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Insights

Welcome to the June 2013 issue of the *Technology Innovation Management Review*. 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.

Contribute

Contribute to the TIM Review in the following ways:

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Editorial: Insights

Chris McPhee, Editor-in-Chief

Welcome to the June 2013 issue of the *Technology Innovation Management Review*. In this issue, our authors present insights about open source business, technology entrepreneurship, intellectual property, process ambidexterity, and risk management.

Michael “Monty” Widenius, the founder and original developer of MySQL and MariaDB, and **Linus Nyman**, a doctoral student at the Hanken School of Economics in Helsinki, Finland, propose a new type of software license, which they call “business source”. A business source license seeks to enable a business model that can both harness the benefits of open source while generating sufficient income for the program’s continued development. The business source license automatically changes terms after a given period: an initial non-open source license with specific usage restrictions that transforms to a fully open source license on a specific future date. In their article, Widenius and Nyman describe the rationale for the new license, offer recommendations for managers, and provide a sample text of a business source license.

Next, a team of authors from universities in Spain, The Netherlands, and Germany, describe their research into the opportunity-objectification process: how technology-based business ideas evolve into real market opportunities. **Ferran Giones**, **Zhao Zhou**, **Francesc Miralles**, and **Bernhard Katzy** conducted a field study of six technology-based entrepreneurs that are pursuing complex and uncertain technology opportunities in Spain and China. Their key results highlight the influence of social interactions in accelerating the objectification of an opportunity; these interactions play an important role in transforming the entrepreneur's and stakeholders' perceptions of the initial business idea. The findings have implications for academics, policy makers, and entrepreneurs.

Derek Smith, founder and principal of Magneto Innovation Management, argues that entrepreneurs can accelerate the early growth of their companies by acquiring and leveraging old intellectual property and technology assets. Through a case study of Piranha Games' acquisition of technology assets and intellectu-

al property rights relating to the MechWarrior game, Smith explains how this often-overlooked strategy can short-cut the growth of a customer base, reduce development effort, and shorten the time to market. The article includes lessons learned from the MechWarrior case, recommendations for entrepreneurs who are considering this strategy, and a due-diligence checklist for activities that should be undertaken when acquiring intellectual property assets.

Paul Renaud, **Sheppard Narkier**, and **Sonia Bot** provide a framework for sustaining improvement in a firm's IT capabilities. They apply the principles of process ambidexterity to identify the key elements required for sustainable change within the capabilities that comprise the IT function of the firm. Their framework delineates the capability domains that will need to evolve, while providing a means to introduce changes, ensure implementation, and measure success. This article is designed to help senior IT executives that seek to systematically transform the IT function and enable IT entrepreneurship within their firms.

Alan Mcnaughtan, a Product Manager at Bell Canada, provides an overview of the skills of product managers and their roles in early-stage businesses through his answer to the question: “Do technology startups need product managers?” Mcnaughtan argues that startups that bring in a strong product-management leader early in their lifecycle will have a high probability of success. Through a brief case study of Wesabe, a failed personal-finance website, Mcnaughtan demonstrates that insufficient attention to product management – and the resulting lack of understanding of customer needs – can be fatal to a startup.

This issue also includes a report on a recent TIM Lecture by **Paul Card**, Director of R&D at Securix, who drew upon his experience as a programmer, entrepreneur, and professor to reflect upon the importance of leveraging uncertainty and managing risk when developing a technology platform in a small company. The event was held at Carleton University in Ottawa, Canada, on May 1st, 2013.

Editorial: Insights

Chris McPhee

In July and August, we will be covering the theme of Cybersecurity, and our guest editor will be **Tony Bailetti**, Director of Carleton University's Technology Innovation Management (TIM; carleton.ca/tim) program. If you have expertise in cybersecurity and wish to contribute an article, please contact us.

Finally, you may recall that several articles in our April issue on Local Open Innovation (timreview.ca/issue/2013/march) focused on the Seeking Solutions approach to solving challenging business problems, which arose from a series of Quebec Seeks Solutions events. The 3rd Quebec Seeks Solutions Conference will be held in Quebec, Canada on 5-6 November 2013, and the conference theme is: "Methods and Policies Creating a Local Ecosystem for Technology Transfer, Collaboration, and Local Innovation". The TIM Review is selecting submissions for the pre-event, and the best papers will be published in a future issue of the TIM Review. Abstracts are due June 28, 2013. Please consider submitting a paper to this conference and sharing this call for papers with your contacts: tinyurl.com/nqwdzd3

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 Editors

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

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Introducing “Business Source”: The Future of Corporate Open Source Licensing?

Michael “Monty” Widenius and Linus Nyman

“*The license is the constitution for the community.*”

Eben Moglen
Director-Counsel and Chairman
Software Freedom Law Center

The benefits of the open source development model have been proven by the test of time; however, making this development model economically feasible can be challenging. In this article, Monty Widenius puts forth a suggestion for a new type of license, which is the result of the lessons learned from decades of work on open source, both as programmer and entrepreneur. The result, “business source”, is a license that seeks to enable a business model that can both harness the benefits of open source while generating sufficient income for the program’s continued development. The business source license automatically changes terms after a given period: an initial non-open source license with specific usage restrictions that transforms to a fully open source license on a specific future date.

In this article, we contribute a proposal for a novel license, a set of recommendations for managers, and a sample text of a business source license. This work will be of relevance to four main groups: i) those developing or managing a closed source program but who are interested in the benefits open source offers; ii) those managing open core programs; iii) projects in development; and iv) investors interested in funding open source projects.

Introduction

Open source is more than free software: it is a powerful tool that can be leveraged by companies to appropriate value (e.g., Carbone, 2007; timreview.ca/article/93). Open source software is increasingly commercially developed and supported (Wheeler, 2009; timreview.ca/article/229); in fact, a majority of open source development today is carried out by companies (Weiss, 2011; timreview.ca/article/436). However, choosing to “go open source” offers both advantages and challenges. Although proprietary software may, in the long run, be hard pressed to compete successfully in the same market with a complementary open source product (Lindman and Rajala, 2012; timreview.ca/article/510), maintaining a quality open source product requires contributors that are both skillful and knowledgeable. Establishing a strong community is considered vital to success (Byron, 2009;

timreview.ca/article/258); however, it is unrealistic to expect the sporadic contributor to achieve complete knowledge of an entire codebase. To train up and maintain in-house programmers, however, requires a project to generate sufficient income to meet these demands.

In days past, there was something of an unspoken agreement that a company that used a lot of open source programs would also purchase services or assign developers to contribute to the program. This, in turn, supported the program’s further development. However, over time, it became more and more common for companies to use open source without contributing to its development (Asay, 2013; timreview.ca/article/650). Whether due to a greater familiarity with open source as a concept, market instabilities and quarterly profit demands, or any other reasons, this approach is short-sighted in that it does nothing to ensure

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that the program in question can continue to evolve and improve over time. Continued success requires harnessing the power of open source while at the same time generating sufficient income to ensure the program’s development and well-being. Finding the right business model and license are important preconditions for success.

Any business model that seeks to leverage the benefits of open source should maintain – to as great an extent as possible – the key elements of the open source development model. Indeed, it is in light of these benefits that open source business models must be examined. Therefore, we begin this article with a reminder of the central benefits of an open source development model. After this, we briefly discuss different types of open source projects, the more common business models, and the impact of licensing decisions. Finally, we introduce business source, a new type of license aimed at securing the benefits of open source while still enabling the generation of necessary income to fund its continued full-time development.

The Benefits of Open Source

From a developer's point of view, going open source is beneficial in that it helps spread the word about a product because it is easy to try out. A further benefit is community contributions, which can lower development costs; provide innovative solutions (sometimes even offering solutions the developing company would not have thought of); and may result in development in areas that are important to contributors but that the company might not have prioritized or realized the importance of including. Also, open source projects generally get more feedback and better bug reports than closed source projects, and have a faster average time from discovery to solution (e.g., see Schindler's [2007; tinyurl.com/l35oetx] comparison), thereby improving quality. The benefits of open source result in a more useful product, more market recognition, feedback, leads, partners, and sales opportunities as well as a strong trademark.

From a user’s point of view, open source offers much in the way of sustainability. Given that users have the right to fork the code at any time, vendor lock-in, planned obsolescence, and similar initiatives are all but impossible to implement (Nyman and Lindman, 2013; timreview.ca/article/644). If a supplier removes important features, one can add them back in oneself; if the supplier stops supporting the version of the product being

used, or abandons the program altogether, it is safe to assume that someone will fork the code and continue its maintenance and development. (For more on open source sustainability see the January 2013 issue of the *Technology Innovation Management Review*: timreview.ca/issue/2013/january) Furthermore, there is little risk of hidden trapdoors or unexpected features (e.g. Amazon's ability to delete customers' Kindle books (tinyurl.com/9eewrw5) and Microsoft's ability to have Windows collect and send usage information) because one can examine the product’s code. Vendors can generally be considered trustworthy because they depend on trust to survive.

From a developer's point of view, using open source software (as a customer) is beneficial in that it is easy to get access to, examine, and use open source code. A developer also has complete freedom to examine and change any part of the code to satisfy business demands, fix bugs, or port to other systems, either themselves or by hiring someone else to do it. Finally, open source offers the freedom to use (read, build, and change) the code and redistribute it in an open source environment.

Types of Open Source Projects and Business Models, and the Impact of Licensing

It is useful to distinguish between different kinds of open source projects given that they can have different goals, requirements, and possibilities regarding licensing as well as profitability. West and O’Mahoney (2008; tinyurl.com/5zl4uc) distinguish between *sponsored* (i.e., corporate) and *autonomous* (i.e., community-developed) projects. In sponsored projects, one or more corporate entities control the project and employ most of the developers (MySQL was such a project); in community-developed projects, governance and control are shared widely among the community. Some community-developed projects have a non-profit foundation created to support the project; however, these foundations have little authority over their members (O’Mahoney, 2005; tinyurl.com/l5xzbva).

Although there is much interesting discussion and debate around business models as well as their content, focus, and definition, for the purpose of this article we will define a business model simply as the way in which a company delivers value to a set of customers at a profit (Johnson, 2010; tinyurl.com/m9uf6xe). The benefits, or value, of open source described earlier are universal to all open source projects; there are, however, differ-

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Michael “Monty” Widenius and Linus Nyman

ences in approach regarding the means of achieving profitability. Among the most common approaches are *the services model*, *open core*, and *dual licensing*. The services model is one in which the product is given away for free and income is generated by offering support, services, training, etc. around the product. In open core, part of the content (the “core”) is open source, with additional closed source features provided for a fee. Dual licensing means offering a program under two separate licenses, commonly one version under a viral, GPL-style license and another under a commercial, closed source license allowing for proprietary use. Traditionally, the source code for both versions is identical, except for changes in the copyright. (For more information on business models and open source, see Bailetti [2009; timreview.ca/article/226]; Daffara [2009; timreview.ca/article/277]; and Shanker [2012; timreview.ca/article/534]. For an introduction to business models that summarizes popular business model frameworks and proposes a modified framework for technology entrepreneurship, see Muegge [2012; timreview.ca/article/545].)

Finally, it is important to include a brief mention of the importance of licensing, which is a significant factor in open source adoption decisions (Daffara, 2011; timreview.ca/article/416). Finding a license that meets the needs of both corporations as well as the open source community is crucial to the continued well-being of open source software development: being too restrictive will harm community growth, while being too permissive will harm business growth.

Introducing: Business Source

Here, we introduce business source: a new type of license that seeks to address the previously discussed challenges of licensing as well as profitability by using two different licenses with a time delay. The source code is made visible and editable to all from the start; however, for a set amount of time, a pre-defined segment of users have to pay to be allowed to use it. After this initial time period, the license automatically changes to an open source license. To clarify the concept, let us break it down into two phases, examining each individually.

Phase 1: Source Code Available

The software begins under a license that makes the code visible to all. The license gives the user the right to modify and redistribute the code. However, it is not an open source license: the license sets specific require-

ments for who is allowed to use the program free of charge and who must pay for it. In other words, for the vast majority of users, it will be indistinguishable from an open source program, while a small minority of users will have to pay for it for a limited time. The license used in phase 1 is valid for a set amount of time, and the specific date when the license changes is stamped directly into the source code.

The goal of business source is to facilitate the generation of income without alienating the open source community. Trust is generated through the knowledge that it is only a matter of time before the code is automatically re-licensed under an open source license. Another benefit with business source is that most of the benefits that users and developers expect from open source – and which were described earlier in this article – are open to them: there is no vendor locking, they are in control of the source code, they have the right to free redistribution, etc.

Business source raises three main implementation questions: what timeframe should the developers choose?, what segment should pay for the program?, and how much should the developers charge? These are questions that the developer needs to answer based on their knowledge of their specific industry; however, we will discuss them briefly to offer some guidance on the matter, based on Monty Widenius’ experiences with open source in general and the database industry in particular.

What timeframe should developers choose?

With business source, the balance that must be struck is one of being reasonable to the company on one hand and to the customers and community on the other hand. From the company's point of view, the timeframe needs to be long enough to make money on the existing program while developing improvements. From the customer's and community's point of view, the issue is one of risk management: if the company begins to behave unreasonably, how long will they have to pay for licenses for original code (that they are not using as such anymore)?

A license duration of just one year would prompt many users to just decide to wait for the open version, whereas any duration over five years would, for all intents and purposes, make the program open core. Three years seems a good balance: people will not want to wait too long to be free of a vendor that misbehaves (such as one that stops developing their product), but it is still a

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reasonable timeframe for a developer to know that the program will soon become open source, regardless of any potential unfavourable actions of the company. As noted, this is a suggestion based on the database industry; the length can be decided individually for each project depending on industry (and investor) criteria.

What segment should have to pay?

Given that this article seeks merely to outline the business source approach on a conceptual level, it is impossible to define “who” should have to pay; instead, we will speak to “how many”. Again, there is a balance to be struck between generating enough community interest and trust versus generating enough income. A ratio that worked well for MySQL was approximately one per thousand users paying for the software. In general, having between one per one-hundred to one per one-thousand users pay should be a good range for any product. It is important not to have too many people that have to pay because one wants to ensure that the product gets maximum spread in order to reach all the people that are prepared to pay. Generally, it is a good thing to arrange it so that those that cannot afford to pay or would not be willing to pay do not have to pay! The criteria for defining which segment to charge for the product will depend on the software and industry, but some examples of metrics that could be used are customers who use the product in the cloud or customers with more than X workers in either the entire company or in some specific department.

How much should developers charge?

The price should be low enough to both encourage people to switch from closed source and also to not fork the product. Being somewhere between one tenth to one third of the price of closed source competitors should be reasonable to all. The entrepreneur needs to ensure a sufficient income for both the staff and the entrepreneur to be able to work full-time on the product without having to do consulting or training on the side. Payment should be made easy (e.g., by offering several payment methods, such as PayPal, credit cards, bank transfers, or cheques. Among the ways MySQL initially grew was by accepting cheques and handling credit cards on the website).

Rather than attempting to increase the percentage of paying customers or maximize the money generated from a customer that has already bought a license, we recommend concentrating on increasing the total customer base. (MySQL’s attempts to increase the percent-

age of paying customers were only marginally successful; growth came primarily from increasing total customer volume.) In practice, this means that one license should cover one copy of the product, including all future versions. (However, these guidelines can and should be adapted to fit the developers needs.) The user should have rights to make any changes to the copy they are licensing. Furthermore, the license should also be transferable. Having such a broad license will both discourage people from forking the product and increase its adoption.

It is important to find a proper balance between the time limit and the license price to avoid a situation where a large-enough group decides it easier to fork and wait for the license to change than to pay for the licenses. One should strive to be the leader, with a community that assists in the development of one’s product. To achieve this, the license must seem reasonable. Offer something better than the alternative and companies will be more willing to aid in the development of the software.

Phase 2: Open Source

In phase 2, the license automatically changes to an open source license on a pre-defined date, making the code available to all, free of charge. In practice, each file is stamped with a statement of when – on which specific date – the license automatically changes to an open source license. A practical question here is what license to choose. If one wants to make the code freely usable by all, BSD version 2 (which is compatible with the GPL) or Apache are the easiest, though GPL is also an option. (The pros and cons of license choice is a topic for another article; it is a question of how much control one will have over possible forks.)

Decisions about contributor licensing are also up to the company implementing business source. One option, preferred by the Free Software Foundation (fsf.org), is to first receive the code and then license it back to the contributor; however, some consider this a bit difficult to explain. Another option is to accept contributions under either the BSD version 2 or a shared copyright. (For more on license selection and business models, see Daffara [2011; timreview.ca/article/416]; for an open access journal on issues related to open source licensing, see the *International Free and Open Source Software Law Review* [ifosslr.org]; and for a list of open source licenses, see the Open Source Initiative [opensource.org/licenses].)

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Michael “Monty” Widenius and Linus Nyman

Managerial Prescriptions: Who Should Consider Business Source?

Business source is neither designed nor suggested to be the correct license for all projects. A requirement common to all projects considering business source is that, given the time-based license change, the program must continue to evolve to ensure that there are new releases with new end-dates for the automatic license change. Further advice and discussion regarding when business source should be considered is categorized by type of project: closed source, open source, and projects that are still in development. We conclude with a brief discussion for investors.

Closed source projects

Business source is primarily intended for closed source projects and as a better alternative for open core projects (see below for details on open core). In short, business source is ideal for all those closed source projects interested in the idea of contributing open source code, opening their product up to the development potential, and other benefits (covered earlier in this article) that open source offers, while at the same time enabling sufficient income to continue development and growth. Specifically, business source is ideal for:

1. Projects that are considering going open source, or projects that are interested in the benefits of open source, but are concerned with its lessened potential for income.
2. Projects that have already decided to make the switch to open source but have not yet implemented it. Business source is particularly well-suited to such a scenario, because the project can try a move to business source first and, if it is not satisfactory, take the further step to make the project open source later.

Open source projects

To be able to implement business source, a project must own the code being licensed, must be able (and allowed) to handle the generation of income, and must allow the use of the phase 1 license that is only partially compliant with the Open Source Definition (OSD; opensource.org/osd). In practice, it is the so-called sponsored projects (i.e., corporate projects) for which business source would be possible. To handle the practicalities of an income, a community-developed project would need a company, turning it (for all intents and purposes) into a sponsored project; and, a community-

developed project governed by a foundation to guard the openness of the code would not allow the use of the first (only partially OSD compliant) phase of the business source license.

Of the main open source business models in use, business source is mainly relevant to open core projects. We urge all those with an open core project to examine the possibility of switching to business source. Such a move would maintain the potential for income, while improving community image and, thereby, increasing the size of the project and the number of contributions. Programs using a services model are likely to find that community and licensing concerns may make business source difficult or impossible to implement. (It can, however, be considered if additional income is essential for project survival; this is a situation the community may well accept as a reason for a switch). The specific set of requirements under which dual licensing works best (e.g., embedded programs) do not always lend themselves to business source if the dual licensing generates a sufficient income. In summary:

1. Business source can be considered for sponsored projects, but will not be feasible for community-developed projects.
2. Open core projects should consider business source.
3. For at least the vast majority of projects focused on services or dual-licensing business models, business source will not be ideal.

Projects in development

Any project that is still in development should consider business source because it will be easier to gain funding and achieve growth with a business source license than with an open source license. (However, license choice naturally depends on the type of project and its goals: a company that aims to remain small can do well with a services approach; a company that seeks strong growth should consider business source.)

Investors

If you are an investor and come across an interesting project (whether open or closed source), consider suggesting business source. As discussed, such a move can offer benefits to both open and closed source programs. (The first author, Monty Widenius, has suggested business source to startups that have approached the investment company Open Ocean Capital

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[openoceancapital.com] with an interesting idea, but that would not generate sufficient income as an open source project. The suggestion has been well received, and development projects that will implement business source are underway.)

Conclusions

Being too restrictive in one’s licensing will harm community growth, while being too permissive will harm business growth. The challenge with open source business models is finding one that simultaneously harnesses the power of open source as a development tool and enables a revenue stream that makes continuing product development possible.

Business source, based on Monty Widenius’ decades of experience with open source entrepreneurship and licensing, addresses this challenge by implementing a time-based, automatic license change. Initially, the code is made available for everyone to view, but a segment of users must pay to use the product. After a set number of years, the license automatically changes to an open source license, freeing the code for all to use freely. Business source seeks to allow for the best of both worlds: maximizing contributor potential through guaranteeing the openness and freedom of the code (an important concern to would-be contributors), while making it possible to generate income.

The license can be tuned and tweaked to target any segment of one’s choosing for the generation of income, while being free to everyone else. As long as the software continues to evolve and delivers value to customers, the developers will maintain a steady income, while (with a delay of a few years) new and improved open source software will continue to be generated.

Monty Widenius has presented the business source idea at conferences and universities in several countries and continents. It has consistently been well received by lawyers, academics, open source practitioners, and entrepreneurs alike.

About the Authors

Michael “Monty” Widenius is the founder and original developer of MySQL and MariaDB. He has been an entrepreneur since 1979 and founded MySQL Ab, Monty Program Ab, SkySQL, the MariaDB Foundation, and Open Ocean capital.

Linus Nyman is a doctoral student at the Hanken School of Economics in Helsinki, Finland. The topic of his PhD is code forking in open source software, and he lectures on corporate strategy and open source software. Other areas of interest include freemium and microtransaction business models in gaming. Linus has a Master’s degree in Economics from the Hanken School of Economics. Regarding this article, he would like to note that business source is Monty’s idea; Linus merely got involved to help put the idea into article form.

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Introducing “Business Source”: The Future of Corporate Open Source Licensing?

Michael “Monty” Widenius and Linus Nyman

Appendix: An Example of a Business Source License

The following is an example of a business source license for a fictional NoSQL product. It should be altered to fit the users’ specific requirements. This example was drafted by Monty Widenius based on his considerable experience with dual licensing, and it has been vetted by a lawyer with expertise in software licensing.

XYZ Business Source License

Copyright © 2013, XYZ Corporation

This license (“License”) grants rights in specified software code (the “Code”) under a business-source-style license that applies one set of terms and conditions (the “Pre-Change Terms”) to the Code and all modified Code before a specified date (the “Change Date”), and another set of terms and conditions (the “Post-Change Terms”) on and after the Change Date. The Change Date for this license is 01 January 2015.

More about this License can be found at http://company-name/Business_source.

A. Pre-Change Terms: License, before 01 January 2015:

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Introducing “Business Source”: The Future of Corporate Open Source Licensing?

Michael “Monty” Widenius and Linus Nyman

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From Ideas to Opportunities: Exploring the Construction of Technology-Based Entrepreneurial Opportunities

Ferran Giones, Zhao Zhou, Francesc Miralles, and Bernhard Katzy

“It's not the size of the dog in the fight,
it's the size of the fight in the dog.”

Attributed to Mark Twain,
Author and humorist

The transformation of business ideas into market opportunities is at the core of entrepreneurship. Nevertheless, the complexity of such a transformative process is seen to change depending on the variables influencing the opportunity-entrepreneur nexus. Although technology-entrepreneurship is regarded as a force of change and dynamism in socio-economic growth, it also depends upon an intricate process of opportunity development. The interest in understanding better how technology-based entrepreneurs simultaneously cope with technological uncertainty while trying to gain stakeholder support and access to resources, highlights a relevant research gap. The research described in this article uses the constructivist view to deepen our understanding of the technology-based entrepreneur's conceptualization of the opportunity as a process of social construction. Our results show how initial consensus-building efforts and iteration with knowledgeable peers are an essential part of the emergence of the opportunity, changing both entrepreneur's and stakeholders' perceptions of the early business idea. Consequently, our results provide evidence in support of policy programs and measures that favour social-construction support mechanisms to foster technology-based entrepreneurship.

Introduction

Establishing a resilient foundation for future economic and social growth has been a long-term goal of governments around the world. Policy makers have prioritized the initiatives that could provide further economic growth and dynamism. In this context, the promotion of technology-based entrepreneurship has often been the most sought-after outcome of such policies and their related programs. However, the results of such efforts have not always rendered the expected returns (Lerner, 2010; tinyurl.com/k4t78l7), either due to design or implementation issues. Further attention is required to understand the challenges related to technology-based entrepreneurship (S. A. Shane, 2009; tinyurl.com/lkejdct).

The operating structure of most policy-promotion programs often assumes that resource limitations are the

main constraint on the future exploitation success of entrepreneurial opportunities (Lerner, 2010; tinyurl.com/k4t78l7). Following a perspective in line with a *discovery view* of opportunities (Alvarez and Barney, 2007; tinyurl.com/kcwsn3a), policy-promotion programs might expect entrepreneurs to act upon objective opportunities, identifying and organizing the needed resources to exploit such opportunities. Nevertheless, the design of such initiatives is currently under question (S. A. Shane, 2009; tinyurl.com/lkejdct). Although many perceive these initiatives as likely to satisfy the resource and input needs of low-profile entrepreneurs, the initiatives struggle to efficiently promote technology-based entrepreneurship. Overall, this situation results in poor economic returns for the initiatives and thus low economic returns and social impact for the policy maker (S. A. Shane, 2009; tinyurl.com/lkejdct), putting under stress the initial assumptions of the program design.

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Prior research on what other factors and processes could influence technology-based entrepreneurship has put the focus on the interactions between the entrepreneur, the technology, and the environment. Scholars have described technology contexts as “high-velocity” environments (Eisenhardt, 1989; tinyurl.com/nxcbzr5) that are inherently dynamic (Clarysse et al., 2011; tinyurl.com/mjxlcxm). In this context of high uncertainty, successful technology-based ventures are seen to heavily depend on the outcomes of actions by entrepreneurs (McMullen and Shepherd, 2006; tinyurl.com/ktjspta) and their ability to not only recombine resources but also tolerate a higher degree of uncertainty (see McMullen and Shepherd, 2006; tinyurl.com/ktjspta) or, as other authors have suggested, accept the unknowns and the unexpected as part of the future (Sarasvathy, 2001; tinyurl.com/cmjpxg).

Consistent with this view, an emergent stream of literature proposes to further explore the preliminary stages of opportunity enactment, aiming to gain a better understanding on how early actions taken by the entrepreneur might favour the construction or creation of opportunities (Alvarez and Barney, 2007; tinyurl.com/kcwsn3a; Klein, 2008; tinyurl.com/kpaf8vj). Thus, instead of focusing on the actions that occur once an objective opportunity has been identified, we focus on actions by entrepreneurs to advance from subjective business ideas into an objectified opportunity, following what would be described as an opportunity-construction process (Wood and McKinley, 2010; tinyurl.com/k8xysv8).

This research uses an inductive field study with six technology-based entrepreneurship cases to study the opportunity-objectification process, which can be observed as technology-based business ideas evolve into objective market opportunities (S. Shane, 2012; tinyurl.com/aznwf4n). The findings highlight the influence of initial social interactions in accelerating the much-needed objectification of the opportunity, transforming the entrepreneur's and stakeholders' perceptions of the initial business idea. The results provide support for fine-grained, customized policy initiatives to foster the development of technology-based entrepreneurship.

Literature Review

In public and private institutions, an increasing awareness of the influence of entrepreneurial dynamism on economic growth (van Stel et al., 2005; tinyurl.com/kg68hvu) has been reflected in the widespread adoption of policies to promote entrepreneurial ventures (Gilbert

et al., 2004; tinyurl.com/klrrrk). Nevertheless, scholars have identified that such policies mostly focus on providing basic resources to entrepreneurs at a subsidized price (Lerner, 2010; tinyurl.com/k4t78l7; S. A. Shane, 2009; tinyurl.com/lkejdt). Such standardization has generated mixed results, and scholars argue that the impact of such programs on high-growth and high-potential technology-based entrepreneurship has been rather limited (S. A. Shane, 2009; tinyurl.com/lkejdt). Although low-profile ventures have been attracted and created as a result of standardized promotion policies, the excessive focus on making the entrepreneurship inputs less costly and easier to access (Lerner, 2010; tinyurl.com/k4t78l7) has actually excluded projects with high levels of risk and uncertainty.

The institutionalized view of how entrepreneurship works (Honig and Karlsson, 2004; tinyurl.com/mfew3cu) favours the design of promotion policies that assume the entrepreneur's ability to identify opportunities. Thus, it is arguable that support should be focused in post-opportunity stages to facilitate resource appropriation, for example by supplying office space, R&D grants, or legal advice at reduced prices. The institutionalized view is rooted in the assumptions described in the discovery view of opportunities (Alvarez and Barney, 2007; tinyurl.com/kcwsn3a; S. Shane and Venkataraman, 2000; tinyurl.com/ljc2z31). The discovery view perceives entrepreneurship as a process of uncovering objective opportunities visible to those that have the prior knowledge and resources to “discover” them (S. A. Shane, 2001; tinyurl.com/n8zv5oj).

The discovery view of opportunities describes entrepreneurial processes where entrepreneurs are able to predict – with some accuracy – future outcomes. In this sense, the entrepreneur's ability to gather information and plan their actions accordingly is seen as a success factors for venture development (Delmar and S. A. Shane, 2003; tinyurl.com/lgs634z; S. A. Shane and Delmar, 2004; tinyurl.com/n4wmjj9). In other words, the entrepreneur's capacity to understand what resources and actions are needed to produce the desired effects helps to explain some of the differences between successful and non-successful entrepreneurs.

As a result, it is not uncommon to see public agencies and institutions with a mission to promote entrepreneurship, endorsing the elaboration of a formal business plan (Karlsson and Honig, 2007; tinyurl.com/msmxvj6). However, researchers have observed that, in some cases, entrepreneurs rarely use or even review their

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business plans after they have submitted them (Bygrave et al., 2008; tinyurl.com/mtamr4e). Apparently, these entrepreneurs feel that their business plan has little functional value beyond its role in fulfilling a formal requirement (Kirsch et al., 2009; tinyurl.com/msaousz).

Opportunity objectification in technology-based entrepreneurship

Describing the actions of technology-based entrepreneurs is difficult using the discovery view of opportunities because the technology context challenges the understanding of entrepreneurship as a process that has “plan/design” and “action” as separate and sequential activities (Baker et al., 2003; tinyurl.com/mj55kcd). The a priori technology-related uncertainty and the often unclear or inexistent market (Teece, 2010; tinyurl.com/oduv9wl) make it cumbersome for technology-based entrepreneurs to advance from their early subjective idea into an objectified opportunity.

Subjective business ideas belong to the individual judgment of a situation, based on prior knowledge and individual motivations, usually emerging in a context of doubt and uncertainty (Shepherd et al., 2007; tinyurl.com/jvwrtvn). Subjective business ideas may gain objectivity and realism: as they are described and acknowledged by third-persons, they may evolve into objective business opportunities, ready to be tested in the market (S. Shane, 2012; tinyurl.com/aznwf4n).

In contrast with environments that are well described using the discovery view, technology-based entrepreneurship is characterized by uncertainty (see McMullen and Shepherd, 2006; tinyurl.com/ktjspta), not only in the exploitation paths of a given technology (Gruber et al., 2008; tinyurl.com/nry3zox) but also in the early steps of conceptualizing the technological opportunity. At this early stage, potential technology-based ideas remain untapped as the entrepreneur struggles to gain a minimum social validation (Shepherd et al., 2007; tinyurl.com/jvwrtvn) that would promote the subjective idea into an objective opportunity.

The perceived positive value of repeated interactions within a relevant context (including interactions with the potential market, stakeholders, peers, etc.) has favoured the emergence of alternative theoretical perspectives, including effectuation, bricolage, and creation theory (Sarvasathy, 2001; tinyurl.com/cmjpnxg; Baker and Nelson, 2005; tinyurl.com/c6svx2e; Alvarez and Barney, 2007; tinyurl.com/kcwsn3a). Overall, these perspectives aim to explain how, regardless of the entrepreneur’s initial stock of resources, learning and

decision-making capabilities can be success factors for constructing entrepreneurial ventures and new markets (Jones et al., 2011; tinyurl.com/knpwrje; Dew et al., 2010; tinyurl.com/kmmohh6).

Constructivist view of entrepreneurship

In contrast with causal decision-logic perspectives embedded in the discovery view, the approaches described in the previous section draw support from evolutionary theories and embrace a constructivist view of entrepreneurial opportunity development (Wood and McKinley, 2010; tinyurl.com/k8xysv8). This alternative theoretical perspective proposes to complete our current understanding of entrepreneurs’ actions in the early stages of opportunity development, by observing the motivations and effects of the social-interaction processes of entrepreneurs. Hence, the attention now shifts to how an entrepreneur’s actions introduce changes in the idea conceptualization and, at the same time, modify the potential venture stakeholders’ assessment of its validity as an objective opportunity.

Despite the emergence of alternative views of the entrepreneurship process in highly uncertain contexts (Fisher, 2012; tinyurl.com/c8yb7rd), little is known about the organization of activities and processes that build the initial opportunity conceptualization in technology-based-ventures. In particular, this research aims to explore and gain a better understanding of the mechanisms used by technology-based entrepreneurs to overcome the challenges of opportunity conceptualization as they evolve their initial business idea into an objective opportunity.

Method and Data

Consistent with our exploratory objective, we drew upon an inductive multiple-case field study design (Yin, 2003; tinyurl.com/7ywkcpy). Multiple-case studies offer support for contrasted evaluation of the initial findings, adding evidence to otherwise singular results (Eisenhardt and Graebner, 2007; tinyurl.com/ckek69c) produced with single-case research.

In addition, case-study data, rich in contextual elements, provide a lively reflection of the motivations and actions performed by entrepreneurs. This approach offers an opportunity to explore questions that have not yet been addressed in the existent literature (Siggelkow, 2007; tinyurl.com/lxx9f4f). The interpretative nature of the method fits well with the intention of capturing the entrepreneur’s perceptions of the stakeholders’ participation in the social construction of the opportunity.

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Previous research linking social context and entrepreneurial opportunities have followed quantitative approaches either using panel or survey data (Dimov, 2007; tinyurl.com/lweyd78; Newbert and Tornikoski, 2011; tinyurl.com/lpgn4hm) and have not been able to uncover the actual motivations and contextual influences of entrepreneurs' actions. This research is designed to provide additional insights that benefit from a rich contextualization of entrepreneurship theories, as described by Zahra (2007; tinyurl.com/kwqamf3) and Welter (2011; tinyurl.com/m584brj), extending the constructivist perspective contributions in the entrepreneurship field (Wood and McKinley, 2010; tinyurl.com/k8xysv8).

Sample

The selected cases depict the opportunity-conceptualization process of six technology-based entrepreneurs that are pursuing complex and uncertain technology opportunities. Three of the cases were part of a Chinese technology-entrepreneurship program, and the other three cases were part of a Spanish program (Table 1). The case selection introduces significant cultural and environmental differences to explore the phenomena and the contextual effects (Rousseau and Fried, 2001; tinyurl.com/m9haomo) at a global scale, with the intention of capturing the sources of variability of the phenomenon beyond a singular geographic location.

As much as possible, we selected ventures with similar opportunities. All of the cases were in high-technology fields: wireless telecommunications, electronics, and software. We also took into account potential differences in venture development to mitigate perceptual differences due to self-reporting biases. For example, none of the entrepreneurs interviewed had started their venture more than three years prior to the start of the study.

In addition, the entrepreneur's prior experience was used as a case-selection variable, because previous research has suggested that entrepreneurs experience might influence their decision-making and operating logics (Dew et al., 2009; tinyurl.com/kg6gw9t). Therefore, we included a mix of profiles from experienced and novice entrepreneurs in the final multiple-case study.

Data collection

We gathered the data through interviews and direct observation conducted between March 2009 and June 2010. The interviews with the venture entrepreneur lasted between 45 to 90 minutes and included questions relating to the entrepreneur's background, the venture's evolution, and related technological background. To further illustrate the study cases, we obtained additional information about the cases through secondary sources.

Table 1. Sample of entrepreneurs' venture description

Venture Name	Entrepreneur Profile	Technology	Initial Idea	Objectified Opportunity
Winet (Spain)	Novice entrepreneur: academic/technology background	Communication protocol	Communication protocol for emergency data exchange	Proximity communications solution to engage retail customers
Powchip (Spain)	Novice entrepreneur: academic/technology background	Design for integrated circuits	Low power consumption asynchronous chips design	New chip design for mobile devices (design method training and full solutions)
DigITV (Spain)	Experienced entrepreneur: technology and market background	Digital television broadcast coding	Digital television changes needs in the broadcaster- user systems	Technological platform to support broadcasters and viewers needs for tailored content on demand
Hying (China)	Novice entrepreneur: technology background	Chemistry treatment for semi-conductor production	Identification of gaps in existing treatments	Disruptive solution for semi-conductor manufacturers
Capital (China)	Novice entrepreneur: technology background	X86-based CPU	Computing power for 3G mobile future	X86 CPU design for mobile Internet devices

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We recorded and transcribed the interviews into a standard template to facilitate analysis. For each of the cases studied, we wrote a case story, weaving together the data obtained through different research sources following a chronological description of the entrepreneur's actions and venture evolution.

For the purposes of this article, the names of the ventures have been changed to protect confidentiality.

Data analysis

We began the data analysis with no a priori hypotheses; despite having some theoretical insights on the constructs that were the subject of analysis, it was the descriptions provided by the informants that guided our initial cases analysis. We captured the stories that started with the first thoughts of their "initial idea" and the early actions, events, and changes that led to "opportunity objectification".

The construct of "opportunity objectification" emerged from the data as the first third-party validation that there was an opportunity. In some cases, the validation came through an informal interaction with a potential customer that was part of the direct entrepreneurs' social network; in other cases, it emerged through discussing the business idea with industry peers. In all sampled cases, the objectification of the opportunity was perceived as a trigger event for the further development of the venture. In other words, this step produced a mindset change in the entrepreneur's perception of the business idea and the overall assessment of the opportunity's viability (Wood and McKinley, 2010; tinyurl.com/k8xysv8).

We used individual case stories to conduct the first rounds of analysis, in which we attempted to make sense of the actions and events that build the opportunity-conceptualization process (i.e., evolving the business idea into the objectified opportunity). As relevant levers and activities started to emerge in the first cases sampled, we added further cases to complete and contrast the initial findings until we reached a saturation point where no new insights were uncovered. Further analysis included a cross-case comparison to either support or capture additional sources of variability for our initial findings.

In parallel to the data-iteration process, we sustained a regular contrast between data-driven findings and literature sources that could provide support and refine our interpretation of the data.

Results

Technology-based entrepreneurship is seen as a process where entrepreneurs are willing to bear high levels of uncertainty (McMullen and Shepherd, 2006; tinyurl.com/ktjspta). The initial business idea is often seen to pivot around an untested technology or an imagined disruptive market solution. Technology-based ventures often combine both elements, meaning there is uncertainty in both the technology and the market. So, how do entrepreneurs mitigate this uncertainty to start exploring the viability of their business idea? What actions and mechanisms accelerate the process of opportunity conceptualization? How does the opportunity become objectified?

In most of the cases we studied, the source of the business idea was an ongoing research project that either produced a technology that offered additional applications or offered evidence of a need for better technology-based solutions. In the words of Powchip's founder: "I've been doing research in the field of asynchronous circuits for many years... only in the last few years power consumption has begun to be important issue, as the market for mobile devices has developed". Or, as the founder of Hying described: "While working as a chemistry analyst, I found technology defects in the existing treatment processes for semi-conductors manufacturing." The entrepreneur is placed in an unknown situation, with an idea at hand but, in most of the cases studied, with limited prior knowledge and experience. It is in these cases where the discovery view can only partially explain the construction process that entrepreneurs are seen to start.

The data we collected shows that, instead of being blocked by uncertainty or risk perception, the entrepreneur moved ahead without a priori planning. As Winet's founder stated: "I started working from scratch on a new technological solution, changing everything." Consequently, the path towards the opportunity requires the entrepreneur to bear the burden of high uncertainty (McMullen and Shepherd, 2006; tinyurl.com/ktjspta), and initial predictive efforts are seen to have limited value. In this context, the entrepreneur relies on their ability to make things happen, using the lenses of the creation or effectuation perspectives (Sarasvathy, 2001; tinyurl.com/cmjpnxg). This is a situation where the entrepreneur's capacity to produce the desired effects with the available (limited) resources become a key factor to understand how the initial idea is transformed into a real opportunity.

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The ideation process

Previous research has highlighted the potential influence of an entrepreneur's pre-existent networks in the conceptualization of the opportunity (Wood and McKinley, 2010; tinyurl.com/k8xysv8). In fact, the mismatch between the entrepreneur's individual knowledge and the opportunity-related needs becomes the trigger of the first key process in the emergence of the opportunity: *iteration with knowledgeable peers*. The entrepreneur's initial identification of peers with whom to exchange early thoughts and information on the initial idea fits more with an effectuation than a causation perspective (Sarasvathy, 2001; tinyurl.com/cmjpnxg). Our results suggest that entrepreneurs mostly rely on the contacts from within their existing network of direct personal ties that are closest and easiest to contact, without assessing the appropriateness of the contacts. As Powchip's founder stated: "It was with a research contact that the idea came out." Similarly, Winet's founder recalled that validation for the idea came about when "talking with an entrepreneur in integrated circuits design that I knew from prior joint-research projects".

Nevertheless, the data showed a slightly different decision path for the experienced entrepreneurs. As suggested by Baron and Ensley (2006; tinyurl.com/l4pl8kt), experienced entrepreneurs were observed to benefit from their pattern-recognition abilities when actually selecting the appropriate peers from their pre-existent network to engage in the opportunity conceptualization. In intentionally employing a selection mechanism, experienced entrepreneurs benefit from their more-balanced personal network, built with both technology-research peers, and market/industry peers. DigiTV's founder recalled that: "It was my previous business partner that insisted on exploring together the changes that Internet and digital TV would produce in the industry". Together, these peers would go on to refine the idea together in a cafeteria: "We met for over a month to draw up our business plan and technological architecture." We did not observe this level of detail in the cases with novice entrepreneurs.

An additional difference between experienced entrepreneurs and novice entrepreneurs was observed: experienced entrepreneurs would simultaneously leverage various processes of *iteration with knowledgeable peers*, whereas novice entrepreneurs were seen to follow a more sequential process of action. Consistent with Dew and colleagues (2009; tinyurl.com/kg6gw9t) and Politis (2008; tinyurl.com/k3umurs), this observation supports the idea that experienced entrepreneurs take ad-

vantage of specific market and technology knowledge, and they benefit from being familiar with the mechanisms that would accelerate the idea-refinement process.

From ideation to opportunity objectification

The constructivist view of entrepreneurship proposes to observe the entrepreneur's influence in the cognitions and beliefs of outside actors involved in the process (Wood and McKinley, 2010; tinyurl.com/k8xysv8). In this sense, the opportunity-conceptualization process would not be described as shedding light into an objective reality, but as an ongoing transformation the perceptions of entrepreneurs and stakeholders regarding the validity of the idea through a *consensus-building* process that drives toward opportunity objectification.

If the initial exchanges of information through *interaction with knowledgeable peers* were seen as a source of early validation and informal feedback, the *consensus-building* process would bring the social exchange into a more formal level. In the words of Winet's founder: "We started to look for people with reputation in the field as advisors." Therefore, this view reflects rational design planning before execution (Baker et al., 2003; tinyurl.com/mj55kcd) and acknowledges, even at this early stage, the value of reputation (see Fischer and Reuber, 2007; tinyurl.com/mse2j65). Besides this oriented action to *consensus building*, the data from our cases reveals two parallel sub-processes: technology assessment, as "evaluating the technology, if it has sense, if it is viable" (Powchip founder) and market "sensemaking" (Weick et al., 2005; tinyurl.com/kobg2ad) between the technology and the intended opportunity. As Powchip's founder pointed to the value of "engaging with potential customers to assess whether your idea could fit". At this point, the influence of the feedback is crucial for the entrepreneur's decision about whether to keep advancing or abandon the opportunity. In the words of Hying's founder: "The encouraging feedback I got from the conversations with colleagues and experts at the Chinese Academy of Science made me feel more confident about the viability of my technological concept."

Therefore, in technology-based entrepreneurship, the conceptualization of the opportunity through *consensus building* involves gaining social legitimacy. At a first level, this means achieving a technology assessment and an acceptable fit between an initial idea and a dynamic market. DigiTV's founder recalled that, "the initial idea has suffered multiple changes... you cannot get stuck in an idea and stop listening or looking at the market". On a second level, there is a need to gain so-

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cial legitimacy to further advance in the *consensus-building* process; as Powchip's founder recalls, stakeholders are seen to expect that “a third-party evaluates the technology and raises the confidence level on the idea”. At this point, the formal involvement of institutions – private or public – mitigates the stakeholders' perception of uncertainty. DigiTV's founder experienced this benefit with “the full institutional support of the university”; Capital's founder experienced this benefit with “the network we built from the Association of Chinese Engineers in Silicon Valley”.

The context of opportunity objectification

The constructivist view posits that opportunity objectification channels an entrepreneur's behaviour towards opportunity enactment (Wood and McKinley, 2010; tinyurl.com/k8xysv8), thereby acknowledging the change in the entrepreneur's mindset and the stakeholders' perception as the subjective opportunity gains third-party acceptance (Shepherd et al., 2007; tinyurl.com/jvwrtvn). However, the cases we studied suggest that the impact of the opportunity objectification on the behaviour of the entrepreneur and stakeholders is highly mediated by their spatial and institutional context. The results show that, regardless of the public or private institutional support gained in the *consensus-building* process, the entrepreneur's early needs for explicit support (e.g., external funding) to advance on the objectified opportunity would raise unexpected hurdles. In the words of Powchip's founder: “Here we are more conservative; we study it more, it is a much longer process”. Winet's founder compares his own context to the context in the United States, where “there is a culture, a network of people that mixes investors and technology specialists”.

In the cases of Winet and Powchip, these hurdles led to the decision of registering part of their companies' future operations in the United States; even when this action meant that they had to follow again a *consensus-building* processes to gain legitimacy in a new context. In other cases (i.e., Hying, Capital, and Mars), the entrepreneur would delay bringing to market the objectified opportunity, to instead engage in further *consensus-building* processes to secure explicit support and access to institutional mechanisms from regional institutions.

Conclusions

With this research, we posit that technology-based entrepreneurship benefits from social interaction mechanisms. In particular, we explore the value of the *iteration with knowledgeable peers* and *consensus-build-*

ing processes in the conceptualization of an idea into an objective opportunity.

Our results provide empirical support to the nascent constructivist view of technology-based entrepreneurship and highlight the value of contextualization Welter (2011; tinyurl.com/m584brj) in the study of the social actions of entrepreneurs. Thus, our findings provide a complement to the traditional discovery view and introduce a description of the bidirectional processes that occur in the opportunity-objectification process and its implications for technology-based entrepreneurship.

Prior research has outlined the explanatory potential of a social construction view on technology entrepreneurship (Wood and McKinley, 2010; tinyurl.com/k8xysv8); this article uses a multiple-case study approach to uncover different mechanisms and processes of opportunity construction depending on the entrepreneurs' experience and institutional environment.

However, this research is not without limitations. First, our observations contain a survivor bias; our sample only contains entrepreneurs that managed to advance to opportunity enactment and venture development. Second, our findings only reflect the cases observed and do not have prescriptive power, despite the cross-case analyses offered inter-case support. Further research following the constructivist view would enhance the empirical support and contrast the validity of our exploratory findings.

Implications

Our research findings have both theoretical and practical implications. From an academic point of view, our results bring data that support the position of the constructivist view as a source of valuable information to understand technology-based entrepreneurship. Thus, we contribute to the growing literature on the social-construction processes of entrepreneurial opportunities. In addition, our results suggest that we are observing a phenomenon that crosses national boundaries; regardless of cultural differences, the conceptualization of the technology-based opportunity in diverse geographic contexts has more similarities than expected.

For entrepreneurs and organizations involved in fostering technology-based entrepreneurship we add value in two different dimensions. Firstly, our data suggests that entrepreneurship-promotion initiatives should make greater emphasis on the opportunity-objectification process. In technology-based entrepreneurship,

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we have seen that the objectivity of the idea is by itself a complex construction process; therefore, it would benefit from additional support mechanisms in comparison to other types of business ideas in which the objectivity of the opportunity is not embedded in uncertainty. Secondly, standard mechanisms derived from the institutionalized logic of early planning before execution might continue to produce low returns in technology-based entrepreneurship, unless the planning instruments are modified and become more receptive to the *iteration* and *consensus-building* mechanisms that are seen to benefit the opportunity conceptualization and raise the commitment of stakeholders.

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Leveraging Old Intellectual Property to Accelerate Technology Entrepreneurship

Derek Smith

“We may be trained to think the new is about to overcome the old, but that’s just an optical illusion.”

Nassim Nicholas Taleb
Author and professor

Acquiring or licensing assets to older technologies, including surviving intellectual property rights, is an often-overlooked viable strategy for accelerating technology entrepreneurship. This strategy can help entrepreneurs short-cut the growth of a customer base, reduce development effort, and shorten the time to market with a minimum viable product. However, this strategy is not without risk; entrepreneurs need to be careful that the acquired intellectual property rights are not fraught with issues that could severely outweigh any perceived value. Proper investigation is required to ensure success because the current literature fails to provide tools that an entrepreneur can apply when considering the acquisition of intellectual property.

This article includes a case study of a technology company – Piranha Games – that indirectly acquired sole and exclusive access to a substantial historical customer base by acquiring and licensing older technology and surviving intellectual property assets. The founders then leveraged the existing product brand and its historical customers to acquire significant funding and went global with a minimum viable product in three years. The copyright and trademark assets provided value on day one to Piranha Games by making it difficult and risky for others to exploit the technology. Based on this case study, this article offers recommendations to entrepreneurs who may benefit from acquiring old intellectual property to accelerate the growth of their startups.

Introduction

Imagine if an entrepreneur had access to a substantial customer base on day one. Imagine if that access was sole and exclusive to the entrepreneur and that the customer base provided the necessary funding and knowledge to the entrepreneur at the very beginning, during a time of limited resources.

Entrepreneurs should be on the lookout for older technology assets that could provide significant present-day advantages during the start-up of a company. If there are surviving intellectual property rights associated with the technology, the assets can be particularly valuable. However, failing to adequately investigate these rights during an acquisition can quickly lead to disaster. Therefore, how can an entrepreneur leverage old

intellectual property to accelerate market entry of a product or technology?

This article is a case study of the acquisition and licensing of the MechWarrior (mwomercs.com) software technology and its associated intellectual property, both of which were acquired by Piranha Games (piranha.games.com). Piranha Games is a small independent developer of video games that was founded in 2000 in Vancouver, Canada. The case study is based upon publically available information obtained from MechWarrior blogs (tinyurl.com/mqmd5y7) and forums (tinyurl.com/lsvzo33), as well as news articles and information available on Wikipedia (wikipedia.org/wiki/MechWarrior_Online).

The following five contributions are made through this article. First, the article raises awareness of the benefits

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acquiring or licensing the assets to older technology to accelerate technology entrepreneurship. Second, it shows how to avoid potentially damaging or crippling issues that may exist with the existing intellectual property. Third, it highlights the value of leveraging the indirectly acquired historical customer base for funding. Fourth, it proposes an approach to creating a minimum viable product and acquiring tacit knowledge from the acquired historical customer base. Finally, it demonstrates how old technology may accelerate opportunities when combined with new business models that better suit the current market environment.

The following section describes the process of acquiring intellectual assets, including an overview of intellectual property rights and the due diligence required to avoid potentially damaging issues when they are acquired. Next, the article develops the MechWarrior case study, including a summary of its history and intellectual property, followed by lessons learned from the case. Finally, the article provides recommendations for entrepreneurs.

Acquiring Intellectual Assets

Acquiring an older technology and related intellectual assets can present many advantages to an entrepreneur; however, this acquisition can also present significant business and legal risks that must be avoided in order to extract the potential value of the older technology. Entrepreneurs need a basic understanding of intellectual property rights, how they relate to customers versus competitors, and how to identify potential legal risks during the acquisition.

Intellectual property

Intellectual property rights relate to copyright, trademarks, patents, and industrial designs, and they provide different forms of protection or assets for different periods of time (Smith and Parr, 2005; tinyurl.com/k9dkgqo). It is important for the technology entrepreneur to understand how these different rights relate to the competition and customer bases:

1. Copyright: protects expression in an original work by an author for a period of time defined by 70 years beyond the life of the author (Mattingly and Samardzija, 2009; tinyurl.com/mbjec7b). For software technology, this right applies to the assets, such as the computer program source code, the object code, the graphic screens creating the environment, and the graphic design. Customers relate to the visual graphics and images, resulting in strong brand recognition. Acquir-

ing an existing copyright from another company or individual owner provides the entrepreneur with a valuable option to be the sole new provider of this content to the existing customers.

2. Trademarks: provide the right to use a mark or design associated with a company's goods and services for extendable terms upon payment of a fee (Cosgrove et al., 2011; tinyurl.com/kkhhb55z). A trademark does not need to be registered (the rights still exist informally under common law), or it may be registered upon the formal filing and prosecution of the mark or design. Trademarks provide commercial value in the form of brand recognition and protection. Customers relate to the brand through the trademarks. Acquiring or licensing trademarks provides another valuable incentive to be the sole source of the associated brand. Early brand recognition by customers is very beneficial to entrepreneurs.

3. Patents: provide a right to exclude others from making, using, or selling an invention for 20 years beyond the filing date upon payment of maintenance fees. Patents provide value to an entrepreneur against infringement from competitors and customers, although a company is less likely to pursue cases of patent infringement by its customers. Industrial designs, also known as design patents, also provide a right to exclude others for a period of 14 years beyond the filing date upon payment of maintenance fees and provide value to the entrepreneur against a competitor (Smith and Parr, 2005; tinyurl.com/k9dkgqo).

Due diligence

Due diligence is an investigation to examine the intellectual property rights being considered for acquisition by a company; it may also investigate the potential for litigation based on intellectual property. The investigation tends to be conducted by intellectual property professionals or persons with special skills and education. The best approach is a combination of external and internal resources conducting the investigation. The external resources focus on the intellectual property rules and procedures and the internal resources focus on the technology and brand. Due diligence is a critical step in any business transaction concerning intellectual property rights (De Andio et al., 2004; *Intellectual Property & Technology Law Journal*, 16(8): 1-3).

A checklist of key activities undertaken during due diligence is provided in Table 1. These activities are typically carried out by the intellectual property professionals.

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Table 1. Due-diligence checklist for intellectual property assets

Key Activity	Trademarks	Copyrights	Patents
1. Determine whether proper marking of the rights in each jurisdiction has occurred.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Review and check status of all pending applications in all jurisdictions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Identify and review unregistered, informal assets (i.e., common-law rights).	<input type="checkbox"/>	<input type="checkbox"/>	—
4. Check status of all formal registrations in all jurisdictions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Check that renewal fees have been paid and identify due dates in all jurisdictions.	<input type="checkbox"/>	—	<input type="checkbox"/>
6. Check ownership rights, employee agreements, third-party agreements, and assignment documents for each intellectual property asset.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Identify and check for the presence of intellectual property clearance procedures and the results.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Check for liens and security interests registered against the intellectual property assets in all jurisdictions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Identify and investigate past litigation concerning the technology and assets against the company and against competitors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The due-diligence process assesses the intellectual property rights associated with the commercial transaction to identify potential issues. As part of the process, existing rights are identified and the status of the existing property rights are determined (Valoir and Dai, 2008; *Intellectual Property & Technology Law Journal*, 20(4): 1-8). The title of the rights should be checked through employee agreements and security interests that may be registered against the property rights (Valoir and Dai, 2008); this is a common practice with venture capitalists when considering an acquisition of a company or when securing the assets of a company in relation to an investment.

The process of due diligence applies to each type of intellectual property right:

1. Trademark due diligence: reviews promotional materials to ensure proper use of trademarks and associated marking. A global search is conducted to identify and review trademark registrations and applications to ensure everything is in proper order. Assignment records are also reviewed to ensure proper ownership and to confirm that the rights may be transferred as part of the acquisition. Finally, a review should be conducted to ensure procedures are in place for clearing the trademark rights of others;

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this process ensures that the company will not inadvertently infringe on any competing trademarks.

2. Copyright due diligence: reviews copyrighted materials, such as computer programs, text, and graphics, to determine ownership. Ownership is an important aspect of copyright, therefore employee agreements, third-party agreements, as well as any vendor agreements must be reviewed to ensure complete ownership has been transferred to the company without any limitations. The investigation identifies any previous copyright risks and any concerns over a company's copyright-clearance practices, and it establishes the overall pedigree of the technology. This aspect of the due-diligence process is important because copyright risks may propagate forward into the future; it helps the acquiring company to understand the potential future risks based upon the past history of the copyrighted material.

3. Patent due diligence: reviews patent applications and granted patents to ensure the assets are in good order (Huebner, 2005; tinyurl.com/mzf59l6). The investigation should also search and consider applications and granted patents of competitors to understand any potential future risks, especially with the financial risks created by patent trolls (Bessen et al., 2011; tinyurl.com/kpm8czn). Patent trolls do not make or manufacture products or offer services – their business is the acquisition of patents and subsequent licensing through aggressive litigation.

Another aspect of due diligence investigates whether the company had a product-development clearance process to avoid intellectual property issues during development (Sheridan, 2011; *Intellectual Property & Technology Law Journal*, 23(1): 14-18). A product-development clearance is similar to due diligence but it is part of a recurring process during product-development cycles. Clearance attempts to ensure that the intellectual property rights of others are not infringed upon during product development.

Consider the case of Volkswagen, who reportedly paid several hundred million dollars to purchase the Rolls Royce and Bentley automobile companies. After closing the deal, management discovered that it did not have the trademark rights to the Rolls Royce brand, which had been previously sold to BMW (Valoir and Dai, 2008; *Intellectual Property & Technology Law Journal*, 20(4): 1-8). Volkswagen's representatives had missed a serious trademark issue during their investigation, which led to

significant costs in time and money through subsequent negotiations to acquire the trademark from BMW. The situation would have been much worse if BMW had chosen to keep the trademark; Volkswagen would have been prevented from realizing their plans for their costly new acquisition. As can be seen through this example, intellectual property rights can either provide a significant competitive advantage or become a significant and possibly crippling business and financial headache when the due diligence for intellectual property is inadequate.

In summary, the two main objectives of due diligence are to ensure that: i) the company can acquire or license all the intellectual property rights it needs, along with the technology assets and ii) the company does not have any historical or future potential issues with the intellectual property rights of third parties. In the next section, the importance of due diligence in acquiring old intellectual property for technology and business leverage purposes is examined through a case study that involved five elements of technology innovation management: intellectual property rights, customer involvement, business models, networks, and knowledge sharing.

Case Study: MechWarrior

MechWarrior is a strategy game that features large robotic war machines. It began in 1984 as a board game called Battledroids, which was developed by the FASA Corporation. The game was later renamed BattleMech and then MechWarrior. In 1989, FASA released the first video-game version of MechWarrior on CD-ROM for personal computers. In 2001, the MechWarrior trademark became the property of Microsoft Corporation, and soon after, a version of the game was released on the Xbox video-game console platform. Sometime thereafter, the product had little perceived commercial value due to availability on a single console platform in a highly competitive software gaming market.

In 2008, the founders of Piranha Games acquired and licensed the technology assets and intellectual property rights (i.e., the copyrights and a trademark license) from Microsoft. By acquiring this older software technology, Piranha Games hoped to save a great deal of early development work, especially with the graphical screen content, themes, storyboards, and associated animations and representations of characters. The MechWarrior brand also gave Piranha Games indirect access to the historical customer base that spanned almost 20 years from the product's first introduction in 1989.

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Although Piranha Games wholly acquired the technology assets, restrictions on the trademark license from Microsoft meant that the historical approach to CD-ROM distribution and retail sales was no longer viable, nor was distribution via console platforms. To overcome these limitations, Piranha Games developed a new business model based on a free-to-play online version of the game.

Piranha Games conducted an initial test of the market and potential customers by announcing the MechWarrior opportunity over the Internet. In 2012, Piranha Games announced “MechWarriors founders”, which was effectively a crowdfunding program designed to leverage the associated copyrights and trademarks by raising funds from the historical customer base. For a fee, members of the historical customer base had the opportunity to become founders, and through this program, Piranha Games reportedly raised over \$5 million USD. MechWarrior Online was initially released as a minimum viable product in the form of a closed beta version that was only available to these founders. This approach allowed Piranha Games to establish a collaboration network (Pisano and Verganti, 2008; tinyurl.com/67bcd3b) with the historical customer base, from which the company received valuable tacit knowledge (Kaupila et al., 2011; tinyurl.com/k19uyfx) with respect to the game. This knowledge included feedback about the closed beta version of the game as well as direction towards features, the evolution of the game, and historical insight into the game.

Lessons Learned from the MechWarrior Case

1. Old intellectual property accelerates technology entrepreneurship through technology assets and historical customers.

Acquiring these intellectual assets provided accelerated entrepreneurship in two ways. Firstly, the old technology could be used as a basis for a minimum viable product to shorten the development time and re-introduction of the software game. Secondly, it substantially shortened the time to build a customer base by attracting the historical customers to the founders program through the existing trademark recognition. However, if the acquired property rights were problematic, as in the case of Volkswagen, it would add significant expense to the company as well as create a serious unresolvable legal issue for the entrepreneur.

2. Proper due diligence reduces the risk of downstream intellectual property issues.

A trademark issue relating to the pedigree of the techno-

logy from FADA's previous product should have been found through the due-diligence process: the original board game was named BattleDroids, but the word "droid" is a registered trademark owned by LucasFilm Ltd. This trademark infringement forced FASA to change the game's name to BattleMechs. This intellectual property issue should have been identified by a due diligence study as a previous legal issue that was resolved, and it should have raised a general concern over FADA's intellectual property practices.

A further infringement on intellectual property rights relating to the pedigree of FADA's technology occurred in 1996, when certain graphics were added to the MechWarrior game, but they were apparently based upon designs from another company, Harmony Gold. This infringement came to light in 2011 when Harmony Gold raised the this legal issue with Mechwarrior's new owners, Piranha Games. The outcome of previous litigation in 1996 between Harmony Gold and FASA required FASA to change some of the material and withdraw from production certain graphical representations of the MechWarrior characters. This should have been revealed by a due diligence study during the acquisition by Piranha Games as a potential risk and ensured the path forward was clear and established appropriate safeguards to avoid the subsequent complaint between Harmony Gold and Piranha Games suggesting the issue in 2011 was completely avoidable.

3. Historical customer bases are powerful assets that may be leveraged.

Entrepreneurs exercising sole and exclusive access to the historical customer base through copyrights and trademarks may seek out opportunities with crowdfunding to raise funds. They may also create a minimum viable product and collaboration network and involve the historical customer base to obtain tacit knowledge before offering the product to new customers.

The indirect link to the historical customer base from the acquired intellectual property assets is compelling because it presents significant funding and knowledge opportunities to entrepreneurs.

4. New business models can be based upon old technology in the current market conditions.

A new business model provides the older technology with the advantages of new and future technological opportunities as the entrepreneur continues to leverage the historical customer base while adding in new customers. For Piranha Games, current market conditions open up the distribution of software and access to a

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global market through the Internet. The new "free-to-play" business model takes advantage of both the old technology and the current market conditions. The Internet provided Piranha Games with a way to find and access the historical customer base on a global scale; it also provided a simple, low-cost approach to global distribution of the technology.

Recommendations For Entrepreneurs

1. Consider acquiring (or licensing) the assets of an older technology to accelerate technology entrepreneurship.

Acquiring older technology can be beneficial to entrepreneurs by shortening the time to develop technology. Acquiring or licensing intellectual property assets also provides different value to entrepreneurs depending on the type of intellectual property (e.g., patents providing an exclusive monopoly for a period of time, trademarks providing brand recognition with the historical customers) (Smith and Parr, 2005; tinyurl.com/k9dkgqo); these assets can also provide an early competitive advantage. Understanding the difference in value and how they apply to competitors and customers is key when considering a strategic acquisition of older technology assets. Entrepreneurs seeking historical customers should focus on acquiring or licensing trademarks and copyrights. Entrepreneurs seeking exclusive rights to technology should focus on acquiring or licensing patents

2. Reduce the risk of acquiring past intellectual property issues through a rigorous due-diligence process.

Older technology and assets need to be assessed to ensure potential future issues are avoided; any loose ends need to be identified during a due-diligence investigation. A due-diligence investigation is key to any potential acquisition of older technology and assets, and it should be a global investigation (Valoir and Dai, 2008; *Intellectual Property & Technology Law Journal*, 20(4): 1-8). Use the checklist in Table 1 to avoid missing key activities.

3. Leverage the indirect acquisition of the historical customer base for potential funding.

Through trademarks and copyrights, entrepreneurs can indirectly acquiring access to historical customer bases. Key to this approach is the option for sole and exclusive use of copyrights and trademarks, which can be used as a form of crowdfunding.

4. Establish a collaboration network and leverage the historical customers for knowledge.

Create a minimum viable product based upon the older technology and provide initial restricted access to the historical customer base. Capture the wealth of tacit knowledge (Kauppila et al., 2011; tinyurl.com/kl9uyfx) from these customers and users to avoid past issues, and act upon this value before opening up the technology to the rest of the world.

5. Create new business models to accommodate old technology in the present market.

Business models may be innovated (Desyllas and Sako, 2012; tinyurl.com/kbmp6hr) to accommodate older technology in the present. This approach requires fresh thinking concerning the best business model to introduce the older technology into the current market, which is a key consideration before acquiring older technologies and assets.

Conclusion

Acquiring the physical and intellectual assets of older technologies is a significant strategy in accelerating the start up of a technology business with limited resources. Technology entrepreneurs and managers should seek out these opportunities and acquire older assets that were once successful to accelerate technology entrepreneurship. The keys to success with this approach include: the indirect acquisition of the historical customer base through the surviving intellectual property rights, the ability to ensure past intellectual property violations are not acquired along with the technology and intellectual property rights, overcoming past issues that historically contributed to failure, and innovating a new business model.

Further research should examine a broader range of surviving intellectual property rights, the risk and value of old intellectual property to technology entrepreneurs, the impact of old intellectual property on the choice of market, and how leveraging surviving intellectual property can be used with historical customers.

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Enabling Sustainable Improvement in IT Entrepreneurship

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

“*Never confuse movement with action.*”

Ernest Hemingway (1899–1961)
Author and journalist

Firms must embrace processes that enable the information technology (IT) function to become a strategic partner to the business functions it serves. Process ambidexterity is a way for processes to be augmented to improve alignment and adaptability to new markets and technologies. By applying the principles of process ambidexterity, the key elements required for sustainable change within the capabilities that comprise the IT function of the firm are identified. Furthermore, the scope and depth of the dysfunction that is widespread across large firms that depend upon IT are outlined to provide a contextual basis for presenting a solution framework to address sustainable change. This framework for sustainable change is of primary benefit to IT executives seeking to systematically transform the IT function and enable IT entrepreneurship.

Introduction

Information technology (IT) provides essential services that make it possible for a firm to operate and generate revenue in an increasingly competitive, global marketplace. In many cases, IT is now the electronic face of most firms, as well as the central nervous system. A firm's dependency on IT is a consequence of its need to provide prompt support to its client- and partner-facing business services in response to rapidly shifting global demands. Unfortunately, the IT function often lags behind because it is fearful of the risk of moving too fast and is generally unable to change as quickly as the firm requires. This fear creates a culture that inhibits advanced innovation that can create competitive advantages for the firm.

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 firms experience the following pain points:

- Non-IT business executives aggressively introduce "change projects" in reaction to a perceived competitive threat or opportunity. These executives rarely ap-

preciate the operational consequences of the new, abrupt changes or the cumulative burden that new capabilities put on the IT function's agility.

- Existing IT capabilities are not explicitly defined and exist at varying levels of maturity. In firms that have a decentralized IT function, capabilities are diffused across isolated pockets, and the same capability can be at different maturity levels in different business units.
- Expertise is not often shared across the firm, because the person or team that possesses the expertise is often too busy to be used by other teams.
- New technology is often introduced and implemented by a team with a very narrow focus that may be indifferent to the broader interests of the firm.
- New processes are often informally derived from ad hoc processes that are not well integrated with other processes.
- Novel technologies that could have a positive impact are rarely proliferated due to inadequate knowledge and support (i.e., supporting competencies), so fear of operational risk often inhibits broader adoption.

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- Costly redundancy occurs when the same new technologies are introduced in disparate and disconnected units of a firm.
- Best practices are rarely implemented even though they are crucial for reducing operational and lifecycle costs.
- A culture of learned helplessness becomes the accepted norm, in which being stuck in the capability trap is widely viewed as unchangeable and inescapable (Repenning and Sterman, 2001; tinyurl.com/m4u77dd).

IT entrepreneurship is the implementation of innovative business-driven practices that better align the IT function to the business functions of the firm. Bot and Renaud (2012; timreview.ca/article/596) established the value of process ambidexterity in improving IT entrepreneurship

and established that IT entrepreneurship includes the management of capabilities within IT, as illustrated in Figure 1. This article explores the capability aspect of process ambidexterity to show how a capability-based approach can promote a successful adaptation of innovation that addresses the pain points listed above.

This article defines IT capabilities and presents a framework that senior IT executives can use to improve the IT function’s responsiveness to changes in business demand. This framework delineates the capability domains that will need to evolve, while providing a means to introduce changes, ensure implementation, and measure success. This framework leverages existing standards while synthesizing a cohesive approach to continual improvement.

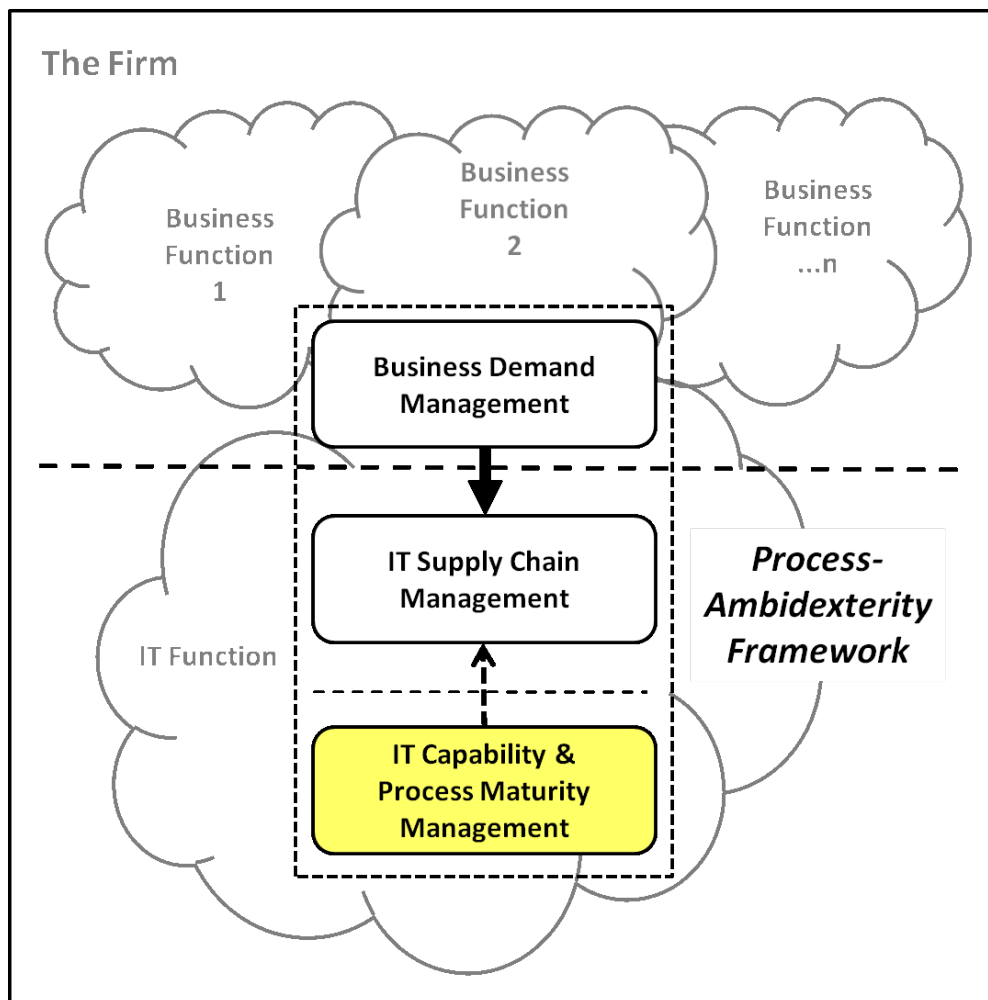


Figure 1. A high-level view of the process-ambidexterity framework

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IT Capabilities

The Open Group (2011; tinyurl.com/3q85nl7) defines a capability as: "an ability that an organization, person, or system possesses." The Capability Model, developed by The Open Group Architecture Framework (TOGAF; togaf.org), decomposes capabilities into:

- technology capabilities that are possessed by a system or tool
- process capabilities that are possessed by an organization
- competency (people skills) capabilities, which are the skills/competencies possessed by a person/team

Most IT organizations have separated IT operations from IT engineering, largely due to the need to improve the cost effectiveness of competency management, and in many cases, these organizations have outsourced some or all of the operational processes and competencies for the same reason. Renaud and Bot (2012; timreview.ca/article/627) examined the impact of outsourcing on process adaptability in the IT supply chain and found that outsourcing generally reduced both business flexibility and IT control, thereby impairing process adaptability. Outsourcing essentially trades off process adaptability in an attempt to gain cost effectiveness.

This article proposes a framework for capability management that promotes process adaptability via the disciplined improvement of capabilities that comprise the maturity of the IT function. Disciplined capability improvement strikes at the pain points identified earlier to deliver cost effectiveness without trading-off process adaptability. In this article, whenever the term "capability" is used by itself, it is understood to refer to all three types of capability: technology, process, and competency).

In many large firms, "learned helplessness" has created an environment in which improvements to any process capability are often viewed as onerous and prohibitive, and therefore are subject to exceptions. Learned helplessness often is the cause of the allergic reaction that many IT functions have to the very practices which would make them more cost effective:

- New functionality is often implemented using non-compliant workarounds that short-cut critical steps that would otherwise enhance reliability.

- Skills augmentation is viewed as an overhead cost when new technology is introduced and consequently is rarely considered strategic, causing new technology capabilities to under under-perform.
- Architecture reviews and standards are often seen as an inhibitor that must be overcome to avoid missing deadlines, and new technology introduction is often forced, which can sometimes result in severe, unintended consequences.

As a result, much of the firm's investment in new technology does not meet expectations because it takes too long for the investment to be scaled out and made more robust. New technologies and the expertise to exploit them often remain in isolated pockets within the firm. If the technology is attractive enough, multiple business functions will deploy and maintain their own versions, proliferating inefficiencies and wasting work.

Technology capabilities can certainly solve complexity, reduce costs, and promote agility, but the IT function must also advance skill maturity and enable those skills to operate efficiently by promoting process maturity. Implementing technology alone will do little and will be rapidly abandoned if supporting skills are not developed and if the new capability is not integrated into existing processes. Furthermore, new technologies often require new or modified processes for them to be accepted within the constraints of existing organizations.

Failure to fully implement process and skill changes necessitated by introducing new technology will inevitably result in the new technology being too expensive to employ. Sustainable change requires that all three capability types are improved in a balance with each other, often as a composite capability that combines improvements in process and competency capabilities along with advances in technology capabilities.

Sustaining Entrepreneurial Change in IT

Most people view maturity as the end goal of a one-way journey. Yet, the most important and counterintuitive concept that IT professionals struggle with is the fact that maturity in IT capability is not static; it can degrade as well as improve. IT maturity is fluid because the business it supports must be agile in the face of market forces and regulatory forces and, consequently, is always changing. In addition, the introduction of new technology capabilities occurs at a pace that outruns the ability of most IT organizations to absorb these cap-

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abilities through adjustments in processes and competencies needed to embrace these innovations properly. Carnegie Mellon’s Software Engineering Institute (SEI; sei.cmu.edu) has defined five progressive stages of process maturity (tinyurl.com/7pa6b), which are useful for assessing and improving existing IT process maturity but do not consider changes to the scope of maturity required (e.g., new processes) or the possibility of maturity erosion in existing processes. Firms with large IT organizations will see degradation in their maturity levels over time unless specific effort is made to halt the erosion. A key consideration is the level of investment and degree of risk the IT function is willing to incur to reach the maturity level they need to enable their strategy.

Renaud and Bot (2012; timreview.ca/article/626) identified that IT entrepreneurship can occur even if the firm itself is non-entrepreneurial, but IT entrepreneurship cannot be a one-time event because the IT function must remain continuously aligned to the continually changing needs of the firm. IT entrepreneurship requires a sustainable governance ability that ensures dynamic and continuous alignment.

Creating an IT function that is continuously aligned to the needs of the firm requires a significant shift in mindset of most IT executives. Specifically, IT entrepreneurship requires a deliberate, collaborative effort that leverages existing capabilities to implement change such that the changes are widely and rapidly adopted. Advancing technology, process, and competency capabilities in concert with each other is essential for attaining rapid and wide-scale adoption.

Coordinating capability advancement across the wide breadth of capabilities in an IT function is a large undertaking, which can be greatly simplified by exploiting the fact that capabilities can be combined with other capabilities to create higher-level capabilities. Figure 2 illustrates, for example, that the process capability for system monitoring can be combined with the technology capabilities of security and internet-protocol connection monitoring and the process capability for patch-level monitoring to create a higher-level capability called server health monitoring.

In fact, it is the *combination* of process and technology capabilities that makes such advancement feasible, for

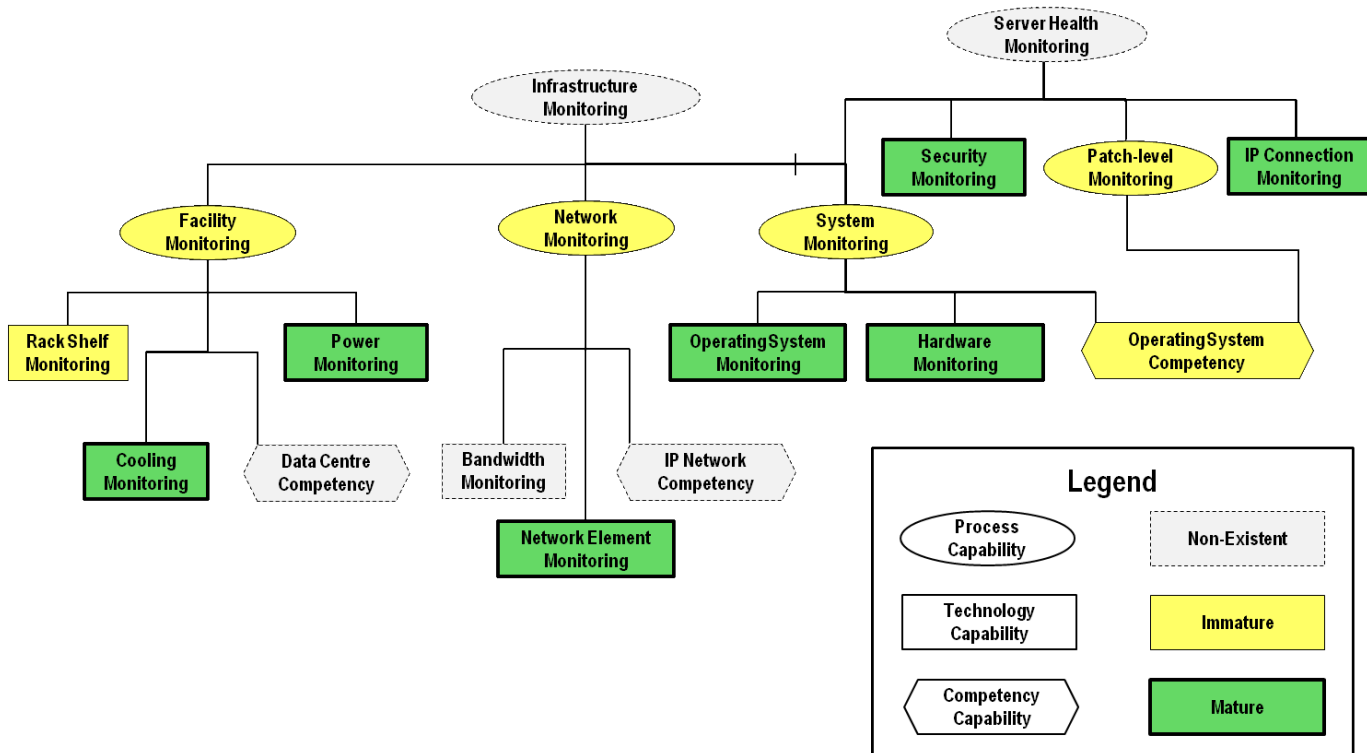


Figure 2. An example capability hierarchy

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neither type of capability would be sufficient if implemented alone. Observe that a process capability always contains at least one competency capability or is constituted from at least one subordinate process capability. A process would have to be fully automated not to employ at least one competency or skill, and alternatively, if it were fully automated, the automation technology would be a technology capability.

In essence, capabilities are the building blocks for sustainable change within the IT function. Any change in the IT function requires the development or implementation of one or more capabilities. Disciplined, systematic, and sustained improvement in capabilities is fundamental to improving an IT function's ability to change to meet the firm's stated strategic goals. Explicitly mapping of capabilities, their dependencies, and relative maturity levels is the key to sustaining entrepreneurial change.

Coordinated Improvement of Capability Maturity

The overall maturity of the IT function can be measured by the combination of the number of capabilities implemented and the relative maturity of each capability. The more capabilities that an IT function possesses and the more mature each of those capabilities are, the more mature and adaptable the overall IT function will be. Greater maturity in the IT function promotes greater agility, alignment, and responsiveness to the business.

In practice, the amount of change that is possible within the IT function in any given year is constrained by other priorities that may make improvements too risky to attempt, as well as by the degree of difficulty in changing culture and behaviour within the IT function. Given that IT maturity improvement depends both on the IT function's goals (new capabilities) and capacity for change (introducing and improving capabilities), both must be grounded in the context of business needs if the ability to change is to keep up with the goals that are driving change. Hence, sustainable change is an enabler for IT maturity and the lack of sustainable change limits a firm's capacity for improving IT maturity.

Identifying, managing, and defining capabilities are the first phases of capability maturity improvement. A disciplined basis for capability improvement provides clear objectives, measurable criteria and lifecycle perspective. Bot and Renaud (2012; timreview.ca/article/596) identified that process ambidexterity requires a process-management control system to provide this discipline.

The scope and function of this system needs to be generalized to control improvement across the entire range of capabilities, including people and technology, in addition to controlling the improvement of process capabilities. In other words, sustainable improvement in competency capabilities and technology capabilities need to be managed as processes if the IT function is to mature. Furthermore, the systematic addition and improvement of capabilities also needs to be managed as a process to sustain improvements in the firm's capabilities. Thus, the same mechanisms commonly used for process maturity improvement can be applied more generally to the challenge of capability maturity improvement, which encompasses technology, process, and competency capabilities.

By viewing IT maturity improvement as a set of processes with clear stages and tasks to accomplish, a management system can be defined as illustrated in Figure 3. This management system requires two levels to ensure that the advancement of capabilities is coordinated, across the three types of capabilities as well as within each type of capability.

In Figure 3, the top-level process focuses on how to coordinate the addition of new capabilities in the context of existing ones and how to prioritize which immature capabilities to improve based on the dependencies of the new capabilities being added. This process provides clear guidance on how to measure capabilities and delivers a periodic plan that decides which capabilities are to added or replaced and which need improvement based upon business goals and the appetite for investment in change. By identifying foundational and requisite missing capabilities and setting objectives for capability improvement that closes those gaps, IT maturity is accelerated in a manner that is cost-effectively aligned to the firm's needs.

The IT Capability Maturity Improvement process is the control process by which planned improvements in different capabilities can be prioritized and tracked. This process should be invoked on an event-driven basis whenever new capabilities are to be added, and on a periodic-basis to review the status of capability maturity improvement initiatives and their key performance indicators (KPIs). One of the outputs of this process is a balanced scorecard for how the IT function is maturing.

Implementing capability maturity improvement for specific technology, process, or competency capabilities requires initiation and coordination of specialized improvement processes that operate on the lower level

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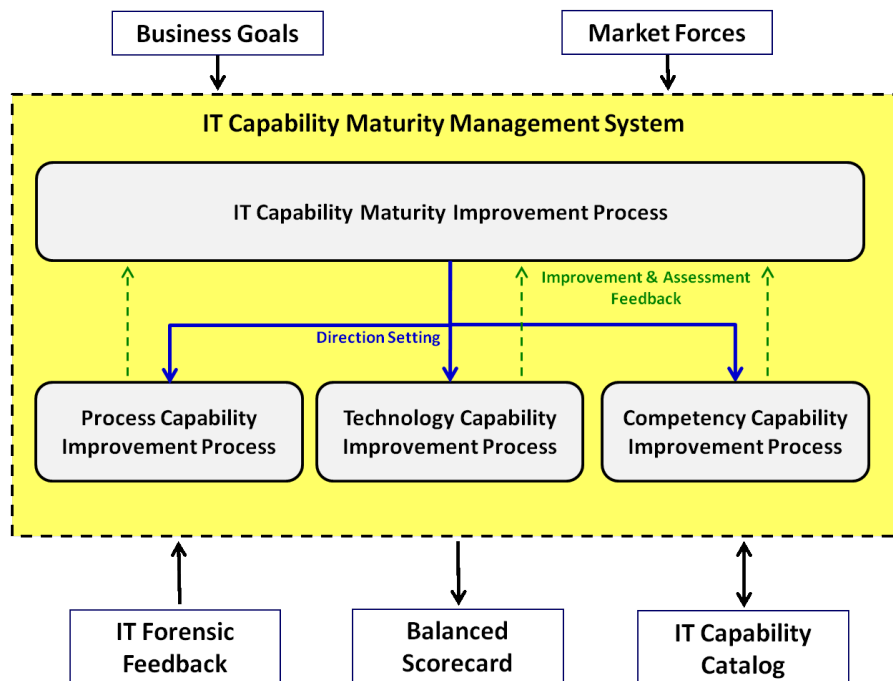


Figure 3. A management system for sustainable IT capability maturity improvement

of the maturity-management system. These improvement processes are specialized for the type of capability being improved. For example:

- Incremental improvement of specific technology capabilities is best performed by a Technology Capability Improvement process that can be as defined in Table 1c below or, in a more mature IT function, based on an IT Solutions Lifecycle Management process that coordinates with IT Product and Standards Management processes described by Renaud and Bot (2012; timreview.ca/article/626).
- Similarly, Process Capability Improvement is best performed by a disciplined and systematic methodology for managing the business to improve customer satisfaction and bottom line results, such as Lean Six Sigma (tinyurl.com/cy9nbfw). Lean Six Sigma is a popular and effective methodology for process improvement that applies a discipline of defining, measuring, analyzing, improving, and controlling processes as shown in Table 1b below. Other methodologies for process improvement could also be employed.
- Competency capability improvement can be managed by the disciplined application of the SEI People Capability Maturity Model (tinyurl.com/l8lfch2), as defined in Table 4 below.

The operating framework for each the three types of capability improvement processes has five similar stages with unique tasks for each stage that are appropriate for that capability type. The overall Capability Maturity Improvement Process utilizes these same five stages and also has unique tasks. All four processes, their stages, and unique tasks are delineated in Table 1.

Measuring Sustainable Change

As the maturity of the IT function improves, the quality of information on the performance of its processes and its ability to improve in response to business needs also improves. The lower-level improvement processes should produce both predictive as well as outcome-oriented KPIs that measure capability maturity improvement so that the top-level process can prioritize which capabilities need subsequent improvement.

Improving IT cost-effectiveness requires insight into how the IT function is improving. Senior management should review scorecards for maturity improvement that are produced by the system for capability maturity management and judge how best to guide investments to achieve their goals. Improved accountability is a natural by-product of a disciplined approach to capability improvement because improvements can be planned and measured on a recurring basis. This improved

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Table 1. The Capability Maturity Improvement Process

A. IT Capability Maturity Improvement Process					
	Define	Measure	Analyze	Improve	Control
	Review demand for new capabilities Map capability dependencies for new capabilities	Review performance of existing capabilities and update maturity level within the capability hierarchy Create balanced scorecard for communicating overall capability maturity	Weight weak capabilities by number of capabilities depending on them	Review demand for new capabilities Prioritize and select capabilities to improve	Review performance of existing capabilities and update maturity level within the capability hierarchy
B. Process Capability Improvement Process					
	Define	Measure	Analyze	Improve	Control
	Define problem statement, process objectives, target customers, and ownership Identify outcome KPI	Capture current state for existing process Capture customer requirements for process and prioritize Measure process capability and stability Establish improvement / performance targets	Identify and validate with data root causes for failures, variability, and waste (<i>existing processes</i>) Select high-level design based on analysis of alternatives (<i>new processes</i>) Quantify opportunity area	Evaluate and prioritize alternative solutions Design, pilot, and validate process improvements / new process Implement improvements / new process	Institutionalize improvements / new process (wide scale) Implement Process Management Control System for ongoing monitoring and control
C. Technology Capability Improvement Process					
	Define	Measure	Analyze	Improve	Control
	Identify scope and needs Define criteria for evaluating alternatives Examine make / buy / sourcing factors	Assess alternatives Assess trade-offs (ATAM)	Pilot preferred solution Assess missing skills Assess changes to processes	Implement required training Implement supporting processes Scale out into production	Implement performance monitoring Assess technology maturity level
D. Competency Capability Improvement Process					
	Define	Measure	Analyze	Improve	Control
	Define scope and supporting skills Define criteria for attainment Define KPIs	Identify linkage to processes Implement skills testing or survey	Assess existing skills base Assess usage of skills in relevant process areas	Implement required training	Implement skills tracking Implement compliance in role monitoring Assess competency maturity level

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accountability causes the IT function to become more proactive in improvement instead of being a reluctant participant that is driven by change.

Although all aspects of the IT Supply Chain must be measured including IT maturity, in the authors' experience, most IT functions collect and track too many metrics yet somehow fail to collect the most useful ones. This inefficiency adds unnecessary cost and diminishes the value and usefulness of producing KPIs for management purposes. This section provides criteria for selecting meaningful KPIs for a balanced understanding of capability maturity.

The method for determining the maturity of a capability varies by the capability type. For example a technology capability is measured differently than a process or competency capability. In general, capabilities can be measured by their suitability (i.e., fit for purpose), the extent to which they are (appropriately) employed (i.e., scope), as well as the "depth of effectiveness" of the capability itself. For example:

- The maturity of a technology capability suitable for a specific need can be measured by the combination of the depth of its features as well as how widely this technology is in use within the firm.
- A process capability can be measured using a combination of two criteria: i) the maturity and stability of the process in terms of how effective it is in meeting the needs of the firm and ii) how consistently the process is used across the firm.
- A competency capability can be measured by its appropriateness within a process step, the depth of mastery of the skills involved, and the number of individuals in the same role that possess those skills.

Understanding the maturity of the IT function requires that capability assessments are performed on a periodic basis so that opportunities to improve are identified. These assessments should be based on *objective* criteria that measure each capability's proliferation, appropriate usage, and effectiveness in fulfilling its intended purpose. An important outcome is the formal definition of existing capabilities and how they related to each other. This definition forms the basis for an annual capability-improvement plan to advance maturity levels on a sustainable basis.

Bot and Renaud (2012; timreview.ca/article/596) identified that successful capability management requires establishing sub-level KPIs. Although KPIs must be *measurable*, it is important to recognize that they can be *categorical* as well as *quantitative* metrics. Bot and Renaud highlighted that seemingly more precise quantitative metrics (i.e., continuous interval or ratio quantities) can often be less accurate than categorical (i.e., discrete qualitative) metrics. Furthermore, metrics should be both *predictive* as well as based on *outcomes*.

Implementing accurate process-ambidexterity metrics requires a balanced definition of both predictive and outcome metrics in the following performance domains:

1. Fit for purpose: meets defined requirements, improves existing IT solutions, and assures responsiveness to the needs of the firm. Metrics in this measurement domain predicatively measure process alignment, focusing primarily on the responsiveness and agility aspects of process adaptability. When applied at a process or project level, sub-level KPIs assess whether business priorities and service levels are met (i.e., they determine whether it meets, or is on-track to meet its objectives – ensuring an emphasis on outcomes instead of self-absorbed activities performed). Overby (2011; tinyurl.com/3hw8z7y) identified that meeting objectives is only a pre-condition for sustainable IT because the IT function must also be responsive to the business. Hence, a key aspect of KPIs designed to measure the fit for purpose is measuring the rate at which a project or process meets its objectives.

2. Feasibility: identifies and scopes the changes needed in IT to support the new technology. To best assure process customization, metrics in this measurement domain should address all three capability areas. These metrics focus on the customization aspect of process adaptability as well as indirectly gauging the internal-alignment aspect of process alignment. When applied at the level of a process or project, these sub-level KPIs assess the feasibility of how project scope, completion, and risk management are evaluated. For in-flight projects, these KPIs measure progress towards completion of the feasible scope (i.e., they determine whether it is feasible for a given project to be completed, thereby preventing situations where a project never ends). For processes, these KPIs measure the predictive and outcome controls for the process (i.e., they determine whether the process is operating within its defined

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parameters, thereby preventing out-of-control processes or processes from which there is no escape).

3. Effectiveness: identifies value-added aspects or removal of non-value-adding activities. For instance, is the business case realistic given the investment that the firm is prepared to make? Does the change introduce risks or trade-offs that are acceptable to the firm? Are non-value-adding activities and waste minimized? Metrics in this measurement domain enable practitioners to balance the practices that are being implemented to ensure that they are adequate as well as lean. These metrics focus on the flexibility and responsiveness aspects of process adaptability as derived outcome metrics of process alignment. These sub-level KPIs measure expected or added value given the investment (i.e., they determine whether a process or project adds value, thereby forcing accountability and a willingness to change to more effective alternatives).

Measurement has a well-accepted role within the IT function, but traditional approaches to measurement rarely consider whether the IT function is meeting its business goals; in essence, they do not measure *why*

change is occurring. Instead, most IT functions calculate hundreds of metrics pertaining to the implementation of change (i.e., what, when, and how) that are rarely employed by senior business management because there is no apparent relevance to the “why questions”. Given that metric collection, analysis, and interpretation is expensive, the IT function should seek to minimize KPIs without sacrificing balance and accuracy and without losing the benefits provided by implementation-oriented measurement of change.

This balance can be accomplished by applying the above KPI-measurement areas evenly for each new project and process using the paradigm of a measurement spirit level (tinyurl.com/5e4d4n), as illustrated in Figure 4. In a spirit level, a bubble floats to indicate the direction that the level is unbalanced. When the bubble is centered in the level, the item being measured is perfectly balanced. The three-way measurement of feasibility, effectiveness, and fit for purpose promotes a culture of relevance within the IT function. Too many metrics in one vertex means that measurement of the other vertices is weaker and is unlikely to effectively support business goals.

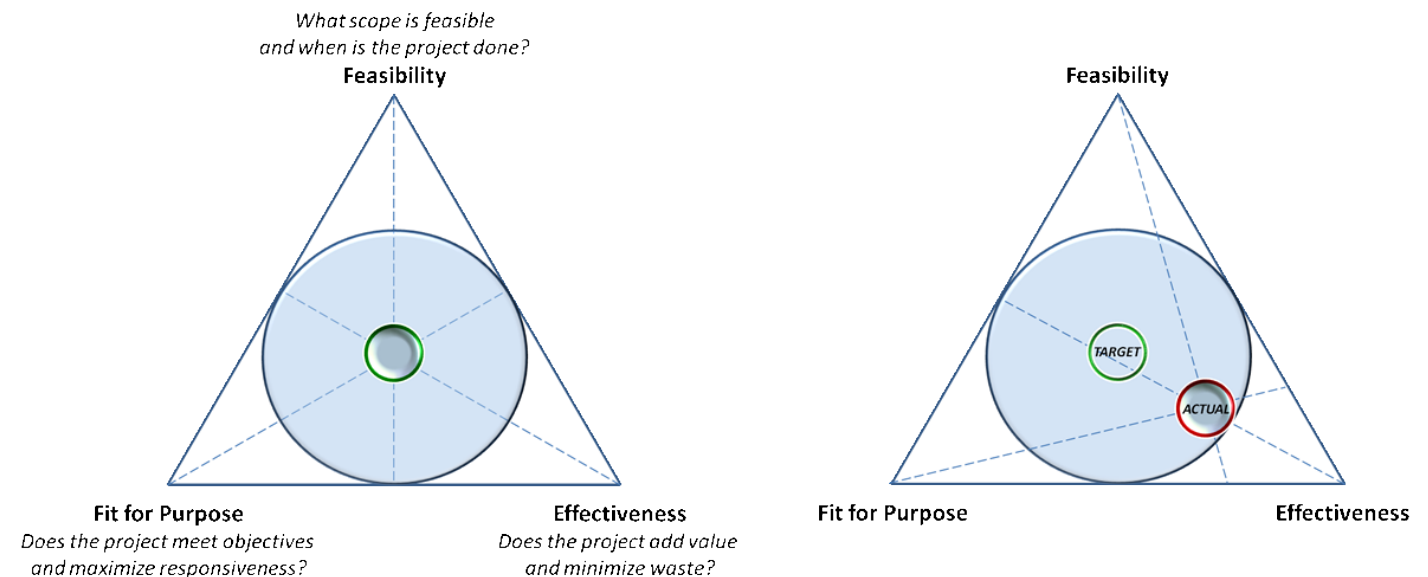


Figure 4. A spirit level for sustainable metrics (Left: an ideal/balanced scenario; Right: an unbalanced scenario where improvement is required)

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Conclusion

IT entrepreneurship can be a cornerstone of a firm's competitive success in a global, highly connected marketplace where agility, adaptation, and alignment are necessary. In summary, accomplishing and sustaining IT entrepreneurship requires:

1. Systematic, maturity-driven, and cost-effective investment in IT maturity improvement. This investment must be supported by executive sponsorship in technology, new processes, skills, and competencies to continuously introduce innovation, which is vital to a firm's competitive success.
2. Creation of the cultural environment for IT to become a strategic enabler of change. Unlike other forms of entrepreneurship, IT entrepreneurship must be continuously aligned and change must be proactively managed. These changes must occur in the context of IT maturity improvement for IT entrepreneurship to be sustainable.
3. Understanding IT maturity through the lens of three types of capability maturity improvement: technology, process, and competency. Composite capabilities consisting of these three types will be assembled to meet specific business needs and to advance IT maturity. The resulting hierarchy of capabilities is self-describing and provides a useful taxonomy for communicating scope and interdependencies, as well as maturity.
4. Recognition that IT maturity is as dynamic as the capabilities required to enhance the firm's performance in a changing global economy. The scope of IT maturity is continually growing and overall maturity can erode and, in fact, degrade whenever new capabilities depend on immature existing capabilities.
5. Acceptance that the introduction of a new technology capability by itself is not sustainable. And, although enterprise architecture and blueprints are essential for the successful adoption of new technology, it is insufficient on its own for sustaining technology change. New technologies also need to be balanced and supported by appropriate competen-

cies and processes. A capability hierarchy is a useful tool for understanding IT maturity and mapping the interdependency between capabilities of all types.

6. Managing IT maturity improvement by using an integrated capability maturity management system. Sustainable maturity improvement requires a two-level management system encompassing capability maturity and individual capability improvement by type of capability.
7. Appreciating that a unified maturity improvement system, based on Lean Six Sigma, can improve all three types of capability: technology, competency, and process. The use of a common system facilitates management and promotes sustainable governance of change.
8. Minimizing KPIs without sacrificing balance and accuracy. Given the high cost of collecting, analyzing, and interpreting metrics, balanced measurement of progress must at least encompass the dimensions of feasibility, fit for purpose, and effectiveness, and it should include both outcome and predictive KPIs.

Maintaining continuous change in any organization requires maintaining an ongoing cultural acceptance for change. Change creates fear and introduces risk that can only be overcome by a concerted effort that is supported by senior management. In the authors' experience, continuously nurturing a culture of change is especially important within the IT function because of the high rate of staff turnover in IT role assignments. The imperative to sustainably manage change across a wide range of capabilities is unavoidable for the IT function of a firm. IT executives must proactively manage the cultural acceptance for change if they wish to overcome the learned helplessness that is prevalent in most IT functions and otherwise prevents the IT function from being innovative in responding to the needs of the firm.

Given that most firms cannot stand still, if the IT function does not embrace sustainable change, new technology will be introduced anyway. The difference is that, without proactive management of capabilities, the new additions will quickly become unmanageable.

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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 Queen's University.

Sheppard Narkier is a business-driven, senior executive in information technology 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 co-founder and Chief Scientist of Adaptivity, which was recently acquired by EMC. Sheppard is responsible for designing the rules engines that enable better system-design decisions. 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 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 entrepreneurial-minded leader/executive and strategic thinker with extensive experience in technology innovation and global business management. She specializes in new venture creation, operational excellence, business transformation and strategy, leading organizational change, and evolving entrepreneurial ecosystems. She is an accomplished industry presenter, author of numerous peer-reviewed articles, member of the Lead to Win Council, and industry executive member of the Technology Entrepreneurship & Commercialization Council at Carleton University. Ms. Bot currently partners with executives and entrepreneurs of small-to-medium enterprises and large entrepreneurial companies in the information and computing technology sector (namely healthcare, mobility, telecommunications, software, Internet, IT) to assist in building, growing, and transforming global ventures and to solve wicked business problems. Her prior work experience includes BlackBerry / Research In Motion, 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 entrepreneurship, process ambidexterity, IT capability, process maturity, capability maturity assessment, sustainable metrics, IT function

Q&A

Alan Mcnaughtan

Q. Do Technology Startups Need Product Managers?

A. Product management is a dynamic discipline requiring a unique mix of business acumen, technological savvy, and customer-orientation. A strong product-management focus is critical within organizations looking to deliver best-in-class offerings to optimize profitability. But do technology startups need project managers in the very early stages of the business?

Technology startups may not have product management "in their DNA" because founding partners are often technology experts or, if they come from a business background, they may have little formal product-management experience or training. Technology entrepreneurs tend to be product-focused, which often leads to a company culture of "if you build it *right*, they will come". However, many startups fail due to their inability to articulate a need that their product is intended to resolve or how their product might improve performance or user experience. Products may be altered and improved by iteration, but a startup's success can be facilitated by a disciplined, *customer-centric* approach to product management. Technology startups that see product management as a core competency improve their chances of becoming stable and profitable organizations.

What does a product manager do?

The exact role of a product manager is difficult to define and even more so in a startup environment. According to Martin Erikson (2011; tinyurl.com/43hddh4), a project manager lives at the intersection of business, technology, and user experience. To be successful, Erikson argues, a product manager must be: an expert in one of these domains, passionate about all three of them, and constantly engaging with key stakeholders in each domain. This description of a product manager's role underscores the dynamic and varied nature of the position, spanning user experience, financial analysis, and cross-functional team management. Thus, product managers should become subject-matter and marketplace experts that are keenly attuned to customer needs and able to translate and integrate feedback into improving their products.

In *The Product Manager's Desk Reference* (2009; tinyurl.com/mjcpqss), Steven Haines describes product management as "the holistic business management of the product, from the time it is conceived as an idea to the time it is discontinued and withdrawn from the market". This is a more traditional description of product management; it is rooted in multi-phase, lifecycle product management. Lifecycle product management is a methodical phase/gate approach to product management where the end of each phase represents a "gate" where a specific business decision is made to proceed through to the next phase of product lifecycle.

Product management phases and gates exist to help organizations manage various product portfolios and make informed decisions about where scarce resources should be invested. Startups rarely deal with those tradeoffs. However, startup founders can be distracted by a myriad of issues as they gain momentum, and so it is even more important to have strong product-management focus on customer deployment – to interact with early adopters. Ben Yoskovitz, VP of Product at GoInstant, argues that a strong product manager is technologically savvy, metrics-orientated, and able to translate customer feedback into core product requirements that developers can focus on. Product managers need to ensure that their team is focused on the *right* things: the founder's vision tempered by customer feedback (Yoskovitz, 2009; tinyurl.com/m2stp8e).

Entrepreneurs tend to be serial entrepreneurs and generally have a difficult time delegating product responsibility before it is too late (Paquet, 2009; tinyurl.com/k3ta3he). Saeed Khan, product management guru and contributor to the Pragmatic Marketing website, has argued that venture capital firms should insist on a focus on product management as part of their investment agreement. "I've seen too many cases where a CTO and a CEO are leading a company and the CTO really is technical and the CEO is very business focused and yet they fail because they don't understand how to bring those two worlds together and how to bring products to market in a scalable, efficient way" (Khan, 2009;

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tinyurl.com/mjh4t32). Bill Campbell, former Intuit CEO, similarly supported a product management approach for startups. When asked who should follow the CEO or founder of a startup he says, “I know (it) sounds like a strange answer, Product Marketing, some people call it Product Management, but somebody who can really understand the dynamics of what goes on in a marketplace, apply technology to that marketplace, see how the technology can work, and continue to advise brilliant scientists so they can adapt their products to make sure customers are happy” (Khan, 2009; tinyurl.com/mjh4t32).

It is not easy for a technology startup to become a stable, profitable business. Data from the Bureau of Labor Statistics in the United States suggests that two-thirds of startups will fail within a decade (Shane, 2011; tinyurl.com/mzc7skl). A funding-recommendation engine called ChubbyBrain analyzed 32 unsuccessful startups to identify the top reasons for failure. The top three reasons are: i) ignored marketplace, ii) no market need, and iii) not the right team (ChubbyBrain, 2001; tinyurl.com/3bgkhbf). A product-management focus within a startup is key to validating market need, improving a product or service via customer feedback, and making sure that the founder’s vision is not lost in translation.

Case study: Wesabe

A great way to underscore the importance of a customer-focused product manager within a technology startup is to look at how Wesabe (wikipedia.org/wiki/Wesabe) lost its first-mover advantage in the personal-finance industry to Mint (mint.com).

Wesabe was at the forefront of the Web 2.0 explosion when online experiences moved beyond static data to interactive experiences tailored to specific users. Launched in November 2006, Wesabe was a site dedicated to helping people manage personal finances. It aggregated a user’s financial data online and made recommendations based on the data to improve the user’s financial position. It was a great idea at the right time – Wesabe preceded Mint by almost a full year – so, where did it all go wrong for them?

Like many technology startups, Wesabe was co-founded by two friends: Marc Hedlund (Chief Product Officer) and Jason Knight (CEO). As CPO, Marc made almost all product decisions relating to Wesabe’s service. When Jason Knight was forced to step down due to family illness, it was Mark Hedlund at the helm, guiding Wesabe through the final two years of its existence.

According to Hedlund (2010; tinyurl.com/l8lluqy), there are two fundamental reasons for Wesabe’s demise. First, Wesabe made a strategic error relating to a “build vs. buy” decision. At the time, Yodlee (yodlee.com) was the clear leader in financial data-aggregation services. They were, however, not in great shape financially. Wesabe did not want to tie themselves to a single provider with a poor financial outlook, so they decided to build their own data-acquisition systems, which never worked as well as Yodlee’s. Their decision to build rather than leverage a proven technology was a mistake.

The second reason that assured Wesabe’s would lose credibility and market share to Mint had to do with the product itself. Wesabe’s ultimate goal was to provide a tool for their users to interact with their own financial data; they were trying to make usability and editing of data as intuitive as possible in an attempt to get customers to change their behaviours. Mint, on the other hand, was creating a product where customers did not actually have to do any work to interact with their financial data. Mint automatically categorized all of a user’s financial data and transactions; they also made signup painless. In short, Mint had a better user experience and actually addressed a core customer need that improved the lives of its users: they provided a simple solution to aggregate and sort financial transactions.

Marc Hedlund's company had a significant first-mover advantage. And, he had a clear vision: to help users improve their financial personal-finance management and decision-making. The whole company took on Marc’s view that “if they build it, they will come”. Neither Marc nor any of the Wesabe team ever took a customer-centric product-management approach to see what users really required. Instead, they addressed what Wesabe thought were the customers’ needs. In the end, their product was far too complex for an average user. Mint provided a simple and easy-to-use tool to aggregate personal finances and did it in a slick and intuitive way. It is not a coincidence that it was Mint that was acquired by Intuit, not Wesabe, given the importance Intuit Chairman and former CEO Bill Campbell places on product-driven startups that identify and then solve specific customer needs.

Conclusion

Serial entrepreneurs are aware that launching a successful startup is difficult. Failure can be traced back to not understanding a target market or there being no market need for a specific product. Further complicat-

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ing the path to success are founders who are biased towards a “build it and they will come” attitude. Startups that bring in a strong product-management leader early in their lifecycle will have a higher probability of success. Venture capital firms would be wise to mandate a senior product-management position as a stipulation of funding so that sufficient focus is placed on understanding marketplace dynamics to ensure that there is a current or imminent need for a new product. The presence of a strong product manager may ensure a metrics-oriented approach to obtaining and analyzing customer feedback to create product requirements that can actually solve specific customer needs rather than an unproven vision.

Recommended Reading

- *The Product Manager's Desk Reference*
by Steven Haines (2009; tinyurl.com/mjcpqss)
- *42 Rules of Product Management*
by Brian Lawley and Greg Cohen, eds. (2012;
tinyurl.com/mqbj sca)
- *Inspired: How To Create Products Customers Love*
by Marty Cagan (2008; tinyurl.com/klck5oq)

About the Author

Alan Mcnaughtan is a Product Manager for Residential Internet Access Services at Bell Canada. He supports a team of Product Managers focused on developing and improving products across Bell's Internet portfolio. Core portfolios include Bandwidth Management, Internet VAS portfolios (email, security, and usage) and overall Internet strategy for Bell Residential Services. Alan has an MBA from Griffith University in Brisbane, Australia, and a BAH from Queen's University in Kingston, Canada. Alan is an active member of the Broadband Multimedia Marketing Association (BMMA) and the Ottawa Product Management Association (OPMA).

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Keywords: product management, product manager, startups, Wesabe, Mint

TIM Lecture Series

Using Risk to Drive a Security Service

Paul Card

“The more knowledge you gain about your business and your technology, the more you decrease the sphere of unknowns and maximize your odds of success.”

Paul Card
Director of R&D at Seccuris

Overview

The fourth TIM lecture of 2013 was presented by Paul Card, Director of R&D at Seccuris (seccuris.com). Card drew upon his experience as a programmer, entrepreneur, and professor to reflect upon the importance of leveraging uncertainty and managing risk when developing a technology platform in a small company. The event was held at Carleton University in Ottawa, Canada, on May 1st, 2013.

The TIM Lecture Series is hosted by the Technology Innovation Management program (carleton.ca/tim) at Carleton University. The lectures provide a forum to promote the transfer of knowledge from 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.

Summary

At the core of this lecture was the concept of using an ICT platform to enhance or grow an existing business. Once a company has sufficiently developed the technological platform upon which it will differentiate itself from its competition, it must use this platform to play both offence and defence. On offence, it must decide how to enhance and market the platform; on defence, it must mitigate risk and leverage uncertainty. In contrast with existing platforms, which benefit from established

business models, a startup with a new platform has nothing to draw upon and faces greater risks and challenges on both offence and defence. Additional challenges arise a startup focuses on the technology first, which is a common scenario.

The challenges with the technology-first approach to platform commercialization include:

1. Customers may be reluctant to change.
2. It may be difficult to demonstrate to customers how much better the new platform is compared to existing alternatives. Gaps in communication and understanding are common with new technology.
3. Customers may not be as enthusiastic as the startup about "state of the art" technology. They do not care how "cool" the technology is; they are driven by the problem, not the solution.
4. At times, a technology-focused startup must overcome its own reluctance to use existing, simpler technology, which may be the most efficient solution from a business perspective.
5. The business case (even if validated) might not fit the vocabulary of customers or they may not be ready to consume the solution.
6. At least in Canada, there is very little funding available for technology development.

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To some extent, these risks can be mitigated by the education and experience of the management team. Ongoing efforts to further validate the business case, analyze the market, and understand the underlying business problems are essential. Furthermore, startups should recognize and embrace the uncertainty that comes with doing business in the technology domain. Although risk is a negative aspect of uncertainty, its opposite is luck, which is an undervalued success factor in business.

Card explained that luck is especially important for startups, which are more susceptible to the positive and negative impacts of uncertainty than large companies, in which unexpected events can be buffered by momentum and time. For a startup, hiring the wrong person or missing an opportunity can be fatal; however, the opposite is also true: a startup's early success can hinge upon taking the right opportunity when it comes along.

To take advantage of good fortune, a startup must be prepared. Although uncertainty can be a major blind-spot to many CEOs, there are ways to minimize or manage it, such as:

1. **Identifying the unknowns:** if you "find out what you don't know", you can at least recognize sources of potential risk and opportunity.
2. **Hedging your bets:** when possible, maintain a flexible strategy in which different positive outcomes are possible, depending on how conditions change.
3. **Modelling risk:** understand the likelihood of different risks and how they can affect the company.
4. **Embracing risk:** foster a culture that does not shy away from uncertainty, but rather manages it and embraces it as a source of good fortune.

Case study: Seccuris

In the second half of the lecture, Card used Seccuris as a case study on risk management using a technology platform. Seccuris is a privately owned Canadian company that was founded in 1999. It employs over 120 staff in its headquarters in Winnipeg, in regional offices across Canada, and in its US headquarters in Dallas. Initially, the company's vision was to provide a managed data-security service for residential customers; however, the business model and technology evolved

over a 10-year period in response to increasing uptake by enterprise customers. Now, Seccuris specializes in helping companies manage their information risks using a service model they describe as "information assurance". Seccuris provides its clients with information assurance by first carefully studying the core of the client's business and then building a security service that is tailored to its needs. The broad set of integrated services offered by Seccuris includes consulting services, managed services, cloud services, education services, solutions integration, and R&D.

As the Seccuris platform evolved, a key question was how to de-risk the platform and business as they grew. Through an analysis of alternative technology in the market and a re-evaluation of its own platform, Seccuris was able to not only reduce its own risks, but also identify further opportunities for the business. Thus, the case study illustrates how embracing risk can help a company play good offence and good defence at the same time. Seven of these opportunities are summarized below. The first four opportunities are business-driven and arise from the same investment in a common platform:

1. **Service opportunity:** given that solutions offered by the competition often neutered the technological functionality in pursuit of ease of use, Seccuris concluded that these solutions were no longer effective for security purposes. By addressing the functionality deficits and hiding the complexity from users, Seccuris was able to take away the headaches currently affecting customers, while using the same vocabulary that customers were familiar with.
2. **Product sales:** for customers that did not want a service, Seccuris would offer product sales.
3. **Add-on services:** through interactions with customers, opportunities for add-ons and upselling arose.
4. **New markets:** the platform also opens up new markets for other services (e.g., training, reselling, consulting, platform customization).

The final three opportunities are examples of future markets for the technology:

5. **Advanced persistent threats:** Seccuris gains valuable experience with its diverse client as it observes, categorizes, and studies the cybersecurity threats

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faced by these clients. Securis can leverage this information to focus its analysts' time and develop future services that focus on sophisticated threats.

6. Insider threats: in addition to providing security against outside threats, Securis also leverages their platform and experience to counter data loss by "legitimate" channels (e.g., disgruntled staff, laptop infection from home). The level of monitoring and the response to insider threats can be tailored to the needs and risk levels of clients.

7. Real-time, tailored monitoring: the model of the client organization's goals and risks can be continuously updated using real-time data from the client's network. Thus, the monitoring service feeds into multiple levels (e.g., IT infrastructure, security, human resources, financial systems) and helps the client organization refine its own view of the organization and the risks it is facing.

These seven examples demonstrate how Securis mitigates risk by allowing various sales and services models based on a single platform. All of these opportunities are tied to a number of real business problems and are applicable to many industry verticals and regions. However, the company does not require all of these opportunities to succeed; it has hedged its bets by making a single investment in a platform upon which overlapping routes to success can be mapped out. Most importantly, Securis has developed and is refining this platform by leveraging its existing knowledge and a deep understanding of its customers and their business needs.

Lessons Learned

In the discussions that followed each portion of the presentation, audience members shared the lessons they learned from the presentation and injected their own knowledge and experience into the conversation.

The audience identified the following key takeaways from the presentation:

1. Companies should find it liberating (not depressing) to recognize that luck plays such an important role; it makes them more agile and ready to take advantage of opportunities.
2. We set our own measures of success.
3. A lot of people make their own luck. Attitude is important... and tenacity.
4. The platform is what you build on top of, but you can differentiate in the add-ons or in the platform itself.
5. Large companies reduce risk by having a portfolio of projects; a startup is really just one project.
6. If you pivot off an opportunity, multiple opportunities can result.

Actions

Following the lecture, Dr. Tony Bailetti, Director of the TIM program, asked the audience to suggest actions that the local Ottawa community could take in the domain of cybersecurity. Audience members proposed the following actions:

1. Develop an architecture to allow comparisons of cybersecurity capabilities.
2. Create an industry-driven consortia of cybersecurity companies to create standards, collaborate, and network.
3. Avoid local/federal bottlenecks; the cybersecurity market is global.
4. Develop a mechanism for harnessing cybersecurity knowledge in Ottawa.
5. Develop an education/marketing program to overcome ignorance of basic security practices and modern technological developments.
6. Seek funding for startups in the cybersecurity space. Develop a network of investors that understand the space; find out who these investors are and engage with them.
7. Reach out to the security community and invite them to participate in defined activities.
8. Dedicate upcoming issues of the TIM Review to the theme of cybersecurity.

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This report was written by Chris McPhee.

About the Speaker

Paul Card is Director of R&D at Securis. He has more than 10 years of experience working with domestic and international companies to advance technology, research, and development strategies. Prior to joining Securis, Paul was a Research Scientist at TR Labs, where he was responsible for the security research portfolio. He has worked with over 20 different ICT companies in research and development activities. Paul holds a PhD and MSc in Electrical and Computer Engineering from the University of Manitoba in Winnipeg, Canada. Paul is an Adjunct Professor of the University of Manitoba, and he is a member of the IEEE and the ACM.

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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. Only the essential references should be included. The URL to an online reference is preferred; where no online reference exists, include the name of the person and the full title of the article or book containing the referenced text. If the reference is from a personal communication, ensure that you have permission to use the quote and include a comment to that effect.
7. Provide a 2-3 paragraph conclusion that summarizes the article's main points and leaves the reader with the most important messages.
8. Include a 75-150 word biography.
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