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Recent Research

Welcome to the second issue of the *Technology Innovation Management Review*. In this issue, we present recent research perspectives on business ecosystems, innovation, and entrepreneurship. We invite your comments on the articles in this issue as well as suggestions for future article topics and issue themes.

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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 early-stage 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 third sector, and others – to bridge the gap between theory and practice. In particular, we focus on the topics of managing innovation, technology entrepreneurship, economic development, and open source business.

Upcoming Issues

- *December*: Intellectual Property Rights
Guest Editor: Peter Carbone
- *January*: Open Source Business in 2012
Guest Editor: Leslie Hawthorn
- *February*: Entrepreneurship Theory
Guest Editor: Tony Bailetti
- *March*: TBD
- *April*: Social Innovation
Guest Editor: Stephen Huddart

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

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Contribute to the TIM Review in the following ways:

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- Review the upcoming themes and tell us what topics you would like to see covered.
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Editorial: Recent Research

Chris McPhee, Editor-in-Chief

Welcome to the second issue of the *Technology Innovation Management Review* (TIM Review). The TIM Review is the new name for the *Open Source Business Resource* (OSBR), which we have been publishing on a monthly basis since 2007 from the Technology Innovation Management program at Carleton University in Ottawa, Canada (<http://carleton.ca/tim>). In the final issue of the OSBR, I described how the journal began with an emphasis on the business of open source, but has evolved over the years to focus on the theories, strategies, and tools that help early-stage technology companies succeed (McPhee, 2011; <http://timreview.ca/article/465>).

The editorial theme for this issue is Recent Research. The articles in this issue present research perspectives that are relevant to many of the topics that are a focus of this publication, including business ecosystems, open source business, innovation, and entrepreneurship.

Steven Muegge presents key results from his recently-completed PhD research into open source, community-developed platforms. Using the example of the Eclipse ecosystem, he offers a systems perspective on community-developed platforms and the institutions that structure the participation of individuals and companies. His article unites perspectives on platforms, business ecosystems, and communities and describes how a "system of systems" view can benefit both researchers and practitioners.

Stoyan Tanev, Mette Præst Knudsen, Tanja Bisgaard, and Merethe Stjerne Thomsen examine how national innovation policies reflect the emergence of three new innovation paradigms: user-driven innovation, open innovation, and value co-creation. By analyzing the practices and recommendations of multiple policy organizations in Denmark, the authors present a case study that provides insights to other developed countries that also face the challenges of adopting these new innovation paradigms.

Sandra Schillo uses the example of "entrepreneurial orientation" to examine the extent to which the academic literature can provide clear insights to managers. Entrepreneurial orientation examines the extent to which a firm is entrepreneurial and this topic has yielded

a substantial body of literature that attempts to measure entrepreneurial orientation and its impact on performance. The article takes a critical view of this literature and shows that, while there are useful indicators for managers, greater specificity in future studies is required before managers can take reliable guidance from the literature in this area.

Chris Justus presents the results of his recent research into the importance of relationships for young technology companies. His novel research methods enabled him to extract relationship and revenue data from historical records. The article focuses on the managerial implications of his findings, which include the importance of early funding, niche identification, and building relationships with large firms.

In December, guest editor Peter Carbone presents an exciting line-up of authors offering their perspectives on the editorial theme of Intellectual Property Rights. We invite article submissions for January's issue on Open Source Business in 2012 and February's issue on the Entrepreneurship Theory. We also encourage you to suggest themes you would like to see covered in future issues.

We hope you enjoy the second issue of the TIM Review and will share your comments on articles online. Please also feel free to contact us directly with feedback or article submissions: <http://timreview.ca/contact>

About the Author

Chris McPhee is Editor-in-Chief of the *Technology Innovation Management Review* and is in the Technology Innovation Management program at Carleton University in Ottawa. Chris received his BScH and MSc degrees in Biology from Queen's University in Kingston, following which he worked in a variety of management, design, and content development roles on science education software projects in Canada and Scotland.

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Business Ecosystems as Institutions of Participation: A Systems Perspective on Community-Developed Platforms

Steven Muegge

“The architecture of Linux, the Internet, and the World Wide Web are such that users pursuing their own "selfish" interests build collective value as an automatic byproduct.... These projects can be seen to have a natural architecture of participation... By consistent effort (as well as economic incentives ...), it is possible to overlay such an architecture on a system that would not normally seem to possess it..

Tim O'Reilly

Founder of O'Reilly Media and supporter of the free software and open source movements

This article introduces a systems perspective on community-developed platforms and the institutions that structure participation by individuals and companies. It brings together the past research about technology platforms, company participation in business ecosystems, and individual participation in developer communities, and links these codependent subsystems through resource flows, interconnected institutional arrangements, and shared governance. To achieve this synthesis, it draws on conceptual arguments from a broad range of sources, including Elinor Ostrom's research program on the economics of sustainable commons governance, Tim O'Reilly's practitioner essays about the architecture of participation, and prior management research on modularity and design, resource dependence, and systems thinking. The resulting “systems of systems” perspective is parsimonious and insightful for entrepreneurs, managers, and community leaders.

Introduction

High-impact innovation, once thought to be the province of corporate R&D labs, is now known to occur in many settings outside the boundaries and exclusive control of traditional business firms. Technology-intensive business organizations, from specialized startups to diversified multinational enterprises, increasingly self-identify as participants within business ecosystems, adopters and patrons of open platforms, and stewards and promoters of innovation communities – trends well-known to readers of the *OSBR* and the *TIM Review*. There exists today growing bodies of knowledge about platforms, ecosystems, and communities, but these bodies of knowledge are not well connected and have developed in different directions. Platforms research has tended to emphasize the closed or partially-open platform architectures controlled by *platform leaders* such as Apple, Microsoft, and Amazon. Business ecosystems

research has often focused narrowly on *keystone organizations*, particularly the strategies by which profit-motivated platform leaders can sustain and leverage a lucrative privileged position, and the strategies available to firms aspiring to become platform leaders, but less is known about ecosystems anchored around not-for-profit keystone foundations and platforms that the keystone can nurture but not control. Research on innovation communities has typically attended closely to the mechanisms of *value creation*, particularly the processes of free and open source software development, but often with less attention to and connection with adoption, commercialization, and the mechanisms of value capture. The Apache Software Foundation, the Linux Foundation, and the Eclipse Foundation are three prominent examples of systems comprised of a community-developed platform, a commercial ecosystem of for-profit companies and other organizations, and a meritocratic developer community of individuals who

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maintain and extend the platform. These components interact and co-evolve to produce high-impact innovation. Nonetheless, much past scholarship has too often examined platforms, communities, or ecosystems in isolation, rather than examining the broader context in which each of these subsystems are collectively embedded or the interactions *between* these subsystems.

In this article, the engine driving innovation on community-developed platforms is presented as a *resource cycle* from the business ecosystem, to the developer community, to the community-developed platform, and back to the business ecosystem. The developer community is the locus of value creation, the business ecosystem is the locus of innovation commercialization and value capture, and the platform sits between as a shared commons resource: the outbound product of the developer community and inbound open innovation for the economic actors of the business ecosystem. The resource cycle of innovation is driven by institutional characteristics of the platform, community, and ecosystem, and by keystone actions of the governance foundation. Collectively, these multilevel *institutions of participation* and *keystone actions* motivate participation in subsystems and resource flows between subsystems. Later sections introduce and elaborate on each of these concepts.

An integrated “systems of systems” perspective complements previous work in at least two ways. First, by raising the level of analysis, it joins these various bodies of knowledge as each addressing aspects of a larger partially-decomposable system. Second, by introducing the language and concepts of institutional theory and prior research on the economics of commons governance, it focuses attention on aspects of the system that are unaddressed or under-addressed by other perspectives. An elevated level of institutional analysis provides practitioners with a common vocabulary for effective communication and discussion with others, and a conceptual framework for thinking clearly about the interactions between platforms, business ecosystems, developer communities, and the polycentric governance structures that comprise a governing keystone foundation.

This article is organized in seven sections. This first section has introduced the topic and key concepts. The next four sections develop the “systems of systems” perspective, starting with the platform, next adding the business ecosystem and its relationship to the platform, then the developer community and its relationships to

the platform and ecosystem, and finally the keystone foundation and its network of relationships with other subsystems. Collectively, these four sections develop an integrated systems perspective on participation, value creation, and value capture. The sixth section discusses the contribution of this work, emphasizing the practical implications for various stakeholders. The seventh section concludes and looks ahead to the future. Illustrative examples throughout the article are drawn from the author's field research on the Eclipse Foundation, platform, ecosystem, and community (Box 1), and other systems of distributed innovation.

Platforms

A platform is a set of technological building blocks and complementary assets that companies and individuals can use and consume to develop complementary products, technologies, and services. Innovators that build on top of platforms can reuse the non-differentiating assets that are core to the platform to focus their effort and attention on assets that will differentiate the innovator's offer from others.

The *technological building blocks* of a platform could in principle take many different forms, such as electronic hardware, schematic designs, specifications, online services, or knowledge assets, but many prominent platforms today are implemented largely in computer software. *Complementary assets* increase the value of the technological building blocks, often by decreasing the associated costs or risks of adoption and use. For example, important complementary assets may include the facilities for distributing platform assets, the communications infrastructure enabling user-to-user support, and a structured process for accepting new contributions. At a 2008 talk at Carleton University (<http://timreview.ca/article/200>), Eclipse Foundation Executive Director Mike Milinkovich described the Eclipse platform as the combined base of technologies, architectures, designs, and assets used to build market offers, components, products and services, legal and licensing frameworks, and processes which anchor economic community – a view consistent with this perspective.

Two findings from prior research on platforms are especially salient. First, we know that platforms vary widely in level of openness, where openness is a multidimensional construct including not only the property rights of the platform assets – that is, the rules by which others can use, modify, and redistribute the assets – but

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Box 1. The Eclipse Foundation, platform, ecosystem, and community

The illustrative examples in this article are drawn from the author's recent field research on the Eclipse ecosystem (<http://eclipse.org>) – a setting likely familiar to many readers of this journal. Eclipse Foundation staff have been active contributors to the *OSBR*, with articles by Don Smith and Mike Milinkovich in the inaugural issue of July 2007 (<http://timreview.ca/article/94>), Ian Skerrett in January 2009 ([article/219](http://timreview.ca/article/219)), Mike Milinkovich again in January 2010 ([article/320](http://timreview.ca/article/320)), and Ian Skerrett again in January 2011 ([article/409](http://timreview.ca/article/409)). In last month's inaugural issue of the *TIM Review*, Carleton Professor Michael Weiss illustrates several concepts with a case study of Eclipse ([article/488](http://timreview.ca/article/488)).

The Eclipse field setting includes all the components discussed in this article: a community-developed platform, a business ecosystem, a developer community, and not-for-profit keystone governance foundation. According to the bylaws of the Eclipse Foundation (<http://eclipse.org/org/documents/>), Eclipse exists “to advance the creation, evolution, promotion, and support of the Eclipse Platform and to cultivate both an open source community and an ecosystem.” In the January 2010 issue of the *OSBR*, Executive Director Mike Milinkovich writes: “This duality is built into our bylaws, our organization and, I would assert, our DNA” (<http://timreview.ca/article/320>). Likewise, the characteristics of vendor neutrality, extensibility, and accessibility are embedded into the Eclipse Foundation's legal identity.

According to Eclipse Foundation staff, “This really is the best of both worlds: the openness, transparency and meritocracy of open source with the resources and commitment of corporations both large and small” (Smith and Milinkovich, 2007; <http://timreview.ca/article/94>).

At the time of this writing, the Eclipse Foundation comprises 174 member organizations, 1057 individual committers, and 273 projects. Eclipse software assets are community-developed open source software that can be freely obtained, used, modified, and redistributed. The Eclipse software platform is comprised of modular extensible frameworks for building software and a family of tools and runtimes built on those frameworks. The most well-known Eclipse tool is the Eclipse Java IDE – often called the dominant IDE for software developed in the Java programming language. Eclipse is structured to deliberately encourage companies to incorporate Eclipse software assets into their own in-house software and commercial products. Through well-defined extension points and application programming interfaces (APIs), software developers can use Eclipse tools to create new plug-in components to extend Eclipse tools and frameworks in new ways. This month, the Eclipse community celebrates its tenth birthday (<http://eclipse.org/10years>) at EclipseCon Europe 2011 (<http://eclipsecon.org/europe2011>).

The scholarly research that underpins this article was a multi-year field study of the Eclipse Foundation, community, platform, and ecosystem. In addition to the findings reported here, the research also examined the origins and meaning of the ecosystem concept, the characteristics of each institutional structure and their interdependencies, tensions between participants and the management of those tensions, the motivations for company participation, and the institutional features that enable, promote, and sustain company and individual participation. The research design was a nested multilevel explanatory case study that collected data on individual participation in Eclipse open source projects, company participation in the Eclipse ecosystem, and the interactions of individuals and companies within Eclipse governance structures, including the board of directors, the foundation staff, and the cross-project governing councils. Data sources included direct observation of participants and participant communications, extensive archival data, and interviews with individual participant informants at multiple levels of analysis. The research was multidisciplinary in the sense of drawing on several scholarly disciplines, including strategic management, organization theory, institutional economics, and analogy with natural ecology to better understand and explain phenomena that cross traditional disciplinary boundaries.

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also the processes of maintaining and extending the platform assets. Any particular platform may be more open in some respects and more closed in others, and the number of possible permutations is large. Second, we know that platforms are hubs for both value creation and value capture, and the dynamics of each of different.

From an institutional perspective, a platform that is at least partially open for use and adoption is a commons resource, and participation in maintaining and extending a platform is collective action – notions useful for linking the platform to the subsystems of value creation and value capture. (Box 2 introduces the research behind these concepts). Conceptually, the notions of platform value creation and platform development are closely related, as are the notions of platform value capture and the property rights for distribution and use. On the value capture side, platforms that are widely ad-

opted by organizations and individuals can become the anchor of what practitioners are calling “business ecosystems” – examined in the next section.

Business Ecosystems

Business ecosystems are a practitioner-driven phenomenon where organizations and individuals typically self-identify as an ecosystem, both in their own internal discourse and in the brand identity they convey to others. Although practitioners differ on definitions, they generally agree that companies within a business ecosystem interact both cooperatively and competitively to co-evolve capabilities around a platform. The scholarly management literature has examined business ecosystems from at least four different perspectives: i) as an industry structure anchored around a technology platform; ii) as a context conducive to open innovation; iii) as an innovation community that extends member-

Box 2. Elinor Ostrom's research program on sustainable commons governance

Elinor Ostrom shared the 2009 Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel (<http://tinyurl.com/ygum66h>) for "analysis of economic governance, especially the commons." Ostrom's work challenged economic orthodoxy that collective action is rarely sustainable and investigated the antecedents and determinates of successful collective action around commons resources. A commons (<http://wikipedia.org/wiki/Commons>), interpreted broadly, is a shared resource potentially subject to social dilemmas (http://wikipedia.org/wiki/Social_dilemma).

In traditional economic thought, three “classic” models of collective action (http://wikipedia.org/wiki/Collective_action) together comprise the conventional theory of the commons: Mancour Olson's *The Logic of Collective Action* (1965; <http://tinyurl.com/3dfqj4f>), Gareth Hardin's

“The Tragedy of the Commons” (1968; <http://tinyurl.com/3n5f5nl>), and the Prisoners' Dilemma game of analytic game theory (Poundstone, 1992; <http://tinyurl.com/3d5apgn>). All predict that collective action cannot be sustained without strong property rights or a coercive state. Hardin famously writes: “Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.” Ostrom argued that although these models can be useful in helping to conceptualize some of the incentives in simple situations, they have been over-used as realistic models of much more complex and dynamic situations.

Three decades of empirical studies have found that collective action problems can sometimes be solved

by voluntary action. These studies have focused mainly on systems of shared natural resources such as groundwater basins, irrigation systems, grazing systems, fisheries, and forests, but also urban goods such as policing and education. In some of these systems, resource users did self-organize and succeed in preventing severe over-harvesting of resources they depended on, and although these institutions did not always succeed, neither did private or state ownership. More recently, Ostrom's methods have been applied to the scholarly study of knowledge commons, such as software and other digital assets, where the dilemmas threatening sustainability are under-production and *enclosure* (<http://wikipedia.org/wiki/Enclosure>) rather than over-utilization dilemmas of the traditional commons.

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ship to organizations as well as individuals; and iv) as an innovation network of ties and relationships between firms. These perspectives are complementary: each provides a different vantage point and conceptual lens to bring into sharp focus some aspects of the business ecosystem that are unaddressed or under-addressed by other perspectives.

An institutional perspective on business ecosystems instead emphasizes the rules, norms, and enforcement characteristics that structure interaction and participation. Also, institutional theory provides a precise language for formally specifying the business ecosystem as an organizational field: the set of all organizations that, in the aggregate, constitute a recognized area of institutional life. The organizational field is a well-defined research construct in organization studies. In scholarly social science research, organizational fields connect organization studies to the wider macrostructures of societies and world systems.

Bringing together all of these ideas and adapting a popular definition from James Moore (2006; <http://tinyurl.com/5rtbj6u>), a business ecosystem is the field of economic actors whose individual business activities, anchored around a platform, share in some large measure the outcome of the whole ecosystem. This definition makes three specific and deliberate refinements to Moore's

definition. First, the notion of an organizational field provides definitional precision and clarity, links to previous management scholarship, and reduced likelihood of confusion between the business ecosystem and developer community construct (introduced in the next section). Second, it explicitly identifies the platform as the anchor point of the ecosystem and the nexus of entwined participant outcomes. Third, it replaces Moore's language of "shared fate" with the notion of "shared outcomes" to remove any suggestion of predetermination: outcomes are interdependent and co-evolving but not fixed in advance. From this perspective, the Eclipse ecosystem includes a broad set of organizations and individuals conducting business transactions with products, services, and technologies anchored around the Eclipse platform. Some ecosystem participants become members of the Eclipse Foundation, while others do not. Some ecosystem members become active in the maintenance and extension Eclipse software, while others do not.

Activity within a field is structured by an *institution* – the set of formal constraints, informal constraints, and enforcement characteristics that structure interaction (Box 3). Prior research on business ecosystems has had little to say about the institutional factors associated with participation, and this gap in our collective understanding was one of the motivations for this research.

Box 3. Institutions

An *institution* is a set of formal constraints, informal constraints, and enforcement characteristics that structures human interaction in a way perfectly analogous to the rules of the game in a competitive team sport (North, 1993; <http://tinyurl.com/ywppys>). Some aspects of an institution may be codified and explicit while others are tacit and are taken for granted. Some aspects may be unnoticed and unquestioned by participants.

One outcome of Elinor Ostrom's research program (Box 2) was the Institutional Analysis and Design (IAD) framework, which arose from the need to specify and compare di-

verse collective action situations. IAD focuses attention on three broad categories of institutional variables: i) underlying factors of the rules in use, attributes of the community, and attributes of the resource; ii) the action arena of actors in an action situation; and iii) outcomes. The earliest applications of IAD were to guide case study research and to enable cross-case comparisons. Later applications employed IAD for meta-analysis, experimental designs in the laboratory and in the field, mixed method studies, agent-based simulation models, and large sample studies. More recently, researchers have employed IAD to study sustain-

able "knowledge commons", including digital information, libraries, and other knowledge resources.

The IAD framework was the central organizing framework guiding data collection and analysis for the author's research on the Eclipse field setting (Box 1). The details of that analysis are outside of the scope of this introductory article, but the key point is that the IAD framework provided a way to describe and specify the Eclipse institutions structuring individual and company participation.

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In the author's field research, companies were observed to participate in the Eclipse ecosystem in a wide variety of different ways, and each case company participated in ways that strengthened or transformed its business model. All of the case companies gained access to capabilities required for their business models (Bailetti, 2009; <http://timreview.ca/article/226>); interestingly, capabilities obtained from governance activities and activities undertaken to maintain and extended the platform were often as important as the consumption of platform assets as inbound open innovation. Some companies performed a portion of their R&D within the Eclipse developer community, through some combination of employing Eclipse committers and by contributing assets to the platform. A few companies invented new business models, anchored around Eclipse, that would not otherwise have been viable. The direct link between the platform and business ecosystem was one of resource flows: consumption of platform assets by ecosystem companies, and contribution of company assets to the platform. Equally important were indirect links through the Eclipse developer community – the topic of the next section.

Developer Communities

A developer community is the community of individuals, organized as a meritocracy, who collectively maintain and extend the platform. This definition is consistent with the research on open source software developer communities and the broader research on community innovation. Like the business ecosystem, the developer community operates within an institution – a developer community institution that structures the activity of individuals who maintain and extend the community-developed platform.

Within a community meritocracy such as the the Apache Software Foundation or the Eclipse Foundation, it is individuals, not the companies employing those individuals, that have merit and status (Skerrett, 2009, <http://timreview.ca/article/219>). Organizations, of course, may be influential within the larger system, but their influence within the community is indirect through the individuals that they employ. Within Eclipse, for example, commit privileges and other community roles attach to an individual rather than an individual's employer: an individual's roles and responsibilities in the developer community do not change if that individual changes employers or other organizational affiliations; likewise, a contributor is said to receive no special community status from any partic-

ular organizational affiliation. According to the Eclipse development process (EDP; <http://tinyurl.com/3rsaba6>), the activities to create and maintain Eclipse platform software are structured into Eclipse projects – the “main operational unit at Eclipse” and the context in which Eclipse software development occurs. The *committers* on a project – the individuals with write access to the project's resources and a vote in project matters – have the exclusive authority to nominate and elect new committers to that project within the rules of the EDP. Eclipse *contributors* are the much larger group of individuals who contribute code, fixes, tests, documentation, or other work to an Eclipse project, but have not been elected as committers. Eclipse practitioners speak also of other Eclipse communities, which are said to include organizations as well as individuals (Skerrett, 2011; <http://timreview.ca/article/409>). For example, there is the community of Eclipse users and the community of Eclipse adopters. This section focuses narrowly on the developer community, which is comprised exclusively of individual committers and contributors.

Three findings from prior research on developer communities are especially salient. First, we know about a wide variety of motivations and incentives for individual participation, including career and personal development, self-determination, peer recognition, identification, self-promotion within the social structure, and belief in the inherent value of free software, and we know that participants differ widely in their self-reported rankings of the importance of different factors. Second, we know that many open source software developers are employed by companies to develop open source software as part of their formal job assignment. On projects with active company involvement, interested companies may employ most or even all active developers. Third, prior research identifies some of the institutional factors associated with participation in developer communities. Baldwin and Clark (2006; <http://tinyurl.com/3qnf5xn>), argued that the architecture of a software code base is a critical factor that lies at the heart of the open source development process. Employing a series of increasingly sophisticated game theory models, Baldwin and Clark showed that increasing modularity and option value has two effects on the software development process: it increases the incentives of developers to get involved and remain involved in the development process, and it decreases the amount of free riding in the equilibrium. Both effects promote growth of the developer community. Evidence from subsequent empirical studies has supported a deep and positive connection between modularity and

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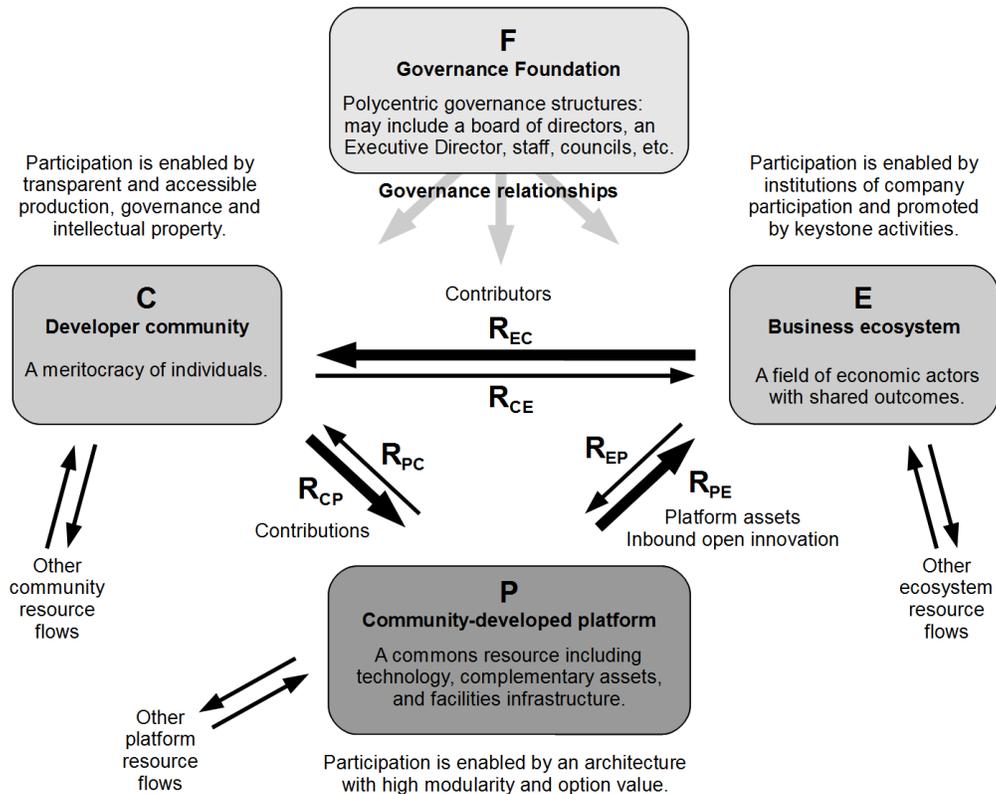


Figure 1. Resource cycle of participation (situating extant theory)

participation. West and O'Mahony (2008; <http://tinyurl.com/66fly95>) examined twelve open source projects initiated by corporate sponsors and found that sponsors consider three design dimensions that together create a specific participation architecture: i) production (the way that the community conducts production processes); ii) governance (the processes by which decisions are made within the community); and iii) intellectual property rights (the allocation of rights to use the community's output). Community institutions offering greater transparency (the ability to obtain and use assets, and observe activities and decisions) and accessibility (the ability to change code, participate in project activity, and create derivatives) are better able to attract external participants and grow.

Figure 1 brings together all of these ideas along with the findings from prior sections to propose a cyclical relationship between a *community-developed platform* (P), a *business ecosystem* (E), and a *developer community* (C). The developer community and the business ecosystem are structured by institutions of rules, norms, and

enforcement characteristics, both sharing the platform as a commons resource, and a *governance foundation* (F) that provides the functions of both community governance and an ecosystem keystone. These subsystems are bound together through co-dependencies for resources, shared actors, and multilevel and nested interactions. (Box 4 summarizes some additional conceptual arguments underpinning the structure depicted in Figure 1).

The engine driving innovation on community-developed platforms is a *resource cycle* from the platform, to the business ecosystem, to the developer community, and back to the platform (labeled R_{PE} , R_{EC} , and R_{CP} , and indicated by the thick black arrows of Figure 1). The developer community is the locus of innovation creation and platform value creation, and the business ecosystem is the locus of innovation commercialization and platform value capture. The platform is the outbound product of the developer community and inbound open innovation for the economic actors of the business ecosystem.

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Box 4. Conceptual linkages

To link these subsystems together into an integrated systems perspective, the author's research program draws on ideas and conceptual arguments from various academic, practitioner, and interdisciplinary sources.

The first source is the research program of Elinor Ostrom and her colleagues on commons governance and institutions for collective action (Box 2), especially the Institutional Analysis and Design (IAD) framework (Box 3).

Second is the practitioner writing of Tim O'Reilly on architectures of participation. In a series of essays, presentations, and blog posts, O'Reilly argues that systems that successfully attract user contribution possess an architecture that links the design of the technical system and the organization of the community of users (e.g., O'Reilly, 2004; <http://tinyurl.com/3vxstbp>). Within

such systems, users pursuing their own selfish interest build collective value as an automatic byproduct, and systems get better the more people use them.

Third is the scholarly research of Professors Carliss Baldwin and Kim Clark on design rule theory. Baldwin and Clark draw on well-established ideas in architectural design, engineering design, and software engineering to argue that modularity in design alters the mechanisms by which designs can change. This enables design evolution – a value-seeking process with strong parallels to biological and ecological processes – and links architectural design, organizational design, and industry structure in an interconnected multilevel complex adaptive system. The design rules at each level are reflected in the design rules of the other two levels. This research contributes to the small scholarly literature, along with Baldwin and

Clark (2006) and West and O'Mahony (2008) cited previously, that has begun to operationalize O'Reilly's arguments as the basis for a theory of participation.

Fourth is systems thinking, a perspective on business and management that emphasizes cyclical feedback loops, varying time delays between actions and outcomes, and complex interactions, rather than the linear “event-driven thinking” of cause and effect and of independent and dependent variables that is more common in management theory and practice.

Fifth is resource dependence, a “classic” management theory dating from the 1970s in which the survival and performance of organizations depends on the ability to acquire and maintain resources through reciprocal resource exchange relationships with other organizations.

In research on the Eclipse field setting, the author found that resources for the Eclipse developer community originated largely from the for-profit companies comprising the Eclipse ecosystem (R_{EC}). The most important of these resources was the effort and attention of individual contributors paid by companies to contribute to Eclipse projects. Individuals within the Eclipse developer community maintained and extended the Eclipse platform through contributions (R_{CP}): writing and testing software, creating documentation and other resources, and other project activities. The economic actors of the business ecosystem used, extended, and commercialized the assets of the Eclipse platform to create and capture economic value (R_{PE}) – and in doing so, entwined their own business outcomes with the outcomes of the ecosystem. A second set of reciprocal resource flows moved in the direction opposite to the main resource cycle of production (R_{PC} , R_{CE} , and R_{EP} , indicated by the thin black arrows of Figure 1). For example, the platform provided software development tools to the developer community (R_{PC}), the developer

community was a source for capabilities – including information, customer leads, and experienced developers – for ecosystem companies (R_{CE}), and some companies within the ecosystem contributed directly to the platform by donating software that had been developed outside of Eclipse (R_{EP}).

Two other sets of resource flows were observed, which are also shown in Figure 1. A third set of governance relationships connected the Eclipse Foundation to each of the other subsystems. A fourth set of external resource flows connected each subsystem with the exogenous environment. The next section examines governance and governance relationships.

Governance

The governance foundation in Figure 1 is at once both an *open source software foundation* (Xie, 2008; <http://timreview.ca/article/194>) and a *business ecosystem keystone* (McPhee, 2010; <http://timreview.ca/article/375>).

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Prior research on developer communities and business ecosystems has treated these roles separately, but for community-developed platforms, they are inseparable.

In the author's research on the Eclipse field setting, the Eclipse Foundation provided governance and services to both the community and ecosystem, and stewardship for the platform as gatekeeper of Eclipse quality through the project review process required for a project to declare a software release for public consumption. As noted in Box 1, recognition of these multiple roles is explicit in Eclipse governance documents and evident in practitioner discourse. From its member organizations, the Eclipse Foundation obtained the financial resources for operation. From the developer community, it obtained the effort and attention of individuals who contribute to governance activities. Where there were tensions between the community and ecosystem, the Eclipse Foundation actively managed these tensions and harnessed them in ways that ultimately improved the system. Keystone actions by various governance structures – for example, to promote awareness of the platform, grow the user and adopter base, and provide services to benefit member companies – promoted participation and resource flows.

Practitioner Implications

Systems thinking around community-developed platforms is not new. In the author's research, many references to “positive feedback loops” were observed in Eclipse community discourse. Likewise, Eclipse Foundation staff spoke of an “Eclipse virtuous cycle” (Milinkovich, 2008; <http://timreview.ca/article/200>) in which some vendors that consume platform technology choose to re-invest a portion of their profits back into developing the platform in anticipation of future benefits. What is new and useful here, however, is the precision and clarity with which the constructs and relationships are specified, the empirical grounding in rigorous field research, and solid theoretical underpinnings that join the scholarly literatures on platforms, communities, and business ecosystems.

This systems-level model makes at least four contributions. First, it provides a conceptual framework for thinking clearly about distributed innovation and it provides a vocabulary for clear communication with others. It distinguishes explicitly between the developer community and the business ecosystem, the different roles that each plays in the larger system, and the differing motivations of participants. Second, it focuses at-

attention on the interactions *between* subsystems, not only on the subsystems themselves. Sustainability or growth of this system requires operation of each node and each segment of the resource cycle between nodes. For example, merely growing a large business ecosystem around a community-developed platform may not be sustainable unless the institutions structuring activity and the actions of the keystone also motivate an adequate flow of resources from the ecosystem to the developer community. Third, it clarifies the role of governance. The governance foundation of a community-developed platform is both an open source foundation and an ecosystem keystone, attending to the differing needs of both the community and ecosystem without benefiting one to the detriment of the other. Fourth, there may be tensions between the participants of the community and ecosystem, but the governance foundation can actively manage those tensions and harness them to improve the system.

Individuals looking to contribute to a developer community and entrepreneurs looking to join an established ecosystem can use these insights to make better informed decisions about participation. Managers of participating companies can use these insights to make better informed decisions about resource allocation. Community leaders and foundation staff, and top management teams looking to launch new systems of distributed innovation, can employ these insights for thinking clearly about effectively promoting participation.

Conclusion

Much has been written separately about platforms, business ecosystems, and communities, without linking these subsystems together into a systems-level perspective of distributed innovation. This article has argued that business ecosystems can be usefully understood as institutions of participation that are linked to developer communities and community-developed platforms through resource flows, interconnected institutional arrangements, and shared governance. It extends and contributes to a nascent stream of management research working to develop a general theory of participation in systems of distributed innovation.

A “systems of systems” perspective contributes to both research and practice. For management researchers, it provides a data collection and analysis framework for empirical study of the institutions of company and indi-

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vidual participation, theorizing about the relationships between communities, ecosystems, platforms, and governance foundations, and comparing the institutional arrangements of different field settings. It joins several formerly disparate literatures and provides definitional clarity. For practitioners, it provides an alternative perspective for thinking clearly about distributed innovation and it provides the vocabulary to clearly communicate these thoughts with others.

Further research will seek to more clearly specify the institutional features that enable and promote company and individual participation and motivate the resource cycle between nodes, and to better understand the circumstances under which those arrangement are effective. The present model contributes a framework in which to situate and interpret those results.

About the Author

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Innovation Policy Development and the Emergence of New Innovation Paradigms

Stoyan Tanev, Mette Præst Knudsen, Tanja Bisgaard,
and Merethe Stjerne Thomsen

“*Innovation policy design has to be based on a double principle, namely, the existence of real problems hindering innovativeness of an economy, and the ability of public agents to proactively solve or mitigate them.*”

Charles Edquist, Leif Hommen, and Maureen McKelvey
Innovation and Employment: Process versus Product Innovation

The objective of the present article is to discuss innovation policy issues related to three emerging innovation paradigms: user-driven innovation, open innovation, and value co-creation. It provides a summary of insights based on innovation policy practices and challenges in Denmark. The choice of Danish innovation policy practices is not accidental. In 2008 Denmark implemented 40 different national innovation programs by allocating about 400 million euros. Since the three emerging paradigms have become globally relevant, the discussion of Danish policy development challenges and practices is expected to be insightful for innovation experts from other developed countries that are currently dealing with the adoption of these paradigms.

Introduction

Market competition is becoming increasingly driven by new products, processes, business, and organisational resources that integrate inputs received from customers, suppliers, universities, or other external partners in multiple forms, such as new market insights, new technological knowledge, or through specific customer interactions. Von Hippel (1978; <http://tinyurl.com/3aoq3uv>) explains this as a move from a *manufacturer-active paradigm*, where the manufacturer of goods survey customers needs using market data analysis to identify new product ideas, to the *customer-active paradigm*, where the manufacturer more actively screens customer needs and generates product ideas based on these customer inputs. This fundamental paradigmatic shift implied a new understanding of innovation management leading to the emergence of at least three new innovation paradigms: user-driven innovation, open innovation, and value co-creation.

User-Driven Innovation

There is no unique way of summarizing the different approaches to user-driven innovation (von Hippel,

2006; <http://tinyurl.com/3trcqff>; Buur and Matthews, 2008; <http://tinyurl.com/5whluou>). One example of such summary was provided by the Danish Enterprise and Construction Authority's division (FORA, 2010; <http://tinyurl.com/5rt8sdh>) for research and analysis focusing on the development of proposals for business and innovation policy. It defined a user-driven innovation framework consisting of four main areas: user tests, user exploration, user participation, and user innovation. User innovation takes place when companies actively involve experts or advanced users in some of the key steps of the innovation process. In many cases, users are more knowledgeable on specific areas regarding specific products or services (von Hippel, 2006; FORA, 2010). Here, users are actually able to innovate for themselves and not only provide feedback to a specialized manufacturer (von Hippel, 2006). The user innovation area includes the *lead user approach* as suggested by Eric von Hippel (2001; <http://tinyurl.com/3dwqxlw>). Lead users can be found based on a systematic search using well-defined criteria or within the activities of existing innovation-driven communities. They are users (but not necessarily customers) that are ahead of a trend by having spent the time and resources to develop their own solu-

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tion and at the same time would have a much greater use benefit from the commercial implantation of a given innovation. Companies gain insights from lead users and therefore have better chances to overcome the challenges with “sticky information” (von Hippel, 1994; <http://tinyurl.com/3tsw3t3>), which is information that is costly to acquire, transfer, and use in a new location.

The user innovation approach also includes the development of *innovation toolkits* (Jeppesen, 2005; <http://tinyurl.com/6hezgg8>; von Hippel, 2001; Piller & Walcher, 2006; <http://tinyurl.com/6zfykzh>). Companies using toolkits set up a framework where the users are empowered to create their own products with the features they need. Well-designed innovation toolkits could be of great benefit for both users and manufacturers in sectors where the user needs are rapidly changing (von Hippel, 2001) and it is therefore more difficult for the manufacturers to keep ensuring that their products meet the actual needs of their customers.

The next steps in user-driven innovation need to embrace a more holistic perspective on user heterogeneity and a more refined systematic perspective on using “technology” as an innovation enabler and not merely as a “feature” of the market offer. Technology goes beyond its integration into specific products and services and should be seen as a driver for innovation by the facilitation of real-time analytic capabilities during the collection and processing of larger amounts of data and, at the same time, as providing a platform focusing on the participatory and interactive aspects of innovation processes.

Open Innovation

Recent views on the open innovation paradigm argue for the involvement of a wider range of actors, including firms, universities, and research and technology organisations that may be either public or private. The paradigm has received significant interest from the business community as well as from researchers that have articulated a set of relevant questions but are just beginning the search for the answers. “Firms that commercialise external (as well as internal) ideas by deploying outside (as well as in-house) pathways to the market” have adopted the open innovation model (Chesbrough, 2003; <http://tinyurl.com/455m3q6>). Chesbrough and Crowther (2006; <http://tinyurl.com/4xjse3r>) deepen the understanding of openness by pointing out that open innovation involves flows in two directions; first “the inbound open innovation which is the practice of leveraging the discoveries of others”,

and second outbound open innovation where firms “look for external organizations with business models that are better suited to commercialize a given technology than the firm’s own business model”. Simard and West (2006; <http://tinyurl.com/3oftvn2>) point out that “in open innovation, some firms need to identify external knowledge and incorporate it into the firm; others seek external markets for their existing innovations”.

Fundamentally, open innovation leads to: i) the reactivation of internal capabilities by complementing them with external inputs, and ii) the identification of potential new sources of returns from projects that no longer fits firms’ strategies.

Pisano and Verganti (2008; <http://tinyurl.com/67bcd3b>) distinguish between the truly open collaboration that can include virtually anyone in the architecture (the participant decides to participate, as seen, for example, in crowd sourcing) and closed networks, where (normally) it is a company or existing consortium that decides whom to select and include in the innovative activity. The first type of network innovation, involving companies, academic researchers, and others, has increased and many central corporate laboratories have become more open to various types of cooperation of this type. Nonetheless, it is generally still the latter approach that is seen as providing the primary evidence for open innovation practices.

Value Co-Creation

Value co-creation is an emerging business, marketing and innovation paradigm describing how customers and end users could be involved as active participants in the design and development of personalized products, services, and experiences (Prahalad and Ramaswamy, 2004; <http://tinyurl.com/3up3mhr>; Etgar, 2007; <http://tinyurl.com/3h75f4c>; Payne et al., 2008; <http://tinyurl.com/3by88xx>). It is based on the design and development of customer participation platforms, providing firms with the technological and human resources, tools and mechanisms to benefit from the engagement experiences of individuals and communities as a new basis of value creation. The active participation of customers and end users is enabled through multiple interaction channels, very often by means of technological platforms through the Internet (Sawhney et al., 2005; <http://tinyurl.com/62sm59n>; Nambisan and Nambisan, 2008; <http://tinyurl.com/6dwt78w>; Nambisan and Baron, 2009; <http://tinyurl.com/6bpnnw7>). The advancement of information and communications technologies (ICT) enabled customers to be much more active,

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knowledgeable, globally aware, and willing to use interactive virtual environments to personalize the existing and shape new products and services. The multiple channel open interaction and dialogue between the firm and its customers, between the firm and its suppliers and partners, between the different customers, and between the customers and firms' suppliers and partners, constitute a fundamental part of the value co-creation philosophy. The emergence of the value co-creation paradigm creates unprecedented opportunities for firms in dealing with the impacts of the ongoing globalization processes, which include a much faster degree of technological change; the necessity to be more innovative and, therefore more competitive, by accessing and managing globally distributed resources; and the need to enhance their international competitiveness by addressing multiple markets and heterogeneous customer needs within and across different market segments (Prahalad and Krishnan, 2008; <http://tinyurl.com/4yowma2>). The ability of value co-creation platforms to enable the personalization of new products and services challenges the operational regime of traditional marketing by moving it to a new service-dominant logic (Vargo and Lusch, 2004; <http://tinyurl.com/3enpsr7>), which redefines the terms of existing market segmentation techniques (von Hippel, 2006) and enables firms to address a broader market with a higher degree of customer satisfaction.

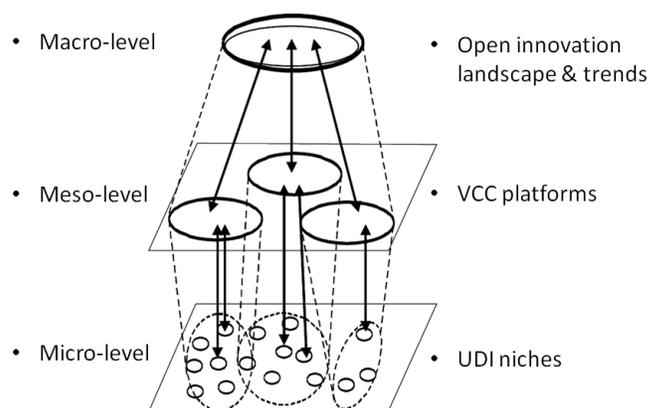
The new dominant logic of marketing entails a new vision of the topology and the dynamics of the entire value creation system (Hearn and Pace, 2006; <http://tinyurl.com/4u9ldxn>). Such vision promotes a new understanding of the customer centricity of traditional value networks which are now considered dynamically, as people-driven webs of potential value configurations that could be actualized on the basis of specific customer demands (Norman and Ramirez, 1993; <http://tinyurl.com/3j9d6cy>; Flint and Mentzer, 2006; <http://tinyurl.com/3de4uvw>; Gattorna, 2009; <http://tinyurl.com/3w5dpju>). The dynamic recognition and alignment to highly heterogeneous customers and customer groups requires the development of appropriate technological infrastructures that are able to seamlessly integrate contributions from globally distributed resources to real-time analytics information and flexible business processes (Prahalad and Krishnan, 2008). Technology, therefore, plays a double role in value co-creation: it could be part of the specific products and services, but more importantly, it becomes a key enabler of co-creation experiences inde-

pendently of the industry sector and of the nature of the particular products and services. In other words, it is becoming even more pervasive than before, although within a completely different context.

A Comparison of the Three Paradigms

Comparing the three paradigms is a challenging task since they seem to express different and, at the same time, interrelated visions about business innovation practices. They could be considered as three complementary perspectives on an emerging stronger market-driven vision about the management of innovations. The three perspectives can be visualized by means of a multi-level framework (Warnke et al., 2008; <http://tinyurl.com/3w47b6w>) that distinguishes three analytical levels: innovation niches, regimes, and landscape (Figure 1). The first micro-level is that of user innovation niches – specific places, or smaller technological sectors, in which novelties are created and developed, building on learning processes among producers and users of a specific product or technology. Such niches are the most appropriate places to position the user-driven innovation paradigm. The second level is the meso-level of regimes. A regime refers to the dominant practices, rules, and technologies, including the logic of appropriability pertaining to the domain, giving it stability as a platform for guiding decision-making. There could be different types of sub-regimes, such as technology regimes, production regimes, marketing regimes, user regimes, or policy regimes (Warnke et al., 2008).

Figure 1. Multi-level representation of the user-driven innovation (UDI), value co-creation (VCC), and open innovation paradigms



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The second meso-level seems to be the proper place for the positioning of the value co-creation paradigm with its dominant customer participation and marketing orientation building on linkages to the first innovation niche level. The third level is the socio-technical landscape (i.e., the wider context or environment in which the regimes are embedded). The landscape consists of the social values, policy beliefs, worldviews, political and business coalitions, and dominant IP appropriability culture, but also the physical and geographic settings, prices and costs, trade patterns, and incomes in which processes of regime change are embedded. In our view, this is the place to position the open innovation paradigm. It can be seen as the existential fabric of the first two levels that could be potentially influenced in the long-term by the transformative changes in the dominant marketing regime empowered by advancements in specific user innovation niches.

Policy Issues Relevant to the Three Paradigms

The emergence of the new innovation paradigms definitely challenges existing national innovation policies. At the same time, while the three paradigms are relatively new worldwide, some countries and organisations did already develop some initial policy responses aimed at their more systematic promotion. The insights suggested here were derived from an analysis of the recommendations discussed by policy related organizations in Denmark. The focus on Denmark was driven by the existence of multiple national innovation programs that provide a good basis for reflection on policy issues. For example, the Danish program for user-driven innovation aimed to strengthen the diffusion of methods for user-driven innovation by focusing on a broader, multiple-stakeholder innovation perspective. The program had a yearly budget of 13.4 million euros and ran for four years between 2007 and 2010. It was administered by the Danish Enterprise and Construction Authority, which is part of the Danish Ministry for Economic and Business Affairs. After looking at the existing Danish policy framework, five areas were found to be particularly relevant to the three emerging innovation paradigms. These areas are:

1. Innovation support (targeted innovation programs)
2. Innovation networks (matchmaking between companies and in some cases knowledge institutions)
3. Education and competencies (the development of new skills related to innovation)

4. Entrepreneurship (enhancing the creation and growth of new companies)

5. Intellectual property (IP) issues

The five areas are not unique to the Danish innovation environment. Therefore their discussion will be highly relevant for other developed countries dealing with the implementation of the three emerging innovation paradigms.

1. Innovation Support

National innovation policy strategies emerge within the context of the different innovation programs that are offered by various ministries. While there are usually multiple programs focusing on innovation, most often the dominant perspective is technological. Such dominance implies the need of broadening the innovation policy development perspective by, first, adopting a more holistic business innovation philosophy and, second, by promoting practices enabling the adoption of the three emerging innovation paradigms. For example, promoting mechanisms enabling and enhancing users' participation in innovation by creating relevant infrastructures and platforms has thus far not been an area of any substantial policy focus and could become a relevant innovation policy area to target in the future.

2. Innovation Networks

Policy organizations highlight the need to foster networks and partnerships among companies, as well as between companies, the public sector, and other research organisations. Typically, innovation networks are seen as part of a vision that has two main targets: i) more innovative businesses, and ii) an enhanced knowledge-sharing mechanism between public and private institutions. While most networks are sector specific, there are already multiple examples of networks created around the experimentation with new innovation methods. On average, the total funding received by innovation-related networks has increased over the last few years. However, to enhance the ongoing emergence of the three paradigms, a much more structured governance of the networks should be used (Pisano and Verganti, 2008). The focus on the need for more efficient network governance is a key issue across the developed world.

3. Education and Competencies

Most of the developed countries need to enhance their educational systems by gearing them towards the creation of new skills and competencies that could enable

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or enhance user and employee involvement in innovation processes. The problem is that educational systems usually fall outside of the ministries that formulate innovation policy. In addition, any potential changes in the educational system would only underline the need to formulate broader national innovation strategies cutting across and integrating the efforts of the various ministries. While there has been a stress on the need to add entrepreneurship to the teaching agenda in schools and universities, little attention has been paid to preparing graduates for the newly emerging types of workplaces and innovation tasks. Fortunately, there is a visible trend in the development of program components to teach students how to work in multidisciplinary teams and obtain new skills that will enable them to be innovative employees and leaders.

4. Entrepreneurship

During the last decade, entrepreneurship has become a hot topic for policymakers worldwide. Many developed countries perform relatively well in terms of the amount of new companies that have been formed. In addition, there is a growing trend related to the development and implementation of innovative business-creation programs. However, there is a common weakness when it comes to both sustaining the businesses and enabling growth among startup companies. There does not seem to be a clear understanding of the type of policies that are necessary to create innovative companies by enabling them to become globally successful and ensuring efficient job creation and stability.

5. IP Issues

Creating a new system for IP and copyright rules, as well as the adoption of a more open entrepreneurial orientation by both new and existing firms, were also mentioned as relevant policy areas that could enhance the adoption of open innovation practices. While reforming the IP system is vital to enhancing the adoption of new innovation paradigms, it is not an issue to be dealt with on a purely national level. The entire discussion of intellectual property rights must remain high on the political agenda. Why is this the case? To answer this question, one could point out that a patent owner is granted the right to exclude others from commercially using, selling, offering, and keeping in stock an invention as specified in the claim section of the patent (Junghans and Levy, 2006; <http://tinyurl.com/3wme7hx>). In return for these exclusive rights, the patent owner is obliged to make the patent available to the broader audi-

ence, which is secured by the patent authorities publishing the patent documents a period after the application date. The fundamental rationale for granting intellectual property rights to innovators is to increase private investment in innovation. However, it is also known that there is a social welfare loss caused by the owners restricting the use of their legally protected information in order to increase private profits. In other words, intellectual property rights are thought to be good for innovation and bad for competition (von Hippel, 2006).

Furthermore, it is important to understand that the company can protect one particular technology from being exploited by other companies through the patent application. However, it is more often becoming the case that the inventor of the technology attempts to “disguise” a real invention by “patenting around” the original invention. Already in the early 1980s, when researchers really started to use patents to assess firm technology strategies, the situation of defensive patents surrounding the core patent was highlighted by Campbell (1983; <http://tinyurl.com/3auj6z9>) as a key issue. Campbell also described how competitors may position offensive patents close to the defensive ones. This practice has two implications. First, the company can hide the invention and thereby gain a competitive advantage based on time before the competitors discover the patent, which ultimately may provide the company with additional profits. Second, the cost of inventing around the patent carries large costs for the patent granting authorities, but also for general knowledge generation in the society.

These practices underline the particular challenge of developing an effective patenting system, and it is therefore our argument that a well-functioning international patent system is needed both in order to lower the cost of applying for protection, but also to ensure an effective protection of the invention. However, as mentioned earlier this is not a task for a single country, but should be a coordinated international effort. It is quite vital that, while opening up the innovation process, companies are encouraged to reveal proprietary knowledge to collaborators. The current trend towards a changing weight of the innovation ingredients (from technologies towards other types of innovation sources) as well as towards more open and collaborative paradigms raises the question about the proper IP protection systems.

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Conclusions

This article addresses the question of how national innovation policies may reflect the emergence of three new innovation paradigms: user-driven innovation, open innovation, and value co-creation. Five areas were found to be particularly relevant to the three emerging innovation paradigms: innovation support, innovation networks, education and competencies, entrepreneurship, and intellectual property issues. The discussion of these five areas leads to the conclusions that, even though many national innovation policy organizations have taken significant steps towards promoting a modern innovative business environment, the new innovation paradigms can only to a certain extent spread and flourish under the current innovation policies. Hence, there are still areas that need to be addressed with new and improved policies. Another important conclusion is that new innovation policies will prove relevant and highly impactful only if they are developed within the context of integrated national innovation frameworks.

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Entrepreneurial Orientation and Company Performance: Can the Academic Literature Guide Managers?

Sandra Schillo

“*Innovation is the specific tool of entrepreneurs, the means by which they exploit change as an opportunity for a different business or a different service. It is capable of being presented as a discipline, capable of being learned, capable of being practiced. Entrepreneurs need to search purposefully for the sources of innovation, the changes and their symptoms that indicate opportunities for successful innovation. And they need to know and to apply the principles of successful innovation.*”

Peter Drucker (1909-2005)
Author and Management Consultant

This article comments on the management implications of the various approaches to measuring entrepreneurial orientation (EO), and it discusses the implications of a range of empirical findings for management decisions. On the whole, the argument is that academic research needs to increase its understanding of the differences in empirical results between different studies. To date, the research mostly spells a small number of useful warnings, for example that the positive impact of EO may level off or turn negative beyond a certain point and that it may not have the anticipated positive effect in all circumstances. However, the academic research has yet to identify these circumstances to a level of specificity that could provide useful guidance to managers.

Introduction

Peter Drucker's quotation above highlights the close relation between innovation and entrepreneurship. It also suggests that much can be learned about innovation and entrepreneurship and that systematic application of this knowledge can lead to success. Academics seem to agree with Drucker, as evidenced by the vast numbers of papers published each month on innovation and entrepreneurship. Numerous researchers have published work identifying entrepreneurial companies and determining how the characteristics of such companies are linked to company performance.

In an ideal world, this knowledge about entrepreneurship and innovation would also serve to inform management practice. In reality, there are certain characteristics of the academic research that make it quite difficult to apply the research findings to manage-

ment practice in the area of innovation and entrepreneurship. This article highlights these difficulties using the example of “entrepreneurial orientation” (EO).

In the academic literature, EO refers to the extent to which a firm is entrepreneurial. This concept seems particularly suited for the discussion of the applicability of academic research results to management practice because there is a strong stream of research that has used relatively consistent definitions of the concept. This research has developed since the 1980s, not only measuring EO in companies, but also investigating its link with company performance from many angles.

This article takes a critical view of this literature from the perspective of its implications for management. To this end, the following section outlines the definition of entrepreneurial orientation, followed by a discussion of the implications of various measurement approaches.

Entrepreneurial Orientation and Company Performance

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Key results from the literature are then presented and discussed in terms of their implications for management, all of which are summarized in the conclusions section.

Defining Entrepreneurial Orientation

The most widely used definition of EO is based on work by Miller (1983; <http://tinyurl.com/6g7r9vv>), developed further by Covin and Slevin (1989; <http://tinyurl.com/6drqgjk>) and many others, and augmented by Lumpkin and Dess (1996; <http://tinyurl.com/5t4d38y>). This conceptualization has been used in over 200 studies focusing not only on entrepreneurship, but ranging from management and marketing to healthcare (George and Marino, 2011; <http://tinyurl.com/6y2l3ux>). The five components of EO in this stream of research are:

1. Risk-taking was historically a key characteristic associated with entrepreneurship. It originally referred to the risks individuals take by working for themselves rather than being employed, but has since been widely applied to companies, for example, when managers make decisions that commit large amounts of resources to projects with uncertain outcomes.

2. Proactiveness describes the characteristic of entrepreneurial actions to anticipate future opportunities, both in terms of products or technologies and in terms of markets and consumer demand. This characteristic was at the centre of early economic thinking in this field: the entrepreneur was thought of as someone who identifies opportunities in the marketplace and proactively pursues them (Lumpkin and Dess, 1996). Translated to the level of the firm, proactive companies are leaders in the market, rather than followers.

3. Innovativeness relates to the types of products and services a company has introduced to the market. For some theorists, innovativeness is intrinsically linked to entrepreneurship in that entrepreneurs create new combinations of resources by the very fact of their entry into the market. In the context of EO, innovativeness is defined more narrowly, emphasizing the importance of technological leadership to the company, as well as changes in its product lines.

4. Competitive aggressiveness refers to the company's way of engaging with its competitors, distinguishing between companies that shy away from direct competition with other companies and those that aggressively pursue their competitors' target markets.

5. Autonomy "refers to the independent action of an individual or a team in bringing forth an idea or a vision and carrying it through to completion" (Lumpkin and Dess, 1996) without being held back by overly stringent organizational constraints. Although this component seems to primarily have "face validity" in the context of large organizations, many researchers have applied it to the context of small companies and obtained statistically significant findings.

The components have typically been measured using questionnaire items with Likert-type scales (i.e. from 1-5 or 1-7), as shown in Table 1. Some researchers have anchored the items of both sides of the scale (i.e., they provided explanations of both the 1 and the 7), while others have only provided a single statement to be ranked (e.g., as shown in Table 1). There is some evidence (Miller, 2011; <http://tinyurl.com/6jjzdkx>) that suggests that the scale remains robust even with slight variations in the wording of questions or other minor measurement variations.

Management Implications of Construct Measurement

Authors vary in how they combine the dimensions above into the overall EO construct. In contrast to the above-mentioned variations in the wording of the items, the variations in the combination of the different components has notable implications when trying to apply the concepts in the context of corporate management. The most common variations are for researchers to use either the three components of risk-taking, proactiveness, and innovativeness (Miller, 1983; Covin and Slevin, 1989) or all five components. There are also studies that report on single components only. In addition, a small number of studies use practically any other combinations of the components.

In terms of management implications, the studies using single components are straightforward – the component labels are reasonably intuitive and typically can be translated relatively easily into management practice. The interpretation of the combinations of the components into an overall EO construct, however, requires more attention to the details of how the construct is formed.

Some authors suggest that each of the dimensions is a reflection of a company's EO. In other words, if they could be measured perfectly, each dimension would have the same score as the overall EO construct. This

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Table 1. Measuring the components of entrepreneurial orientation

EO Component	Typical Assessment Items
Risk-taking*	<ul style="list-style-type: none"> • In general, managers in my firm have a strong proclivity for high-risk projects (with chances of very high returns). • In general, managers in my firm believe that [...] owing to the nature of the environment, bold, wide-ranging acts are necessary to achieve the firm's objectives.
Proactiveness*	<ul style="list-style-type: none"> • In dealing with its competitors, my firm [...] typically initiates actions, which competitors then respond to. • In dealing with its competitors, my firm [...] is very often the first business to introduce new products/services, administrative techniques, operating technologies, etc.
Innovativeness*	<ul style="list-style-type: none"> • In general, the top managers in my firm favour [...] a strong emphasis on R&D, technological leadership, and innovation. • How many lines of products or services has your firm marketed in the past 5 years? <ul style="list-style-type: none"> - Very many new lines of products or services. - Changes in product or service lines have usually been quite dramatic.
Competitive aggressiveness*	<ul style="list-style-type: none"> • When confronted with decision-making situations involving uncertainty, my firm [...] typically adopts a bold, aggressive posture in order to maximize the probability of exploiting potential opportunities. • In dealing with its competitors, my firm [...] typically adopts a very competitive, 'undo-the-competitors' posture.
Autonomy†	<ul style="list-style-type: none"> • My firm supports the efforts of individuals and/or teams that work autonomously. • In my firm, individuals and/or teams pursuing business opportunities make decisions on their own without constantly referring to their supervisor(s).

*Example statements are selected from Covin and Slevin (1989; <http://tinyurl.com/6drqgjk>).

†Example statements are selected from Lumpkin, Cogliser, and Schneider (2009; <http://tinyurl.com/63p6gat>).

approach implies that the different components covary with each other. Indeed, some empirical studies document high correlations or respective results from factor analyses and can reasonably take such an approach (Covin and Slevin, 1989). Other studies, however, report lower correlations or weaker factor analysis results between the components (Ferreira et al., 2011; <http://tinyurl.com/4xeobz>). From a management perspective, it would be important to know under which circum-

stances companies can expect risk-taking, proactiveness, innovativeness, competitive aggressiveness, and autonomy to correlate.

Other authors suggest that the dimensions may vary independently. EO is then constructed as the sum of scores across the separate dimensions or similarly as a weighted linear combination. From a management perspective, this would imply that companies can make up

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for a lower score on proactiveness, for example, by being more innovative. Where EO has been found to increase success, this would mean that increases on any one component would help companies become more successful.

While these two approaches can be implemented relatively easily with current statistical methodologies (Diamantopoulos and Winklhofer, 2001; <http://tinyurl.com/3rujecm>), it seems that neither is likely to reflect managers' experience in all cases. Indeed, the purpose of the original work relating to EO in this tradition (Miller, 1983) was to "show the merits of a configurational approach to the study of organizations" (Wiklund and Shepherd, 2011; <http://tinyurl.com/3gzgvqh>): Miller used the example of entrepreneurship to show that EO has different drivers and different manifestations in different types of companies. Work following a similar approach would clearly improve the applicability of EO to specific management contexts.

However, much of the later work has instead treated the EO scale with the three or five dimensions defined above (i.e., risk-taking, proactiveness, and innovativeness, with or without competitive aggressiveness and autonomy) as a universally relevant construct and has focused on the relationship between EO and firm performance and the various moderating influences on this relationship. This work has led to an extensive list of publications: at least 134 relevant studies prior to 2007 (Rauch et al., 2009; <http://tinyurl.com/3kjbwfr>) and another 67 publications between 2006 and 2009 (Miller, 2011).

Studies in this tradition have identified a broad range of factors that influence how EO relates to company performance, the most important of which are outlined in the following section.

Management Implications of the Results of Prior Research

At first sight, the academic literature seems to lead to the conclusion that higher EO leads to increased performance. This finding can be derived from many published studies, as well as a meta-analysis (Rauch et al., 2009), which suggests that the correlation between EO and performance is significant, although only moderately strong. Upon further investigation, it becomes clear very quickly that the relationship between EO and performance is not a straightforward, positive relationship. There are three key considerations that may be of

critical importance to managers aiming to optimize the performance of their company:

1. The existence of moderators in the relationship.

The meta-analysis quoted above (Rauch et al., 2009) also emphasizes that the positive relationship between EO and performance does not hold homogeneously for all contexts. Rather, there are likely moderators that will determine how EO affects performance. Based on the data available for the meta-analysis, the authors identify the following moderators, all of which only show moderately large correlations with performance:

- *Company size*: EO was significantly more important to company performance for micro businesses than for small businesses. Large companies scored in between these two groups, but the difference was not statistically significant. The results for company size also suggest that there are additional moderators.
- *Industry*: EO was significantly more important for high-tech industries than non-high-tech industries.
- *Culture*: Using continents as proxies for culture, the authors do not find significant differences.

Given the inherent constraints in meta-analyses, these results are limited to a small number of potential moderators that could be coded consistently across the literature and that could be derived from theory. A review of the vast literature reveals many more potential moderators, some of which are: dynamics of the environment, munificence, complexity, and various organizational factors (see Lumpkin and Dess, 1996). Typically, researchers analyze the impact of one of these factors at a time in combination with EO.

From a management perspective, this research approach is quite problematic. Any company finds itself in a context characterized by all of these factors. Its environment will display a certain dynamism, the company will have access to a certain level of resources, and its industry will be characterized by a certain level of complexity. Separate analyses of each of these dimensions can only lead to very limited recommendations regarding the entrepreneurial orientation of a company.

2. The potential that the EO-performance relationship may be curvilinear. EO has been found to have a curvilinear relationship with performance in a number of studies, implying that the positive impact of EO levels

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off or even becomes negative beyond a certain threshold. Other studies report specifically testing for the curvilinear relationship and not finding a significant impact. These differences suggest that there may be moderators that cap the positive impact of EO at a certain level or that certain populations of companies do not usually reach the level of EO at which it becomes less effective.

From a management perspective, these findings may be useful even though it is going to be important to identify the source of the difference in these findings. For the time being, the findings spell a warning that here is the possibility of a company becoming “too entrepreneurial”. Ideally, managers would need to know under which circumstances this occurs or among which type of company this is likely to occur.

3. The potential that the nature of academic publishing introduces biases in the types of results reported.

The common practice of academic journals is to favour the publication of studies with strong, statistically significant findings over those that report non-significant findings. For examples of this bias across disciplines, see Csada et al., 1996; <http://tinyurl.com/3w2rtdl>. It is plausible to assume that there may be a number of studies that found a non-significant impact of EO on performance, and that these studies may not have been published as a consequence.

There is a reason to assume that this scenario is quite likely: studies that report findings for individual components of the EO construct often only report on two or three components. It seems rather unlikely that at least some authors would not have also included the additional 4-6 items of the entire EO scale in their study design. The fact that only a subset is reported on perhaps suggests that the findings were not significant and thus not useful for publication. Considering common publication practices, it thus seems quite likely that studies like the meta-analysis by Rauch et al. (2009) quoted above overestimate the positive impact of EO.

Conclusions and Suggestions for Future Research

The concept of EO has proven fruitful in sparking a substantive body of academic research. It is remarkable in the context of entrepreneurship research in that it has been defined relatively consistently across a large number of studies. Although there are issues related to the

definition and related measurement approaches, meta-analytical research provides some evidence that the overall findings are relatively robust. Thus, from an academic perspective the question arises whether the literature is “at a point of saturation with little more to learn, or can future investigations of EO still make contributions to the strategy and/or entrepreneurship literature?” (Wiklund and Shepherd, 2011)

From a management perspective, the discussion presented above suggests that much remains to be learned before the existing insights can reliably be translated into management recommendations. There are some useful pointers. For example, the finding that entrepreneurial orientation often has a curvilinear effect on performance spells a useful warning for managers.

Beyond this finding, the literature can only provide limited guidance for managers of individual companies. While it is interesting to know that, in general, EO may contribute positively to performance, each business faces very specific combinations of external influences and internal corporate characteristics. These combinations are not typically dominated by the two or three factors that individual studies on EO have investigated. Rather, managers need specific guidance under what combination of external and difficult-to-alter internal circumstances an increased EO can lead to increased performance. Thus, while there is a relatively substantial body of literature on EO, academic research would need to deliver much more specific results in order to provide reliable guidance for management.

This requirement is likely to provide a substantial challenge for academic research. Current methodologies using regression analyses typically can only provide reliable findings for a small number of variables, and even the use of structural equation models is limited by the number of items any questionnaire can realistically contain. To date, this challenge has not been systematically addressed in the business literature. Potentially, research from decision science or the broader area of computer science might lead to useful approaches to integrate the findings from existing studies or to more advanced study designs.

Progress in this area is also hampered by the lack of consistent testing for reliability and especially for the validity of EO scales used (Lyon, Lumpkin, and Dess, 2000; <http://tinyurl.com/6f4drn7>). As noted above, the EO

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scale is one of the more heavily researched concepts in entrepreneurship research, and it can be expected that the reliability and validity of other, less popular, scales may also be insufficient to provide a strong basis for management interventions. On a positive note, current statistical methodologies provide the tools to establish reliability and validity, and researchers and editors are well positioned to deliver published work that meets the needs of management applications.

About the Author

Sandra Schillo is a researcher and consultant in the area of innovation and entrepreneurship. She is the Founding Editor of *Innovation & Entrepreneurship* (www.innovationentrepreneurship.com), a publication founded to make academic literature on innovation and entrepreneurship accessible to policy professionals and researchers. She also is the President of Innovation Impact Inc. (www.innovation-impact.com), a company specializing in custom research and consulting services in the areas of innovation, science and technology policy, and entrepreneurship. Dr. Schillo is also on the Review Board of the *Technology Innovation Management Review*.

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The Impact of External Relationships on the Growth of Young Technology Companies

Chris Justus

“It is through cooperation, rather than conflict, that your greatest successes will be derived.”

Ralph Charell
Author

Most management teams in young technology companies are aware that their success may depend on strong relationships with external organizations. However, it may not be clear to them which types of relationships are most likely to impact their growth. This article describes the author's recent research to examine the relationship between the number and diversity of business relationships and the revenue growth of young companies. By examining data collected from 80 technology firms, and the 1943 relationships they established over a two-year period, certain types of relationships were found to have measurable impacts on growth. The article focuses on the managerial implications of these findings, which include the importance of early funding, niche identification, and building relationships with large firms.

Introduction

For young companies in particular, growth often equates to survival. Growth provides a company with more resources – primarily financial resources – that it can use to attract better employees, invest in research and development, and market and sell its products and services, all of which increase the likelihood of further growth and maturation. Accordingly, researchers have studied a wide variety of factors that impact the growth of new companies, including: founder characteristics (e.g., personality, values, skills, experience, education, behaviours, decisions), industry characteristics (e.g., market size, barriers to entry, competitive landscape, nature of buyers), and business strategy variables (e.g., strategy formulation, goals, strategic direction, entry strategy, competitive positioning, segmentation, scope, investment strategy, alliances). For further details of these factors and a proposed model of their impact on new venture performance, see Chrisman, Bauer-schmidt, and Hofer (1998; <http://tinyurl.com/3c2cxq8>).

Among these factors, both researchers and management teams alike are increasingly recognizing the importance of a company's relationships, which include any interactions between a company and an external

organization. A relationship can be a customer or supplier relationship, or a relationship in which the firms work together directly, such as a joint venture or a marketing or business partnership. It can also include financial relationships in which a firm receives financing in return for equity or other considerations. Finally, a relationship can be with a standards body or an association through which the firm associates with other related firms.

Street and Cameron (2007; <http://tinyurl.com/3cdnppq>) reviewed the literature related to networks, alliances, joint ventures, and ecosystems and found that researchers commonly examined how these systems work, who participates in these relationships, and how these relationships benefit the organizations that are working together. The units of analysis in the literature reviewed by Street and Cameron were individual firms, two-firm partnerships (examining who extracts the most value from the other firm), or entire networks, but the review focused on established firms and did not specifically consider the relationships of young companies. (In this article, “young” refers to a company that between two and 10 years of age. Unlike a startup, a young company is an established organization with revenue from a product or service.)

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Similarly, a substantial body of literature has examined how networks can assist a firm and how networks should be ignored at a firm's peril (e.g., Lechner and Dowling, 2003; <http://tinyurl.com/3zxcqfl>; Larson, 1991; <http://tinyurl.com/3lprkq5>). Networks can assist companies by helping them to establish credibility. They can fill holes in a market offering, allowing a company to focus on its core product or service, while other firms assist in other ways. Networks can help firms reach international markets that would not otherwise be easily entered. Relationships with customers can help a firm to build products that better meet that customers needs, and in turn better fit the market as a whole. Networks can also help give firms access to resources (capital, intellectual property, etc) that they would not otherwise have access to alone. Companies can work with associations or standards bodies to increase credibility, sway a standard towards a new company's technology, as well as allowing a group of firms to spread risk and rewards. Unfortunately, despite the compelling reasons why network relationships can be advantageous, the research in this area typically does not examine young companies in particular.

While many of the factors examined by studies of relationships in established firms overlap with the factors of interest for young companies (i.e., examining characteristics of the management team and the firm, as well as its strategies, systems, processes, and resources), the majority of the research has focused on established firms. This is notable because relationships may be of higher importance to young companies and young companies have limited abilities to establish and maintain relationships relative to established firms.

The author is aware of only two studies that directly examine the impact of relationships on new company growth, and even these studies offer little in the way of generalized guidance for young companies. Baum, Calabrese, and Silverman (2000; <http://tinyurl.com/3rvjccn>) examined startup biotechnology companies in Canada and reported on how the relationships they established positively affected revenue and research output. Their findings are specific to the biotechnology industry, which is a unique industry (the high costs associated with bringing a biotechnology product to market forces a startup to work with established players, and this symbiotic relationship has been consistent over decades), and not necessarily applicable to the North American information technology market. Lee, Lee, and Pennings (2001; <http://tinyurl.com/3vupmlr>) examined startup technology firms in Korea. The Korean market is unique in

that the government and established banking system have a large effect on the success of a technology startup, providing financial resources and connections to promising firms. Again, this research was not necessarily applicable to the North American information technology market.

So, despite the critical role that growth plays in the early days of a company's existence and the recognition of the importance of relationships, it is surprising that this area has received so little attention in the literature. Even research into the growth factors for new ventures has generally ignored the relationships that new companies establish. As a result, there is a lack of models or explanations for why one firm succeeds while another similar firm fails, at least with respect to the role of relationships in these outcomes. Further, the literature lacks research that identifies the types of relationships that might be most beneficial to young companies. As Gulati, Lavie, and Singh (2009; <http://tinyurl.com/3f5hqr2>) observe: "not all relationships are equal, and ... some relationships force exclusivity or monogamy, preventing a firm from forming other relationships."

This article summarizes recent research to address this important gap in the literature as part of the author's Master's thesis in the Technology Innovation Management program (<http://carleton.ca/tim>) at Carleton University. The aim of the research was to better understand the importance of relationships as a growth factor for new companies and what types of relationships might be most beneficial for young information technology companies.

The structure of this article is as follows. First, an overview of the methodology will be provided. Next, the results of the research will be presented and discussed. Finally, conclusions are given, including a summary of the key implications of the research for management teams in young companies.

Research Method Overview

One of the reasons for a relative lack of research into the relationships of young companies may be the difficulties in collecting data. Most mature firms are publicly traded, and as such, their financial information is audited, and databases about these firms are available. In contrast, limited financial information is available for young companies, most of which are privately held. When researching these companies, the typical approach is to collect data through interviews or surveys,

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which means that samples sizes are small and the data is subject to opinion and bias.

In this research, historical sources available on the Internet were used to collect data about Canadian information technology firms founded between 1995 and 2005. The goal was to collect sufficient objective data to determine whether the number and diversity of relationships affected the growth rate of young companies. The expectation was that the more relationships that a firm had, and the more diverse its relationships, the faster the firm would grow. This expectation was based on the assumption that young companies would be able to leverage these relationships, in effect creating value simply by creating relationships. It was also expected that a firm could over-extend itself and that firms with too many relationships would display weak growth.

Historical Branham300 lists (<http://branham300.com>) from 2002 to 2010 were used to identify a sample of 80 young companies and collect revenue data. Branham300 lists are yearly compilations of data about the 300 largest information technology companies in Canada and include both publicly traded and private companies. The lists include revenue data, which is either from public records, supplied by the firms, or is estimated by Branham. For each firm in the sample, three consecutive years of revenue data were used to calculate the firm's growth rate.

While the Branham300 list features the 300 largest companies, it is important to note that the sampling criteria meant that the sample came mostly from the bottom half of the list and did not include only successful firms. The sample displayed a wide range of annualized growth rates, which varied from 345% to -59%, with 12 of 80 firms having a negative annualized growth rate (Figure 1).

Once the young companies had been identified, historical sources on the Internet were used to gather relationship data for the two-year period before the first revenue observation from the Branham300 list. A two-year period was chosen so that: i) more data could be gathered; ii) relationship changes could be observed; and iii) to allow time for any effect of the relationships on revenue to become apparent.

The relationship data was collected through Internet searches and the Internet Archive (<http://archive.org>), which is sometimes referred to as the "Wayback Machine". The Internet Archive stores historical snapshots

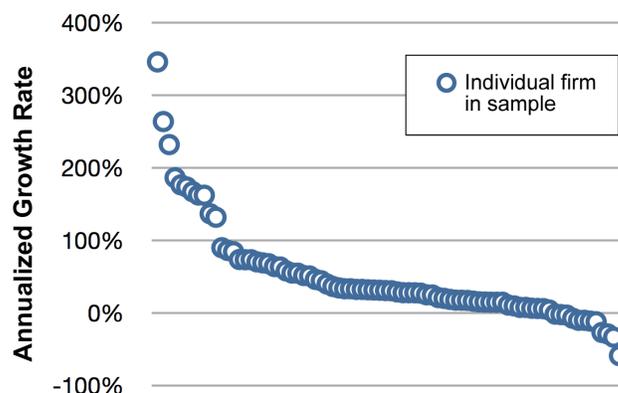


Figure 1. Annualized growth rate of the 80 young companies in this sample

of websites and currently holds over 150 billion pages, covering from 1996 to the present. By viewing historical versions of companies' website, data about their past relationships could be gathered. Through historical press releases and partner pages for 80 young companies, 1943 relationships were identified, covering a two-year period for each firm in the sample. While these sources would not reveal all of the relationships held by these firms, they comprised a representative set of relationships that the firms self-identified as being sufficiently important to warrant the creation of a press release or inclusion on their website. Based on the data, variables were generated representing the total number of relationships and their diversity based on the types of relationships, which were categorized as follows:

- large firms
- associations, standards bodies, or industry organizations
- suppliers
- distributors
- customers
- financial firms
- product integration partners
- strategic relationships with another small firm
- merger/acquisition relationships
- top management team relationships

Once collected, the relationship and revenue data were compared using a stepwise regression (<http://tinyurl.com/3oasxdh>) to examine the effect of relationship type, volume, and diversity on growth over the sampled two-year period.

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Results and Discussion

The results of this study identified three factors that affect the growth in revenue of a young information technology company, which translate into the following guidance for young companies:

1. Secure funding early.
2. Identify the firm's niche.
3. Increase in the number of relationships with large firms.

Securing funding early

The first variable selected by stepwise regression represented changes in relationships with financial partners. The regression model suggests that the correlation between growth rate and this term is negative. In other words, new or discarded relations with financial firms resulted in negative performance.

This finding suggests that firms should seek funding early and then limit their need for additional funding. This is counter to the findings of Baum and colleagues (2000) and Lee and colleagues (2001), which might be due to the age of firms in those studies. The mean age of firms in this study was four years; in the other studies, firms were examined from the moment they were created.

Niche identification

The second term selected by stepwise regression represented the volume and diversity of the relationships that a firm has with other firms. This variable was based on the work of Ferrier (2001; <http://tinyurl.com/3byx9lz>), who found that, in the area of competitive actions, the more diverse and intense actions that were taken, the better the firm did versus a competitor. It was expected that the correlations between firm growth and relationship volume and diversity would be represented by upside-down "U" shapes. Firms with few relationships and low diversity were expected to perform poorly, while firms with moderate to high diversity and a moderate number of relationships were expected to perform best. As the number of relationships exceeded some value at which a firm could no longer maintain all relationships, performance was expected to degrade. However, the results indicated that the correlation between relationship volume and diversity was linear and negative.

These findings suggest that young firms must focus on specific niches in order to grow. Young firms that establish many diverse relationships might be unfocused and underperform relative to their more focused peers.

Relationships with large firms

The final term selected by stepwise regression is a variable representing the change in the number of relationships with large partners, which were defined as partners with over \$1B of revenue. Partnerships of this type typically involve changes in behaviour at the observed young firm, but little or no change in behaviour at the large partner firm. This was the only variable that was found by stepwise regression to have a positive correlation with the growth rate of the young companies in the sample. It is interesting that this term emerged in the stepwise regression, whereas close partners or partner integration did not.

These findings suggest that, when a young company is considering various relationship opportunities (either partnering with a partner its own size, an association of firms, or with a large firm), the relationship with the large firm should be considered a priority. Previous research has demonstrated that relationships with large firms lend credibility to the young company and help the young company overcome the liability of newness (e.g., Stuart, Hoang, and Hybels, 1999: <http://tinyurl.com/3rtutgp>; Gulati and Higgins, 2003: <http://tinyurl.com/3aw5lm2>).

Other findings

Also of interest are the relationships variables that did not show a statistically significant effect on the growth of young companies:

1. Mergers and acquisitions. These results are consistent with Bhidé (2000; <http://tinyurl.com/43hq98s>) who found no significant difference in organic growth versus growth by mergers and acquisitions.
2. Distribution partnerships. Despite an expectation that young firms that created distribution networks, or business models that facilitated partners for broad distribution of a product, would be associated with higher growth, this was not supported by the stepwise regression analysis.
3. Supplier partnerships. The expectation had been that a young firm that wanted to rapidly reach a market would call upon supplier relationships to deliver non-

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core technologies to a product offering, and so a firm with a high number of supplier partnerships was expected to be associated with high growth. However, the results did not support this expectation, and in fact showed weak support for the opposite effect.

4. Close partnerships. Working with close partners might allow equals or near equals with varying experience and markets to work together to improve their performance versus their competition. However, this variable was not found to have a statistically significant effect in the stepwise regression model.

5. Total number of relationships. Companies have a limited amount of resources available to them. Even if relationships are generally beneficial, trying to create and support too many relationships might exceed the capabilities of the firm. It was expected that the relationship might follow an arc in which firms benefit from a large number of relationships, but observe decreasing gains past a certain point. The stepwise regression included quadratic terms, which would have revealed this effect, but it was not found to be statistically significant.

6. Standards and associations. Baum et al. (2000) found that firms that joined associations in the biotechnology industry were negatively correlated with performance. They posit that this might be due to the founders trying to make up for personal and firm weaknesses by joining these organizations. If a person were to consider standards and associations with a network view, in which firms assist each other, it would be expected that these types of relationships would be beneficial. However, in this study, this variable was not found to be statistically significant in the stepwise regression.

7. Top management teams. As new members are introduced to the management team, they might bring with them their past relationships (and the potential benefits to growth that they represent). However, it is difficult to measure the effectiveness of an individual leader with the method used here to collect information about relationships, and as such it was not unexpected that this variable was not found to be important in the analysis.

Conclusions

Young companies must grow to survive. Companies traditionally create business plans outlining their business model and how they will acquire customers. Few young companies use a strategic mindset to consider their relationships with other companies. However, relationships are a resource that can be planned, monitored, and measured just like any other. Young companies have limited resources to create and maintain relationships and should therefore consider whether a particular relationship will provide value to the company. The results of this research provide guidance to management teams of young companies by highlighting the importance of three activities: i) securing funding early; ii) identifying the firm's niche; and iii) building relationships with large firms.

About the Author

Chris Justus is a software architect at bitHeads in Ottawa, Canada. He recently completed his Master's degree in the Technology Innovation Management program at Carleton University with a thesis entitled "Relationships of young information technology companies and growth in revenue." He also holds a Bachelor of Mathematics from the University of Waterloo. Chris has over 20 years of experience in the technology space and has cofounded three information technology companies, including one of the largest independent ISPs in Canada and an information technology staffing and software company.

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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.

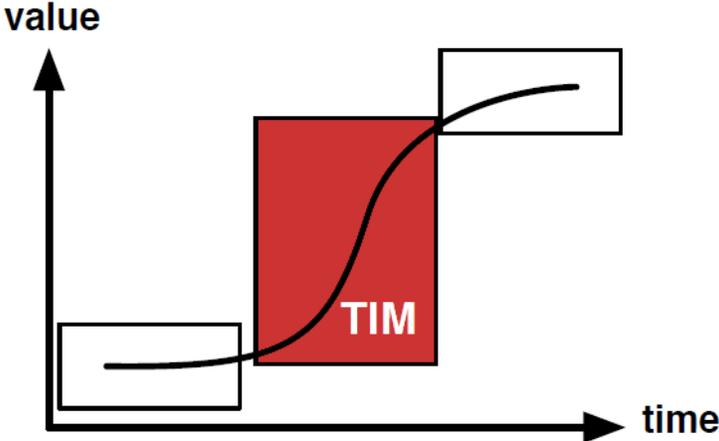
When writing your article, keep the following points in mind:

- 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.

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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.
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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.
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8. Include a 75-150 word biography.
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