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ABSTRACT

Small- to medium-sized enterprises (SMEs) often lack the resources and knowledge to strategically adopt information and communication technologies (ICTs). Governments across the world have acknowledged this issue by designing intervention programs aimed specifically at the SMEs sector. Recent research on government intervention in SMEs' ICT adoption has tended to focus on the role of technological factors, such as the technology properties and technical expertise in creating effective intervention programs. However, little attention has been paid to the social factors that can play a major role in the adoption process, especially in a context like the SMEs sector. Through an in-depth case study, this paper investigates the role of the firm's network in the implementation of a government technology intervention program. This research is guided by the technology intervention model and network analysis for data collection and analysis. Findings of this research suggest that different institutional actions are required to foster ICT adoption in SMEs, depending on the SME's network building phase.

Keywords

ICT adoption; diffusion; government intervention; institutional actions; SMEs; network ties; developing countries

INTRODUCTION

Two widely debated issues form the basis of this research. The first is the debate about technology and its potential contribution to enhancing the productivity of small- and medium-sized enterprises (SMEs). The second is whether governments should intervene to promote information and communication technology (ICT) adoption and diffusion. Recently, researchers have examined institutional actions and their impacts on the diffusion and adoption of ICTs. King et al.'s (1994) definition of institutions is adopted in this research. They state that "an institution is any standing, social entity that exerts influence and regulation over other social entities as a persistent feature of social life" (King et al., 1994, p. 141). The purpose of this paper is to better understand the links between institutional actions in information and communication technology (ICT) intervention and firms' network building events in the context of small firms in a developing country (Bahrain) as a means of providing greater insight into the importance of the context for researching government ICT interventions. The role of government has been addressed in earlier research as being fundamental in the diffusion of infrastructure (Madon, 2000; Scupola, 2003) and eradicating the digital gap between developed and developing countries. On a smaller scale, governments play a role through initiatives in fostering the adoption of ICTs in SMEs to avoid a digital divide between small and large enterprises.

According to the Organisation for Economic Co-operation and Development (OECD; 2010), ICT is differentiated from the general definition of information technology because it provides access to information through telecommunications, including the Internet, wireless networks, and other communications mediums. In addition, Ministry of Industry and Commerce in Bahrain (MOIC; 2005) defines SMEs as enterprises with up to 250 employees.

It is important to note that there is a tendency for researchers examining ICT adoption in developing countries to treat all contexts that are categorized as "developing" economies by the World Bank (2011) in the same way. A result of this is a body of research that is dominated by reports of inadequacy of financial and human resources and dependency on external

institutions to introduce and promote ICT. Nevertheless, research lenses should not be identical when investigating different developing countries' contexts. According to The World Bank (2011), Bahrain is classified as a high-income country with a $25,420 gross national income per capita. Therefore, despite the fact that countries in which infrastructure building relies heavily upon international aid and countries with a high IT readiness index might fall under the same category (i.e., developing countries), researchers must address each context differently.

The case study presented in this paper shows how institutional actions that influence ICT adoption in SMEs differ, depending on the firm's network building phase. It also shows how different levels of IT knowledge in firms change the institutional action required to advance technology utilization.

The paper is organized into sections. The next section describes the research background and context. Further, it sheds light on the literature on the role of institutional intervention in the adoption of technology and the network perspective of SMEs. The following section presents the research design and data collection. Then, the analysis and discussion of the findings are presented. Finally, the last section provides concluding remarks of the research.

RESEARCH CONTEXT AND BACKGROUND

This study is based on an investigation of an implementation of a government technology intervention program in an SME. The intervention program was initiated in 2008 by a government agency in Bahrain called "Tamkeen", the Arabic equivalent of the verb "to enable". The primary objective of this program is to enhance productivity of Bahraini SMEs by employing state-of-the-art technologies and eliminating the need for unproductive labor. Since its inception, two cycles of the program have been implemented. The first cycle took place between 2007 and 2010, whereas the second will continue from 2009 to 2012. Implementation of both program cycles was outsourced to two operational agencies, although each cycle was managed by a different agency. The duration of each cycle is four years divided into two phases. The first phase lasts for two years and includes a thorough examination of the firm's status, needs, and purchase and implementation of technology. The second phase lasts for another two years and incorporates an evaluation of the firm after the implementation. The case firm presented in this paper joined the program in 2009 with the commencement of the second cycle.

This paper is guided by two distinct yet complementary theories for theoretical conception and analysis purposes. It focuses on the role of a small firm's network in the adoption of a technology intervention program. This focus was selected following a comprehensive review of the relevant literature and the completion of a pilot study to explore the problem area. Therefore, two lines of knowledge exemplified by the small firm network literature and institutional intervention literature were explored in order to gain a comprehensive understanding of the topic under investigation, allowing for a rigorous and sound analysis of the data.

The first theory used in this paper is the network theory. An analysis based on this theory was applied to construct, view, and evaluate the different types of relationships that governed the dynamics of the case firm. According to the philosophical assumptions of a network study, network analysis is categorized into quantitative and qualitative analysis. The quantitative type uses a number of metrics to construct a graph that can be measured in various ways. These metrics include degree centrality, closeness, betweenness, and eigenvalue. The qualitative type involves an exploration of the network contents, interactional dimension, and motivations behind the creation of and enrollment in networks. It typically utilizes qualitative techniques for data collection, such as interviews. This latter type of network analysis was utilized in this paper to investigate the network of the case firm.

The second theory used in this paper is the institutional theory. Central to an institutional perspective is the importance of considering the environmental context of an organization. Assumptions from King et al.'s (1994) work on institutional actions in technology intervention constitute a complementary line of thinking to the institutional theory. These assumptions form the theoretical foundation of the technology intervention dimension of this study. The data collected supported King et al.'s (1994) categorization of institutional actions that stimulate or impede technology adoption. Some of the institutional actions suggested in the model were noticeable in the case study, whereas other actions were not evident.

The Role of Institutional Intervention in the Adoption of Information and Communication Technologies

In their highly cited model, King et al. claim that institutional intervention in information technology adoption is constructed at the intersection of the influence and regulatory institutional powers and the ideologies of supply-push and demand pull models of innovation. Institutions, therefore, can use their non-legal influence to spearhead the development of IT while still can use legal forces to guide IT development. Supply can be encouraged through facilitating investment in production of technology while demand can be stimulated by creating the need for innovative products. Six institutional intervention

actions are produced and categorized in the technology intervention model: knowledge building, knowledge deployment, subsidy, mobilization, standard setting, and innovation directives.

- Knowledge building: actions performed to provide the base of scientific and technical knowledge needed for innovations to be produced and exploited. The most identifiable form of knowledge building is sponsored research by governments and/or private and international foundations.
- Knowledge deployment: actions performed in order to disseminate new knowledge. These actions are undertaken by knowledgeable individuals and organizations or in the form of 'repositories of knowledge' such as specialized libraries. Knowledge deployment can take different forms: general provision of education, encouragement of knowledgeable work force to come into a region or a country and training a group of potential users.
- Subsidies: actions performed by institutions to defray costs and risks to innovators and users. Forms of subsidies include: funding of prototype projects, purchasing innovations and produced goods and services that contain those innovations and suppression of substitute goods and services.
- Mobilization: actions performed to encourage decentralized actors and organizations to think positively or negatively about an innovation and thus affect its diffusion. Mobilization can be achieved through promotional and awareness campaigns.
- Standard setting: regulative actions performed on decentralized actors and institutions to bring them into line with larger social or institutional objectives. They take the form of agreements among interested parties in order to act in a preferable way.
- Innovation directives: actions performed to produce and use innovations, or to engage in activities facilitating production or use of innovations. Forms of innovation directives actions include institutions produce their own innovations and use them and requirements for organizations to invest given amounts of available resources in R&D.

This framework demonstrates the essential role governments play in fostering ICT adoption and diffusion within countries. Nevertheless, it recognizes the crucial role played by private and international foundations in production and diffusion of innovations. It has been suggested that this framework provides a useful approach for researchers interested in studying the adoption of information technologies in developing countries as well as policy makers in governments and agencies concerned with ICT adoption (Silva and Figueroa, 2002). The framework has been used to provide further understanding of ICT institutional intervention in a number of studies (e.g. Silva and Figueroa 2002, Scupola, 2003). The intervention model has been criticized for its reliance on legitimacy of institutions to elicit adoption of ICT. However, this criticism does not lessen the explanation power of the model.

SMEs as Networked Entities
Despite the growing attention on networks and the role of networking in the endurance of organizations, significant gaps exist in understanding the processes and dynamics of small-firm networks (Coviello, 2005; Shaw, 2006). Tracking early theoretical approaches to firm networking studies, Mitchell's (1969), Granovetter's (1985, 1992), and Johannisson et al.'s (1994) work on social network theory, embedded networks, and entrepreneurship and networks, respectively, provide a strong theoretical perspective to use to understand the complexity of relational influences that impact small firms (Shaw, 2006). This study adopts Shaw's (2006) definition of network to include a variety of small-firm interactions, such as those with competitors, membership of network organizations, and the personal contact network of owners.

Network research on SMEs incorporates a number of analysis dimensions, including the network's structure, content, interactions, and processes; the firm's motivations behind its engagement in networks; and the network's influence on the SME's actions and processes. This study focuses on the latter dimension to understand the role of the firm's network in facilitating or inhibiting the firm's engagement in a government ICT intervention program.

In the past few years, researchers have highlighted the importance of addressing SMEs research from a relational perspective (e.g., Parker & Castleman, 2007). This argument is based on the assumption that SMEs are social formations. Whereas some ties, such as business relationships, have been explored in technology adoption studies, other relationships, such as family, friends and local community groups, have not typically been considered in the literature. Yet, these "overlooked" relationships have been found to be an influential force on general business decisions in SMEs research (Mason et al., 2006; MacGregor & Vrazalic, 2007; Beckinsale et al., 2006).

RESEARCH DESIGN
Given the scarcity of studies about the interactional dimension of network research and the fact that research on institutional intervention is still in its infancy, an exploratory qualitative approach was identified as appropriate for use in this study. In his work on social networks, Mitchell (1969) stated that the contents of social networks could only understood by analyzing the

meanings that individuals attached to relationships. Therefore, according to the epistemological stance adopted in this research, direct and close contact with participants is needed not only to collect data, but also to generate a comprehensive understanding of the small firm network contents and interactions, including the intervention program. Consequently, a case study strategy was identified as appropriate for use in this study. Data used in this paper were part of a larger research project on ICT intervention in Bahraini SMEs.

Case-Selection Process

The case firm, referred to as TCP, is a start-up telecommunication SME that was established in 2006. The company began operating in the Bahraini market in 2007. In 2009, as a result of aid from Tamkeen ICT intervention program, TCP was able to extend its service portfolio from selling international calling cards to offering a wide range of telecommunication services, including voice over Internet protocol (VoIP) services and asymmetric digital subscriber line Internet service for residential and corporate customers. Approximately 70% of the employees at TCP had a technical background.

Selection of TCP served the main research objective of exploring an SME's hands-on experience of an implementation of a Bahraini government ICT intervention program. In addition, the decision to select TCP to empirically investigate the implementation process was made to explore the impact of IT readiness and expertise in the case firm on facilitating a successful implementation of the initiative. The unit of analysis in this case study was the small firm, rather than the owner or the intervention program for two reasons. First, a firm's network goes beyond the owner's relationships to include staff members' relationships. Second, the purpose of this study was to understand the firm's network impact on the adoption of technologies via government intervention programs and not vice versa.

Data Collection

Semi-structured interviews were conducted with the managing director, 4 senior managers, and 12 staff members in the case firm. The in-depth interviews conducted lasted on average ninety minutes. Data analysis occurred simultaneously with data collection. The interview guide revolved around three main sets of questions. The first traced the firm's system and network as a whole, captured important dynamic dimensions of the network, and covered the interactional dimensions of the network. The second set of questions tracked the process of the firm's enrollment in the government technology program. The third set of questions sought to determine how this enrollment was influenced by the firm's network. In addition, interviews were conducted with the government team responsible for the intervention program.

ANALYSIS AND DISCUSSION OF FINDINGS

The stage model offered by Kazanjian (1988) was deemed particularly useful to analytically determine the SME's network development phases. The model was originally developed for technology-based new ventures. Kazanjian's suggested model comprises four stages/phases. Each phase is discussed within TCP context in the following paragraphs.

Phase I: Conception of Business Idea

In 2005, the telecommunications sector in Bahrain was liberalized, ending three decades of a telecommunication market monopoly. The Telecommunications Regulatory Authority started establishing licenses for companies that planned to start their businesses in Bahrain during the same year. This prompted dramatic reductions in service prices and increased investments of international companies in this sector. Once they heard about plans for the future liberalization of telecommunications services in 2004, four employees who were working at the former sole telecommunication provider in Bahrain discussed the idea of starting their own company. Their business idea was based on using the highest available technology in the market to provide inexpensive services. The four founding members sought financial funding from local banks. They were granted a low-interest loan from Bahrain Development Bank through a program aimed at assisting start-up SMEs. They also offered employment opportunities to their former colleagues at TCP.

Order	Tie actors and description	Tie direction		Tie content			Tie Durability		
		In	Out	Family/ Friend	Business	Both	Short-term (one-off)	Medium-term	Long-term (ongoing)
Phase I									
Birth of an idea, conception of TCP (early 2005- late 2005)									
0	Managing director (MD) and three of board members at TCP work in the telecommunication sector in Bahrain.	N/A		N/A			N/A		
1	TCP concept born when MD approaches the three board members with the idea of creating a telecom business based on the voice over IP (VoIP) technology.		✓			✓			✓
2	The four founding members seek financial support through local banks and potential investors.		✓		✓				✓
3	Founding members offer former colleagues employment opportunities at TCP.		✓		✓				✓
Phase II									
Establishment and commercialization (early 2006- late 2007)									
4	Head of IT department contacts local and international IT vendors for hardware and software purchases.		✓		✓			✓	
5	Recruitment division contacts Ministry of Labour to announce job opportunities for Bahrainis. A step carried out by organizations recently to express their commitment to the national economic plan of Bahrain.		✓		✓		✓		
6	TCP publishes advertisements in local newspapers and prints and distributes brochures.		✓		✓		✓		
7	TCP is reached through one of the employees' family members to sponsor an event for kids with special needs. An article is published in the newspaper about the event.	✓				✓	✓		
8	TCP outsources its technological needs to an international IT vendor to cut costs.		✓		✓			✓	

Order	Tie actors and description	Tie direction		Tie content			Tie Durability		
		In	Out	Family/ Friend	Business	Both	Short-term (one-off)	Medium-term	Long-term (ongoing)
Phase III Early Growth (early 2008-early 2009)									
9	TCP is approached by a UNIDO representative regarding potential growth opportunities.	✓			✓		✓		
10	TCP participates in IT conference in Bahrain.		✓		✓		✓		
11	TCP applies for a government ICT initiative and gets approved.		✓		✓				✓
12	TCP asked by e-government authority to participate in e-government exhibition.	✓			✓		✓		
13	TCP enters a bid to provide public schools with telephone services and wins the tender.		✓		✓				✓
Phase IV Thriving Business (mid 2009- early 2010)									
14	TCP takes the decision to end its contract with the IT outsourcing company and meet its technical requirements.		✓		✓		✓		
15	TCP increases its residential customer base to reach 80,000 subscribers.		✓		✓				✓

Table 1. Chronology, direction, content and durability of TCP ties. Adapted from Coviello (2005).

Phase II: Establishment and Commercialization

The head of the IT department contacted local and international IT vendors whom he had known through his previous workplace to secure hardware and software purchases for the business to start. At the same time, TCP announced job opportunities for Bahrainis through Ministry of Labor's Bahraini Quota Employment Program. This step paved the way for future cooperation between TCP and the ministry. With the commencement of business activities, TCP management made the decision to outsource its technological needs to an international IT vendor. During this phase, commercial activities were continued to promote TCP's services through printed advertisements in newspapers and brochures. In 2007, TCP held an event for kids with special needs after being approached by an employee's family member.

Phase III: Early Growth

As TCP started to provide its services in the Bahraini market, it was approached by a representative from United Nations Industrial Development Organization (UNIDO) in Bahrain as part of the international program for SMEs support. Around the same time, TCP participated in a conference for IT vendors and telecommunication companies in Bahrain and met a representative of the government ICT initiative. TCP applied to the initiative and was approved. Through enrollment in the government initiative, TCP was invited to participate in all e-government conferences and exhibitions. By participating in one of these events, TCP entered a bid to provide public schools with telephone service based on VoIP technology and won the tender.

Phase IV: Thriving Business

With the financial aid it gained through enrollment in the government ICT initiative, TCP was able in early 2010 to terminate its contract with the international IT vendor and meet its technical requirements. Further, after gaining the financial ability to purchase the technology needed to expand the scope of its services, TCP was able to increase its customer base to reach 80,000 subscribers in 2010.

Phase of network building	Type of action	Institutions involved
Phase I: Conception of Business Idea	Standard Setting Subsidy	Government Private Sector
Phase II: Establishment and Commercialization	Knowledge Deployment	Government Academia
Phase III: Early Growth	Mobilization Standard Setting Subsidy	Government International Institutions
Phase IV: Thriving Business	Subsidy	Government

Table 2. Institutional intervention in ICT adoption in relation to network building events

It is imperative to state that no attempt was made in this short paper to categorize every event in the history of the case firm's network building and enrollment in the intervention program; instead, the major occurrences are placed into a theoretical model. Table 2 depicts the institutional intervention actions in technology adoption constructed in relation to network building events derived from the case study. The table shows network building as a four-phase process and identifies at each phase the institutional intervention action that emerged as salient in the data analysis. The model demonstrates that subsidy activities contributed the most at the early phases of network formation. Knowledge deployment and mobilization contributed the most at the middle phases, and institutional interventions that enabled standard setting and subsidy contributed the most at the early and late phases of the firm's network formation. In contrast, although they contributed initially to reach this stage of ICT adoption, knowledge building and innovation directives activities were not found to have contributed directly in this particular case. A summary of the model includes the following propositions:

> *Proposition 1*. In developing countries, institutional intervention is essential in fostering ICT adoption in SMEs.

> *Proposition 2*. Institutional actions in ICT adoption in SMEs vary, depending on the SME's IT knowledge and network building phase.

CONCLUSION

This research sought to explore the relationship between institutional actions by the Bahraini government to facilitate ICT adoption in SMEs and the contextual influences that accompanied network building events in these firms. In terms of theory, two interpretive frames were used in the analysis of the data. One was based on an institutional approach (King et al. 1994). The second interpretive frame was based on network theory. In this study, there was a focus on the interactional dimension of network analysis.

Based on the analysis and discussion, there seem to be two prime findings that contribute to theory and practice. First, this study identifies significant differences in terms of the relative importance of the factors mentioned in King et al.'s (1994) institutional approach to IT innovation and diffusion. In the Bahraini context, four institutional factors were important and exerted the greatest amount of influence on the SME's adoption of technologies. This finding is significant, as it considers the relative importance of each institutional action based on a number of factors, including the distinct level of IT readiness in a developing context, level of technology know-how in organizations where government initiatives take place, and phase of the organization's lifecycle. This finding works in harmony with the King et al.'s (1994) acknowledgment that that not every possible institutional action is appropriate for every objective.

Second, with regard to practice, the case study presented suggests that technology adoption in SMEs requires support from numerous different institutions, including the government, where some of this institutional support can take forms other than direct technology intervention. This study demonstrates that technology adoption occurs in contexts that cannot be separated from their surrounding environments. Therefore, contextual relationships are one vital dimension to be considered when planning and implementing ICT initiatives. Findings of this research suggest a modified plan of institutional actions that "fit" the contexts in which these plans are implemented.

A limitation to consider in this study is related to the use of a single case method and generalization issues. However, the purpose of this study is not to generalize but to provide valuable insights into the experience of Bahraini SMEs adoption of ICTs through government initiation.

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