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DEVELOPMENT AND ADOPTION OF INNOVATIVE IS IN AN INTERNETWORKED ORGANIZATION: AN EMPIRICAL INVESTIGATION

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ABSTRACT

Organizations are increasingly using innovative information systems (IS) to adapt and thrive in the increasingly dynamic and competitive environment in which they operate. However, current literature on how innovative IS could be developed and adopted in an inter-organizational network is limited. Motivated by these concerns, we investigate a technological innovation initiated by a hub company in the broadcasting advertising industry in South Korea. We apply Van de Ven's industry infrastructure framework to investigate how the innovation process proceeds through complex social interactions among key stakeholders and the environment, and how an IS may be developed and adopted by an internetworked organization. This study contributes with insights into IS based innovation, suggesting explanations of why a hub organization's IS enabled innovation succeed or fail in an internetworked business. This study adapts the industry infrastructure framework by applying it to a single case of innovation instead of multiple instances of an innovation within an industry. Our analysis how the framework's components were interpreted in the context of IS enabled innovation in broadcasting advertising industry.

Keywords: internetworked IS, inter-organizational IS, industry infrastructure framework, institutional view theory, case study

INTRODUCTION

Information Systems (IS) have the ability to instill change and innovation at organizations. Innovative use of IS facilitates technology-enabled transformation of organizations to achieve a variety of goals such as the cost reduction, increased of transparency, and efficient service delivery [16]. While traditional IS has been internally focused, the focus has recently expanded to include inter-organizational systems which meet the needs of diverse stakeholders. This technological innovation in inter-organizational networks occurs with socially complex and intensive interactions among internal and external stakeholders. However, our understanding of how innovative IS could be developed and adopted in an inter-organizational

network is limited. While most uses of IS in organizations focus on the improvement of internal efficiencies, researchers have argued for the innovative use of IS for transforming public organizations (Norman 2006). Responding to Irani et al.'s [18] call for the study of such IS that facilitate transformation in organizations which play a role of a leading organization for an industry, we investigate a technological innovation initiated by a hub organization in the broadcasting advertising industry. We apply Van de Ven's industry infrastructure framework [29,30] to investigate how the innovation process proceeds through complex social interactions among key stakeholders in inter-networked organizations. Specifically, our research seeks to answer the following research questions:

How do contextual factors and infrastructure in particular, affect the development and adoption of innovative IS in an internetworked organizations?

The study seeks to contribute to IS research through a detailed analysis of the development and adoption an innovative IS by an industry leading public company in South Korea. In addition, the study examines how Van de Ven's industry infrastructure framework can be adapted to understand this innovation. The paper is structured as follows. The next section introduces a review of literature on theoretical background on institutional view and industry infrastructure framework. Next, we discuss our research methodology and results from our case study, followed by a discussion of the contributions and implications for both research and practice.

THEORETICAL BACKGROUND

Recent studies provide mixed results on the magnitude of changes that new IS introduce in organizations which usually play a role of a hub organization for an industry. Some empirical studies suggest low impact outcomes for IS projects, while others note significant changes in business processes and services [4]. In the latter cases, hub organizations actively engage in IS-enabled transformation to reduce costs, increase transparency, and improve service quality [17]. This transformation often involves socially complex and intensive interactions and processes with internal and external stakeholders. However, little is known about the contextual factors that influence hub organizations in networks to develop and adopt innovative IS. Our study is motivated by this concern and uses Ven de Ven's institutional view theory to further our understanding in this area.

Institutional View Theory

Institutional theory is one of the three most influential theories in intensive studies on the relationship between organizations and their environment [15]. Studies suggest that the institutional setting is an important contextual component in the success of IS implementations [9,10,21]. However, different definitions and views exist on the "institutional" environment to which organizations

and their innovations are exposed. "Institutional" environment can be narrowly defined with limiting the institutional context mostly to legal and regulatory arrangements [10]. It has also been defined as an elaborate set of rules and requirements that organizations must conform to in order to attain support and legitimacy [21]. Among others, we concur with Van de Ven in his comprehensive and broad perspective on institutional context.

Van de Ven's framework is based on an open systems view that acknowledges that technological and institutional innovations reciprocally produce each other. It compiles components from both the technology imperative perspective and institutional determinism. We subscribe to this stream of research which views that technology-based innovations are embedded in larger context beyond individual organizations or a limited network of organizations. Van de Ven's framework suits our study, because it adopts the inter-organizational field as the unit of analysis and focuses on the infrastructure necessary to develop and commercialize technology-based innovations. The framework fits our process-oriented view that the innovation emerges over time and that the infrastructure emerges through numerous events that influence each other over an extended period of time. The proponents of the framework also state that the innovation process needs to consider numerous actors not only in the private sector, but also in the public sector [32, p.150], which suits our study as well.

Van de Ven and colleagues argue that successful diffusion of innovations through commercialization is a collective achievement that resides not only in the parent organization of the innovation but also in the construction of an industrial infrastructure that facilitates and constrains the innovation. They suggest a framework shown at Figure 1 to analyze infrastructure including 1) institutional arrangement to legitimize, regulate, and standardize a new technology; 2) resource endowments of basic scientific knowledge, financing mechanisms, and a pool of competent labor; 3) market mechanisms to educate consumers and stimulate demand for a new technology; and 4) proprietary research and development, manufacturing, production, and distribution functions by organizations to commercialize the innovation for profit.

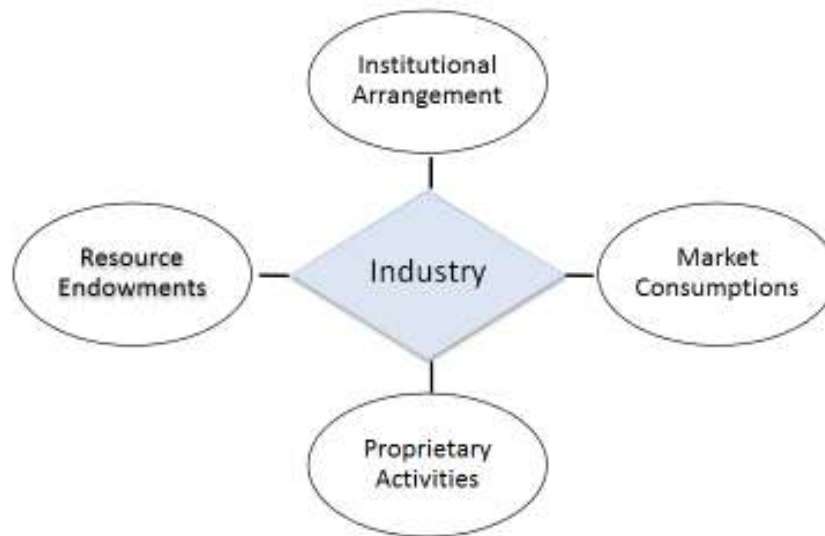


Figure 1: Industry Infrastructure for Technological Innovation [29]

Institutional arrangement covers the rules and norms of the society in which organizations function [14,27] and the political context to institutionalize and legitimize a social system which permits firms to operate [22]. The success and failure of a new industry and firms within it depend on their abilities to achieve institutional isomorphism [12]. Van de Ven et al. summarize various institutional influences into three components: governance, legitimization, and technology standards. Actors governing these components, according to Van de Ven et al., include the governmental agencies, professional trade associations and scientific/technical communities that legitimate, regulate, and standardize a technology.

Resource endowments are critical to developing most technology-based innovations. Basic scientific or technological research provides the foundation of knowledge that underlies technological innovations. Financing of such research comes from public institutions as well as venture capital, corporations, and markets. Van de Ven et al. suggest that the commercialization of many technological innovations requires unique industry-wide financing arrangements. Another essential resource component is a pool of competent human resources because new technologies require new ways to perform essential tasks related to research, manufacturing, or marketing.

Markets are normally underdeveloped for new innovations. New markets have to be created for many innovations, and potential customers find it difficult to compare and adopt new products. Van de Ven et al. state that it is very important to shape institutional environ-

ments for evaluation routines and standards to help customers discriminate and adopt new products. Firms use publicity and promotion to create needs and shape customer preferences.

According to Van de Ven et al., the proprietary activities component focuses on the actions of individual firms that typically appropriate basic knowledge from the public domain and transform it into proprietary technology innovations. If firms persist in developing the innovation, they subsequently develop products and gain access to the complementary assets (e.g., manufacturing, marketing, and distribution functions). Such functions and resource channels can be developed by a network of firms outside the innovation firm or be integrated within the firm.

We adopt the industry infrastructure view to provide a theoretical framework to understand the unique context of the focal innovation and to explain its adoption in comparison with a failed attempt at a similar innovation. While the framework is designed for industry-level analysis of innovations across organizations, we adapt the framework to the level of an individual organization. We also focus on the analysis of innovation from its conception, implementation, and further diffusion with a network of collaborating organizations in an industry. We also adapt Van de Ven et al. [30] methodological suggestion to explore innovations by conducting a context-level analysis.

Context analysis may disclose unnoticed or unexplained contexts in which IT-based innovations are em-

bedded [9,10]. Prior study found that IT-based innovations were adopted differently across organizations and industries [2]. These innovations may succeed in one context and fail in another. Identification of these contextual factors can help researchers and professionals better understand and improve IT-based innovations.

RESEARCH METHOD

Context of Study

We studied the development and adoption of a technological innovation initiated by a public company in the broadcast advertising industry in South Korea. This organization was established by a special law in 1981 and had been a sole provider of ad-slots in the broadcasting industry in South Korea for over three decades. Though the innovation was developed by a single company, it affected the entire broadcast advertisement industry because the monopolistic position of the company was protected by law. For this reason, an industry-level theoretical lens is needed to understand the context of the innovation in this organization. The focal innovation is embedded in a very peculiar context bridging the public and the private sectors because the public sector organization is pushing for its innovations for use by private sector organizations. To understand such intriguing context of the introduction and adoption of the innovation, an industry-level framework such as the institutional perspective provides an appropriate theoretical lens. In addition, the organization was facing a dynamically changing market and regulatory environment which necessitated it to simultaneously engage in both exploitative and explorative activities. Since the organization used the development and adoption of an information system as an important vehicle in achieving both goals, we examine this phenomenon with the theory of ambidexterity at the organizational level as well.

History of K-Net 2.0: K-REP was set up as a public company by special law in South Korea in 1981. The purpose of the company was to sell advertising (AD) slots to AD agencies and advertisers on behalf of broadcasters. K-REP has been a sole provider of AD slots for TV and Radio, except for cable and satellite TV. As of 2013, 134 broadcasters and 600 AD agencies worked with K-REP. To obtain sales information and to purchase AD slots, professionals working in these organizations had to visit K-REP in person or use fax until late 1990s.

In 1998, K-REP initiated the development of a new information system called K-Net 1.0. K-REP felt the

need to innovate their services, in part due to a financial crisis in South Korea. Another motivation for K-REP was the consideration by the government and the Congress to introduce competition in the industry. K-Net 1.0 received limited success due in part to the lack of maturity of the technology that was used and the lack of commitment from the sales department. However, a new system called K-Net 2.0 was implemented in 2003. Based on K-Net 2.0, a system called K-DEX for the online transmission of AD material was developed to support conversion and online transmission of AD material from K-REP to broadcasters. Previously, AD materials (e.g. TV beta-cam tape: 30,000, Radio reel tape: 50,000 per year) were delivered to broadcasters via postal mail or in-person. With the development of K-DEX integrated with K-Net 2.0, AD materials could be forwarded to broadcasters in real-time in the form of digital files. K-Net 2.0 was well received by the clients of K-REP. Advertising professionals using K-Net 2.0 reported that the system enabled them to dramatically reduce manpower as well as time and cost of their transactions. The Korean government recognized K-REP with an excellence award for business innovation. K-Net 2.0 received highest evaluations from users among public companies under the Ministry of Culture, Sports & Tourism.

K-REP initiated the development of K-Net 2.0 system to provide better service to its stakeholders, thereby improving its competitiveness for the future. Since early 1990s, the government and the Korean Congress had been considering introducing competition to this industry. Due to the fear of disrupting existing structures as well as political pressures, this proposal had not been implemented. However, in November 2008, the Constitutional Court of Korea ruled that the special law through which K-REP was established was not constitutional. As a result, the Korean Congress passed a law to introduce limited competition to the broadcasting industry in 2012.

As a result of the new law, K-REP was allowed to serve only two major public broadcasters. Another organization (C-REP) was created to serve a major private broadcaster. C-REP developed an information system that attempted to mimic the functionalities of K-Net 2.0, but this system was deemed a major failure. It could not handle even 30% of C-REP's AD sales correctly. A significant number of AD agencies avoided working with C-REP due to the failure of this system. This development provides additional motivation for our study which is focused on understanding the factors that affect the development and adoption of innovative IS in public organizations.

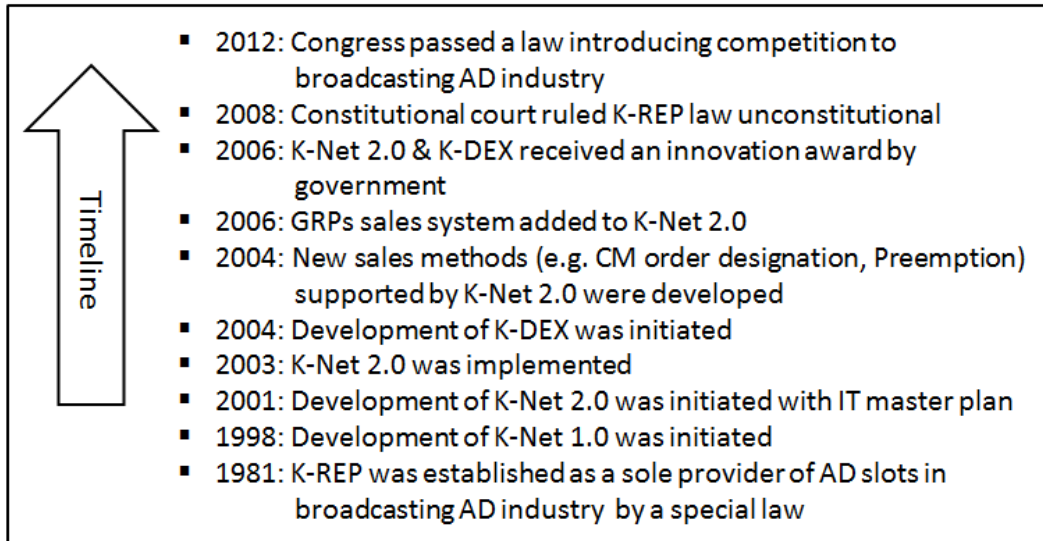


Figure 2: Key Events at K-REP

Currently, more than 1,300 users from 389 organizations (TV: 52, Radio: 96, DMB: 3 - 2011) are using K-Net 2.0. K-REP is developing a customer relationship management application based on K-Net 2.0. Figure 2 summarizes major events related to K-REP and K-Net 2.0.

Description of AD Sales: K-REP acts as a media representative, by marketing AD slots on behalf of TV, Radio, and terrestrial broadcasters throughout South Korea, as shown at figure 3. Broadcasters send information on available AD slots to K-REP. Then, K-REP makes a sales package for purchase by its clients. AD agencies and advertisers purchase AD slots provided by broadcasters through K-REP. Broadcasters receive sales information along with their order for AD broadcasting (in a document

called the Q-sheet). Broadcasters broadcast their programs and advertisements purchased through K-REP. This process was paper-based until the establishment of K-Net 2.0.

Description of K-Net 2.0: K-Net 2.0 as shown at figure 4 consists of two systems: K-Net 2.0 Web and K-Net 2.0. K-Net 2.0 Web is used by K-REP sales professionals to confirm sales transactions. K-Net 2.0 has three main user segments: K-REP sales management, broadcasters, and AD agencies. K-REP sales management professionals use K-Net 2.0 to coordinate sales and finalize the order for advertisements. Broadcasters use K-Net 2.0 to manage AD slots of TV/Radio programs. AD agencies use K-Net 2.0 to manage the purchase of AD slots and AD materials.

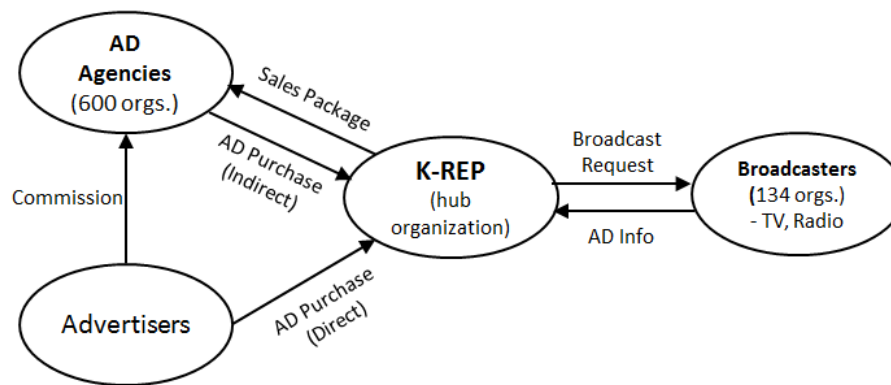


Figure 3: Structure of Advertising Sales

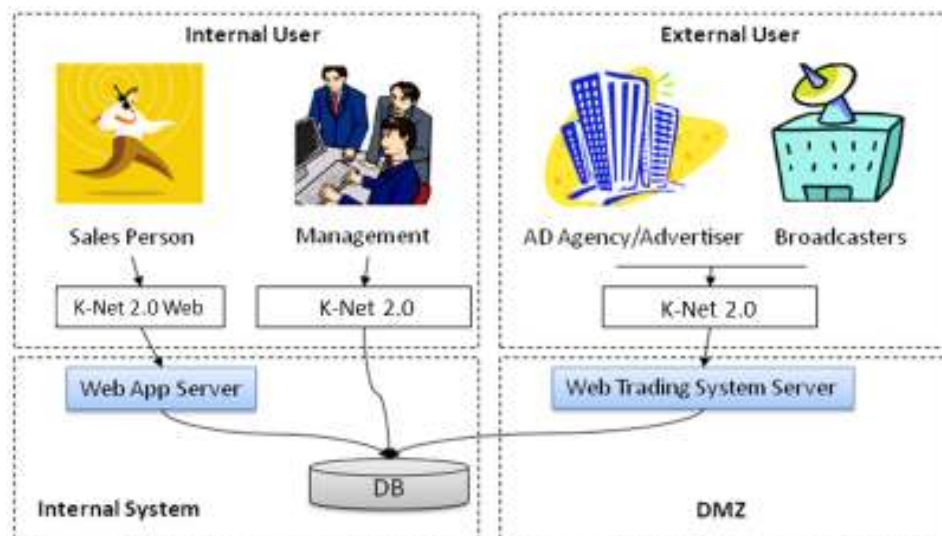


Figure 4: Overview of K-Net 2.0

Research Design

A case study approach was adopted to investigate the technology innovation that has impacted the entire Korean Broadcasting industry. A case study is well suited to understand IT-based innovations in organizational contexts [11]. Even single cases can provide a rich description and understanding by allowing in-depth analysis by researchers [33]. This methodological choice is also consistent with Yin's suggestion to consider three conditions to choose a proper research method: (1) the type of research questions posed; (2) the extent of control an investigator has over actual behavioral events; and (3) the degree of focus on contemporary as opposed to historical events [34]. First, a case study is more appropriate to handle how and why questions than what questions. Therefore, the research question posed in this study favors a case study approach. Second, we do not have any intention or are in a position to manipulate the development of the innovation or influence behaviors of the involved stakeholders. Third, this innovation is currently in use in multiple organizational contexts (e.g., K-REP, AD agencies, broadcasters) allowing an in-depth analysis.

The research was designed as a single case study with multiple organizations involved: K-REP and its networked partners. The main data sources were documents and interviews of various stakeholders involved in the

development and use of K-Net 2.0. The researchers were able to get enormous amount of extensive data from K-REP including company overviews, project development data, and customer satisfaction survey data over several years. Interviews of managers and executives in K-REP, broadcasters (small and large) and ad-agencies (small and large) served as the primary source of data. Interviews were conducted with 28 individuals drawn from 21 organizations (see the Table 1). All interviews were semi-structured and lasted typically between 30 to 60 minutes. If necessary, follow-up interviews were conducted to seek clarifications. All interviews were recorded and transcribed. Detailed notes were also taken during or right after each interview.

Interview guidelines prepared before interviews were tailored to different stakeholder groups of interviewees. The data including the interview notes, transcribed text, and all related documents were then analyzed using the chosen theoretical framework. First, a chronological understanding of the processes of the innovation development and adoption using Van de Ven's infrastructure theory was developed. The analysis using the framework revealed why the innovation attempt of K-Net 2.0 was successful while an earlier attempt of K-Net 1.0 at a similar innovation failed several years earlier. The following section presents detailed results of the analysis.

Table 1: Details on the Study Site

Organization	Number of Organizations	Number of Subjects	Roles in the Organization (Role, # of subjects)
K-REP (K)	1	5	IT Manager (IM, 2), Sales Director (1), Sales Manager (SM, 2)
Broadcasters (B)	7	9	Director (D, 2), Manager (M, 4), Deputy manager (DM, 3)
AD-Agencies (A)	13	14	Director (D, 2), Manager (M, 12)
Total	21	28	

RESULTS

We have analyzed the case from an industry infrastructure framework to answer our research question posed in this study. Our analysis focuses on the understanding of the development and adoption of the innovation in K-REP using Van de Ven's infrastructure framework.

Finding from Industry Infrastructure Framework

The data was analyzed according to the four schematic categories of Van de Ven's industry infrastructure theory. This analysis shows how a particular innovation has been developed and adopted and how the processes were shaped by the interaction with the infrastructure level factors. The impact of the factors becomes more obvious and dramatic when the focal innovation is contrasted with one that was attempted several years earlier, but failed.

Proprietary Activities: This category emphasizes the actions of individual firms that typically appropriate basic knowledge from the public domain and transform it into proprietary technology innovation. Within K-REP, there had been on-going efforts to digitize paper-based transactions and report generation methods. In late 1990s, there was an attempt to implement an intranet-based sales reporting system called K-Net 1.0 within K-REP, but K-Net 1.0 turned out to be a failure because the stakeholders who were the primary intended users avoided the use of the system. In early 2001, K-REP began its endeavor to develop a more ambitious internet-based system (called K-Net 2.0) to process transactions with partner organizations in the AD and broadcasting industry.

The project manager of the K-Net 2.0 project was very devoted to ensuring the success of the system

development effort. As a middle-level manager, he had close connections with the sales department (which was the end user of the system). He also had a long-term vision for the industry and its technology use. The following comment from a senior manager testifies to the project manager's leadership in the project:

"...It is hard to push such project over a leadership change period. He (the project manager) was perseverant and aggressive in the system development project. Without him, I do not think we will be using K-Net 2.0 today... He did not have any IT background at all, but ironically, that turned out to be a positive factor in the project." (K-SM)

The project manager was successful in internal marketing and promotion of the system and persuaded middle level managers about the merits of the project. Triggered by the change in the institutional environment, the company leadership sought strategic initiatives to secure its position in the market. K-Net 2.0 was internally marketed as such and secured sufficient funding for its development. Overall, the company persisted in developing the system over several years, and it subsequently developed and gained access to the complementary assets to develop and distribute it.

The arrival of a new visionary CEO also played an important role in the development of K-Net 2.0. He instilled a sense of emergency that K-REP would get behind if it is satisfied with the status quo. He pushed K-REP to improve its competitiveness and engage in innovation. He provided a customer-oriented vision that shaped how K-REP would operate.

"(As to the motivation of the development of K-Net 2.0) CEO came and shouted competitiveness ... decisive motivations include the arrival of a new CEO driving innovations and increasing competitiveness... we cannot be complacent with a current situation." (K-SM)

Resource Endowments: Public-resource endowments are critical to developing most technology-based

innovations. Basic scientific/technological research, financing of such research and a pool of competent labor are often the foundation for innovations.

When K-REP developed K-Net 1.0, resources for the development were limited. Considering K-Net 1.0 as an internal system development project, K-REP did not allocate sufficient budget and skilled IT staff for the project. IT infrastructure was not mature for the development of K-Net 1.0 and the resource for user-training was limited. As a result, only a small number of internal users adopted K-Net 1.0.

In the case of K-Net 2.0, IT infrastructure that was necessary for the success of this internet based system was in robust shape in South Korea at the time of its development. In addition, budget and skilled IT staff were sufficient.

"...the technology trend played a role. In almost every sector, companies are moving towards information systems and online systems." (A-M)

By the time of K-Net 2.0 was released, broadband internet was widespread in South Korea and communication technologies were mature. With maturing IT infrastructure, the broadcasting industry recognized that it needed to aggressively embrace digital technology.

"The overall trend in society cannot be ignored. Many things are in digital trend. Stock trading system has become a home trading system. The society was under digital wave. This affected the development of K-Net 2.0.(K-SM)"

A manager at an AD agency and echoed this view about the penetration of technology in the society.

"Around 1997, internet was introduced and used ... Since then, lots of things have been digitized. We all followed the direction of digitization and internet ... Our industry relies on numbers, we felt the need to do business as people started using internet-based stock trading systems at home."(A-M)

In a nutshell, the social IT infrastructure and industry-level technologies were mature and their need was well recognized by stakeholders such as AD agencies to facilitate innovations like K-Net 2.0.

During the development and maintenance of K-Net 2.0, K-REP extensively engaged with its partners (e.g. AD agencies and broadcasters) to understand their requirements and help them adapt to a new system through extensive training. K-REP included its partners in an advisory committee that interacted with the development team by providing requirements and feedbacks on features of the system.

"In the beginning (of adoption of K-Net 2.0), there were a lot of training (sessions). Even now, with the

system upgrade once or twice per year and new comers, training programs are on-going." (A-DM)

Institutional Arrangements: K-REP's institutional arrangements for the development of K-Net 1.0 were limited. K-REP and its stakeholders did not perceive any imminent deregulation of the industry in 1998. Instead of arranging close collaboration among stakeholders such as sales department and IT staff, IT staff with limited skills and resources had to develop K-Net 1.0. In addition, industry-wide standards were not ready during the development.

The case of K-Net 2.0 is rather unique in K-REP which holds a monopoly position protected by law in the advertising sales industry. It is ironical that the firm's monopoly position was declared unconstitutional in 2008. A strong political debate on the possible deregulation of the industry was started in 2000. The industry shared the notion that K-REP's monopoly position may be removed soon. The company was pressured into developing capabilities that would improve its competitiveness before the industry would be deregulated. The plan for the broadcasting advertising industry deregulation had been delayed for years amid political debates. The ruling of the federal court in 2008 turned out to be one of the strongest motivations for the development of K-Net 2.0.

"Surely, K-REP made it (K-Net 2.0) to have its own competitiveness." (K-SM)

"If there is a competitor against K-REP, K-REP with this system (K-Net 2.0) will be competitive for sure. I think K-REP made it (K-Net 2.0) in consideration of those (market deregulation and competition)."(B-M)

K-REP formed a special task-force whose members were later integrated into the IS division or sales departments. An institutional arrangement includes such structural and human resource related changes.

"The special task force was formed... later people at the task force joined IS team to develop K-Net 2.0 (K-IM)

The company also launched well-organized initiatives in the standardization of ad sales before deregulation was implemented. Digitization of ad sales processes required a standardization of the sales removing any unnecessary variations. In particular code standardization of ad films removed redundant input of codes and enabled prompt broadcasting status check of ads.

"... now things are standardized to process tasks fairly and quickly."(K-IM)

Market Consumption: K-Net 1.0 was designed for partial digitization of the sales processes. K-REP and its stakeholders were against full digitization which would require significant changes of existing business processes.

Users of an existing sales system preferred face-to-face sales.

The broadcasting industry was growing fast and naturally the volume of advertisement sales also grew tremendously. The industry needed a better way to handle increased sales volume because the existing methods for sales processing using pen and pencil, snail mail, fax and physical delivery of ad materials could not support the increasing demand. Market liberalization in sister industries such as cable TV advertisement sales increased pressure on K-REP to seek a better sales management system.

"If K-REP had not developed this system, even broadcasters would have made similar systems... it would be different from K-Net 2.0... There were some discus-

sions on transmitting AD materials in a digital format among AD agencies...It follows the (digital) trend."(A-M)

"During old days, buying a broadcasting AD slot was really difficult. Now supply (in broadcasting AD slots) increased while demand gets smaller ... In the past, broadcasting advertising (slots) were all we had. Now we have cable (channel) and other alternatives." (A-M)

In summary, the demand for better service by the clients and the recognition of the importance of client satisfaction by K-REP management provided strong motivation for the development and adoption of K-Net 2.0. Table 2 summarizes how the components in Van de Ven's framework help explain the factors that influenced the development and adoption of K-Net 2.0.

Table 2: Context-Level Analysis

Components in Industry Infrastructure Framework	Context-level analysis	Consequences
Proprietary activities	<K-Net 1.0> <ul style="list-style-type: none"> The development was initiated and supported by only IT department. No or little influence from other business functions like sales, marketing or HR. 	<K-Net 1.0> <ul style="list-style-type: none"> K-NET 1.0 was adopted by a limited number of users. Proprietary activities were minimally engaged in the development and implementation process.
	<K-Net 2.0> <ul style="list-style-type: none"> The development was initiated and supported by a devoted project manager. A new company CEO instilled an atmosphere for innovation. Close connection with end-users in and outside K-REP was maintained throughout development Middle management provided strong support for the development and adoption. K-REP provided strong internal marketing and promotion. 	<K-Net 2.0> <ul style="list-style-type: none"> The innovation initiatives was driven by a special task force at K-REP; middle management actively engaged in diffusing the innovation by encouraging the use by in and outside users. Close and frequent communications with stakeholders facilitated the development and improvement of K-Net 2.0. K-Net 2.0 was adopted by large number of users both in and out of K-REP.
Resource endowments	<K-Net 1.0> <ul style="list-style-type: none"> Budget and skilled IT staff were limited. IT infrastructure was not mature. Limited resource was provided for user-training. 	<K-Net 1.0> <ul style="list-style-type: none"> K-NET 1.0 was developed and initially adopted by a limited number of users for improving internal sales processes.

Table 2 (cont.)

Resource endowments (cont.)	<p><K-Net 2.0></p> <ul style="list-style-type: none"> Budget and skilled IT staff via outsourcing were sufficient. Internet was widely available. IT infrastructure was mature and broadcasting industry was transitioning to digital format. Significant commitment by K-REP was made to training and interaction with users. Large-scale outside stakeholders had resource for innovation while small-scale outside stakeholders had limited resource. 	<p><K-Net 2.0></p> <ul style="list-style-type: none"> K-Net 2.0 was developed and adopted by both internal and external users not only for improving existing processes but also for innovating them. Compared to large-scale outside stakeholders, small-scale outside stakeholders (e.g., small AD agencies) were exposed to different levels of resource endowments, for example limited use of data from K-Net 2.0.
Institutional arrangements	<p><K-Net 1.0></p> <ul style="list-style-type: none"> No imminent deregulation of the industry was a dominant perception shared by K-REP and stakeholders. Existing IT staff with limited skills and resource was engaged to the development of K-NET 1.0. No industry-wide standards were prepared for K-NET 1.0. 	<p><K-Net 1.0></p> <ul style="list-style-type: none"> Lack of efforts for institutionalization and adoption of K-NET 1.0
	<p><K-Net 2.0></p> <ul style="list-style-type: none"> Political debates on possible deregulations of the industry in the near future were widespread and shared. Special task force team was formed. Later its members were integrated into the IS division or sales departments. Well-organized effort was made in the standardization of AD sales 	<p><K-Net 2.0></p> <ul style="list-style-type: none"> Major efforts of wide-adoption and institutionalization of K-Net 2.0 in the early stages. During a wide-adoption period, new stakeholders including media research companies emerged and adopted K-Net 2.0.
Market consumption	<p><K-Net 1.0></p> <ul style="list-style-type: none"> The development was focused on limited improvements of efficiency on sales processes. Pressure was low in improving existing sales management systems which supported face-to-face sales. 	<p><K-Net 1.0></p> <ul style="list-style-type: none"> The adoption of K-NET 1.0 was limited and hampered by lack of the strategic vision and weak participation by users.
	<p><K-Net 2.0></p> <ul style="list-style-type: none"> Market needed a better system to handle increased volume and to support new sales methods. Stakeholders shared consensus on an inevitability of competition in the near future market liberalization in industries such as cable TV advertisement. Pressure was high in seeking innovative online sales management system in the industry. 	<p><K-Net 2.0></p> <ul style="list-style-type: none"> Wide and strong adoption of K-Net 2.0 supported transaction improvements and innovative solutions. Continued user training and meetings with stakeholders supported industry wide adoption of K-Net 2.0.

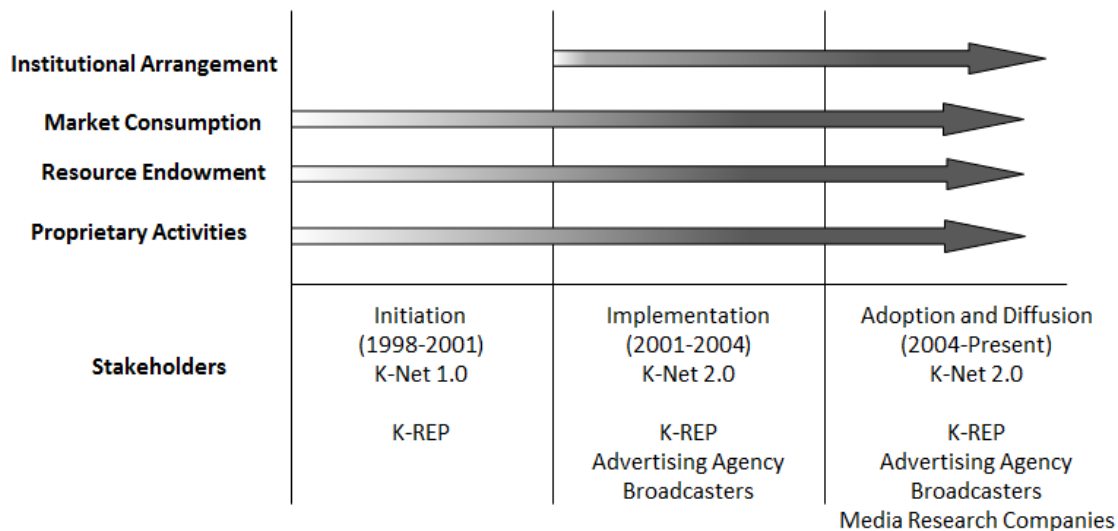


Figure 5: Activities and Stakeholders

Our analysis examined the industry infrastructure as a whole and the relations among its four components during the innovation process. We observed three major stages of the innovation: the initiation of K-Net 1.0 from 1998 to 2001, the implementation of K-Net 2.0 from 2001 to 2004, the adoption and diffusion of K-Net 2.0 from 2004 to present. Figure 5 summarizes the major activities and stakeholders according to the four industry infrastructure components and the three stages. The darker color of the arrows at figure 5 indicates increased level of activities.

Benefits of K-Net 2.0: K-Net 2.0 delivered significant quantitative benefits to K-REP (with an estimated Net Present Value of \$4.9 million) and broadcasting advertising industry (with an estimated Net Present Value of \$31 million) [5]. This assessment was based on eleven quantitative measures of strategic benefits, innovation, business process improvements, and client service. K-Net 2.0 also delivered qualitative benefits including improved accuracy of information, increased transparency of business processes, and improved ability of data exchange among systems. K-REP realized benefits by improving the efficiency of its operations. In addition, K-REP created new services, adapted its services to changing conditions in the market and regulatory environment, and engaged in innovation that not only improved its competitive position in the industry but also helped its clients achieve significant benefits.

DISCUSSION

We have presented a case study of an IS that enabled a hub organization in the broadcasting advertising industry in South Korea to innovate its business and its industry. The study highlights the role of institutional infrastructure in facilitating the development of such a system. The system was successfully developed and adopted by K-REP as well as its clients which are broadcasters and advertising agencies.

Our study provides insights into the role of IS in hub organizations that are increasingly facing competitive pressures. To answer our research question that guided our study, we focus on the components of the industry infrastructure framework suggested by Van de Ven [29] and identify several factors affecting the development and adoption of an IS. At K-REP, market consumption provided a strong motivation for the development and adoption of K-Net 2.0. K-REP recognized that it may face fierce competition due to changes in government regulations and legislation. Senior management recognized the potential of a transformational IS to provide capabilities that are essential to survive and thrive in the competitive environment that the organization was expected to face. Our study examines how the interaction among infrastructure level factors shape the process of the development and adoption of IS in a hub organization. In the early phases of design and development, institutional arrangements played a critical role. In particular, the formation of

a special task force team signaled to K-REP's major stakeholders that it was dedicated to the development of the system that would help improve the services provided to them as well offer innovative solutions. Proprietary activities and resource endowments played an important role during the development and evolution of the system. Well-coordinated effort by middle managers and the strong support from a new CEO's were important drivers of K-Net 2.0 development and its success. Intense interactions with and the training provided to stakeholders throughout the development process also played a critical role in making the project successful.

Our study of K-REP contributes to existing knowledge by providing new insights that can help us further explain the risks and challenges involved in developing innovative IS at an inter-networked organization. Most importantly, our study is among the first to provide a broad perspective on IT innovation at a hub organization and its industry. Our study examines an organization that served as a hub of internetworked organizations in broadcasting industry. This setting provides a unique opportunity to analyze development of a IS in the industry through the four components of the industry infrastructure framework: proprietary activities, resource endowments, institutional arrangement, and market consumption [29,31]. In summary, our analysis shows that when all the four components were mature, the initiative to create a IS was successful.

Our study also contrasts the success of K-Net 2.0, with the failure of prior efforts to create a similar information system (K-Net 1.0). First, market consumption, in terms of competitive pressures, and the perceived need for efficient processing of AD sales was weak when K-Net 1.0 project was pursued. The project received limited support in terms of institutional arrangements. The IS department that developed the system received only nominal support from top management. During the development phase, interactions between the development team and the external stakeholders were very limited. Therefore, the project failed to gain commitment from these stakeholders. Also, since K-Net 1.0 was designed to provide only limited functionalities such as generating sales reports and did not include any innovative functionalities, the project failed to generate strong support from middle management or garner adequate resources.

Thus, Van de Ven's industry infrastructure framework helps explain how differences in proprietary activities, resource endowments, institutional arrangements and market consumption between the two initiatives (K-Net 1.0 and K-Net 2.0) contributed to the failure of the first initiative and the success of the second. Our findings suggest that organizations involved in the development of

transformational information systems should pay careful attention to establishing appropriate institutional infrastructure, especially the maturity of each of the four components.

This research also contributes to our understanding of how institutional theory, the industry infrastructure framework in particular, may be adapted to examining innovative IS development and adoption. While the origins of the industry infrastructure framework are in industry-level analyses of emerging market segments and innovations [29,31], our study illustrates its use to examine IT-based innovation that supports a hub organization and its client network. While some components of the framework apply directly, others need to be interpreted appropriately in the context of our case. For K-REP, institutional arrangements were interpreted as a major driver. In particular, K-REP anticipated a constitutional challenge to a special law which had allowed it to dominate the market, and as a consequence the need to face strong competition in the marketplace. Therefore, it worked diligently to create an environment in which the all the four components of the institutional framework were salient for the development of IS that helped maintain and even extend its position as a market leader.

Our study found that contextual characteristics should be considered in the interpretation of Van de Ven's framework. For example, the nature of competition faced by a hub organization may be unique. Although there was no competitor to K-REP in broadcasting industry when the development of K-Net 2.0 was initiated, the potential for strong competition triggered the innovation pursued by K-REP.

Our study leads to novel interpretations of Van de Ven's institutional framework. Van de Ven [29] argues that organizations which work on innovations in "packs" are likely to be more successful than those that pursue them alone. The implication of this argument is that it is beneficial for organizations to simultaneously cooperate and compete while involved in innovation. While K-REP itself didn't have direct competitors, its clients indeed were competing with each other. Throughout the development of K-Net 2.0, K-REP as a hub organization created an ecosystem in which its clients were developing solutions that integrated with K-Net 2.0. K-REP created an environment in which its clients which are competitors to each other could collaborate in the development and use of K-Net 2.0, thereby eventually benefitting the entire industry. K-REP proactively engaged with its clients over the entire period of development and adoption of the system by including them in a committee that advised the development team and by providing them training on newly developed features of the system. This collective effort

helped K-REP improve K-Net 2.0 and its integration with its clients' IS.

Van de Ven suggests that successful institutional change is often easier to obtain for organizations that are politically savvy. The K-REP case highlights how its savviness in navigating the complex landscape of legislation and regulation was very helpful in realizing its goals. It was also adept at recognizing the interests of its key stakeholders and enrolling them to its viewpoint. In particular, K-REP knew that either the congress or constitutional court would initiate deregulation. Instead of investing much effort to stop deregulation, it developed K-Net 2.0 with intense collaboration with its clients, thereby creating strong ties with them. When competition was eventually introduced in the market, K-REP's clients often preferred to stay with it rather than placing ADs through its competitor. Overall, Van de Ven's framework provides plausible explanations for how organizations that operate under regulatory environments can consolidate their leadership position in the industry by developing an innovative IS.

By actively engaging the internal IT departments of its large clients by helping them integrate their systems with K-Net 2.0, and by inviting them to participate in discussions on the functionalities to be developed, K-REP, in effect, pursued a combined dimension approach in enhancing its organizational ambidextrous capabilities [6,20,26]. Thus, K-REP was able to gain access to external knowledge, by establishing a 'relational context' with its network partners [1,24]. While prior research suggests that this approach is pursued by organizations that have adequate internal resources, K-REP was able to augment its internal resources by gaining access to scarce technical and non-technical resources by actively engaging with its client organizations.

Tempelaar et al. [28] suggest that a complementary use of both external and internal social relationships is essential for knowledge acquisition and knowledge diffusion that are necessary for achieving ambidexterity. K-REP case illustrates how the members of the task force team who closely worked with external partners were later able to facilitate knowledge diffusion within K-REP. Thus, instead of using dual structures that may create tensions, K-REP was able to use a novel mechanism to realize both goals.

Our study also contributes to the literature on public management information systems (PMIS) by providing insights into how technological innovation in a public organization can help it thrive in a competitive and dynamic environment in which many public organizations operate today. There exist a few studies on innovative public information systems. These studies have focused

on the technology needed to achieve innovative forms of government and governance in public organizations [8,13] and the holistic transformation of the management of human, technological, and organizational resources and processes [19]. Rusaw [7] notes that such transformation often involved a complex process related to frequent changes in political agendas, legislation driven goals, and deficiencies in financial and human resources. Bekkers [3] reports on the development of a technical infrastructure that was used to create a wide range of e-services, and a high penetration of IT among the population it served. In contrast to prior research, our study is more explicit in its emphasis on contextual factors that influence the successful development and adoption of innovative IS and adopts Van de Ven's systematic and comprehensive framework to analyzing it.

These insights contribute to the existing body of knowledge on PMIS. Earlier studies have emphasized the adoption, diffusion, and impacts of PMIS [23,25]. In contrast, the insights from our analysis of K-REP case add to our understanding of how innovative public IS can be developed and shaped over time through interactions with key external stakeholders. Our study of K-REP case adds the contextual and structural insights into innovation processes of broadcasting AD information systems in South Korea by providing analysis that can help us further explain the challenges involved.

CONCLUSION

Our study provides a detailed understanding of how a hub organization in the broadcasting advertising industry developed and adopted an innovative IS by actively engaging internal and external stakeholders. Our context analysis based on the industry infrastructure view explores how a hub organization was able to significantly improve its competitive position by changing its focus from achieving internal process efficiency to collaborative IS development with its partners in its business network. It also provides interesting insights on how four components of industry infrastructure can help investigate a hub organization's IS based innovation with its partners in network.

Limitations and Future Research

Our study has its own limitations. Our findings may not be applicable to a different market or business situation such as a network of private organizations. Therefore, generalization of our findings to other contexts should be done with caution.

Our study presents interesting opportunities for future research. While we found that Van de Ven's

framework was useful in understanding how innovative IS was developed and adopted, some of the components might be adapted to examine other types of networked organizations (such as a network of private organizations). Future research to further develop the Van de Ven's framework is needed to understand contextual conditions that are unique to public organizations. In addition, research is needed to further investigate how networked organizations may use innovative IS synergistically to strike a balance between exploitation and exploration for the network as a whole rather than individual members in the network. What are the conditions under which a public organization that is facing imminent deregulation and competition can transform itself to maintain its unique position with the innovative use of technology? These are some of the issues that require careful examination in future research.

REFERENCES

- [1] Adler, P.S. and Kwon, S.-W., "Social Capital: Prospects for a New Concept", *Academy of Management Review*, Volume 27, Number 1, 2002, pp. 17-40.
- [2] Avgerou, C., "The Significance of Context in Information Systems and Organizational Change", *Information Systems Journal*, Volume 11, Number 1, 2001, pp. 43-63.
- [3] Bekkers, V., "Modernization, Public Innovation and Information and Communication Technologies: The Emperor's New Clothes?", *Information Polity*, Volume 12, Number 3, 2007, pp. 103-107.
- [4] Brown, D.H. and Thompson, S., "Priorities, Policies and Practice of E-Government in a Developing Country Context: Ict Infrastructure and Diffusion in Jamaica", *European Journal of Information Systems*, Volume 20, Number 3, 2011, pp. 329-342.
- [5] Byun, J., Chung, Y., Kim, H. and Park, W., Research on Kobanet System Analysis - Based on It Roi Analysis, Research Institute of Advertisement Industry, 2007.
- [6] Cao, Q., Gedajlovic, E. and Zhang, H., "Unpacking Organizational Ambidexterity: Dimensions, Contingencies, and Synergistic Effects", *Organization Science*, Volume 20, Number 4, 2009, pp. 781-796.
- [7] Carol Rusaw, A., "Changing Public Organizations: Four Approaches", *International Journal of Public Administration*, Volume 30, Number 3, 2007, pp. 347-361.
- [8] Castelnovo, W. and Simonetta, M., "The Evaluation of E-Government Projects for Small Local Government Organisations", *The Electronic Journal of e-Government*, Volume 5, Number 1, 2007, pp. 21-28.
- [9] Chiasson, M.W. and Davidson, E., "Taking Industry Seriously in Information Systems Research", *MIS Quarterly*, Volume 29, Number 4, 2005, pp. 591-605.
- [10] Crowston, K. and Myers, M.D., "Information Technology and the Transformation of Industries: Three Research Perspectives", *The Journal of Strategic Information Systems*, Volume 13, Number 1, 2004, pp. 5-28.
- [11] Darke, P., Shanks, G. and Broadbent, M., "Successfully Completing Case Study Research: Combining Rigour, Relevance and Pragmatism", *Information systems journal*, Volume 8, Number 4, 1998, pp. 273-289.
- [12] DiMaggio, P.J. and Powell, W.W., "The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields", *American Sociological Review*, Volume 48, Number 2, 1983, pp. 147-160.
- [13] Foley, P. and Alfonso, X., "Egovernment and the Transformation Agenda", *Public Administration*, Volume 87, Number 2, 2009, pp. 371-396.
- [14] Galaskiewicz, J., "Professional Networks and the Institutionalization of a Single Mind Set", *American Sociological Review*, Volume 50, Number 5, 1985, pp. 639-658.
- [15] Hatch, M.J. and Cunliffe, A.L., *Organization Theory: Modern, Symbolic, and Postmodern Perspectives*, Oxford University Press, 2006.
- [16] Irani, Z., Al-Sebie, M. and Elliman, T., "Transaction Stage of E-Government Systems: Identification of Its Location and Importance", *Proceedings of the 39th Annual Hawaii International Conference*, 2006.
- [17] Irani, Z., Love, P.E. and Jones, S., "Learning Lessons from Evaluating Egovernment: Reflective Case Experiences That Support Transformational Government", *The Journal of Strategic Information Systems*, Volume 17, Number 2, 2008, pp. 155-164.
- [18] Irani, Z., Love, P.E.D. and Montazemi, A., "E-Government: Past, Present and Future", *European Journal of Information Systems*, Volume 16, Number 2, 2007, pp. 103-105.
- [19] Jansen, A., "Assessing E-Government Progress—Why and What", *NOKOBIT*, 2005, pp. 1504-1697.
- [20] Kimberly, J.R. and Evanisko, M.J., "Organizational Innovation: The Influence of Individual,

- Organizational, and Contextual Factors on Hospital Adoption of Technological and Administrative Innovations", *Academy of Management Journal*, Volume 24, Number 4, 1981, pp. 689-713.
- [21] Lamb, R. and Kling, R., "Reconceptualizing Users as Social Actors in Information Systems Research", *MIS Quarterly*, Volume 27, Number 2, 2003, pp. 197-236.
- [22] Meyer, J.W., "The Effects of Education as an Institution", *American Journal of Sociology*, Volume 83, Number 1, 1977, pp. 55-77.
- [23] Movahedi, B.M. and Lavassani, K., "Organizational Development in Electronic Government Adoption: A Process Development Perspective", *International Journal of Electronic Government Research*, Volume 7, Number 1, 2011, pp. 51-63.
- [24] Nahapiet, J. and Ghoshal, S., "Social Capital, Intellectual Capital, and the Organizational Advantage", *Academy of Management Review*, Volume 23, Number 2, 1998, pp. 242-266.
- [25] Palanisamy, R. and Mukerji, B., "The RFID Technology Adoption in E-Government: Issues and Challenges", *International Journal of Electronic Government Research*, Volume 7, Number 1, 2011, pp. 89-101.
- [26] Rogers, E.M., *Diffusion of Innovations*, Free Press, 2003.
- [27] Scott, W.R., "The Adolescence of Institutional Theory", *Administrative Science Quarterly*, Volume 32, Number 4, 1987, pp. 493-511.
- [28] Tempelaar, M., Jansen, J. and van den Bosch, F., "Knowing Your Clients: The Joint Effect of Client and Internal Social Capital on Organizational Ambidexterity", *Proceedings of the Strategic Management Society Annual Conference, Cologne, Germany*, 2008.
- [29] Van de Ven, A., "Running in Packs to Develop Knowledge-Intensive Technologies", *MIS Quarterly*, Volume 29, Number 2, 2005, pp. 365-377.
- [30] Van De Ven, A., DE, P., R, G. and S, V., *Building an Infrastructure for the Innovation Journey*, In *The Innovation Journey*, Oxford University Press, Oxford, NY, 1999
- [31] Van de Ven, A.H. and Garud, R., "Innovation and Industry Development: The Case of Cochlear Implants", *Research on Technological Innovation, Management and Policy*, Volume 5, Number, 1993.
- [32] Ven, A.H.V.d., Polley, D.E., Garud, R. and Venkataraman, S., *The Innovation Journey*, Oxford University Press, Oxford New York, 1999.
- [33] Walsham, G., "Interpretive Case Studies in Is Research: Nature and Method", *European Journal of Information Systems*, Volume 4, Number 2, 1995, pp. 74-81.
- [34] Yin, R.K., *Case Study Research: Design and Methods*, Sage Publications, 2009.

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