

Decision Sciences Institute

Open Services Innovation: Identifying Linkages between
Knowledge Sourcing and Firm Performance

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ABSTRACT

Few studies exist examining the effects of open services innovation through service-oriented lenses. Using Chesbrough's approach to studying open services innovation, this formative work empirically evaluates firm performance based on combining products and/or processes with services to gain a competitive advantage. Using Knowledge-based firm perspective (KBV), as a conceptual framework, a definition of open services innovation is proposed for this context. Research hypotheses are introduced for potential studies of the three main tenants: diversity of knowledge sourcing, external share, and firm performance. This paper serves as a potential catalyst for further research studies that can promote value to a firm through services foci.

KEYWORDS: Services Innovation, KBV, Knowledge Sourcing

CASE STUDY

In the late 1990's, Apple began what was to become a horizontal product strategy aimed at cross-integration. First emphasizing hardware and software offerings, this integration came to include service offerings through the early and late 2000's. This services integration came to exemplify open services innovation because of the seamless relationships within Apple's product ecosystem. Starting with desktops and laptops, product offerings came to include music devices, mobile computing, tablets, streaming music software, mobile phones, and wearable technologies. Regardless of the specific product line, Apple's services are universal within the Apple ecosystem and as a result, Apple receives a deservedly strong reputation for service. Within this environment lies an open innovation where applications can be developed and shared between computing professionals and end-users. This open services innovation network represents a shared model of open-services, cross-segment governance that the likes of Amazon, Google, and Facebook seek to emulate, often with mixed results.

INTRODUCTION

In today's increasingly fast paced innovative and global environment, services are quickly becoming an integral component to value co-creation. Services represent the majority of value added economic activity in advanced economies. According to the Organization for Economic Cooperation and Development (OECD), services account for approximately 80% of economic

activity in the U.S., and over 60% of economic activity in 35 of the top 40 economies internationally (Chesbrough 2011, Mention 2011). At the same time, the breadth of global knowledge for process and product innovations is increasing. This is due in large part to manufacturing industries moving to areas with lower costs which leads to shorter product life spans and commoditization of manufactured goods. Similar to Chesbrough's (2011) thoughts, Mention (2011) states the "internal research and development does not guarantee anymore a sustainable competitive advantage to the firm due to the increased mobility of the knowledge workers and the subsequent inability of the firm to keep control over critical intangible resources," (p. 45). Chesbrough (2011) describes this as an innovation treadmill: those companies that cannot keep up fall off. The system is not sustainable; there is no end and no place to rest, thus posing a major challenge for advanced economies in particular. A key objective to this end is through open service innovation. Whereas, "services-based business models are built around long term customer relationships and recurring revenues. Such business models are the answer to the product-based commodity trap that afflicts so many companies," (Wladawsky-Berger 2011). While traditional business models set in product- and manufacturing-based thinking are based on a closed system that constructs barriers to competition (Chesbrough 2011, Chesbrough and Appleyard 2007), open innovation models exist in a realm where knowledge and technology is exchanged within the wider environment of external organizations (Colombo et al. 2011). By combining these concepts the open services innovation strategy becomes clearer.

In this environment, businesses can rely on platform strategies to bundle their products with services to gain a competitive advantage. An example of using platforms to integrate products and services include Apple's line of products (iPhone, iTouch, iPad) to integrate products with services using open innovation through application development from a variety of sources that are available to customers through their devices. Amazon is another example of a company using a platform approach to integrate open service innovation. The Amazon platform is available to a variety of online sellers to tap into.

As advanced economies become more oriented toward services, products become less important. This leads to businesses having an extrinsic desire to set strategies in service oriented ways. In spite of this shift to a service-oriented focus and its importance, there is little impactful research on service innovation (Chesbrough 2011). Because of this shift coupled with a paucity of research in the field, there is certainly an imperative to further this field through more contemporary research studies (Chesbrough 2011, Love et al. 2011, Van de Vrande 2009).

Set within a framework of knowledge-based theory and further linked to a firm's absorptive capacity, this paper proposes an examination of the effects of firm performance through the use of an open service innovation model. The main idea in open innovation is to exchange knowledge within a wider environment in order to gain a competitive advantage; the main research question explored here is whether firms using an open service innovation strategy in practice have greater overall firm performance than comparable firms that do not.

Consequently, the constructs explored here are the *diversity of knowledge sourcing*, *external share*, and *firm performance*. In the last decade there has been an abundance of research on the new paradigm in open innovation, though few empirical studies have been presented in this area. Particularly in services, and results are mixed from those that have. When moving the concept of open innovation toward open service innovation, the few studies in the area have applied open innovation concepts to firms in the business services sector (e.g. Love et al. 2011, Colombo et al. 2011) rather than applying the service model bundle concept suggested by Chesbrough (2011). The research framework in this paper will attempt to extend the generalizability of open innovation into the service realm for any business sector as suggested by current services innovation researchers.

THEORETICAL BACKGROUND

Following Lin (2011) this research is anchored in the knowledge based view (KBV) theory. Some previous studies on open innovation are rooted in the resourced based view (RBV). Due to the nature of open innovation revolving around the exchange of knowledge and the premise that knowledge based view is an outgrowth from RBV (Grant 1997, Scarborough 1998) thus, embedding this work in KBV is logical. Further adding the dimension of absorptive capacity provides a sound theoretical background for this research.

Kogut and Zander, pioneers in KBV, began the conversation: “the central competitive dimension of what firms know how to do is to create and transfer knowledge efficiently within an organizational context,” (1992, p. 384) to add value to the firm. Grant (1997) summarizes the basic assumptions of KBV as paraphrased below;

- Knowledge is seen as the most important “productive resource in terms of its contribution to value added and its strategic significance,” (Grant 1997, p. 451);
- Transferability varies between different types of knowledge, mainly between tacit and explicit knowledge;
- Individuals are the creators and receivers of knowledge, various processes and procedures require different breadths and depths of knowledge; and
- Knowledge is subject to economies of scale and scope.

The final assumption is also prevalent in Chesbrough’s (2011b) description of the benefits of open service innovation. “KBV theorists suggest that organizational performance ultimately reflects the underlying knowledge-base of the firm,” (Scarborough 1998 p. 192) thus, the organization is viewed as a vehicle for the creation, transformation and application of knowledge (Scarborough 1998). This in combination with absorptive capacity provides a solid theoretical foundation for this work.

Cohen and Levinthal (1990) discuss the importance of outside sources of knowledge and how external sources are often critical to the innovation process in organizations. They further cite March and Simon’s (1958) suggestion that “most innovations result from borrowing rather than invention,” (Cohen and Levinthal 1990, p. 128) an observation that “is supported by extensive research on the sources of innovation (e.g., Mueller, 1962; Hamberg, 1963; Myers and Marquis, 1969; Johnston and Gibbons, 1975; von Hippel, 1988),” (Cohen and Levinthal 1990, p. 128). Absorptive capacity is a firm’s ability to use prior knowledge to recognize valuable new knowledge, to assimilate that knowledge and apply it in marketable ways (Cohen and Levinthal 1990). In the context of this research, KBV signifies the importance of knowledge as a firm resource while absorptive capacity is the firm’s ability or capability of turning that knowledge into profitable ventures. The concept of open innovation builds on this platform.

In defining openness, Chesbrough (2003) states that “open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as firms look to advance their technology,” (p. XXIV). This notion is further clarified when Chesbrough et al. (2006) argue that open innovation is “the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively,” (p. 2). Both of these definitions are widely cited for open innovation in the literature (Gassman et al. 2010, Dahlander and Gann 2010, Han et al. 2012, Lichtenthaler 2011, Colombo et al. 2011). Colombo et al. (2011) take these ideas and state them eloquently as such;

[Open innovation] can be described as an emerging innovation management paradigm which suggests that firms should strategically commit themselves to make the most out of their knowledge abundant external environment, with the aim to improve innovation performance

and, ultimately, create economic value. Open Innovation is therefore all about exchanging knowledge and technologies with a wide population of external organizations, such as Universities, clients, competitors, firms from other industries, individuals, NPD [new product development] service providers, suppliers, (p. 167).

Two main areas of open service innovation are discernable from the literature. The first deals with open innovation directly in service sectors (e.g. Love et al. 2011, Colombo et al. 2011) while the second considers open innovation as a platform approach in bundling products with services to gain a competitive advantage (Chesbrough et al. 2011). The few studies in the area have applied open innovation concepts to firms in the business services sector (e.g. Love et al. 2011, Colombo et al. 2011) rather than applying the service model concept as suggested by Chesbrough for any business sector. Chesbrough (2011a) provides four key concepts for open service innovation, summarized as follows;

1. Think of any business as a service in order to gain new growth,
2. Co-create with customers/suppliers/other external organizations,
3. Open innovation specializations with customers/suppliers, and
4. "Effective services innovation requires new business models that profit from internal innovation initiatives and stimulate external innovation activities that add to the value of their own business."

While there is no precise definition in the literature of open service innovation, the key concepts provided by Chesbrough in combination with the above definitions for open innovation provide a working framework: open services innovation is defined here as the evolution of business models to use a service oriented approach to open channels of knowledge exchange in order to propagate any specialized internal or external innovation to bundle products, processes and services that will add value to the firm. Using the Apple horizontal business model, bundling products or processes with services represents an approach that is generalizable to multiple businesses and a wide array of segments.

HYPOTHESIS DEVELOPMENT

Based on the combination of a variety of sources (*i.e.* Neyer et al. 2009, Gumusluoglu and Ilsev 2009, Love et al. 2011, Mention 2011, and Lichtenthaler 2012) the first construct is *diversity of knowledge sourcing* and is defined as the sources of knowledge a firm uses for innovative service ideas. This construct is split into two categories, internal and external. Internal sources are those innovative service ideas that originate within the firm while external sources are those innovative service ideas that originate from outside the firm (*e.g.* suppliers, customers, and partners). Adapting constructs from Love et al. (2011) and applying concepts from Chesbrough and Crowther (2006), the next construct is *external share*. It is defined as the share of new innovative service ideas that originated from external sources. The idea being that firms engaged in a more diverse knowledge portfolio will result in a higher share of applicable innovative service ideas that originated from external sources. Following Love et al. (2011) the *external share* (EX_i) can be derived from an equation similar to the following:

$$EX_i = \beta_0 + \beta_1 IN_i + \beta_2 DS_i + \beta_3 RD_i + \beta_4 EXP_i + \varepsilon_i \quad (1)$$

Where IN_i represents firm characteristics of internal knowledge resources, DS_i is internal design spending, RD_i is internal R&D spending, and EXP_i is the firm's exploratory relationships (the greater the firm's external connectivity the more likely new innovative ideas will be generated from external sources) (Love et al. 2011).

Construct	Construct Definition	Source
Diversity of knowledge sourcing	<i>Sources of knowledge the firm uses for innovative service ideas.</i> <i>Internal</i> – originates within the firm <i>External</i> – originates outside the firm (e.g. suppliers, customers, partners)	Based on a combination of Neyer et al. 2009, Gumusluoglu and Ilsev 2009, Love et al. 2011, Mention 2011, and Lichtenthaler 2012
External Share	<i>Share of new innovative service ideas from external sources</i>	Love et al. 2011, and Chesbrough and Crowther 2006
Firm Performance	<i>Sales growth; profitability; new product success; share of sales attributed to new products; market share; and return on investment (ROI) or internal rate of return (IRR)</i>	Lin 2011, Love et al. 2011, and Ledwith 2009 (from Langerak et al. 2004, and Slater and Narver 1994)

Table 1.0 – Constructs, definitions, and sources

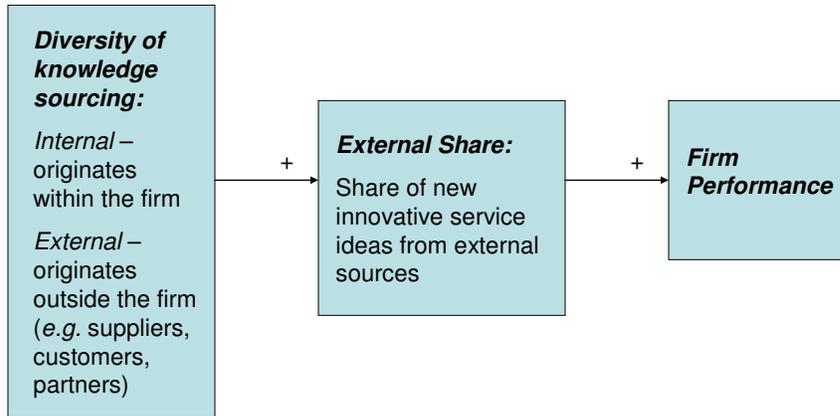
Pena (2002) argues that knowledge-based firms should mix internal core competencies with external sources because firms that emphasize knowledge diversity have access to a wider range of knowledge bases from these inter-firm relationships (cited by Lin 2011). Expanding on this Lin (2011) suggests that firms with access to diversified knowledge bases can use these internal and external resources to build innovative capabilities. By augmenting the concept of open service innovation – particularly the notion of exchanging knowledge with the external environment – with further sources from the literature the premise is set and hypothesis one is posited as follows;

- H1: Firms with a greater diversity of knowledge sourcing will have a greater number of active service innovations from external sources.

The ultimate goal of a firm is earnings, thus the final construct presented here is *firm performance*. Firms engage in the activities they undertake in order to earn money for their owners and stockholders. According to Lin et al. (2011) the "pursuit of earnings is the primary reason that the companies exist," (p. 337). Any strategy a firm follows is done for the purpose of adding value. As such, knowledge diversity has been recognized as a factor that affects firm performance, however empirical results are inconclusive on the direct relationship between diversity of knowledge and firm performance (i.e. Delios and Beamish 1999) (Lin et al. 2011). This research seeks to test the diversity of knowledge indirectly through the *external share* construct. In related areas, Cohen and Levinthal (1990) argue that increasing technology diversity could improve firm performance. Similarly, results from Gemba and Kodama (2001) show that a diversified technology strategy contributes to firm profitability. Still other studies have reported that an announcement alone of increased R&D expenditures is positively related to an increase in share price (Lin et al. 2011).

- H2: Firms with a greater number of active service innovations from external sources will have higher firm performance.

Figure 1.0 Open Service Innovation Measurement Model



MEASUREMENT ITEMS

To measure the *Diversity of Knowledge Sourcing* and *External Share* constructs a combination of items from the Business Research Development and Innovation Survey (BRDIS) administered by the U.S. Census Bureau and National Science Foundation and items from the U.K. Innovation Index Survey following Love et al. (2011) will be adapted for this research. Disaggregated data from the BRDIS survey is not publicly available thus the items will be formulated into questionnaire format and distributed to a large sample of both service and non-service firms. The first construct is divided into two parts with the intent of isolating innovative service ideas from external sources. A preliminary list of items is presented below (the full list is available in the appendix).

According to Lin (2011) "pursuit of earnings is the primary reason that the companies exist, this measure is considered as one of the most important measures of a firm's performance," (p. 337). Firm performance will be measured by a number of variables to allow for a higher level of understanding of the nature of the relationship between *External Share* and *Firm Performance*. Intended measures include sales growth; profitability; new product success; share of sales attributed to new products; market share; and return on investment (ROI) or internal rate of return (IRR) adapted from the literature (Lin 2011, Love et al. 2011, and Ledwith 2009 [from Langerak et al. 2004, and Slater and Narver 1994]).

Items from UK Innovation Index Survey:

Service ideas from outside the firm (%)
 Innovator in service or business model (0/1)
 Innovative percentage of sales (% sales)
 Diversity of innovation activity (%)
 Sales growth (per annum, %age)

Input and process indicators

R&D intensity (% sales)
 Design intensity (% sales)
 Team working index (%)
 Customer interaction index (%)
 IP protection index (%)
 Firm size (employment)

Firm and market characteristics

Firm age (years)

Single site Firm (% respondents)

Externally owned firm (% respondents)

Exporting firm (% respondents)

Number of competitors (number)

Workforce with degree (% respondents)

Multi-functional working

For sourcing knowledge (% respondents)

For knowledge transformation (% respondents)

For exploiting innovation (% respondents)

Public support

For sourcing knowledge (% respondents)

For knowledge transformation (% respondents)

For exploiting innovation (% respondents)

Exploratory linkages

Customers (% respondents)

Suppliers (% respondents)

Competitors (% respondents)

Consultants (% respondents)

Universities (% respondents)

Public research (% respondents)

Trade associations (% respondents)

Commercial labs (% respondents)

Exploitative linkages

Suppliers (% respondents)

Competitors (% respondents)

Market research companies (% respondents)

Advertising agencies (% respondents)

Professional associations (% respondents)

(From Love et al. 2011)

Items from BRDIS – NSF, U.S. Census**Financial measures of R&D activity**

Company R&D expense

By line of business/business segment

By type of expense (wages, materials, etc.)

Outsourced R&D by sector (universities, other companies, etc.)

Similar detail for R&D the company may perform for others under grants, contracts, or other agreements

Measures related to R&D employment

R&D headcount

Measures related to R&D management and strategy

Estimated financial return on R&D

Share of R&D involving science or technology

new to the company and/or market

Share of R&D spent on research vs. development

Counts of R&D projects

Total number of active projects

Number of projects started in a given year

Number of projects moved from R&D to production/marketing in a given year

Share of R&D devoted to specific application areas such as health, defense, energy, and transportation

Share of R&D involving specific types of science or technology such as biotechnology, nanotechnology, software, or social sciences

Share of R&D devoted to partnerships, by type or partner organization (academia, government agencies, other companies)

Measures related to intellectual property (IP) and technology transfer

Patent-related data

Number of patents owned or controlled

Number of patents applied for and issued in a given year

Percent of discoveries that the company attempted to patent?

Did the company participate in specific technology transfer activities?

Information about licensing of IP (mainly counts of agreements)

Number of collaborative R&D agreements the company is a party to and who were the partners (universities, suppliers, federal agencies, etc.)

METHODS

While there are multiple approaches to this research study, several steps for the methodology are proposed: first is to demonstrate construct validity. While initially content validity is established through the literature review, convergent and discriminant validity will be assessed after the data collection process. Next, to ensure reliability of the measurement items; the preliminary items will be reviewed with at least one academician and one practitioner to validate the 'borrowed' items for this study. Any adjustments can be made prior to construction of the initial survey. A sample survey will be distributed to a small group of firms for feedback. Because of the nature of this open service innovation study, examining service aspects of all firm types, a final survey will be distributed to a random sample of publicly traded firms from a variety of NAICS codes.

The distribution data set will be generated from an available business data set. Compustat data will be used to obtain additional financial statement data for firm performance variables. The two data sets will be sorted and matched by company name, using only matched records in the final list. Links to the survey will be emailed to respondents as a cost effective and efficient modern means of delivery and data collection. In the meantime, a web-based data collection system will be designed to automatically capture and code respondents' feedback in a database management system (DBMS) for use in the statistical analysis. After a valid time period a follow-up reminder email will be sent urging participation in the survey.

Standard methods will be employed to demonstrate reliability of the dataset and constructs. T-tests for non-response bias will be conducted on early and late responders. Factor analysis and Cronbach's Alpha will be used to assess discriminant and convergent validity respectively. To test the hypotheses an index of the diversity of a firm's knowledge portfolio at a natural breakpoint value will be identified to categorize knowledge diversity of firms between two groups, firms that innovate based on a diverse portfolio of knowledge with external and internal sources and firms that innovate in a more closed system from mainly internal sources. A regression analysis will be performed on the firms with more diverse knowledge sourcing based on the equation presented in section three. Final tests will be performed on firm performance to evaluate if there is a significant difference in firm performance measures between 'closed' system firms and 'open' system firms with high levels of *External Share* knowledge sourcing for innovative services.

EXPECTED RESULTS AND CONTRIBUTIONS

Based on the literature review and concepts that apply to 'openness' in general and to open services innovation in particular, it is expected that firms with a greater diversity of knowledge from internal and external sources will have a higher number of service innovations from external sources. In turn, it is expected that because these firms are utilizing knowledge resources from a wider pool and gaining economies of scale and scope with it that these firms will have higher overall firm performance than firms that do not engage in open service innovation practices.

As a result, findings from this research are expected to contribute to the theoretical value of open service innovation in two ways. First, no other study in the open services innovation area is known to look at all businesses through a service lens and to evaluate the impact of an open service innovation approach by utilizing external knowledge sources to bundle products and/or processes with services to add value to the firm. Second, this is the first known work to propose a clear definition for open service innovation. Should the results stand as expected this proposed research will add credibility to the concept through further generalization of empirical results. Finally, this research is expected to contribute to managerial significance by further explaining the concept of open service innovation in order for managers to put it into practice.

In addition, by providing empirical evidence that firms engaged in this type of strategy will have overall higher performance will help managers understand the importance of putting open service innovation into practice in their firm.

CONCLUSION

There is little argument that platform strategies undertaken by the likes of Apple, Amazon, and Google represent a product-services bundle that allows for a competitive advantage. As advanced economies continue to evolve with more orientation towards services, products become a less important catalyst for innovation unless they have a service component built in to the business model. In spite of this paradigm shift within major business ecosystems, there is little research on the services innovation side of this model. This research provides not just a narrative for the importance of the topic, but allows for additional research to be undertaken that will contribute to the limited existing body of research begun by Chesbrough. This research is not just endemic to consumer technologies, but also to transportation technology with respect to application, 3PL platforms, and both turnkey and design-and-build technologies.

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