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Article

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RESEARCH

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Organizational innovation: verifying a comprehensive model for catalyzing organizational development and change

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Abstract

In a rapidly transforming global marketplace, organizations need to make effective use of organizational innovations in order to remain competitive. Previous research has identified a need for a more comprehensive framework that will aid in better understanding of the mechanisms catalyzing organizational development and change. Steiber and Alänge (*Triple Helix* 2(9):1–25, 2015) presented such a comprehensive model for organizational innovations based on literature reviews and two empirical studies of the organizational innovations of Total Quality Management, Lean Production, and the Toyota Production System. All of these draw heavily on the experiences of Toyota in Japan and are known for their focus on continuous improvement of quality and efficiency.

This paper investigates whether this model can be applied to different categories of organizational innovations developed in different institutional environments. It is therefore tested on the “Google Innovation System” (GIS), developed in California’s Silicon Valley, which is here viewed as a contrasting organizational innovation focused on continual innovation.

The model is shown to be applicable to analyze the Google Innovation System organizational innovation. This paper therefore verifies a comprehensive model for the creation, diffusion, and sustaining of organizational innovations. The findings extend current theory on organizational innovations and provide insights for practitioners in innovation-intensive environments.

Keywords: Google; Organizational innovation; Organizational development; Creation; Diffusion; Sustaining

Spanish: Innovación Organizacional: Verificando un modelo comprensivo para catalizar cambio y desarrollo organizacional.

Resumen: En un mercado mundial en rápida transformación, las organizaciones deben hacer uso efectivo de las innovaciones organizacionales con el fin de seguir siendo competitivas.

Investigación previa ha identificado la necesidad de un marco más amplio que ayudará a mejorar nuestro entendimiento de los mecanismos que catalizan el cambio y desarrollo organizacional. Steiber y Alänge (*Triple Helix* 2(9):1–25, 2015) presentan tal modelo comprensivo de innovaciones organizacionales basado en revisiones bibliográficas y dos estudios empíricos sobre la Gestión de Calidad Total y la Manufactura Esbelta en el Sistema de Producción Toyota que es conocido por su enfoque en la mejora continua de la calidad y la eficiencia.

Este artículo investiga si el modelo Steiber-Alänge puede aplicarse a las innovaciones organizacionales desarrolladas en diferentes entornos institucionales. Para contrastar el modelo de Toyota centrado en la mejora continua, aquí examinamos el Sistema de Innovación Google, que es una innovación organizacional centrada en la innovación continua.

El modelo Steiber-Alänge prueba ser útil en el análisis de la innovación organizacional del Sistema de Innovación de Google y así corrobora su validez como un modelo comprensivo de la creación, difusión y sostenimiento de las innovaciones organizacionales. Nuestros resultados extienden por tanto la teoría sobre las innovaciones organizacionales y la vez proporcionan información para los profesionales en entornos de innovación intensiva.

French: L'Innovation organisationnelle: Vérifier un modèle global pour catalyser le changement et le développement organisationnel

Résumé: Dans un marché global en rapide transformation, les organisations ont besoin de se servir des innovations organisationnelles pour rester compétitives. Des recherches précédentes ont identifié le besoin d'un cadre globalisé afin de mieux comprendre les mécanismes qui servent de catalyseur au changement et au développement organisationnel. Steiber et Alänge (*Triple Helix* 2(9):1–25, 2015) ont présenté un tel modèle global pour les innovations organisationnelles basé sur des revues de la littérature et sur deux études empiriques sur la Gestion de Qualité Totale et la Production au Plus Juste dans le système de production de Toyota au Japon, qui est connu pour mettre l'accent sur l'amélioration de la qualité et l'efficacité. L'article cherche à savoir si ce modèle peut être appliqué à différentes catégories d'innovations organisationnelles développées dans différents environnements institutionnels. Il est testé en particulier sur le Système d'Innovation de Google développé dans la Silicon Valley californienne qui est vu ici comme une innovation organisationnelle centrée sur l'innovation continue. Le modèle Steiber-Alänge peut être utile pour analyser l'innovation organisationnelle du système d'innovation de Google. L'article vérifie donc un modèle global pour la création, la diffusion et le soutien des innovations organisationnelles. Les résultats étendent la théorie actuelle des innovations organisationnelles et fournit des informations aux professionnels dans des environnements d'innovation intensive.

Chinese: 组织创新:验证一个催化组织发展与变革的综合模型

摘要: 在迅速变化的全球市场条件下,为了保持竞争力组织需要有效地利用组织创新。以往的研究表明需要一个更综合的框架来帮助更好地理解催化组织发展和变化的机制。Steiber和 Alänge(*Triple Helix* 2(9):1–25, 2015)基于全面质量管理的组织创新的文献研究和两个实证研究——精益生产和丰田生产体系的组织创新——提出组织创新的综合模型。它们都大量采用丰田公司在日本的经验,并注重不断提高质量和效率。

本文探讨这一模型是否能适用于在不同制度环境下发展出来的不同类型的组织创新。在美国加州硅谷发展起来的“谷歌创新体系”(“GIS”),在此被看作一个明显注重持续创新的组织创新。因而我们利用GIS验证所提出的组织创新综合模型。

结果表明该模型适用于分析“谷歌创新体系”的组织创新。本文因此验证了创造、传播和维持组织创新的综合模型。这些研究结果扩展了目前对组织创新的理论探讨,也为工作在创新密集型环境下的实践者提供更多的见解。

Russian: Организационные инновации: применение модели ускорения организационного развития и изменений

Аннотация: В условиях быстро меняющегося глобального рынка организации вынуждены эффективно использовать организационные инновации для того, чтобы остаться конкурентоспособными. Результаты ранее проведенного исследования позволили разработать концепцию, которая обеспечивает лучшее понимание механизма катализа организационного развития и изменений. Авторы Steiber и Alänge (*Triple Helix* 2(9):1–25, 2015) предложили более полную модель для описания организационных инноваций, опираясь на релевантные литературные источники и результаты двух эмпирических исследований, посвященных комплексному подходу к управлению качеством, бережливому производству и производственной системе компании Тойота. Все вышеперечисленное во многом заимствовано из опыта работы Toyota в Японии и приобрело известность благодаря ориентированности на непрерывное улучшение качества и повышение эффективности.

В настоящей статье исследуется применимость данной модели к различным типам организационных инноваций, реализуемых в различных институциональных условиях. Апробация была проведена на примере Инновационной Системы Гугл (“GIS”), разработанной в Силиконовой Долине Калифорнии, где рассматриваются различные инновации, ориентированные на непрерывное развитие. Модель подтвердила возможность ее использования для изучения организационных инноваций в рамках Инновационной Системы Гугл. Настоящая статья подтверждает полноту предложенной модели для описания процессов создания, диффузии и поддержания организационных инноваций. Результаты дополняют существующую теорию организационных инноваций и способствуют более глубокому пониманию практиками принципов функционирования инновационно-активных экосистем.

Portuguese: Inovação Organizacional: comprovando um Modelo Abrangente para Catalisar o Desenvolvimento Organizacional e a Mudança.

Resumo: Em um mercado global de rápidas transformações, as organizações precisam fazer o uso efetivo de inovações organizacionais para se manterem competitivas. Pesquisas anteriores identificaram a necessidade de um quadro estrutural mais abrangente que ajude a compreender melhor os mecanismos catalisadores do desenvolvimento organizacional e da mudança. Steiber e Alänge (*Triple Helix* 2(9):1–25, 2015) apresentaram tal modelo abrangente para inovações organizacionais, com base na revisão da literatura e dois estudos empíricos das inovações organizacionais na Gestão da Qualidade Total, Produção Enxuta e do Sistema Toyota de Produção. Todos estes foram intensamente influenciados pelas experiências da Toyota no Japão e são conhecidos por seu foco na melhoria contínua da qualidade e eficiência.

Esse artigo investiga se esse modelo pode ser aplicado para categorias diferentes de inovações organizacionais, desenvolvidas em ambientes institucionais diferentes. Isso foi, por conseguinte, testado no ‘Google Innovation System’ (“GIS”), desenvolvido no Vale do Silício, Califórnia, o qual é considerado como uma inovação organizacional permanentemente focada na melhoria contínua.

O modelo é mostrado ser aplicável para analisar a inovação organizacional do ‘Sistema Google de Inovação’. Esse artigo verifica, portanto, o modelo abrangente para a criação, a difusão e a sustentação das inovações organizacionais. Os resultados ampliam a teoria atual sobre as inovações organizacionais e fornecem insights para os profissionais em ambientes intensivos em inovação.

Multilingual abstract

Please see Additional file 1 for translation of the abstract into Arabic.

Introduction

Over the last half-century, researchers in various disciplines have explored innovation from a range of perspectives, focusing more on technical innovations than on organizational innovations (Birkinshaw et al. 2008; Ganter and Hecker 2013), defined here as new organizational methods in business practices, workplace organization, or external relations (OECD 2005).

Organizational innovations are typically implemented in order to increase operational efficiency and employee satisfaction or, more recently, to improve a firm’s innovativeness. According to Ganter and Hecker (2014), many attempts at adaptation to environmental change pertain to organizational innovations, and remaining competitive in a rapidly changing global marketplace requires their effective use. Some examples of organizational innovations are divisionalization (“M-form”), total quality management (TQM), the Toyota Production System (TPS), and Lean Production (Lean), all of which have led to competitive advantages for the firms that embrace them (Chandler 1962; Bartlett and Ghoshal 1993; Womack and Jones 2003; Liker 2004; Birkinshaw et al. 2008). Further, organizational innovations are often necessary for technical innovations to succeed (Freeman 1982; Leonard-Barton 1988; Tushman and O’Reilly 1997; Teece 2007).

Although organizational innovations create long-term competitive advantages and are important for technical innovations, they “remain poorly managed and poorly

understood". Research has therefore identified a need for a more comprehensive model for understanding the mechanisms behind organizational development and change (Frambach and Schillewaert 2002; Ganter and Hecker 2013, 2014), as well as a need to test such a model on different types of organizational innovations in various institutional environments (Ganter and Hecker 2013).

Steiber and Alänge (2015) presented a comprehensive model¹ for studying the creation, diffusion, and sustaining of organizational innovations based on two literature reviews and the findings of two empirical case studies of TQM, Lean, and TPS. These three innovations can be placed in a single category (here referred to as "Quality Management/Production Systems") of organizational innovations, as all were developed in a context of continuous improvement with the aim of achieving quality and efficiency, and they all draw heavily on the experiences of Toyota in Japan. The question, then, is whether the conceptual model in that study is also valid for other categories of organizational innovations—specifically, those with primary focal points other than quality and efficiency—and whether the model can usefully be applied in a different institutional environment (Ganter and Hecker 2013).

The purpose of this paper is to verify the comprehensive model² presented in Steiber and Alänge (2015) by using it to analyze another category of organizational innovations—namely, the Google Innovation System (GIS), developed in late 1990s to the early 2000s in the Internet industry based in Silicon Valley. GIS focuses on continual innovation³ rather than on continuously improving quality and efficiency.⁴ Google's initial innovations (e.g., Search launched in 1997 and AdWords in 2000) have been followed by a continuous stream of new products: such as Gmail (2004), Maps (2005), Earth (2005), YouTube (2006), Android (2008), and Google+ (2011).⁵ Some of these originated from internal ideas, while others grew from Google's acquisition⁶ of smaller firms.⁷ Some internal ideas or acquisitions resulted in largely organic development of existing business areas. Others, however, were truly disruptive for the industries concerned. These included YouTube (television) and Android (mobile), which caused disruption reminiscent of the effects of Search/AdWords (browser/advertising) on the advertising industry.⁸ According to Google founder Larry Page, many of those "things that seemed crazy at the time," like Google Maps, YouTube, Chrome, and Android, now have over a billion users.⁹ Thus, Google has been able to continually innovate *both* on a more disruptive level and a more incremental level. Another example of continual innovation (on business/operational model level) is Google's reorganization in August 2015, when previous business areas and projects became daughter companies of a new holding company, Alphabet, separating innovations considered large enough to merit their own divisions.¹⁰ In terms of GIS, this change strengthens Google's ambidextrous capacity, allowing greater focus on continually developing new and radically different innovations while growing Google's primary revenue-generating products (Search, AdWords, AdSense, and YouTube).¹¹

The next two sections of this paper outline methodology, a summary of reviewed frameworks for studying organizational innovations, and the conceptual model developed in Steiber and Alänge (2015). We then use GIS to test the conceptual model and present a comparison of the two categories of organizational innovations. Finally, we discuss the applicability of the conceptual model and present our final conclusions and suggestions for future research.

Methodology

Steiber and Alänge's (2015) comprehensive model for understanding the creation, diffusion, and sustaining¹² of organizational innovations is based on two literature reviews (Alänge et al. 1998; Steiber 2012) conducted over a 14-year period and on the findings of two empirical case studies covering four Swedish manufacturing firms and one Swedish hospital (Alänge and Steiber 2009, 2011). However, while that model was developed from a number of case studies, the process has not directly followed the logic for multiple case study research suggested, for instance, by Eisenhardt (1989) and by Yin (1994). Rather, the empirical studies, in combination with recurring theory input, have resulted in the gradual development of a deeper understanding expressed in terms of an evolving conceptual framework (Dubois and Gadde 2002).

The two case studies examine the organizational innovations of TQM, Lean, and TPS¹³—all standardized and known for focusing on quality and operational efficiency. TPS, TQM, and Lean were developed between the 1970s and 1990s, in a period that could be viewed as second industrial revolution. It is therefore relevant to ask whether the comprehensive model also is valid for organizational innovations developed in another industry, with a different aim, and during a later time—for example, in today's digital era (a third industrial revolution).¹⁴

In order to investigate the applicability of the comprehensive model to another category of organizational innovations, we use the model to analyze the creation, diffusion, and sustaining of the Google Innovation System (GIS).¹⁵ In other words, we have purposely sought a “contrasting case” in order to verify the relevance of the tentative comprehensive model (Miles et al. 2014). GIS, as discussed later in greater detail, exemplifies a type of organizational innovation that is different from TQM, Lean, and TPS, and this is why a study comparing them to GIS is valuable for extending emergent theory (Eisenhardt 1989).

The data on GIS were collected through literature reviews and a single-case empirical study of Google.¹⁶ Once again, an abductive approach (Dubois and Gadde 2002) was used. The research team started by conducting a literature review and developed an initial skeleton for a framework. The aim was to identify research literature that had focused on firms' innovativeness and organizational characteristics for continual innovation. This framework was then used when developing themes and items for the questionnaires.¹⁷ The initial literature review also included empirical data from YouTube clips and articles in which Google leaders present their views on Google, but articles and books on Google (e.g., Girard 2009 and Auletta 2009) were at this point intentionally not included because we wanted to gain a firsthand view from our Google interviewees.

The collection of primary data took place through 32 face-to-face interviews¹⁸ with Google employees between 2010 and 2012, of which 80 % were held at Google's headquarters in Mountain View, California; the others took place at offices in Asia, Europe, and North America. Of the interviewees, 26 were at the director level, 2 were non-managers, and 3 were vice-presidents (one person was interviewed twice, 2 years apart and in two different positions).¹⁹ The interview guide was semistructured with open-ended questions. Each interview lasted approximately 1 h and was recorded and later transcribed. The interview guide included questions on innovation and its drivers at Google but also on the topic of organizational development and change over time. At

the end of each conversation, interviewees were asked to rank and then describe seven predefined organizational elements according to their relative importance for Google's innovativeness. Each of the seven elements had been mentioned in previous research literature as potentially important for a firm's innovativeness.²⁰

After the interviews had been transcribed, the two researchers who had jointly conducted the interviews read them independently. Based on this reading, the information in the interviews was coded independently and transferred to Post-Its, which were then used to build subcategories through an affinity technique. The two researchers conducted this grouping process jointly. These subcategories served as a basis for writing an in-depth case study on Google that provided the input for describing and analyzing Google's corporate system for continual innovation and the processes related to creating, diffusing, and sustaining that system (Steiber and Alänge 2013a, 2013c). At this point, the findings were once again related to research, this time also including articles and books about Google. In this literature, Google has been branded as employing a unique management model, and publications such as *The Google Way: How One Company Is Revolutionizing Management as We Know It* (Girard 2009) and *Googled: The End of the World as We Know It* (Auletta 2009) support a picture of Google and its system as highly innovative. Through the coding and categorization of empirical findings, together with new literature reviews triggered by empirical findings, the original framework was developed during the research process.

We are aware that other companies share many of the characteristics of GIS; however, in Google, these are integrated into a corporate system for innovation (Steiber and Alänge 2013a), much as Toyota has integrated many individual characteristics that it shares with other companies into its own production system, TPS, which has become a model for other firms. While Toyota's system is largely standardized, it is constantly being developed. Ongoing development is even more characteristic of GIS, although the latter cannot currently be described as a well-packaged or standardized organizational innovation. Examining GIS allows us to determine whether the conceptual model presented in Steiber and Alänge (2015) is applicable to categories of organizational innovations whose primary focal points are not continuous improvement of quality and efficiency and to determine whether the model can work in a different institutional environment.

Toward a comprehensive model for studying organizational innovations

In spite of the fact that organizational innovations can be important for organizations' long-term competitive advantages, they have been subject to less research focus than technical innovations have (Edquist 1992; Birkinshaw et al. 2008; Ganter and Hecker 2013). This literature review presents some older frameworks for studying the creation, diffusion, and sustaining of organizational innovations.

Literature review of innovation frameworks

Several attempts have been made to explore the creation, diffusion, and sustaining of organizational innovations. For example, Birkinshaw et al. (2008) have presented a model for creating organizational innovations. They found that the creation of these innovations is influenced by three main sets of factors: the environmental context, the organizational context, and external and internal change agents. The environmental context is described

as “the broad set of stimuli—exogenous to the focal organization—that shapes the management discourse and thereby influences the priorities and efforts of external change agents as they engage with organizations” (p 833). The organizational context comprises the “administrative and social mechanisms that management can manipulate to shape the behavior of actors in the organization...and [that] will have a direct impact (positive or negative) on the ability of internal change agents to pursue the core activities associated with management innovation” (p 833). Finally, external change agents are either the “management intellectuals, idea entrepreneurs, independent consultants, academics, and gurus proactive in creating interest in, influencing the development of, and legitimizing the effectiveness and retention of new management practices” (p 832), and internal change agents are, for instance, “employees of the innovating company proactive in creating interest in, experimenting with and validating the management innovation in question” (p 832). The model found in Birkinshaw et al. (2008) consists of four steps: motivation, invention, implementation and theorizing, and labeling. Motivation is concerned with factors that create the motives for, and thereby, the desirability of, changing the organization. The next step, invention, involves experimentation, including developing a solution, thinking through the consequences of the new idea, linking the idea to empirical data, and testing it in practice. Implementation covers all activities that take place after the test but before the new innovation is operational. The last step, theorizing and labeling, aims to build a rationale for adopting the innovation, to name the innovation, and to communicate the rationale and the innovation both internally and externally.

Regarding the diffusion of organizational innovations, Alänge et al. (1998) have found that theories about diffusing technical innovations can also be applied to ideas about diffusing organizational innovations. However, the same study also identified a number of features intrinsic to organizational innovations that are quite different from those of technical innovations. These features are listed along two dimensions: their effects on the market for organizational innovations and their effects on the search and implementation processes. Regarding the market, organizational innovations are more tacit in nature than are technical innovations. There is no traditional market for organizational innovations, and there is no traditional model for calculating return on an investment in them. Further, regarding search and implementation processes, organizational innovations commonly affect the daily work situations of many people in a business. Nevertheless, companies rarely have a formal position or formal strategies in place for these innovations as they would for, say, the research and development of technical innovations (e.g., an R&D manager and R&D strategies for technical innovations). As a result, the market mechanisms function poorly, the search and learning processes may be less conscious and systematic, standardization of the innovations is based on the subjective interpretations of early adopters, and top management’s commitment and the process of the intrafirm diffusion of organizational innovations become more important than they are in the case of technical innovations.

Based on the knowledge of the specific intrinsic features of organizational innovations, Alänge et al. (1998) have identified a number of implications for the diffusion of organizational innovations. Owing to organizational innovations’ relatively tacit nature, they are less readily observable and testable than are technical innovations. In addition, organizational innovations presumably affect a higher number of people than technical innovations do and are harder to evaluate, as there is no traditional financial calculation

method for this type of innovation. As a result, the process of standardization, top management support for and belief in an innovation's relative advantages and the compatibility of the innovation with previously adopted ones play a more important role for organizational innovations than they do for technical innovations. The interdependence of innovations, the subjective determination of boundaries around an innovation, and the continual reinvention of the innovation are all more relevant here than they are for technical innovations. And finally, networks—specifically, interpersonal networks—play an important role in the diffusion of organizational innovations (Ahuja 2000) because no traditional market exists.

Owing to this lack of a traditional market, the local institutional setup, user networks, consulting firms, and movements of people all contribute significantly to diffusing organizational innovations. According to Rogers (1995), the social system influences a firm's innovativeness. Alänge et al. (1998) have highlighted the institutional setup of the local innovation system and its inertia and path dependency. In addition, the importance of local norms and historical experience has been emphasized by Rogers (1995), and other research has focused on national and regional innovation systems (Lundvall 1992; Saxenian 1994; Cooke 2001). According to Rogers, relatively few studies have considered ways in which the social structure affects the diffusion of innovations. Thus, both the local institutional setup and the influence of norms and historical experience on a nation's or region's innovativeness should be considered when conceptualizing the creation, diffusion, and sustaining of organizational innovations.

Finally, sustaining organizational innovation emphasizes the importance of a firm's maintaining a particular innovation for a certain period (Buchanan et al. 2005). However, as pointed out above, innovations are constantly reinvented. According to Buchanan et al. (2005), *sustaining* could refer to a general improvement trajectory rather than to adherence to a particular organizational innovation. According to those authors, this implies a more dynamic perspective on sustained organizational change, making the static view of maintaining a particular organizational innovation only temporarily relevant. The authors have also discussed external turbulence and uncertainty as factors that may inhibit sustained organizational innovation. Buchanan et al. (2005) have identified four sets of factors that all contribute to sustaining organizational innovations: the internal context, the external context, the substance of change, the change process and its timing, and, finally, organizational factors.

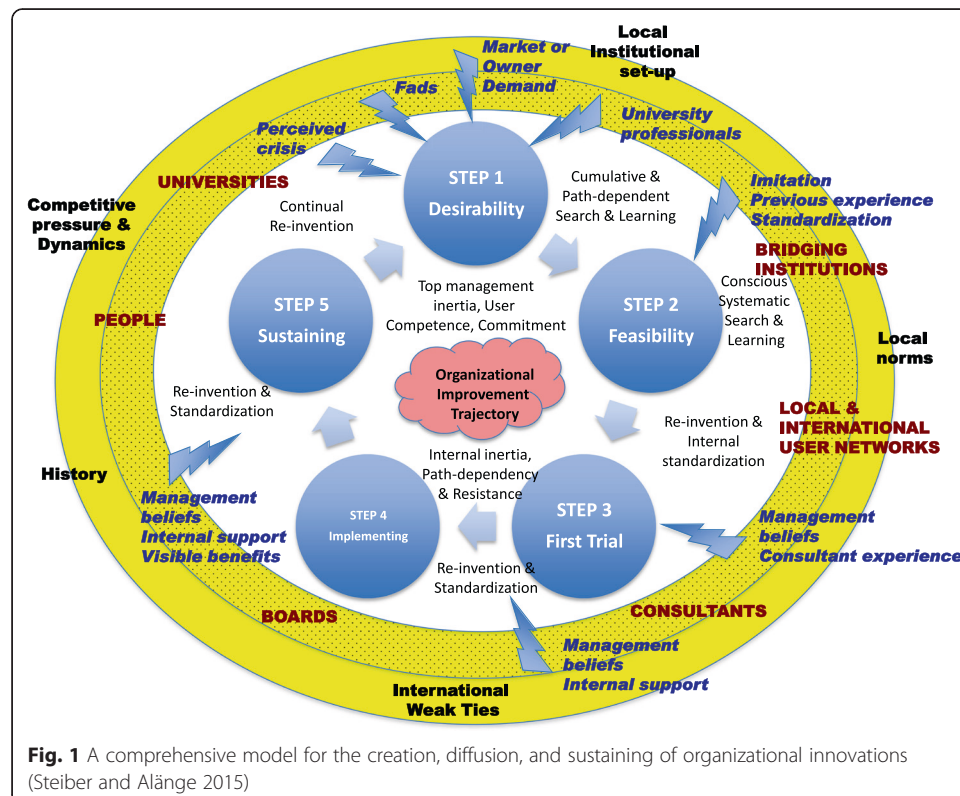
We now turn to literature that has presented more comprehensive models for a better understanding not only of the adoption of organizational innovations but also of the preadoption and postadoption phases (e.g., the models of Frambach and Schillewaert 2002; Ganter and Hecker 2013, 2014). Their frameworks include the antecedents of organizational innovations, such as the adopting firm's organizational context and knowledge-based relations (market-based relations, such as with suppliers; professional relations, such as with consultants, and relations with internal sources). Both research groups also included the external environment and highlighted competitive pressure as an important antecedent. Ganter and Hecker (2013), who compared their findings in a German empirical study with the findings and model of Mol and Birkinshaw (2009), also highlighted factors such as the speed of technological change in the adopting firm's environment. In their study, the intensity of competition, the speed

of technological change, and the brevity of the product life cycle had a clear and significant effect on firm's adoption of organizational innovations.

The framework presented by Frambach and Schillewaert (2002) was developed by integrating research on innovation adoption and technology acceptance that had emerged in the marketing and management literature. Perhaps, for this reason, their model also includes a cluster of factors under the heading "perceived innovation characteristics," such as the perceived advantage and complexity of the innovation. Further, they included social networks as an important antecedent. The authors presented models that clearly mirror each other. Both research groups (Frambach and Schillewaert 2002; Ganter and Hecker 2013) concluded that more research is needed to refine and verify a comprehensive model for explaining both the adoption of organizational innovations and the preadoption and postadoption concepts.

A comprehensive model

In presenting their model, Steiber and Alänge (2015) found that the three concepts—creating, diffusing, and sustaining organizational innovation—must be viewed as intertwined rather than in isolation. For this reason, their conceptual model is visualized in five steps that form a circular pattern around a firm-specific organizational-improvement trajectory rather than a single organizational innovation (see Fig. 1). The model was developed independently of the research of Frambach and Schillewaert (2002) and Ganter and Hecker (2013) but includes the factors identified by the latter two research groups. In contrast to their research, the Steiber and Alänge (2015) model introduces several new



factors: local norms in and the history of the external environment, the importance of weak ties in social networks, and consultants, universities, and people as diffusion mechanisms for organizational innovations and as triggers for change. Regarding the organizational context, the new factors of inertia and user competence are likewise introduced and highlighted. Finally, the model also presents an alternative way of thinking about its central object, suggesting an organizational-improvement trajectory instead of a single organizational innovation. A brief description of the comprehensive model is presented in Fig. 1 and the text that follows.

Each of the five steps (desirability, feasibility, first trial, implementing, and sustaining) is affected by the company's path dependency, which also affects the search and learning processes for future organizational innovations. The organizational development is cumulative, owing to internal inertia among top managers and employees. The steps are thus affected by previously chosen organizational innovations, an idea that fits well with Kimberley (1979)'s findings that subsequent innovations can be parallel (and competing), sequential, or synergistic. Therefore, the concept of sustaining does not refer to a particular organizational innovation but, rather, to an organizational-improvement trajectory, adding a dynamic perspective to the model. When a new innovation directly competes with and replaces previously implemented organizational innovations, however, this could be viewed as the inception of an entirely new organizational-improvement trajectory.

The inner circle in Fig. 1 represents the internal context of the firm. Here, top management and the board are crucial for sustaining the organizational trajectory. Top management's own inertia, user competence, and commitment to the organizational-improvement trajectory all affect internal inertia and resistance to change. Further, the search and learning processes become cumulative and path dependent but could in some cases challenge inertia if they are more conscious and systematic²¹ in the desirability and feasibility phases. Owing to the organization's learning process and to different internal interpretations of the organizational innovation (e.g., by different departments), that innovation is continually reinvented and standardized, first when it is tested, and later during the phases of implementation and sustaining.

The two outer circles in Fig. 1 represent the external context. The outermost circle signifies the external environment in the form of institutional setup, local norms and history, and existing weak ties that the organization has through its employees with networks that are active outside the local context. The external environment also includes factors such as a sector's characteristic competitive pressure and dynamics—stemming from, say, the pace of technological development. The dotted area represents diffusion channels, such as the movement of people (e.g., a new CEO), board members, user networks, bridging institutions, universities, and consultants. These diffusion channels—or change agents, as Birkinshaw et al. (2008) would call them—could play an important role in communicating, translating, and “selling” organizational innovations to a firm. These channels act as mechanisms that could trigger one or several of the five steps (visualized as flashes). The triggers may come in the form of an internal perception of crisis, a new market or owner demand (perhaps itself triggered by technological development and a lower entry barrier in a certain sector), a national or international fad, “proof of benefits” in a user network, or a CEO's or board's conviction based on previous experience and user competence with respect to the specific innovation.

Organizational-improvement trajectories also exist on the national level and even the international level, where organizational innovations are diffused between firms and are gradually reinvented. At a certain point in time, current trajectories are challenged by organizational innovations based on a new way of thinking in management (Lundgren and Alänge 2000; Alänge and Steiber 2011). When national or international improvement trajectories are based on complex organizational innovations, such as TQM and Lean, considerable overlap may occur in terms of content between parallel trajectories. National and international approaches naturally exercise considerable influence on an individual company's improvement trajectory (Alänge and Steiber 2009).

The Google Innovation System (GIS)

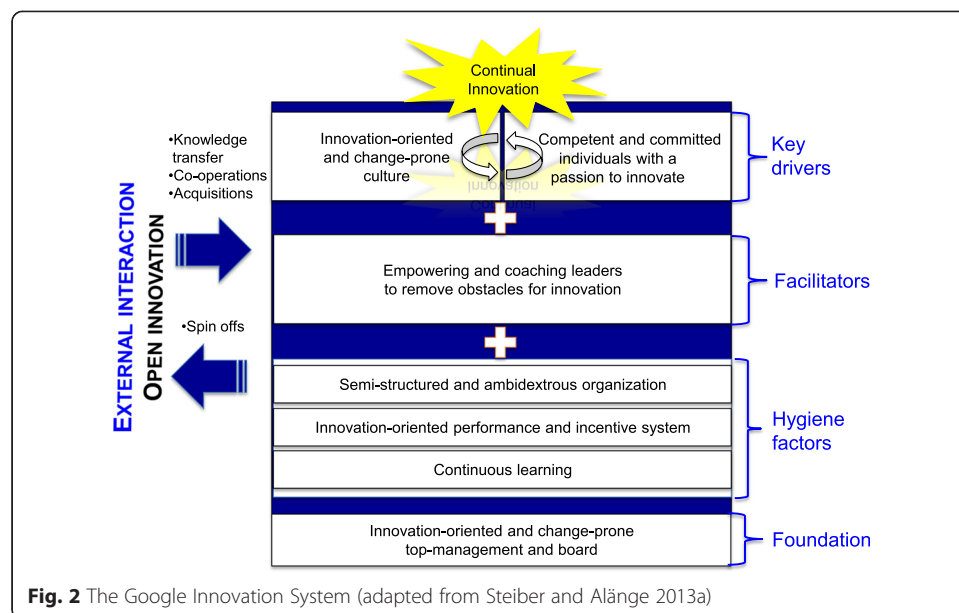
As noted earlier, the TQM, TPS, and Lean organizational innovations, here treated in a single category—largely developed in the automobile industry and drawing strongly on the experiences of Toyota—are standardized and known for their focus on the continuous improvement of quality and operational efficiency. The present study uses GIS to test our conceptual model beyond this category because GIS, developed in an entirely different culture and geographical setting, focuses on continual innovation rather than continuously improving quality and efficiency.

The characteristics of GIS

Steiber and Alänge (2013a) have found GIS to be a complex organizational innovation best described as a dynamic and open corporate system for continual innovation. It is visualized in Fig. 2 as five building blocks: key drivers, facilitators, hygiene factors, external interaction, and the foundation.²²

Each block includes organizational characteristics important for Google's continual innovation. Six organizational characteristics (an innovation-oriented and change-prone culture; competent and committed individuals with a passion to innovate; leaders that empower, coach, and remove obstacles to innovation; a semistructured and ambidextrous organization; an innovation-oriented performance and incentive system; and continuous learning) played different roles as drivers, facilitators, and more or less, necessary hygiene factors for the firm's innovativeness. A seventh is the long-term commitment of the innovation-oriented and change-prone top management and board, the foundation upon which Google has built its corporate system for continual innovation. The eighth and final characteristic is that the corporate system was open enough to embrace good ideas and innovations from everywhere.²³ (This openness in GIS has been reinforced through the creation of Alphabet, mentioned earlier, which separated the main revenue-generating and advertising-based businesses under the Google brand from explorative units under other brands.) These eight organizational characteristics of GIS are interlinked and some major outcomes will be described in the following paragraphs (Steiber and Alänge, 2013a).

First, the firm has an ability to change constantly, supported by the mindset of senior leaders, a change-prone culture, a semistructured organization, and the use of heuristic rules instead of formal processes. Together, these factors allow for a high degree of flexibility. Further, in order to adapt quickly and wisely, decision making takes place lower in the ranks, and the ambition is to utilize the most up-to-date, most relevant



knowledge and experience of the issues that are behind any necessary changes. The same is true of strategies that are built from the bottom up. The facts that senior leaders emphasize change and that the whole organization is designed to handle constant flux suggest that Google strives for dynamic capabilities (Teece and Pisano 1994). A change-prone culture, a semistructured organization, and the use of heuristic rules have been identified by Brown and Eisenhardt (1997, 1998) as characteristics of organizations that are able to renew themselves constantly in rapidly changing industries.

Second, employees are viewed as Google's most important asset. The focus is on attracting and selecting the right individuals,²⁴ and the organization is designed around those individuals in order to facilitate their parallel work of innovation and operational excellence and to reward them for achieving these ends. The organization allows for individuality, diversity, openness/opacity, and small teams, and it requires employees to self-organize.

Third, the emphasis on and trust in employees and their capacity demand a certain leadership style. The leaders' main tasks at Google are to be effective coaches and to empower their employees; to be good ambassadors for the firm; to communicate the company's vision or mission, goals, and priorities to their team; and to help team members achieve these while removing obstacles to innovation.

Fourth, the organization aims at managing both innovations and operational excellence. The focus on "thinking big," in parallel with requiring operational excellence, indicates that Google aims to develop and sustain an ambidextrous organization (Tushman and O'Reilly 1997) that is simultaneously capable of both exploration and exploitation (March 1991).

Fifth, GIS is an "open system." It involves acquiring externally developed technical innovations, cooperating with leading universities and researchers, and investing in external technologies through its own venture capital business, supporting the internal process for more radical technical innovations. Therefore, Steiber and Alänge (2013a) have viewed Google as applying the philosophy behind "open innovation" (Chesbrough

2003). Alphabet makes this even clearer, as many of the open mechanisms identified in GIS have been placed under the Alphabet umbrella (e.g., Google Ventures, Google Capital).²⁵ This structure gives new business areas outside the main search-advertising field room to develop their own identities.²⁶

The uniqueness of GIS and its differences from TQM, Lean, and TPS

Many of the organizational characteristics for continual innovation identified in Google's case can be found in previous research. Google has combined these organizational characteristics into one corporate system (Steiber and Alänge 2013a), striving for—and building—a systemic organizational solution for innovation (O'Connor 2008) into which different organizational characteristics are deeply integrated. For this reason, we view GIS as a unique organizational innovation.

The emphasis on constant renewal within Google's organization and the need to manage continual innovation are not as explicit in the organizational innovations of TQM, Lean, and TPS as they are in GIS. Google's semistructured organization focuses less on formal processes (Steiber and Alänge 2013a, 2013b), whereas TQM, Lean, and TPS focus on continuous improvement, quality, and operational efficiency, leading to a strong "process orientation" and a minimization of slack and variation (e.g., in production). Whereas empowerment and self-organizing, reinforced by leaders who coach employees rather than dictate what they must do, is a characteristic present to some extent in TQM, Lean, and TPS, employee empowerment and self-organization reach an even higher level in GIS. In addition, the expectation for Google employees is not only that they continuously improve but also that they continually innovate (be entrepreneurial). Finally, TQM, Lean, and TPS partly address openness, although in these innovations, the concept primarily refers to openness toward customers and suppliers rather than openness throughout the system of which the firm is part of. In short, the characteristics of GIS are sufficiently different from those of TQM, Lean, and TPS to facilitate a test of our conceptual model's applicability.

Verifying the comprehensive model

We now use the model to describe and compare the creation, diffusion, and sustaining of the two categories of organizational innovations, GIS and TQM, Lean, and TPS (here collectively referred to as Quality Management/Production Systems). The data regarding these aspects of the Quality Management/Production Systems are described in more detail in the two empirical case studies presented in Alänge and Steiber (2009, 2011). The data on the same three aspects of GIS are taken from the authors' case study on Google, partly used in earlier articles, among them Steiber and Alänge (2013a, 2013c).

In order to determine whether the comprehensive model is useful for describing or even for comparing the creation, diffusion, and sustaining of organizational innovations of different characters, we will present first the common factors and then the differences between the two categories of organizational innovations. The actual test of the comprehensive model appears in the analysis that follows. To support our analysis, key factors influencing both types of system are presented in Table 1.

Table 1 Factors that influence the creation, diffusion, and sustaining of two categories of organizational innovations

Influencing factor	Quality Management/Production Systems	Google Innovation System (GIS)
External context	Institutional setup affected desirability and feasibility. Bridging institutions (industry and standard organizations) played an especially important role by standardizing the innovation.	Silicon Valley's institutional setup affected desirability and feasibility of the innovation. However, local history and norms may have played an even more important role.
	User network and role models (national and international), national and international fads, and market demand on ISO 9000 affected them.	User network and role models (3M, Intel, and other innovative firms) affected components of the innovation (e.g., the 20 % rule). Local researchers (local universities) of organizational characteristics for speed and innovation influenced it.
Diffusion mechanisms	Top management movement and the board were important knowledge transfer mechanisms.	Founders played a key role. They, in turn, came directly from Stanford University, which therefore might have played a role. First and second waves of employees also played a role in the system's development.
	In addition, experts (e.g., Toyota employees) and consultants played important roles, especially in the first trial.	The board brought important knowledge and experience regarding components of the innovation. Experts (e.g., the Coach) played a role.
Internal context	Top management's beliefs and involvement in the innovation were important and affected all five steps.	Top management's beliefs and involvement in the innovation were important and affected all five steps.
	The board also played a role in both early and later steps.	Certain board members' user competence played an important role for parts of the innovation.
	Consistency of board members was important for the sustaining of innovation. However, the board also in several cases hindered the sustaining of the innovation across changing CEOs.	Board members' consistency has been important to sustaining the innovation.
Characteristics of the innovation itself	The tacitness of the innovation has been well documented and thereby coded.	GIS is by its nature more tacit than TQM, Lean, and TPS. Not well documented and thus not coded.
	The innovation has been standardized to a high degree.	Not standardized (however, a European standard for innovation management was developed in 2014).
	The innovation was continually reinvented and path dependent within the organizations studied.	The innovation was continually reinvented and path dependent within Google.
Main triggers of organizational development	Market demands for ISO 9000 and the international fads around TQM and Lean.	Local history and norms (open, flat, fast, big thinking, etc.)
	Top management experience of (through either their own experience or role models) and resulting belief in the innovation.	Founders' beliefs about how to develop a great company are an innovation engine.
	Influence of the board	Influence of the board

Commonalities

To begin with, both categories have been affected by the external context. For both systems, institutional setup has played a role in the first two steps, *desirability* and *feasibility*. In the case of Quality Management/Production Systems, bridging institutions on the international and the national level have influenced the degree of desirability and feasibility by standardizing the innovation and by inspiring, educating, and encouraging innovation in local firms and organizations (Cole 1999; Lundgren and Alänge 2000). In the case of GIS, the institutional setup of Silicon Valley seems to have

influenced the firm in relation to local norms about organizing for openness and networking (Steiber and Alänge 2013c). Silicon Valley also provides access to knowledge via local universities (Stanford University and the University of California, Berkeley) and to “intelligent” capital via a knowledgeable business angel network and a venture capital industry.

In the case of Quality Management/Production Systems, the desirability and feasibility of an innovation are also affected by user networks and by international and national fads related to these organizational innovations, in combination with market demands on ISO 9000 certification. Google’s founders have been driven primarily by perceived global opportunities facilitated by the development of the Internet. However, they are also driven by an ambition to develop a dynamic “innovation engine”—a goal that aligns with the culture of innovation and start-ups that is more prominent in Silicon Valley than in many other places around the world. GIS also seems to have been influenced by other innovative firms, such as 3M (Google has a “20 percent rule” that gives engineers the right to take time off from regular work to pursue their own ideas; the older equivalent at 3M is the “15 percent rule”), and by researchers in Silicon Valley. Examples of researchers who have been active in the area and who may have influenced the creation of GIS are Brown and Eisenhardt (1997, 1998), who have discussed firms’ capabilities to renew themselves in fast-changing industries, and Tushman and O’Reilly (1997), who have emphasized the importance of ambidexterity or focusing on new areas for innovation while simultaneously benefiting from present operations. Another example is Chesbrough (2003), who has discussed the importance of “open innovation.” Today, as a result of a rapidly changing environment and shorter product life cycles, there are reasons to speculate whether the next fad (Abrahamson 1996) after quality and Lean will be continual innovation.²⁷ If so, the desirability and feasibility of innovation-oriented organizational development will only increase.

History and norms also played an important role in creating desirability around and a perception about the feasibility of Quality Management/Production Systems. For example, the roots of TQM can be traced back to the 1930s and 1940s, when statistical theory was applied to quality control in US production. Quality control and management were taken to Japan after World War II by Americans such as Deming and Juran. The term total quality control (TQC) was introduced by, but what was called TQC in Japan grew into a more comprehensive concept that was further developed from the 1960s to the 1980s. The focus widened from the quality of products and production processes to the quality of all processes within an organization and in its relationships with customers, suppliers, and society (Ishikawa 1985). In the 1980s, US companies and government agencies, having observed Japan’s success, introduced their own quality initiatives, now called total quality management (TQM), which became the center of focus for the Western quality movement. The introduction of the Malcolm Baldrige National Quality Award in 1987 brought TQM forward in the USA, but it also served as a role model for an international quality movement (Lundgren and Alänge 2000). The historical development of TQM has therefore had an effect on the creation, diffusion, and sustaining of this innovation that evolved across continents.

In addition to history, national values can also influence the way organizational innovations develop. Although the US input was substantial, TQM, Lean, and TPS originated and developed initially in Japan, and one relevant question is whether Japanese

national values favored the development of the prevailing Quality Management/Production Systems. The initial rapid introduction of quality principles has been explained by a strong motivation to catch up after World War II, in combination with the Japanese pragmatism that introduced new ideas that had been shown to work in practice (cf. the Meiji Restoration in the late 1800s and early 1900s). Many of these ideas originated in the USA or Europe but were first combined and tested in a Japanese context. What was unique in the Japanese Quality Management/Production Systems approaches was expressed in TPS as a focus on the “reduction of cost through elimination of waste,” on “treat[ing] workers as human beings,” and on “build[ing] a system that will allow the workers to display their full capabilities by themselves”—including “having the right to make an improvement on waste” (Sugimori et al. 1977). In TQC, this was expressed in terms of involving everyone in continuous improvement and thoroughly applying learning cycles and standards. Ishikawa (1985 p 91) pointed out that “in Japan the vertical line authority relationship is too strong for staff members such as QC [quality control] specialists to have much voice...our approach has always been to educate everyone in every division and to let each person implement and promote QC.” Summarizing the characteristics of Japanese TQC, Ikezawa et al. (1987) also emphasized top leaders’ involvement, policy deployment, the use of QC circles and QC audits, and what once was perceived as unique to Japan (Ishikawa 1985 p 5)—namely, a national agenda (conferences and quality awards) promoting the diffusion of the organizational innovation. However, even this national approach was emulated both in the USA and in other Western economies.

In the case of GIS, what role have history and norms played? There are reasons to believe that the creation, diffusion, and sustaining of GIS was influenced by the history and norms of Silicon Valley, as some characteristics of GIS can also be found in other companies in the area (Steiber and Alänge 2013c). According to AnnaLee Saxenian, a foremost expert on Silicon Valley, new ways of managing firms appeared early there. Two of its early flagship companies, HP and Intel, were organized and run quite differently from most firms from the start. Saxenian (1994) (p 50–51) described Hewlett-Packard’s approach as follows:

“Based on teamwork, openness, and participation...This management style, which was characterized by trust in individual motivation, a high degree of professional autonomy, and generous employee benefits, came to be known as the HP Way....the company provides employees direction ... yet employees are expected to create their own ways of contributing to the company’s success. Hewlett and Packard...encouraged managers to “wander around”...initiating unplanned conversations. The physical setting...encouraged informal communication...By institutionalizing the notion that good ideas could come from anywhere, Hewlett and Packard also pioneered a decentralized organizational structure...to preserve the flexibility and responsiveness of start-ups, they established...semi-autonomous business units.”

In a study of 37 Silicon Valley firms, Bahrami (1992) (pp 38–40) found area companies employing management methods that conferred strategic advantages. She reported that the firms were “experimenting with new organizational arrangements” that helped them “manage novelty and continuous changes in product designs, competitive positions, and market dynamics.” For example, Bahrami noted that the flattening of hierarchies was common and that the companies had dualistic systems and “were both

structured and yet chaotic,” a design meant to strike a dynamic balance between stability and flexibility. The flexibility was attained primarily through temporary teams for a wide range of activities, including product development. GIS was created in this context, where rapidly changing markets have forced companies to search for ways to succeed through continual innovation.

A second factor is the nonexistence of a traditional market for organizational innovations. With regard to diffusion channels replacing a traditional market, there seems to be great similarity between the case of Quality Management/Production Systems and that of GIS. In both cases, external ideas came primarily via top management movement (between firms) and the board. However, it is interesting to note that in Google's early years, the company's founders preferred employees who did not have long track records in the business sector (Steiber and Alänge 2013a); hence, relatively few ideas based on business experience could have come from this group. The founders wanted to build an organization free from what they perceived as the bad behavior characterizing the business sector at the time. Instead, they felt that their own ideas were more feasible in relation to building the organization they desired. This phenomenon can also be found in the case of Toyota and its “green field” approach when the company decided to build its own factories in the USA after mixed experiences in a joint venture with General Motors.

In the early 2000s, the Google founders' negative perception of earlier business experience started to change. This owed partly to active board members such as John Doerr but also to the board's requirements for a professional CEO, a role that was later taken up by Eric Schmidt, who had CEO experience with technology firms. In addition to the movement of senior people and the use of board members' experience and networks, both cases used highly experienced experts or consultants when developing the organization and conducting a first trial. In mid-2000, the top management team at Google began to regularly use the support of Bill Campbell,²⁸ known as “the Coach,” to create a good management team and to build an organization that was able to attain both innovation and operational excellence. In the case of Quality Management/Production Systems, experienced experts or consultants have been used in several cases in the first trial phase. To cite another example, Scania's top management decided to go to the source, hiring Toyota to train both its internal personnel and external consultants in TPS (Alänge and Steiber 2009). Using experienced firms to support other organizations is also common in the early phase of TQM diffusion, where national quality organizations demanded that award winners serve as role models (via, e.g., the Malcolm Baldrige National Quality Award and similar awards given in other regions and countries). Hence, as discussed above, the local institutional setup in the form of industry and standardization structures served as a source of ideas and resources. A similar facilitating role has not yet been found in the case of GIS, although some firms, such as 3M, have functioned as role models of innovation for decades. However, several institutional processes point in this direction: one comprises the ongoing efforts to develop an ISO standard of innovation management; another initiative is the private/public Innovation Engineering System that, with inspiration from Deming and Six Sigma Black Belt approaches, aims at developing an innovation culture in the USA, cooperating with the National Institute of Standards and Technology (NIST)²⁹ (Steiber and Alänge 2013d).

Third, with regard to internal context, the final criterion used in both cases seems to have been a strong belief in the benefits of the organizational innovation. According to Alänge and Steiber (2009, 2011), the top management teams in the adopting firms were convinced of the benefits of TQM, TPS, or Lean. In some cases, the belief—and therefore desire—was present from the time a new CEO was appointed, while in other cases, external information and education, together with imitations of recognized role models, created a desire and a sense of feasibility and therefore a belief in the innovation. In Google's case, the founders' beliefs about how best to design an organization for innovation existed from the start. The company's two founders were convinced that in order to foster innovation, they must invest in a strong innovation-oriented culture, as well as in the right people and in a structure that was flat, open, and transparent, allowing for effective communication between employees. Traditional investment calculation models were not used in these decisions. Interestingly, however, Google has since become very data-driven even in its human resources decisions. Since 2004, the company has based its decisions for the organization's reinvention on data collected through internal projects—for example, on the key habits of leaders who create great team results and on employees' attitudes and behavior. Google's request for data underlying an organizational change could be viewed as a kind of calculation model. In order to conduct these studies and analyses more effectively, Google hired experienced PhDs in organizational development.³⁰

Top management's involvement was crucial for the first trial, implementation, and sustaining of both Quality Management/Production Systems and GIS. In both cases, these leaders were clearly committed to organizational development. In the case of GIS, top management was also the primary creator and driver of change, and the board played an important role in both cases. In two of three cases, boards were actively involved in diffusing and sustaining the Quality Management/Production Systems (Alänge and Steiber 2009), by providing top management with ideas, training, and resources related to TQM, Lean, and TPS. In Google's case, Steiber and Alänge (2013a) have stated that the board played an important role in steps such as desirability, feasibility, and implementation by contributing concrete ideas and support to implementation. Examples include allocating 20 % of employees' time to pursuing their own ideas, as well as the performance and evaluation system. In addition, the consistency of board members over time means that the board played an important role in sustaining organizational innovation. However, a board can also hinder the creation, diffusion, and sustaining of an organizational innovation by failing to share the vision of top management, failing to understand organizational innovations and their benefits, and failing to ensure that innovation is sustained across a change in CEO, as was also found in two of the three cases that Alänge and Steiber (2009) examined.

Finally, there is a need to consider organizational innovations and their creation, diffusion, and sustaining in a context in which the innovation is influenced and dependent on the previous historical organizational development of each specific firm. Both Quality Management/Production Systems and GIS are continually reinvented, but they are also path dependent and are influenced by previously implemented ideas. This means that the three concepts of creating, diffusing, and sustaining are intertwined for both categories of innovations.

Differences

The differences between the two categories primarily involve the innovation itself and factors in the internal context that are affected by the different natures of GIS and the Quality Management/Production Systems. Discussing differences in the innovations makes clear that all of the organizational innovations studied are tacit and more or less corporation-wide by nature. They are also the result of several minor organizational innovations that combine to form comprehensive organizational innovations. However, there is a significant difference between Quality Management/Production Systems and GIS.

GIS is even more tacit than the Quality Management/Production Systems are; this is because in order to encourage and sustain dynamic capabilities, as well as to become an ambidextrous and people-centric organization, Google has purposely implemented a flat, semistructured design wherein formal processes and policies are minimized while empowerment and self-organization are encouraged. In fact, Google did not even provide us with an organizational chart. This could indicate that the organization has no “blueprint.”³¹ For this reason, the imitation—and therefore the diffusion—of innovation must be conducted primarily through the movement of people who have deep knowledge of the organization.

In addition, there is currently no dominant design (Utterback, 1994) for this category of organizational innovation, creating the preconditions for continual innovation in rapidly changing industries. No standardization has been created for this kind of innovation, either by international or national bridging organizations or by consultants and firms (Barsh 2008 p 3; Tidd and Bessant 2009 p 132).

The absence of a dominant design or well-known standard of organizational innovation adversely affects a number of internal factors. First, not only is imitation difficult, but companies’ external search and learning processes also suffer, despite their desire to become more innovative. At best, subcomponents of the innovation can be observed, interpreted, and potentially imitated by different companies. Every adopter must then build its own model by trial and error aimed at the integration of the various subcomponents. An alternative is that a consulting company suggests a solution for the firm. The risk of failure is high in both cases. In fact, Skarzynski and Gibson (2008) (p 252), both management consultants who focus on supporting firms in increasing their innovativeness, made the following observation:

“The reason very few organizations have succeeded at building a deep, ongoing capacity for innovation is that most of them merely dipped their toes into the water, initiated piecemeal activities here and there, and hoped that by throwing some money at these initiatives, they would somehow bear fruit. They never dove into innovation in a serious and systemic way.”

Further, because it is difficult to observe organizational innovations, one could expect the time needed for implementation, as well as the transfer and implementation costs, to be greater in this case than in a case where the innovation is standardized to some degree. Because GIS is built on certain values and a certain culture (Ahmed 1998), moreover, the adopting firms might need to “unlearn” (Akgün et al. 2007) certain things in a way that opposes their historical management traditions (inertia) or top managers’ personal values or in a way that could threaten their political status—that is, that could create mental or political filters for adoption (Jarnehammar 1995). In addition, a semistructured organization might not be feasible in certain

industries, such as those developing products that are highly capital intensive and require many years of development. For these reasons, not all firms can easily adopt GIS. Finally, the role of top management may be even more important here than it is in Quality Management/Production Systems. For example, it could be considered more challenging to sustain organizational innovation that must constantly balance chaos and structure, allow the empowerment and self-organization of employees, and quickly and constantly adapt to external changes than it is to sustain an organization built around a more traditional control-command framework characterized by highly fixed structures and formal processes.

GIS's tacit nature means that the possible degree of standardization of this kind of innovation is lower than that present in Quality Management/Production Systems; this, in turn, could affect the diffusion of GIS. Regarding standardization, it is clear that Google itself adopted a number of standardized organizational innovations that eventually became subcomponents of GIS. Examples of these are Google's performance and evaluation system, called Objective and Key Results (OKR, adopted from Intel) and the 20 % rule (adopted from 3M). Standardized methodologies are also evident in areas such as agile software development (e.g., capability maturity model integration (CMMI)), promoting adaptive planning and facilitating rapid, flexible response to change. Therefore, it may be possible to standardize components of GIS and, potentially, to overall major organizational innovations with characteristics similar to Google's system—thus affecting the diffusion rate. The ongoing effort to develop an ISO standard might also contribute to a diffusion of innovation management that is similar to the corresponding diffusion of quality management and environmental management that has resulted from the ISO 9000 and 14000 standards. However, the case of Quality Management/Production Systems has shown that there might be a need to utilize various standardization attempts in parallel, such as the ongoing work describing Lean product development, primarily based on Toyota's experiences in the automobile industry (e.g., Ward 2007).

Summary

The main influencing factors presented in this paper that affected the creation, diffusion, and sustaining of Quality Management/Production Systems versus those of GIS are highlighted in Table 1.

As can be seen in the table, the influencing factors in the external context were all relevant both for a better understanding of and for comparing the creation, diffusion, and sustaining of the two categories of innovations. In addition, a traditional market was nonexistent in both cases so interpersonal diffusion channels were highly relevant. Decisions about how to develop the organizational innovation were mainly based on top management's or board members' experience and beliefs. Both cases also affect several subsystems within the organization. However, GIS is more tacit and less standardized; thus, several factors in the internal context—such as search and learning processes, transfer and implementation costs, inertia, and costs for sustaining the innovation—may presumably be negatively affected, while a wider dissemination of GIS to other companies and organizations could be limited. However, the ongoing effort to develop an ISO standard³² might help disseminate innovation management much as the

ISO 9000 and 14000 standards have diffused quality management and environmental management.

To sum up, the comprehensive model is useful for improving our understanding of the creation, diffusion, and sustaining of each category of organizational innovations, both of Quality Management/Production Systems and of GIS. The model has also proved useful for analyzing similarities and differences between the two categories of innovations.

Conclusions and future research

This paper finds the conceptual model presented by Steiber and Alänge (2015) applicable in studying the creation, diffusion, and sustaining of GIS, which falls into a separate category of organizational innovations from Quality Management/Production Systems. Further, we have determined that the model is useful for identifying commonalities and differences between the creation, diffusion, and sustaining of two quite different types of organizational innovations: Quality Management/Production Systems and GIS. In addition, it is valuable in identifying issues that could adversely affect the creation, diffusion, and sustaining of organizational innovation. Finally, it aids in the comparison of cases where an organizational innovation was adapted but not invented by an adopting firm (Alänge and Steiber 2009, 2011) and cases where the firm originated the innovation.

Because the comprehensive model in this paper has been tested in only one case of contrasting organizational innovations, and that solely in the context of Silicon Valley, future research should be conducted in order to further verify and refine the comprehensive model by testing it on other types of organizational innovations and in different institutional environments.

Another interesting test would be to compare cases in different companies that have developed their own organizational innovation. An example of this would be comparing the development of the Toyota Way with the development of GIS. Our model might be very useful in this type of comparison, allowing a better understanding of the process of inventing and developing a “new-to-the-world” organizational innovation that also builds upon and integrates earlier practices.

Finally, the Quality Management/Production Systems originated in Japan and GIS originated in Silicon Valley—two areas with very different cultures. In line with Hwang and Horowitz's (2012) argument that culture is the foundation for any innovative ecosystem, future research could conduct a more in-depth analysis that considers how Japanese culture versus the culture of Silicon Valley influenced the creation and development of the two types of organizational systems, Quality Management/Production Systems and GIS.

Endnotes

¹The comprehensive model visualizes an organizational innovation as an organizational-improvement trajectory, where creating, diffusing, and sustaining the innovation are intertwined and can be analytically described in terms of five steps (desirability, feasibility, first trial, implementing, and sustaining) influenced by internal and external contexts that provide triggers and diffusion channels (Steiber and Alänge 2015).

²The purpose of this paper is not to generate or exploit new empirical findings but solely to utilize data from four previously published articles to verify a comprehensive model for understanding the creation, diffusion, and sustaining of organizational innovations.

³*Continual innovation* can be defined as “the ability to renew the organization and to develop new products and business models” (Steiber and Alänge 2013a). “Innovativeness includes being successful in the market in launching new products and business models, but it does not necessarily mean that a company needs to be successful in all market launches. Having no failures could just as well indicate risk aversion, and consequently be an indicator of a less innovative firm. Also an ability to learn from mistakes or to close failed attempts relatively early on could be signs of innovativeness” (Steiber and Alänge 2013c).

⁴The Google Innovation System was presented in Steiber and Alänge (2013a), where it is described as a dynamic and open corporate system for innovation—we call it GIS—in which innovations take place in regular work. Google was selected as the object of the case study because it was characterized by a fast-changing environment and was known, even in 2010, for its focus on continual innovation.

⁵In 2010, when the case study was conducted, only 12 years after its formation, Google had been the world’s most-valuable brand for 4 years in a row (BrandFinance Global 500), and it earned US\$29.3 billion in revenue and US\$8.5 billion in net income (Google.com 2011).

⁶The initial idea or technology of a start-up is often developed into a viable product innovation after the acquisition. Sometimes, this can take several years, e.g., Android started in 2003, was acquired by Google in 2005, and launched as a mobile OS product in 2008.

⁷Acquisition of start-ups is a major contributor to innovation in GIS. In terms of the disclosed acquisitions of tech start-ups between 2009 and November 2014, Google is number one, with 122 acquisitions, followed by Yahoo (55), Facebook (55), and IBM (47). Several of these acquisitions have come through Google’s own VC firm owners/board members, Kleiner Perkins Caufield & Byers, and Sequoia Capital. <https://www.cbinsights.com/blog/53-active-tech-acquirers/> (accessed 17 August 2015).

⁸Core products such as Search, AdWords, AdSense, and YouTube have disrupted whole industries but are also the target for continuous improvement through new functionalities. Some acquisitions have been used specifically for developing AdWords/ AdSense, e.g., Applied Semantics (in 2003), Sprinks (in 2003), and Adscape (in 2007) (Geis 2015)

⁹<https://abc.xyz/> (accessed 5 October 2015).

¹⁰Founder CEO Larry Page explains this move as “allow[ing] more management scale, as we can run things independently that aren’t very related.” <https://abc.xyz/> (accessed 11 August 2015).

¹¹As was noted in Reuters: “The message behind the reorganization is that Google is trying its hardest not to become irrelevant or complacent. Page and his cofounder Sergey Brin are aiming to prevent the company from missing out on the next major tech trends. If it puts too much focus on its search and advertising businesses, which make money, to the exclusion of new products, Alphabet risks failing to invent the next amazing product or service that will change the way we live the way Google search

did...The most important change is in Page's role, which is shifting to a spot at the top, with Brin, of the new Alphabet entity. By formalizing a structure that gives weight to its most out-there, passion-project research, Page is inviting the coolest and most innovative engineers to come work for him." <http://blogs.reuters.com/great-debate/2015/08/13/why-google-and-larry-page-created-their-own-alphabet/> (accessed 16 August 2015).

¹²The purpose of developing this comprehensive framework was to better identify influencing factors and outcomes with regard to how a certain organizational innovation (e.g., TQM) was created, diffused, and sustained over time at a specific firm or organization.

¹³TPS could be viewed as result of Toyota's organizational trajectory and played a crucial role in the later standardization and diffusion of TQM and Lean. Since then, Toyota has continued to develop its organization and is currently experimenting with organizational practices aimed at improved innovation. This is an excellent example of how a successful firm can continue to develop its practices over time along a certain organizational trajectory (discussed later in this paper).

¹⁴Although TQM, Lean, and TPS all draw heavily on the experiences of Toyota in Japan, this paper *does not* aim to compare Toyota's organizational system with that of Google. Instead, this paper verifies our comprehensive model (developed from data concerning TQM, Lean, and TPS in selected Swedish organizations) by analyzing another organizational innovation, GIS, that is not yet standardized or diffused.

¹⁵The conceptual model has already been used in practice as a research framework and has been found applicable in analyzing (governmental) programs that aim to disseminate organizational innovations in the form of management practices that are new to small and medium-size firms (Steiber and Alänge 2013d).

¹⁶As the research project was exploratory in character, the research design chosen was a case study approach. Case studies can impose constraints upon generalizability of findings but are useful when developing new theory rather than testing existing theory (Eisenhardt 1989).

¹⁷The interview guidelines included questions exploring how and when different organizational ideas and practices had been created, diffused internally, and sustained.

¹⁸The underlying scientific perspective is that an understanding of the social world is created through an examination of the interviewees' perceptions. Interviewees' unique experiences, expectations, and positions in the firm all contribute slightly different information. Interviewing a critical number of interviewees therefore creates an interpretation that represents the firm's social world (Bryman and Bell 2011). The collective interpretation is obtained either as a result of a sample size decided at the beginning or when each new interview provides only marginally new information. The latter applied in Google's case after 32 interviews.

¹⁹The interviewees were selected through a three-step process. First, the research team created a list of requested interviewee characteristics: geographical region, function, position, product, gender, tenure, and having worked with or expressed an interest in innovation. Second, a Google sponsor for the research project identified employees who matched the requested characteristics. Finally, a list of potential interviewees was created, and the research team selected the final sample, 25 % were women and interviewees represented engineering, product management, marketing, corporate

communications, sales, people operations, and finance. Product areas included were Search, Geo, Mobile, Chrome, Google+, AdWords, and external developers. Interviewees represented a range of tenures with the firm, and all had worked with or expressed an interest in innovation.

²⁰The interviewees were given the opportunity to add factors to the list, although none chose to do so.

²¹Some triggers—such as role models, national standardization work, new market or owner demands, or a new chairman of the board, or CEO with previous experience of a certain organizational innovation—tend to make the organization's search process more systematic and conscious.

²²The GIS building blocks were generated through the Google interviewees' ranking of literature-based areas important for innovation (see methodology section). The key drivers were ranked as the most important. The leadership dimension was divided into two separate based on the interviews—top management and board as a foundation and coaching leaders as facilitators. Most interviewees were involved in internal innovation processes and only a few had external innovation focus, e.g., on acquisitions, which could have influenced the ranking of key drivers (Steiber and Alänge 2013a).

²³Acquisition of start-ups is an important component of GIS. The reason for an acquisition as well as the way the acquired is being integrated varies from “acqui-hiring” of competence to innovative input to existing business areas or the development of totally new business areas in independent units (Steiber and Alänge 2013c; Geis 2015).

²⁴The acqui-hiring provides competence that is directly linked to key innovation areas but also demands not only capacity for integrating individuals inside Google but abilities for assimilation and absorptive capabilities (that might include organizational unlearning) to benefit from creative input from existing cultures in acquired start-ups.

²⁵The Alphabet structure will also make contributions of new business areas more visible, as they will be reported separately. Reviewing the revenue contributions from different areas shows that in 2014, advertising (Search, AdWords, AdSense, YouTube) accounted for 89.5 % (Google Annual Report 2014).

²⁶In the old structure, contributions from new areas may have seemed insignificant because of the sheer size and growth of the advertising-based business (11.7 % growth between 2013 and 2014). In addition, ideas developed within one area have sometimes created revenue in another. Consider, for instance, the advertising technology developed within the Gmail project (conducted under Google's 20 % free time rule) that created a revenue stream in the multimillion dollar Search and AdWords business (Schmidt and Rosenberg 2014).

²⁷It should be pointed out that Google as a company is fairly young. Many companies before Google were once cited as shining examples of new ways to manage, but these are long gone. We do not have a crystal ball and cannot predict the future of Google or of the management model that we call GIS. However, innovation management exists beyond Google and is currently encouraged by many governments around the globe. In Europe, there exists a standard for innovation management since 2014. These are reasons to believe that innovation management could be the next fad.

²⁸Campbell was also Steve Jobs's close confidant (Isaacson 2011).

²⁹NIST is the same governmental organization that created the Malcolm Baldrige National Quality Award in 1987.

³⁰While Google uses process measurement to monitor GIS (e.g., to see that leadership works according to required criteria), it is also possible to measure output from a corporate innovation system. For example, 3M's New Product Vitality Index (NPVI) estimates the percentage of revenue the company generates from products that did not exist 5 years earlier. At 3M, the NPVI has increased from 25 % in 2008 to 32.8 % in 2014, which shows its potential as a focusing device for innovation <http://multimedia.3m.com/mws/media/1064170O/3m-2015-sustainability-report.pdf> (accessed 26 August 2015). However, using a similar corporate measure for a company like Google that has brought an extreme degree of creative destruction to a product area (advertising), which is still growing in big numbers, risks losing perspective of contributions from new innovations. There is a need of a more elaborate way of measuring contributions of new areas. This is however not a new phenomenon—large companies always risk misjudging contribution from new areas when put in direct comparison with present revenue-generating areas (e.g., Christensen, 1997, Alänge and Miconnet 2001).

³¹This is the case at the company Apigee Inc. in Silicon Valley (interview with Apigee executive conducted by the authors of this paper in 2015). However, this could also be a way to stymie recruiters, serving to defend the company against other firms' poaching its people.

³²The ISO standard for innovation management builds on a systemic approach and includes many components of GIS.

Additional file

Additional file 1: Translation of the abstract into Arabic.

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