existing gap in the literature it is only a starting point. Empirical research studying the efficacy of professional services offerings to develop pragmatic external legitimacy may provide further insights on what technology startups can do to increase their chances to not only survive, but thrive. For example, identifying case studies where technology startups both successfully and unsuccessfully attempted to use professional services to develop external legitimacy would greatly assist future research effort in this field. Additionally, research investigating the opportunity costs that developing professional services practices pose to technology startups, given limited resources, will help us understand the efficacy of this particular approach to developing external legitimacy.

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Jay Payette is a graduate student in the Master of Design program at Carleton University in Ottawa, Canada, and he is Managing Principal of Payette Consulting. Jay founded Payette Consulting in 2011 to help clients balance the consistent results of repeatable business processes and analytic decision making, with the fuzzy world of creativity. His research has focused on applying design-thinking principles to business model generation, strategy, and project delivery. Prior to founding Payette Consulting, Jay worked for the Canadian consulting practice of Accenture and as an independent IT Project Manager.

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Using a Capability Perspective to Sustain IT Improvement

Paul E. Renaud, Sheppard D. Narkier, and Sonia D. Bot

"*Small opportunities are often the beginning of great enterprises.*"

Demosthenes (384–322 BC)
Statesman and orator

A firm's dependency on the information technology (IT) function is increasingly central to its ability to innovate. The IT function must balance this need for change with sustaining consistent, highly reliable operation of all existing services. A firm's ability to rapidly change IT is impeded by its legacy portfolio of applications and infrastructure because changes need to be very carefully managed and understood in order to avoid unintended consequences leading to system failure and process breakdown. The change imperative for IT is urgent and often determines how IT is valued by the rest of the firm.

Improving the IT function's agility requires improvement in IT capabilities, which can be categorized into three broad classes: technology, process, and competency. This article identifies the critical success factors for creating sustainable change for each of these three capability classes. It draws on the practical experience of the authors and leverages appropriate standards that provide grounding for change within the IT function of the firm, along with the roles and tasks that will be involved in this change agency. The article is of primary benefit for IT executives seeking to sustain an ongoing, systematic transformation of the IT function to enable IT entrepreneurship and agility.

Introduction

As firms become increasingly dependent on the capabilities of their IT function, their appetite for change becomes dependent on their ability to accelerate maturity in the IT function. Yet, most IT functions have an inherent inability to mature, which impedes a firm's ability to innovate due to the following factors, as we described in an earlier article in this series (Renaud et al., 2013):

1. The IT function must manage a large and growing collection of aging applications, which are typically tightly interconnected and poorly documented, and the firm may have little knowledge of their overall workings. This common state of affairs is termed "legacy debt". These applications have been running for such a long time that, although many are considered integral to the firm's survival, the insight to fix their significant and accrued problems has been lost.
2. Changing these applications engenders a level of risk that is hard to mitigate without extraordinary measures. Therefore, even necessary incremental changes are made infrequently and without a holistic expectation of how the application will react. Applications typically will degrade over time due to poor documentation and the loss of organizational knowledge about their inner workings and the extent of their external collaborations. This degradation is heightened if the application has been supported in a minimal maintenance context for an extended period of time. As a result, the technical and competency capabilities to properly maintain them are usually lost such that changes often incur unpredictable and unintended consequences. These applications are usually characterized as "brittle". Worse, this legacy debt is compounded by years of "workarounds" done to accommodate the inadequacies of ancient applications and often organizational knowledge of these work-

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arounds (e.g., fixed limits that are now too small to support the firm's needs, idiosyncratic behaviour that perverts the processes that rely on these applications) is also lost due to inevitable churn in personnel, obsolete development tools, etc.

3. The IT function's budget has been constrained by supporting this legacy environment, despite mounting pressure to support new initiatives. There is little tolerance from the business to invest in fixing the aging environment (i.e., the applications and infrastructure) because the pressure to innovate outweighs the effort, cost, and time required to remediate. As a result, the amount of legacy debt compounds every year.

This previous article defined how these recurring shortcomings could be overcome by showing how to incrementally improve an organization's execution maturity through a set of capability building blocks, whose introduction would be carefully managed by a set of measurable processes that respected the vital interrelationship between the three fundamental capability classes (shown in Figure 1). The previous article provided the background for manageable change by:

1. Depicting how maturity improvement in capability classes can be coordinated and managed

2. Exploring the relationship of these three capability classes, as shown in Figure 1

3. Providing guidelines for leveraging capabilities to sustain change

This article examines the critical success factors for managing the maturity improvement of each of these three capability classes in greater depth. We will also make the case that there must be a systematic and holistic approach to improving capabilities with an integ-

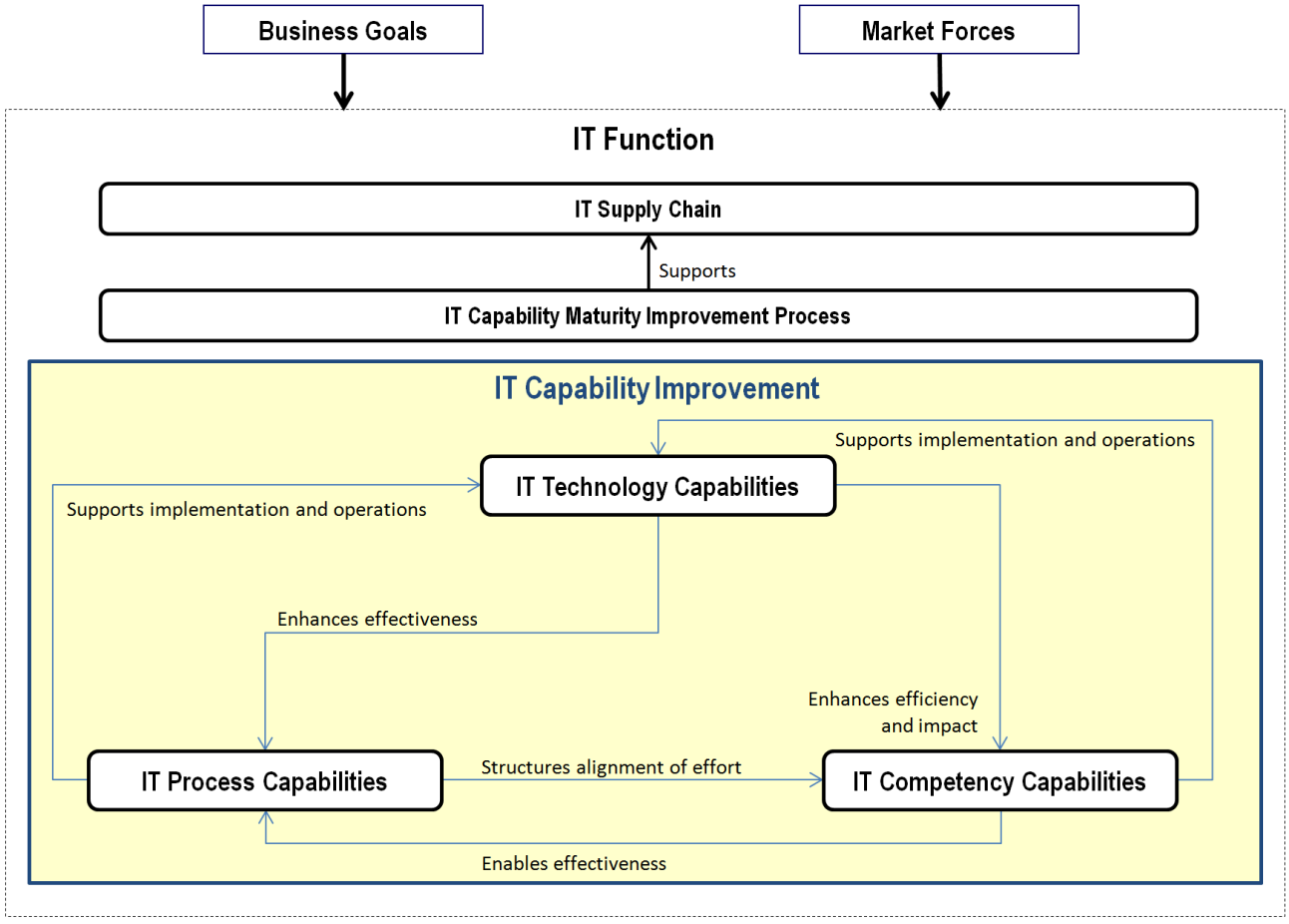

Figure 1. Relationships between IT capability improvement entities

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rated strategy in mind. We will start with a review of each of the three capability classes and then proceed to explore the requisite success factors in improving each class to address the following pain points:

1. The three capability classes that enable advancements in IT maturity are not well defined nor uniformly applied in an IT organization.

2. The supporting relationships between these classes are not understood or are ignored.

3. There is little incentive to share innovation beyond a specific project context, and technical capabilities are introduced without sufficient process and competency underpinnings.

4. The result for IT executives can be summarized as lost opportunities, wasted time and resources, and perhaps worst of all, the perception that the IT function is unresponsive to the needs of the business. Achieving an IT function that is continuously aligned to the needs of the firm requires a significant shift in the mindset of most IT staff in order to restore responsiveness.

This article will establish that IT capability improvement is not only essential for the IT organization's relevance to the firm, but is achievable through the deliberate incremental introduction of defined technical, skill, and process capabilities. We will show how the more advanced capabilities often comprise several building blocks from these three classes. We will also make it clear that the path to IT maturity is a committed and constant journey because market forces necessitate changes to how a firm will stay relevant to its customers. As a result, the unique process steps for incremental improvement for each capability class will be discussed in detail. Finally, we will introduce how sustainability will optimally thrive if there is an enabling enterprise architecture group that embraces its role as a facilitator of strategic, business aligned change.

Capability Improvement Is Holistic as Well as Incremental

Sustainable IT entrepreneurship requires a deliberate, collaborative effort to advance technology, process, and competency capabilities in concert with each other because most capabilities have dependencies. For example, introducing a new technology capability, such as a storage array, will require some skill set improvement combined with an augmentation of some processes to enable the intended impact and reach of the new technology. Although this dependency may appear obvious in the abstract sense, in reality, most IT functions will introduce a new technical tool with little training or support to scale it out to the firm because they are under massive pressure to introduce and evolve technology with little regard for the importance of operational efficiency. Consequently, the competencies and process required to ensure the tool would be properly run in production are rarely made.

An example would be the introduction of comprehensive end-to-end performance monitoring for applications in a business unit. This introduction requires the integration of several technical tools so that monitoring data can be used by stakeholders. It also requires processes and education to specify how and when the tools should be run or turned off, and how data should be collected and archived. Without this understanding, the real benefits of such a complex capability cannot be achieved and the investment in the new technology is largely wasted.

Technology Capabilities

New technology capabilities are introduced by lead projects that are either "shadow IT" projects (Dyche, 2012), which are projects led by a business function without a direct engagement of the IT function, or are "official IT" projects involving collaboration between the IT and a business function. For example, in chaotic firms, business unit leaders lease cloud equipment and deploy applications in what they perceive to be an expeditious manner but without engaging with the IT function. In most of these cases, the applications will ultimately incur unexpected performance, security, and reliability problems shortly after deployment. In mature IT functions, these projects typically follow a standardized *new technology introduction process* that assures that all operational and support units within the IT function are prepared for the new technology. In the authors' experience, this level of maturity is rare for the reasons mentioned in the introduction.

Existing technology capabilities are typically improved by exploitative projects, which are typically led by an IT architecture group within the IT function. This group sets standards for technology capabilities to control complexity, lower cost of support, lower cost of operations, and facilitate and accelerate maintenance and repair activities. The process by which the evolution of technology capabilities is managed must be flexible and responsive to the needs of the business.

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Without a respected architecture group, technology investment remains arbitrary, with no guiding portfolio discipline. This lack of discipline accelerates technological obsolescence, which increases legacy debt, which in turn increases the tendency of businesses to embrace shadow IT to work around a stagnant IT function. We will explore the IT architecture group's relevance issues later in this article, when we address the need for sustainable technology change. In mature IT functions, these issues fall under the scope of the *IT product management process* identified by Renaud and Bot (2012a).

Process Capabilities

Process capabilities in IT can be managed via the Software Engineering Institute's (SEI; sei.cmu.edu) five-level capability maturity model (Paulk et al., 1993) along with some guidance from the standards in service design, operations, and strategy produced by the Information Technology Infrastructure Library (ITIL; itil-officialsite.com). The capability maturity model defines five levels of maturity (initial/ad hoc, managed, defined, predictable, and optimizing), and the highest level reflects the attainment of self-optimizing processes, which are inherently adaptable to the changing needs of the IT function.

In the authors' experiences, these levels cannot be achieved without sufficient skills or supporting technology capabilities to make the IT processes run cost effectively. Augmenting processes without corresponding skills and tooling to underpin process improvements inevitably leads to a waste of resources.

Many processes within the IT function in a large firm will typically have more than one instance of the process. For example, an instance of the *change management process* will typically exist at each data centre location. In general, a process can have many instances at different levels of maturity. For example, change management in the London data centre might be more mature as a process than the instance the Hong Kong data centre. A critical success factor for maturity assessment is rating all instances of a process, not just the best one. If this comprehensive approach is not applied (and typically it is not), then the justification for funding to scale out the maturity will not be supported.

Competency Capabilities

Competency capabilities pertain to skills and competency management. Skills are possessed by people and competencies are possessed by teams. We will use the term "competency capabilities" instead of "people-related capabilities" throughout this article because it is more frequently used. Most IT organizations have well-defined competency requirements for roles, and the better ones explicitly manage skill levels for those competencies. Even the worst-run IT functions recognize the value of IT certifications and define vendor skill-certification requirements as part of the job descriptions for many roles. Improving competency capabilities has a direct impact on the agility and responsiveness of an IT function because it develops the processes to promote and sustain the growth of a learning organization (Senge, 2006). Increased competency also promotes an awareness among IT professionals that the firm is investing in its people and, consequently, that they need to take ownership for their own learning to increase the success of the organization.

The "people capability maturity model" developed by the Software Engineering Institute provides a framework for assessing and improving people/competency capabilities that can be generalized for application in an IT function (Curtis et al., 1995). This model underpins the capability model developed in *The Open Group Architecture Framework* (TOGAF) (The Open Group, 2011) and relates the use of competency capabilities to the process areas where they are applied. Individual knowledge and skills are integrated at a team level to form competencies.

However, a lack of investment in competency leads to poor technology implementation and usage, and decreasing morale. It also furthers the idea that the IT function is out of touch with business needs. This lack of investment acts as a vicious spiral: poor morale causes the best talent to leave and, as turnover increases, so does the knowledge loss, the legacy debt, and the perception that the IT function is a hindrance. In turn, this perception drives the urge to create shadow IT projects, thereby increasing legacy debt and further constraining agility and investment resources to fix these increasing problems.

Sustainable Technology Change

Given that the IT function's *raison d'être* is to manage technology, it is "mission critical" to manage technology change effectively. Sustainable, continuous capability improvement is the key to maintaining the responsiveness of the IT function as the pace of change accelerates. However, due to the high volume of technology changes, the IT function will be unprepared for change without sustainable IT governance that is

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rooted in capability improvement to guide determined and purposeful change.

The critical success factors for sustainable technology capability change are:

1. Successful integration of new technology capabilities with existing technology capabilities and the decommissioning of legacy capabilities that are no longer useful

2. Introduction of new competency capabilities (e.g., expertise in the new technology) as well as new or changed process capabilities to manage the new technology

3. Sufficient critical mass of new competencies to ensure that there are enough people who can both perform the work and teach the skills required to others who will use different instances of the new technology. This critical mass of skill base is necessary to implement operating processes that can scale-out to coincide with the introduction of the new technology capability.

4. Objective assessments of what technologies need to be retired and when they can be decommissioned. This aspect of technology change is essential to reducing compounded operational cost but is often skipped in practice because of the risk associated with unknown interdependencies within legacy environments. Mapping interdependencies in turn requires additional technology and competency capabilities.

The Practice of Enterprise Architecture Is Essential for Sustainable Change

Successful integration of new technology capabilities requires an enterprise-wide architectural perspective. Enterprise IT architecture was first formulated by Zachman (1987), who introduced a disciplined approach to the management of information systems to reduce cost and to enable the success of the firm. Zachman established that a holistic approach to systems architecture was necessary and that a framework for enterprise architecture should explicitly consider the aspects of data, function, network, people, time, and motivation in each of the dimensions of scope, business, system, technology, and detailed representations.

In a mature IT function, this holistic approach is commonly accepted as an enterprise architecture practice (EAP) that consistently guides the choice of new technical capabilities. EAP encourages the use of standards, guides the evaluation of a technology's business relevance, and, if properly developed, encourages business-driven sustainable improvement by enforcing an enterprise architecture as a reference model for all applications and infrastructure.

Codifying the guidelines and principles for an enterprise reference architecture definition is essential for the successful inter-operation of varied technologies. However, as two of the authors discovered at Wachovia Investment Bank, defining a *particular reference architecture* is not a sufficient condition for sustainable technical change. When implementing enterprise reference architectures, such as a service-oriented architecture (SOA), many IT functions make the mistake of assigning less-talented personnel to the role of the advisory architecture teams because the best people are always in use by mission-critical projects. These firms do not deliberately invest in the skills needed for enterprise architecture definition, which creates a self-fulfilling prophesy of poor expectations or a dependency on outside system integrators who supply architectural guidance without the firm's larger interests in mind. To compound matters, centralized architecture teams rarely interact with development or implementation teams other than through the role of an approval hurdle when new technologies are being introduced, or as "judge and jury" when conducting post mortems of project disasters. In effect, these firms have failed to properly integrate technology with competency capabilities and, as a result, technology capabilities fall short of their potential.

Role of Capabilities in Enterprise Architecture

At Wachovia, the authors found that enterprise architecture teams have significantly greater impact when they act as a proactive and helpful guide, engaging with implementation teams to help find a priori solutions to problems instead of being posterior critics of solutions proposed by those teams. We found that this approach increased the velocity of effective use of new technology by a factor of four.

As stated in the previous section, there are reasons most organizations do not take the enterprise architecture teams seriously and why behaviour is not proactive. Proactive help accelerates the diffusion of new technology throughout the firm as well as accelerating the adoption of new technology in any given part of the

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firm. Through the proactive use of capability change agents, change becomes part of the culture, where alignment is expected and adaptation is celebrated and rewarded for its contribution to the firm. These supporting acts of teaching, recognizing, and rewarding are essential to overcome the typical inertia associated with IT change arising from legitimate fears of risk and complexity.

Figure 2 shows a process flow whereby new technology is introduced in an incremental, codified method that both introduces change while managing its proliferation. The enterprise architecture function is perfectly suited to facilitate this process, because its practitioners:

- have an enterprise view of skill gaps and potential pilot opportunities
- can codify the evaluation process so that it is repeatable
- can invest in the required impact and success analysis once rollout begins
- have enterprise-level clout with vendors to orchestrate training

All of these attributes support the technical capability-improvement process in Figure 2, which elaborates the improvement process for IT technology capabilities from Figure 1.

Although this diagram shows the critical success factors for sustainable technology change, most organizations rarely follow it, even if they have defined something similar. The reasons have been alluded to earlier, but are briefly listed below:

- a lack of respect for the enterprise architecture group
- a belief that such a process is too time consuming and too costly
- a "hyped up" belief that the technology itself provides all that is required for success
- a new, untried technology has been deemed "critical" to a project's success. The time pressure to deploy this project is extreme and there is no time to waste on a "cumbersome ivory tower process" to vet the technology.

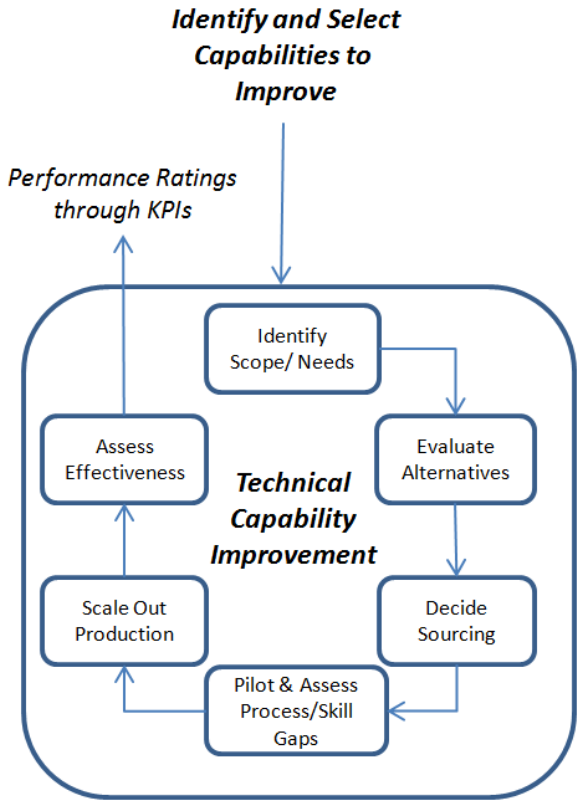

Figure 2. The technology capability improvement process

The technology capability improvement process depicted in Figure 2 enables a sustainable model of change over time, yet it is surprising how infrequently this proven approach is applied in practice due to lack of a capability-driven perspective. The five-step flow includes the initial needs assessment, which helps ground the proposed capability in terms of relevance. The alternative-evaluation stage provides an opportunity to compare various solutions, which is especially important during an innovation wave because many of the initial product offerings that provide the capability may not live up to the market hype. The sourcing-decision stage evaluates the various product vendors' viability, which must be assessed before a long-term investment can be made. Rolling out a new capability is a two-phase activity: the first phase is a pilot, and the second phase is a larger-scaled rollout. The pilot phase localizes the impact until it is better understood and should be done by a small dedicated team. Finally, the assessment of effectiveness and associated ratings of key performance indicators (KPIs) provide feedback to the overall process as well as a judgment on the technology itself.

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Sustainable Process Change

Senior management must sponsor, drive, and *own* process improvement. Management must be held accountable for process performance and should be rewarded for demonstrable improvement, because these improvements are critical to sustainable success and therefore have parity with other executive initiatives. Only *active* executive sponsorship enables disciplined process-performance improvement and generates acceptance for process alignment and adaptability that can spread across the firm. Bossidy and Charan (2002) characterize this type of active sponsorship as a leader's most important responsibility.

Figure 3 elaborates the IT process capability improvement process. In this context, both the capability of a process (i.e., the ability of the process to meet specifications) and its stability (i.e., the consistency/stability of process behaviour over time) are addressed as part of the IT process capability improvement process.

This model builds up to the "improve process" phase in a systematic multi-step approach. The first step, identification of process scope and needs, is critical. This step is often bypassed or done poorly, which has detrimental downstream impact, limiting the benefits of the process-improvement efforts as well as introducing re-work (i.e., waste) along the way. In this first step, the process specifications are captured along with outcome indicators, which set the bar for what is considered success.

Next, the process flow is captured and then indicators and controls are identified and confirmed. At this stage, the additional indicators are typically predictive in nature given that the outcome indicators should have been already identified in the first step, unless there is a need for additional sub-indicators (outcomes). The controls relate to the triggers and interventions that would be required when the process is not performing. Ideally, predictive indicators should be statistically confirmed with the outcome indicators. Then, the Process Management Control System is implemented, which enables systematic monitoring and assessment of process performance along with the appropriate intervention. The Process Management Control System is essential to the "assess/monitor performance phase" because processes and process improvement both heavily rely on the coordination and cooperation among different roles and departments.

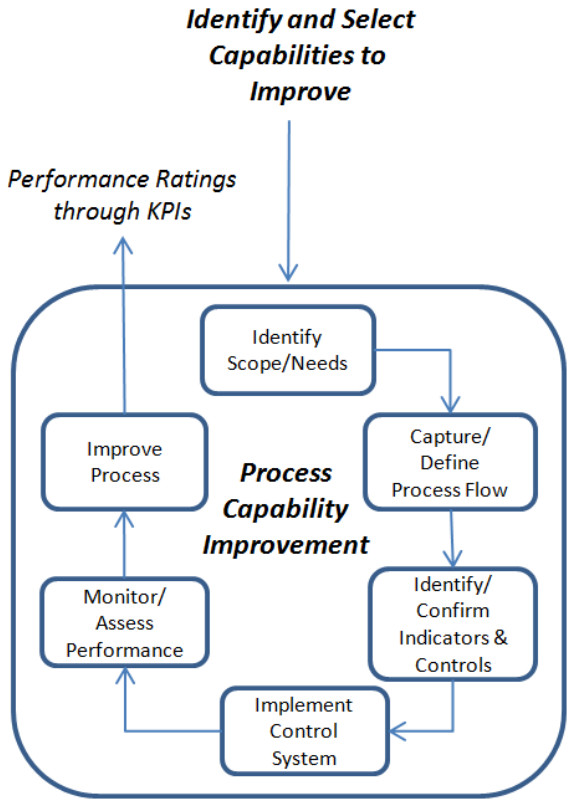

Figure 3. The IT process capability improvement process

The "assess/monitor performance phase" leads to the "improve process" phase. Any process improvement methodology can be used. In Renaud, Narkier, and Bot (2013), we illustrated the define-measure-analyze-improve-control (DMAIC) process from Lean Six Sigma because this particular methodology is central to realizing sustainable breakthrough improvements as opposed to only incremental ones.

As IT processes begin to improve, the IT function will inevitably discover that its existing capabilities are bottlenecks for business processes. These bottlenecks occur because the scope of process improvement is limited to the IT function but IT processes enable larger business processes. Restricting process improvement within the IT function may not necessarily be the best way of resolving these bottlenecks. More effective changes to the business process may avert the need to alter IT capabilities or may require the introduction of new capabilities of a different type. For example, the nightly IT

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operational process of loading a data warehouse may uncover that errors in data are causing the IT process to not complete overnight as required by the business process. A more effective solution than simply speeding up data error correction would be to alter upstream business processes to prevent them from producing transactions that contain data errors in the first place. Technology change may be necessary elsewhere in the IT function or improved processes may be required within the business function.

A key factor in making process changes is related to how the business goals and drivers are impacted by the requisite processes. The appetite for change and investment will be fueled by the degree which current processes are considered an impediment.

Sustainable Competency Change

The goal of an IT competency capability improvement process is proactive learning and its essential aspects are illustrated in Figure 4. The process steps to improve or introduce new competencies enable incremental improvement over time and are distinguished from the other improvement processes by two definition and two assessment stages – one for the requisite competencies needed by the IT function and the other for the competencies needed by the personnel in various IT roles.

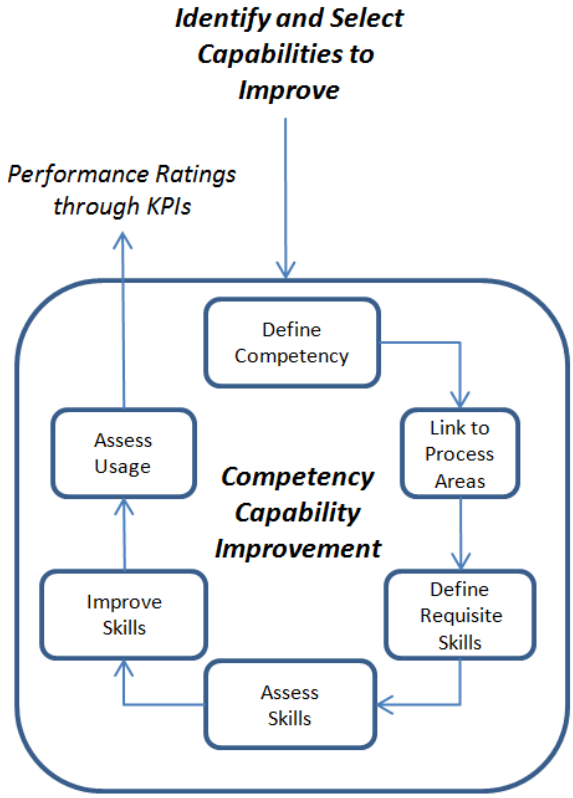

Figure 4. IT competency capability improvement process

Proactive learning

As shown in the "define competency" step of Figure 4, identifying, selecting, and then defining a competency are vital first steps in this process because the outcome of this improvement process is an investment in training and recruitment. Yet, in practice, the skill set of the IT organization is rarely proactively upgraded. Most learning occurs on the job, in a “just-in-time manner” that is driven by a response to previous changes. Although this approach may work for an exploratory process such as evaluating a new technology, it does not scale due to the full workload most IT practitioners have on day-to-day basis. Where active learning exists, the dissemination process established by the human resources function is too general and does not necessarily reflect how the IT function needs to support the firm’s goals. Learning of new capabilities is rarely codified and typically does not have the dedicated resources to move rapidly if needed.

The subsequent step of linking to a process area is the key to understanding the scope and impact that each role is supposed to have within the IT function combined with the requirements for the requisite skill set. By failing to link competencies to process areas, many firms under-invest in IT training. This reluctance to invest is due to the perception that technology changes rapidly. Therefore, investing in training for changing technology needs will not reap sufficient benefits before the training becomes obsolete. This misperception is the result of two kinds of learning that are essential for IT competency improvement:

1. Less-volatile fundamentals of each process role (e.g., design principles, understanding each of the processes in IT, requirements gathering and analysis)

2. Volatile needs relating to specific technologies, such as new programming languages (e.g., Scala) or major revisions of well-known products (e.g., a new Oracle database release)

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Another major concern about IT learning is that older training curricula are not sufficiently reviewed for relevance, or are not revised or retired. A new IT training role must be created to review, update, and purge training content and curricula within the context of role-driven knowledge management and information life-cycle management.

To define requisite competencies, a role-based skills sheet should be produced for each group within the IT function based upon the firm's strategy. The competencies of an individual should then be evaluated against the required skills so that a training plan can be produced and subsequently tracked.

The rest of the flow depicts an improvement phase where the skills are assessed and improved upon, while determining the degree of impact and adoption the skills are having throughout the firm.

Investment by the IT function into becoming a learning organization must balance the needs of both volatile and non-volatile training. Less volatile material should be taught on-demand through computer-aided learning that is supplied by specialty vendors. Formal classroom training should be used for learning areas that require wide socialization due to their "radical" nature (e.g., extreme programming) or novelty. Despite being less volatile, any formal training should be organized via collaboration with institutes for higher education to ensure that that course content remains fresh. The need for formal instruction and active group participation should be means-tested against intent. For instance, interpersonal skills improvement clearly requires an active class with formal instruction, whereas learning the basics of systems architecture could occur via computer-aided instruction supplemented by a "live lab" to answer questions.

More volatile learning areas, which are often very hands-on (e.g., a new language or new product release), are best licensed through the vendors so that they can bear the ongoing cost of updating the learning curriculum. Just-in-time classes can be effective provided that the attendees can be insulated from day-to-day responsibilities and that they meet the prerequisites to learn the class material.

The successful implementation of such a program requires a supporting culture which includes mentorship. The side benefit of such a program is that it relates a promotion path to company goals, which emphasizes a value-based growth-reward system.

Competency improvement is clearly a long-term investment in learning and can only be sustained in an IT function if it is supported by a cultural mindset that can see beyond the usual horizon of yearly objectives. The alternative is the perpetuation of the current problem-ridden status quo of learned helplessness.

Importance of Culture

Sustainable improvement in any capability area will occur only when implemented in a way that also matures the culture of the IT function. Culture is commonly defined as a set of shared values, goals, and principles that guide the behaviours, activities, priorities, and decisions of a group of people working toward a common objective (Bohannan, 2010). Weigers (1996) emphasizes several key points:

1. The improvement of process and product, along with the management of risk, is a key competitive advantage, no matter what changes occur in technology.

2. This advantage enhances the ability of an organization to make a sustainable work environment while remaining competitive with respect to time to market and price.

3. A shared culture is a necessary foundation for progressing through the capability maturity sequence, until the discipline of creating repeatable and measurable development processes can be achieved.

Weigers' observations on the culture of software engineering can be generalized to the entire IT function because promoting sustainable change in the behaviour of the IT function requires deliberate attention to creating a *culture of relevance* throughout the IT function. This culture emphasizes and promotes the purpose of the IT function, which is to enable and facilitate the firm's goals – not impede them. Any cultural change needs continuous reinforcement, particularly within the IT function, which can experience 17–22% yearly turnover in staff (Fidato Partners, 2012). Although turnover varies widely in IT organizations depending upon regional and industry differences, this reported level of turnover matches our experience across many industries. We attribute these turnover rates to ongoing changes in technology and competitive inter-firm demand for qualified personnel.

Thus, a change in culture cannot occur without a deliberate focus on executing a capability improvement plan that is tracked with the understanding that this plan is

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instrumental to the IT function's survival as a relevant entity. Achieving this level of focus on execution requires ownership, accountability, and responsibility across all management levels. A systematic approach to sustaining the culture will assess, align, and measure the results that the culture produces in the day-to-day running of the firm. Although business goals will change frequently, cultural values should not be that volatile. Instead, the key concern is the dilution of the culture due to employee turnover and management inattention.

Organizing for cultural change is a governance activity that transcends reporting hierarchy and extends to wide-ranging subjects, from how the IT supply chain inventory is categorized to how the IT function measures its capabilities and performance. The capability hierarchy presented by the authors in an earlier article in this series (Renaud et al., 2013) provides the taxonomy for categorizing technology capabilities within the IT supply chain. The capability hierarchy also provides a self-describing and rigorous means of defining and categorizing capabilities. For example, it is easy to understand what technology capabilities are categorized under a particular capability simply by seeing which other capabilities it depends on.

Conclusion

Continuous, sustainable change to IT capabilities is required by firms seeking agility in innovation. Lack of sustainable change in IT will result in the failure of the firm.

IT change cannot be performed in isolation because the introduction of the most innovative and impactful technology will fail to deliver its promise without supporting process and competency capabilities. A capability perspective is critical to identify gaps in processes, skills, and technology that impede the firm's goals.

However, capability improvement does not just occur by declaration. Instead, capabilities, which are strongly linked to the discipline of execution, must be well-defined, with inter-relationships and dependencies mapped and underpinned by supporting capabilities.

Proactive improvement by IT executives and change agents requires both a culture shift and alignment with business goals and drivers in order to receive the business unit sponsorship required. Alignment is also necessary so that the IT function's relevance can properly be linked to the firm's innovation needs. The alternative is that IT stagnates, ultimately hurting the firm's ability to innovate.

Recommended Reading

This article completes the authors' six-part series on IT entrepreneurship in the *Technology Innovation Management Review*:

1. Process Ambidexterity for Entrepreneurial Firms (Bot, 2012)

2. Process Ambidexterity for IT Entrepreneurship (Bot & Renaud, 2012)

3. Enabling Process Alignment for IT Entrepreneurship (Renaud & Bot, 2012a)

4. Process Adaptability in the IT Supply Chain (Renaud & Bot, 2012b)

5. Enabling Sustainable Improvement in IT Entrepreneurship (Renaud, Narkier, & Bot, 2013)

6. Using a Capability Perspective to Sustain IT Improvements (Renaud, Narkier, & Bot, 2014: the present article)

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About the Authors

Paul Renaud is Chief Executive of The Lanigan Group, which specializes in customer-driven product strategy and business-aligned IT service delivery. He is an advisor to CEOs, CTOs, and CIOs in the technology community and he is a member of industry advisory boards, including Queen's University's Innovation Council for the School of Computing and Ubiquity's Chairman's Advisory Board prior to its acquisition by Avaya. His previous roles include VP Business Intelligence Development at Cognos, Director of Computing & Networking and the Advanced Computing Research Lab at Bell Northern Research, Director of Nortel's Public Network Switching Capacity program and Chief Architect at SHL Systemhouse. Mr. Renaud is a co-author of several patents and authored *Introduction to Client/Server Systems*, which was published in four languages and widely used as a university textbook. He has a BSc degree in Computer Science and Mathematics from Queens University.

Sheppard Narkier is a business-driven, senior information technology executive who generates business value where investment in enabling technology is an integral part of a company's business strategy. Sheppard's experience spans roles as a senior executive, enterprise architect, systems engineer, and developer. He has been recognized for building strong, diverse, and motivated teams that have delivered measurable business value in diverse IT environments. He has implemented mission-critical systems, reusable assets, and technology roadmaps in premier financial services institutions such as the American Stock Exchange, S&P, and UBS-IB. Sheppard was a co-founder and Chief Scientist of Adaptivity, which was acquired by EMC. Sheppard is responsible guiding EMC's application transformation portfolio strategy. Sheppard has a BA in both Mathematics and Anthropology from Oswego State, NY. He is the co-author on several patents, has written thought-leadership blogs for Network World, Adaptivity, and EMC InFocus, and has ghost-written the book *Next Generation Datacenters in Financial Services: Driving Extreme Efficiency and Effective Cost Savings*.

Sonia Bot is an accomplished operational executive who has experienced a wide range of climates in businesses, from unprecedented extreme highs and lows through to various stages of lifecycle development, transformation, and turnaround. She is an entrepreneurial-minded leader and strategic thinker with extensive experience in technology innovation and global business management. Ms. Bot is the Chief Executive of The BOT Consulting Group Inc., where she partners with executives and entrepreneurs of global technology companies in to assist in building, growing, and transforming ventures and to solve wicked business problems. Ms. Bot is an accomplished industry presenter, author of numerous peer-reviewed articles, and industry executive member of university and business acceleration boards. Her prior work experience includes Research In Motion (BlackBerry), Nortel, Bell-Northern Research, IBM, and TransCanada Pipelines. She holds degrees in Computer Science with Systems Design / Electrical Engineering (BMath) from the University of Waterloo and Biomedical Engineering (MASc) from the University of Toronto, and she is a certified Lean Six Sigma Master Black Belt.

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Keywords: IT function, technology capability, process capability, competency capability, capability improvement, shadow IT, capability maturity model, enterprise architecture, change management, organizational learning, organizational culture

TIM Lecture Series

Insights on Innovation

Ibrahim Gedeon

> *"Never put one person in charge of something that should be part of everyone's job. Whether it's innovation, reliability, or transformation, make sure everyone understands it and takes ownership."*
>
> Ibrahim Gedeon
> CTO, TELUS

The TIM Lecture Series is hosted by the Technology Innovation Management program (TIM; carleton.ca/tim) at Carleton University in Ottawa, Canada. The lectures provide a forum to promote the transfer of knowledge between university research to technology company executives and entrepreneurs as well as research and development personnel. Readers are encouraged to share related insights or provide feedback on the presentation or the TIM Lecture Series, including recommendations of future speakers.

The fourth TIM lecture of 2014 was held at Carleton University on June 19th and was presented by Ibrahim Gedeon, CTO of TELUS (telus.com), who shared his insights on innovation from his experiences in the telecommunications sector, particularly from his recent work at TELUS. Below are selected insights from his lecture:

1. For telecommunications providers, the business is no longer just about running the network – it is about understanding how the network runs how it can do different things for different people.

2. Increasingly, our vision is "people as service providers" in their own right – not in the sense of selling services for monetary exchange, but in the sense of individual entities that both consume and provide services.

3. Each of us has different aspects that form part of our overall identity, including even our phone numbers, banking information, health information, the content we read, etc. Telecoms can add value by providing personalized services that cater to the different aspects of our identities.

4. Providers can no longer try to own everything. Instead, our goal is to nurture a healthy ecosystem where we can be one player. We want to expose what we can control and have others work together, but we do not have to control the ecosystem itself.

5. In my day-to-day role as CTO of TELUS, the only things I really to ask are: how reliable is the network, how happy are the clients, and how fast is everything running? If I focus on these three things, the rest will take care of itself.

6. The most difficult part of my job relates to people: people accepting innovation, rather than the technology itself.

7. In any company, the person who looks at what the customer is doing is the most important person in the company.

8. I never want to lose a single customer, ever. It is always harder to win a new customer than keep an existing customer.

9. There are two ways of communicating: to please yourself or to transmit your message. With the first approach, we just assume that people know what we are talking about, but it takes discipline to make sure they actually do.

10. To test an idea, avoid only telling it to people who are just like you. Double-check your ideas with someone who may not automatically understand how the solution works but will focus solely on its benefits.

TIM Lecture Series – Insights on Innovation

Ibrahim Gedeon

11. The most important thing to remember about innovation is this: if it doesn't work, kill it. The problem is that technologists in particular are not good at killing projects that they care about. What is often required is input from outside of the project team, urging them to let it go. And, remember that carrying on with a project that is floundering stops you from doing something else.

Citation: Gedeon, I. TIM Lecture Series – Insights on Innovation. *Technology Innovation Management Review*, 4(6): 40–41. http://timreview.ca/article/803

Keywords: innovation, telecommunications, service provision, ecosystems, customer focus

This report was written by Chris McPhee.

About the Speaker

Ibrahim Gedeon is CTO of TELUS, where he is responsible for technology strategy, service and network architecture, service delivery, and operational support systems for the company's wire line and wireless divisions, as well as service and network convergence, enterprise applications, and network infrastructure strategies and evolution. Ibrahim began his career in telecommunications engineering and research in 1990 when he joined Bell Northern Research. After moving to Nortel in 1994, he was named Vice President and Director of Data Network Engineering in 1996; Vice President of Internet Brand Management in 1999, and Senior Vice President of Wireless Engineering in 2000. Ibrahim has held numerous leadership roles in the Institute of Electrical and Electronics Engineers (IEEE) and has also received numerous professional awards and various forms of industry recognition, including being named three times to the Global Telecoms Business magazine's "GTB Power 100," a list of the 100 most powerful and influential people in the telecoms industry. Ibrahim also serves on the board of a number of industry associations, including the Alliance for Telecommunications Industry Solutions and Industry Canada's Communications Research Centre. He holds a Bachelor's degree in Electrical Engineering from the American University of Beirut and a Master's degree in Electronics Engineering from Carleton University in Ottawa, Canada. In 2010, he received an Honorary Doctor of Laws degree from the University of British Columbia.

Author Guidelines

These guidelines should assist in the process of translating your expertise into a focused article that adds to the knowledge resources available through the *Technology Innovation Management Review*. Prior to writing an article, we recommend that you contact the Editor to discuss your article topic, the author guidelines, upcoming editorial themes, and the submission process: timreview.ca/contact

Topic

Start by asking yourself:

- Does my research or experience provide any new insights or perspectives?
- Do I often find myself having to explain this topic when I meet people as they are unaware of its relevance?
- 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. Provide a 2-3 paragraph conclusion that summarizes the article's main points and leaves the reader with the most important messages.
7. Include a 75-150 word biography.
8. List the references at the end of the article.
9. If there are any texts that would be of particular interest to readers, include their full title and URL in a "Recommended Reading" section.
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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