

Managing Information Systems Based Activities to Foster Organizational Innovations: The Role of Knowledge Stock and Interfirm Partnership

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Abstract

Organizations experience severe competition during their lifecycle. Current advances in technologies, especially in Information Technology (IT) and Information Systems (IS), have made it possible for small firms to threaten giants in virtually every field of business. Additionally, lack of resources and capabilities are the most critical limiting factors. In this paper, I review the literature on IS innovation published in prominent journals of management studies. Then, I propose a model to study the roles of a firm's knowledge stock and interfirm relationships in IS-based innovations. I argue that a firm's information processing capabilities can moderate this relationship. Finally, I propose data collection and analysis methods to provide empirical evidence for the proposed model.

Keywords: Information Systems, Innovation, Knowledge-Based View.

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1. Introduction

Nowadays, organizations are under tremendous pressure to answer the rapid changes in the market to survive. Innovation is one of the means that organizations devise to answer the need for competition. Digital technologies changed the way innovations can occur. With the advances in digital technologies, any small start-up can become a disrupter, game-changer, or giant technology firm in a short period.

Information Systems (IS) play a vital role in digital innovations. Information systems help the new technology to be effectively accepted and used in organizations. Other aspects like inter-organizational relationships, organizational processes, structure, and design can also be affected by innovations through information systems (Swanson, 1994).

Innovation has been at the center of interest in different disciplines years after Schumpeter's theory. There is a large number of contributions, empirically and theoretically, in different disciplines of management. Information systems

management is the discipline of interest in this paper.

In this paper, I propose a model to study how different resources and activities like partner involvement, information processing capabilities, knowledge stock can affect the level of novel innovation in an organization.

2. Background

Several journals have been selected to review the extant literature on information systems management. A list of the selected journals can be seen in Tab. 1. If a journal's scope is innovation and information system, it is included in the list. Academic Journal Guide has ranked the journal based on the subjects, and it was consulted in selecting the journals. In addition, I benefit a lot from published literature reviews on information systems innovation (Kohli & Melville, 2019; Lowry et al., 2013; Nambisan et al., 2017; Yoo et al., 2010) and innovation (Crossan & Apaydin, 2010; Thongpapanl, 2012) to select proper journals for the review.

Table 1: Selected journals for the review

Journal Name	Focus-Related Scope
Academy of Management Journal	Management Science and Innovation,
Academy of Management Review	Management Science and Innovation
Decision Support Systems	Information Systems Management
European Journal of Information Systems	Information Systems Management
Harvard Business Review	Management Science and Innovation
IEEE Transactions on Engineering Management	Management Science and Innovation
Industrial and Corporate Change	Innovation
Information Systems Journal	Information Systems Management
Information Systems Research	Information Systems Management
Journal of Management Info. System	Information Systems Management
Journal of Marketing	Management Science and Innovation
Journal of Product Innovation Management	Innovation
Journal of Strategic Information Systems	Information Systems Management
Journal of the Association for Information Systems	Information Systems Management
Management Science	Management Science and Innovation
MIS Quarterly	Information Systems Management
Organization Science	Management Science and Innovation
R&D Management	Innovation
Research Policy	Innovation
Research-Technology Management	Innovation
Strategic Management Journal	Management Science and Innovation
Technovation	Innovation

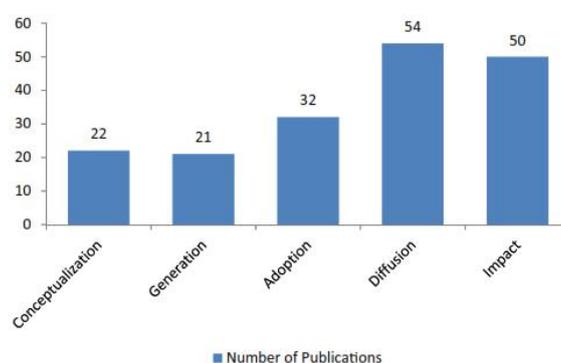


Fig 1: The frequency of IS innovation studies
Source: (Jha & Bose, 2016).

While adoption, diffusion, and impact of innovation have been widely studied, few studies about initiation and making use of innovation in the IS literature (Kohli & Melville, 2019). Another recent literature review study shows that a few studies have been done on innovation generation, as illustrated in Fig. 1 (Jha & Bose, 2016).

2.1 Locus of Information System Innovation

To provide a better understanding of the role of IS innovation and the research on IS innovation, it is essential to study how different researchers have envisioned where and how IS innovation is adopted, implemented, and used within the

organization. The study of locus and purpose of IS innovation is done using several theories in the field (Costello & Donnellan, 2007; Rose & Lyytinen, 2001; Swanson, 1994).

Base and infrastructure innovations, product innovations, service innovations, and process innovations are different areas of IS innovation. Due to the emerging digital technologies, however, the border between product, process, and service is becoming weaker and weaker (Barrett et al., 2015; Dougherty & Dunne, 2012; Nambisan et al., 2017). IS innovation typology helps to get a better image of the source and aims of innovation in IT and using IT to innovate. For example, there is a

difference between innovation in database management systems and innovation in computer-aided design and manufacturing since they are served different functions in a business (Costello & Donnellan, 2007; Grover, 1997; Swanson, 1994).

2.2 Content of Information System Innovation

Actions related to IS innovation can be categorized into initiation, development, implementation, and exploitation (Kohli & Melville, 2019). Initiation consists of activities regarding identification, assimilation, and application of the proper knowledge to solve a problem or create an opportunity. Development activities are designing and developing a new type of IS or IT, adopting and customization a solution that already exists. New processes, training activities, and new methods of governance in the installation and maintaining an information system are activities related to the implementation of innovation. Organizations conduct exploitation activities to maximize the values they can gain from leveraging or reusing IS, existing data, and existing systems (Kohli & Melville, 2019).

2.3 Outcomes of Information System Innovation

Although firms may usually have numerous goals to innovate, innovation research regularly focuses on one measure for innovation output. At the broader range of strategic management, patent-based measures, financial measures, and strategic or competitive advantage measures have been widely used. In IS/IT innovations studies, however, patent-based measures are more popular than other measures (Branstetter et al., 2018; Saldanha et al., 2017).

Despite being widely recognized, a greater quantity of innovation may not be an effective way of studying innovation since the quality of the innovation cannot be captured only by counting the number of patents (Fichman, 2004). The come up with this issue, a few revised patent-based measures have been developed. For example, patent citation relates to the firm market value in a way that a new citation can increase the market value of the firm (Hall et al., 2005). Accordingly, some research used citation-weighted patent count to account for the quality of innovations (Kleis et al., 2011; Ravichandran et al., 2017). In this method, each patent receives a weighted coefficient base on the number of its citations in other patents. A normalization method applies to prevent bias in some dimensions (Hall et al., 2001). Some research used the number of highly cited patents to concentrate on breakthrough innovation (Srivastava & Gnyawali, 2011).

2.4 Antecedents of Information System Innovation

A considerable amount of research has been conducted on the antecedents of innovation, and accordingly, IS innovation. Among numerous and wide factors that have been studied in the literature, knowledge (Carlo et al., 2012), and expertise (Kleis et al., 2011), changes in technology (Huang et al., 2017; Yoo, 2013; Yoo et al., 2010), organization capabilities (Roberts et al., 2016), users and crowd (Tarafdar & Tanriverdi, 2018), and fads and management fashions (Kaganer et al., 2010; Swanson & Ramiller, 2004) are the main avenues of research on antecedents of innovations.

2.5 Knowledge-Based View and Information Systems Innovation

The knowledge-based view has been widely used in studying innovation. The knowledge-based view assumes that knowledge is the primary resource of a firm to create value since the productivity of humans and the existence of machines are knowledge-dependent (Grant, 1996). Transferability of knowledge between firms and within the firm (Ravichandran & Giura, 2019) is the critical distinction between knowing how and knowing about or tacit and codified knowledge. Communication can reveal explicit knowledge, while implicit knowledge can be realized through its application (Grant, 1996). Capacity for knowledge aggregation is another critical issue (Ruiz et al., 2020). Since when the knowledge is ready to be transferred, the firm should be able to receive it to aggregate it with its current knowledge (Grant, 1996). The role of specialists in knowledge acquisition is more critical than knowledge utilization. Appropriability of knowledge is in question since, on the one hand, tacit knowledge cannot be transferred easily, and on the other hand, explicit knowledge can be resold without losing. It can be revealed through marketing activities to sell it (Grant, 1996).

3. Proposed Model

There are multiple factors that enable a firm to increase its level of innovation. One of these methods, as discussed in the literature gap section, is to use the current information system and capabilities.

3.1 Partner-Firm Innovation

Strategic alliances are essential for innovation since, on the one hand, the knowledge-sharing phenomenon can help the alliance to absorb the required knowledge to innovate. On the other hand, a wide variety of firms make an alliance with joint innovation or knowledge creation (Schilling & Phelps, 2007). For example, the involvement of other organizations in the focal firm's innovation

by helping to gather market intelligence has been done before (Song & Thieme, 2009).

3.2 Information Processing Capability

To be successful in innovation, firms need to process the data and derive insight from the information they can acquire. Information Processing Capability (IPC) is the ability of a firm to gather, process, and analyze the information it acquired from other sources to gain critical insight into innovation in a timely manner. Since information is of a variety of forms, it can be processed in different methods. Therefore, IPC can be of different forms. Following the literature (e.g., Saldanha et al., 2017, Chen et al., 2012), Information Processing Capability (IPC) can be defined as the ability of a firm to gather, process, and analyze the information it acquired from other sources to gain critical insight about innovation in a timely manner. Artificial intelligence and data mining are examples of such methods. In addition, we define Relational Information Processing Capability (RIPC) as a form of IPC that employs

relational methods. Using existing information systems, like CRM or SCM, is an example of RIPC.

3.3 Firm's Knowledge Stock

Drawing on the knowledge-based view of a firm, we define the firm's Knowledge Stock (FKS) as the current stage of implicit and explicit knowledge in an organization. Based on this definition, the focal firm's KS can be distinguished from partner firm KS and alliance KS. Following the literature (Ravichandran & Giura, 2019), we define Alliance Knowledge Stock (AKS) as the cumulative knowledge stocks of all the firms that made the alliance. Making an alliance enables knowledge to flow between the firms.

3.4 Research Model and Hypotheses

The discussion above provides us the conceptual underpinnings for our research model. Drawing on the key ideas of IS innovation, we develop a model of repurposed information systems innovation as affected by firm partner involvement, information processing capability, and knowledge stock. This model is depicted in Fig. 2.

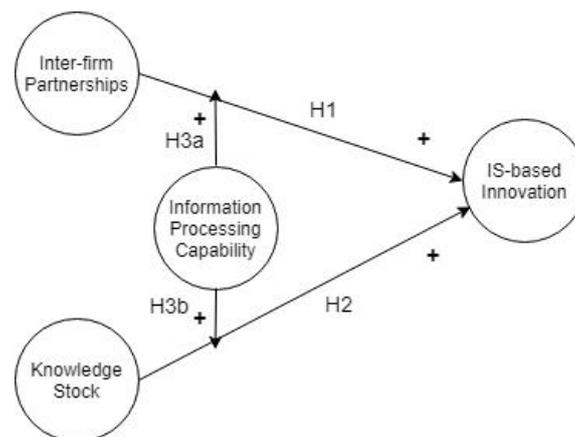


Fig 2: Proposed Model of the Study

Partner firm involvement can help the focal firm to innovate. Hence, we propose:

H1: Firms that exhibit high levels of Partner Firm Involvement will have higher levels of IS-based Innovations

A more significant amount of knowledge and access to more diverse knowledge can be effective in finding new ways to innovate. Therefore I propose:

H2: Firms that exhibit high levels of Knowledge Stock (KS) will have higher levels of IS-based Innovations.

Using the current information systems, a firm can search, absorb, assimilate, recombine, and reuse tacit and explicit knowledge in its knowledge stock

or the alliance knowledge stock to improve innovation performance. Hence:

H3a: Information Systems Capability (ISC) positively moderates the relationship between the level of Partner Firm Involvement and the level of IS-based Innovations.

H3b: Information Systems Capability (ISC) positively moderates the relationship between the level of the Firm's Knowledge Stock (KS) and the level of IS-based Innovations.

4. Proposed Data Gathering and Analysis Methods

Here, I propose the method of gathering the data needed for the study. It can be suggested to survey professionals and key business executives (CIO,

CTO, CEO, CFO, COO) and board members of the companies. Top executives in information systems, technology and innovation, finance, and operations will have a good understanding of their organization's strategy, state, and vision for innovation. Using the S&P Capital IQ database, in addition to industry information, it is possible to find the following information about organizations:

Company profile
 Company financial information
 Current and pending subsidiaries and investments
 Key professionals and board members.

There is a page containing contact information, personal information, board memberships, and professional functions for each key professional. I suggest sending an online questionnaire to the selected respondent emails.

Industry information like industry reports, market forecasts, industry index, organizations within an industry can be accessed through the S&P Capital IQ database, ABI/INFORM Collection, and Mergent Online databases. There are different sources to find patent information. For example, US patents can be accessed through the NBER database.

Different methods of analysis can be proposed at this stage. However, regression models and structural equation modeling can be used as the top methods to analyze the gathered data.

5. Conclusion

This paper reviewed some literature on information systems and digital innovation. It is clear that while the extant research in this field is promising, little is known about the role of information systems in facilitating novel innovations.

A model to study two antecedents of IS-based innovations is proposed in this study. According to the literature, knowledge stock of the firm and inter-firm partnership can have a positive effect on the level of IS-based innovations. This study argues that information processing capabilities can positively moderate the relationship between knowledge stock of the firm and inter-firm partnership to facilitate innovation.

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