Innovation Discontinuation in Public Organizations: From the Institutional and Ecological Perspectives

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Abstract

The present paper examines the discontinuation of two types of innovation adopted in public organizations by employing the integration of institutional and ecological perspectives. The analysis of data was performed on 292 public organizations that use voluntary innovation (e-learning) and compulsory innovation (e-auction) through multiple regression models. Control variables include organizational size and innovation experience. The findings find that discontinuation of voluntary innovation can be explained by cultural compatibility, innovation legitimacy, sunk cost of innovation, and adaptation factors (knowledge management practices and collaborative networks). However, only cultural compatibility, innovation legitimacy, and knowledge management can explain the discontinuation of compulsory innovation. The inclusion of knowledge management and collaborative networks factors in the framework reduces the environmental determinism of the ecological and institutional perspectives and highlights the importance of organizational adaptation. By introducing types of innovation to its methodology, the current study contributes a potential solution to the problem of contradictory results from previous innovation studies. The findings of this research could help make failure of potentially highly advantageous innovations less likely, and could help to facilitate their successful implementation.

Keywords: Innovation discontinuation, Institutional theory, Population ecology, Public Organizations, Voluntary innovation, Compulsory innovation

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การสิ้นสุดนวัตกรรมในองค์การภาครัฐ: จากมุมมองของทฤษฎีสถาบันนิยมแนวทฤษฎีนิเวศน์ประชากรองค์การ

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บทคัดย่อ

บทความนี้ศึกษาการสิ้นสุดของนวัตกรรมที่ใช้ในองค์การภาครัฐ โดยใช้ตัวแบบซึ่งพัฒนาจากการบูรณาการระหว่างทฤษฎีสถาบันและทฤษฎีประชากรองค์การ การศึกษาครั้งนี้เก็บข้อมูลจากองค์การของรัฐ 292 แห่ง ซึ่งใช้นวัตกรรม 2 ประเภทคือ นวัตกรรมแบบเสรี (การเรียนรู้อิเล็กทรอนิกส์) และนวัตกรรมแบบบังคับ (การประมูลอิเล็กทรอนิกส์) โดยใช้การวิเคราะห์ความถดถอยเชิงพหุคูณ ตัวแปรควบคุมคือขนาดขององค์การและประสบการณ์ในการใช้นวัตกรรม ผลการวิเคราะห์พบว่าการสิ้นสุดของนวัตกรรมแบบเสรีสามารถอธิบายได้ตามตัวแบบที่เสนอ ซึ่งประกอบด้วยความเข้ากันได้ของวัฒนธรรมองค์การและนวัตกรรม ความชอบธรรมของนวัตกรรม ต้นทุนจมของนวัตกรรม และตัวแปรการปรับตัว (การจัดการความรู้ และเครือข่ายความร่วมมือ) ส่วนการสิ้นสุดของนวัตกรรมแบบบังคับสามารถอธิบายโดยความเข้ากันได้ของวัฒนธรรมองค์การและนวัตกรรม ความชอบธรรมของนวัตกรรม และการจัดการความรู้เท่านั้น การนำเรื่องการจัดการความรู้และเครือข่ายความร่วมมือเข้ามาในตัวแบบที่ใช้ศึกษาช่วยทำให้มุมมองด้านประชานิเวศน์และสถาบันมีความยืดหยุ่นและทำให้เห็นความสำคัญของการปรับตัวขององค์การ การนำประเภทของนวัตกรรมมาใช้ในการศึกษาก็ช่วยแก้ไขปัญหาของผลของการศึกษาในอดีตที่มีความขัดแย้งกันได้ นอกจากนี้ ผลการศึกษาครั้งนี้น่าจะช่วยลดปัญหาความล้มเหลวของนวัตกรรมที่เป็นประโยชน์ และส่งเสริมให้การมีการนำนวัตกรรมไปใช้ให้ประสบความสำเร็จมากยิ่งขึ้น

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INTRODUCTION

Organizations may invest significant resources to adopt innovations to improve performance (Melville, Kraemer, and Gurbaxani, 2004), to remain competitive (Chung, 2011), and to survive (Han et al 2001 cited in Dalglish and Newton, 2002). Unfortunately, in many instances, organizations discontinue these innovations for various reasons (Mascarenhas, 1991; Scheirer, 1990). In any given year, there are as many failed innovations as there are initial adoptions (Rogers, 2003). The prevention of discontinuation of effective innovations is a crucial issue that needs to be addressed. This research informed by the lessons learned from innovation adoption processes will enhance organizational performance and save resources.

The objective of this paper is to investigate the factors contributing to discontinuation of innovations within organizations. Innovation discontinuation is an underdeveloped field of research (Visser, 2012). A major weakness in the current innovation literature is the pro-innovation bias. Continuation of the use of innovations tends to be advocated over discontinuation (Rogers 2003: 110). Specifically, there is a paucity of research based on organizational theory regarding the failure of innovations in the public sector, relative to the scale of their adoption and diffusion. This present paper attempts to develop and test a framework dealing with the ecological and institutional factors influencing the discontinuation of innovations in public organizations.

The research questions are as follows: What are the factors that cause organizational innovations to be discontinued? Are there any differences between voluntary and compulsory innovations in the factors explaining innovation discontinuation? Most innovation research works focus exclusively on one type of innovation (Cooper and Kleinschmidt, 1987). In this study, two types of innovations, voluntary (e-learning) and compulsory innovations (e-auction), are used to address the problem of inconsistent results in past innovation research (Cooper, 1979; Van der Panne, Van Beers, and Kleinknecht, 2003). Voluntary innovation is an innovation that adopters can choose to adopt and implement freely; whereas compulsory innovation is an innovation that the adopters are forced to adopt and implement in a mandatory manner. Innovation discontinuation is normally defined as the rejection of an innovation after it has been adopted (Rogers, 2003). However, in this work, innovation discontinuation refers to the extent of termination of an innovation after adoption. In coercive environment, an organization may pretend to implement certain innovations

even if it does not believe that they should be implemented. If the innovation discontinuation variable is measured by the dichotomy of decision-making, acceptance or rejection, it will not reflect the real intention of the organization.

Innovation in the public sector has become critical, as public expenditure is cut, more complicated problems present themselves, and people express higher levels of dissatisfaction with existing public services. Like other developing countries, the Thai public sector has a long history of promoting and adopting various innovations to improve its performance in addressing these problems. Some recent examples include balanced scorecards, outsourcing, core competencies, TQM, activity-based costing, customer relations management, reengineering, ISO, six sigma, e-revenue, e-passport, smartcard, tablet personal computers for students, privatization, and public and private partnerships. The adoption of these innovations presented particular challenges to innovation management due to the poor rate of use and high rate of rejection of innovations in Thai public organizations, with some discontinuation rates higher than 80 percent (Lorsuwannarat, 2007). Despite the considerable experience accumulated in innovation in developed countries, much of this knowledge is not directly applicable to developing countries due to contextual differences (Aubert, 2005). Failure of adoption of appropriate innovations in the public sector has the potential to impair the systems which serving the public in many economically and socially vital fields of national administration (Donahue, 2005).

This paper is divided into five parts. First, the paper reviews the relevant literature on institutional and population ecology perspectives in order to propose a model of innovation discontinuation. Then, the research methodology is presented and data analysis techniques are discussed. Next, the findings are discussed and summarized. The paper concludes with a discussion of theoretical and managerial implications and potential directions for further research.

THEORETICAL BACKGROUND AND PROPOSED HYPOTHESES

Institutional theory was introduced to the innovation field to assist in understanding how the way in which normative beliefs may drive management innovation (Abrahamson, 1991; 1996; Strang and Meyer, 1993). Population ecology theory considers the influence of the environment on organizational mortality at the population level. From such a perspective, structural inertia limits the change capacity of organizations. The combination of institutional

theory and population ecology has contributed to the explanation of dynamic processes in organizational population (Baum and Oliver, 1991; Baum and Amburgey, 2002; Singh and Lumsden, 1990; Zucker, 1989).

Institutional Theory

Institutional theory investigates "how structures, including schemas, rules, norms, and routines, are created, adopted, diffused, and adapted over space and time; and how they fall into decline and disuse." (Scott, 2004: 408) According to institutional theory, organizational choice is constrained by multiple external pressures (Meyer et al., 1983; Oliver, 1991), which implies that organizations tend to conform to the norms and expectations of the institutional environments in which they operate (Scott and Meyer, 1991). Changes among organizations tend to produce isomorphism, which involves three processes: coercive, mimetic, and normative (DiMaggio and Powell, 1983; Scott, 2001). Coercive processes are concerned with acquiescence to the demands of powerful organizations; mimetic processes are concerned with modeling other organizations in order to reduce uncertainty; and normative processes arise from professionalization.

Institutional theorists pay more attention to organizational innovation (Tolbert and Zucker, 1983; Hinings and Greenwood, 1988; Hargrave & Van de Ven, 2006) and have used these three processes of isomorphism to explain the adoption and diffusion of innovation. Once an innovation has become institutionalized, it is adopted and accepted not because of its rational or technical characteristics, but because it is socially expected that good, well-managed organizations will adopt such innovations (Pfeffer, 1982; DiMaggio, 1988). Institutional theory also offers insights into imitative behavior in the process of innovation diffusion (Abrahamson, 1991; Abrahamson and Rosenkopf, 1993). Such theory endeavours to explain how myths, meanings, and values, rather than efficiency, autonomy, and exchange, drive organizational behavior (Oliver, 1991). Institutional theory thus enables us to understand irrationality better. Such irrationality is manifest in the widespread diffusion of inefficient innovations. This model is called 'institutional diffusion' (Hargrave & Van de Ven, 2006).

Notwithstanding these substantial contributions, institutional theory is limited in its capacity to explain innovation discontinuation. Although it demonstrates why a lack of innovation is so commonplace, it stresses environmental determinism by overemphasizing conformity to the prevailing

institutional environment (DiMaggio and Powell, 1983). Furthermore, very little work based on institutional theory has been carried out to explain the forces driving innovation discontinuation (Zucker, 1987; Baum and Oliver, 1991).

Population ecology theory

The theory of population ecology proposes an alternative to the prevailing organizational adaptation perspective (Hannan and Freeman, 1977). This theory is derived from the study of interactions between organizations and their environments that influence the birth and death of organizations and organizational forms within the population. It assumes that organizations have inertial forces that limit their ability to adapt to environmental changes (Hannan and Freeman, 1989). According to Hannan and Freeman (1989), these inertial forces are both internally and externally constrained. Internal constraints include the investment of the organization, the flow of information to top management, internal politics, and organizational history. External constraints include the legal and fiscal barriers to markets, the availability of information, and the limits of recognized legitimacy. The population ecology perspective suggests that processes of change are ultimately determined by the environment through these inertial forces (Morgan, 1997). In other words, the mechanism of change is one of natural selection rather than of organizational adaptation.

The process of change in the population comprises variation, selection, and retention (Aldrich, 2008). Variation arises as a result of cross-reproduction and the random variation of characteristics. Some types of variation will become established in competitive environments. Selected organizational forms will then be preserved and become institutionalized in the environment. This three-step process leads to changes in current organizational forms as well as the establishment of new ones.

The strength of population ecology is that it explicitly highlights the importance of selection processes, which have largely been ignored in previous organizational theories, and it emphasizes the dynamics of change (Pfeffer, 1985). Models of population ecology can also be used to understand the consequences of changing mechanisms of variation or selection (Pfeffer, 1985). Despite these contributions to the field, population ecology has been criticized for being too deterministic to adequately explain how organizations actually evolve (Astley and Van de Ven, 1983; Singh and Lumsden, 1990) and for being insufficiently

attentive to adaptation mechanisms (Perrow, 1986; Singh and Lumsden, 1990; Lewin, Weigelt, & Emery, 2004). Such theory also focuses on competition at the expense of the role of collaboration. Population ecologists argue that empirical evidence indicates that the evolution of organizations is shaped jointly by the processes of selection and adaptation (Baum and Shipilov, 2006). Nevertheless, there is a paucity of research on the selection and adaptation processes used in organizational innovation, especially on how organizational and population-level learning processes facilitate adaptation and diminish organizational mortality (Amburgey & Rao, 1996).

PROPOSED HYPOTHESES

This present paper develops a framework combining institutional and ecological theories in order to examine the forces influencing innovation discontinuation. These two theories have been treated as potentially complementary concept (Carroll and Hannan, 1989; Hannan and Carroll, 1992). The insights of institutional and ecology perspectives have contributed to our understanding of organizational mortality (Baum and Oliver, 1991; Carroll and Hannan, 1989; Hannan and Freeman, 1988), with implications for understanding innovation discontinuation. The proposed model contributes to understanding innovation discontinuation by including institutional and ecology variables (cultural compatibility, innovation legitimacy, and sunk cost of innovation) and by introducing two additional aspects of internal adaptation (knowledge management and collaborative networks) which may reduce the influence of selection and institutionalization pressures.

Cultural Compatibility

According to institutional theory, institutionalization is viewed as the process by which individuals come to accept a shared definition of social reality (Scott, 1987). Force of habit, history, and tradition within an organization foster a congruence of values among organizational members around certain re-enacted activities (Hinings and Greenwood, 1988).

Innovation is not value-free (Pacey, 1991). The values that influence the creativity of designers and inventors are manifest in their innovations (Pacey, 1991). If the cultural dimension attached to the innovation is consistent with the prevailing organizational culture, the transmission of institutionalized practices to new members will continue (Tolbert, 1988). However, if the innovation is not compatible with the inherent culture of the organization, it will create

social pressure on the organization to revise its established innovation practices (Oliver, 1992). Case studies in many countries (e.g. China, Greece, and India) related similar experiences of conflict between cultural dimensions of ERP and organizational culture leading to project failure (Srivastava & Gips, 2009; Koh, Simpson, Padmore, Dimitriadis, & Misopoulos, 2006; Huang & Palvia, 2001). An innovation that is proven to be incompatible with the inherent organizational culture will lead to a culture clash, which may bring about its eventual decline. Therefore, it is hypothesized:

H1. Organizational innovation that is culturally compatible with the prevailing organizational culture will be less prone to innovation discontinuation.

Legitimacy of Innovation

Legitimacy of innovation refers to the degree of societal support for an innovation (Meyer and Scott, 1992). Suchman (1995: 574) defines legitimacy as "a generalized perception or assumption that the actions of an entity are desirable, proper or appropriate within some socially constructed system of norms, values, beliefs and definitions." Legitimacy is usually controlled by those outside the organization (Singh, Tucker, and Meinhard, 1991). An organization may have to deal with external interest groups, professionals, or the government, which may set standards and measures that form a basis for their stance on innovation legitimacy (e.g. pollution control systems).

According to institutional theory, conformity to the norms and social expectations of the institutional environment improves the survival chances of an organization significantly (Oliver, 1991) or reduces organizational mortality rates (Singh & Lumsden, 1990). To create and sustain organizational legitimacy, public organizations need to receive more societal and political support in terms of increased resources and autonomy (Verhoest, Verschuere, & Bouckaert, 2007). When organizations establish ties with reputable societal institutions, they typically obtain benefits that increase their likelihood of survival. These benefits include a greater legitimacy and status (Baum and Oliver, 1991), improved access to resources, and greater predictability (Miner, Amburgey, and Stearns, 1990).

H2. Organizational innovations that are highly valued for their legitimacy will be less prone to discontinuation.

Sunk Costs of Innovations

Population ecologists posit that organizations have inertial pressures which inhibit their speed of change—organizations cannot change fast enough to keep up with changing technologies (Hannan and Freeman, 1984). These inertial pressures include sunk costs. Sunk costs are defined to be the investments of an organization in the plant, equipment, and specialized personnel, all of which constitute assets that are unrecoverable and not easily transferable to other tasks or functions (Hannan and Freeman, 1989). Specifically, the sunk costs of innovations include the expenses incurred on hardware, software, construction, training, R&D, advertisement, and systems improvement. Sunk costs also include transaction costs as well as the enforcement and policing of contracts (North, 1990). When organizations face resource scarcity, awareness of the sunk costs of innovation will tend to make the organizations more likely to retain high-cost innovations even though the innovations may be obsolete or fail improve performance.

H3. Organizational innovations that have high sunk costs will be less prone to discontinuation than innovations that have low sunk costs.

Knowledge Management Practices

The process of knowledge management is concerned with the acquisition of knowledge, its codification, sharing, and distribution. Knowledge management aims to improve organizational effectiveness (Davenport and Prusak, 1998; Takeuchi and Nonaka, 2004). Knowledge of innovation processes may be managed in such a way that the transfer of such knowledge becomes institutionalized, with creation and realization of innovations transmitted and transferred as an institutionalized value. Process over time and transfer similar knowledge of an innovation from individuals to groups and to organizations, this process is like the institutionalization process which supports instilling value and creating reality of innovations. In this way, individuals within the organization are educated and socialized into acceptance of shared knowledge of innovation processes, the validity of which is then "seen as the 'way things are' and/or the 'way things are to be done'" (Scott, 1987: 496).

Knowledge management and innovation are closely interdependent (Horibe, 2007; Thornhill, 2006). Effective knowledge management is considered a means to improved innovation and performance (Darroch & McNaughton, 2002). Knowledge management practice can be adapted to institutional constraints in

a manner consistent with both population ecology and institutional theories if such practices encourage a sense of employee's sharing and learning of new knowledge of innovation. Therefore, organizational innovations implemented in the context of such knowledge management practices will have a lower organizational innovation discontinuation rate than those implemented in organizations without such knowledge management practices.

H4. Organizational innovations implemented by organizations that practice knowledge management will be less prone to discontinuation than those implemented by organizations without such practices.

Collaborative Networks

Collaborative networks ensure greater and more predictable flows of supplies and resources (Aldrich and Auster, 1986; Saxenian, 1991), improve access to resources (DiMaggio and Powell, 1983), and make information exchange easier (Rogers, 2003; Saxenian, 1991). Collaborative networks also enhance the innovative activities of organizations (Hagedoorn, 2002; Rothaermel, 2003) by allowing organizations to apply external sources of knowledge to the creation and implementation of innovations. Such collaborative networks can enable trust-based interchange of creativity and new ideas (Sorensen & Torfing, 2012).

These advantages of collaborative networks help reduce innovation complexity, especially with respect to uncertain and conflicting inputs, processes, and outcomes. Baum and Oliver (1991) have also shown, that institutional linkages significantly reduce the failure of childcare service organizations. My research, in this paper, aims to test the proposal that organizational innovations implemented by organizations with collaborative networks will have lower discontinuation rates.

H5. Organizational innovations implemented by organizations that have collaborative networks will be less prone to discontinuation.

Control Variables

In order to avoid the biases from the effects of organizational size and of innovation experience on innovation mortality, organizational size and innovation experience were introduced as control variables in the hierarchical regression models. A number of previous studies have addressed how size of organizations influences organizational mortality (Carroll, 1983; Thornhill & Amit, 2003). Small organizations are at a major disadvantage when it comes to raising capital (Aldrich and Auster, 1986) Small organizations are also potentially

more vulnerable to adverse influence from government regulations. Previous experiences with innovation are beneficial to the organization's capacity to manage further innovation and enable the organization to exploit a learning-by-doing effect (Van der Panne et al., 2003).

METHODS

Sampling and Data Collection

The data used in the present analysis were gathered through the use of survey questionnaires that were mailed to the managers of Thai public organizations. These questionnaires required respondents to explain the factors that influenced the discontinuation of innovation in their own organizations. In order to improve comparability and generalizability, the present study used two types of innovation: voluntary and compulsory innovation (Majumdar and Marcus, 2001; Marcus, 1988). These two types of innovation are in widespread use in public organizations but are rarely researched. Voluntary innovation is innovation that is used by individuals or organization freely; whereas compulsory innovation is innovation that is mandated by an authority external to the organization charged with implementing it (Marcus, 1988). The inclusion criteria for selecting the innovations used in this study were that they had been widely used in the public sector for at least five years, had been through an innovation life cycle from adoption to diffusion, and they were information technology related. Consultations with local experts familiar with the selected innovations of e-auction and e-learning were conducted before the data collection process. E-auction is a compulsory innovation that all government agencies, state enterprises, and public organizations were forced to implement by cabinet resolution, whereas e-learning is a voluntary innovation.

The unit focus in this study was on divisions. Therefore, the population of this study was comprised of the divisions in the selected public organizations in Thailand that are responsible for the two innovations of interest: namely, the procurement division for e-auction and the human resources division or information technology division for e-learning. The study used census sampling from a list of units in the Thai Government Organization Directory. A total of 568 questionnaires were then distributed to the heads of units involved in managing these two innovations.

Measures

This subsection explains the measurement of dependent, independent, and control variables in the present study.

Dependent Variable: Innovation discontinuation is the extent of termination of the innovation after use. Public organizations may use the innovations while executing little or none of the activities normally related with that practice (Lounsbury, 2001). If this variable is measured by the dichotomy of decision-making, acceptance or rejection, it will not reflect the real intention of the organizations. Innovation discontinuation (a = .825 for e-auction, and a = .841 for e-learning), therefore, was operationalized by using five items: the degree of willingness to use an innovation in an organization, the seriousness of intention to use the innovation, the confidence to use it sustainably, the continuity of use, and the idea of not using it.

Independent Variables: Cultural compatibility is the degree to which an innovation was perceived to be compatible with the existing values, past experiences and needs of potential adopters (Rogers, 2003). Cultural compatibility (a = .943 for e-auction, and a = .934 for e-learning) was measured by three items: value compatibility, experience compatibility, and needs compatibility.

Innovation legitimacy is the degree of social support for an innovation (Meyer and Scott, 1992). The measurement of innovation legitimacy (a = .822 for e-auction, and a = .790 for e-learning) covered six items: acceptance by public agencies, the laws that support the innovation, the consistency of the innovation with government policy, the number of adopters in the public sector, and innovation legitimacy.

Knowledge management within an organization involves strategies, plans, systems, mechanisms, and resources dedicated to the creation, dissemination, and incorporation of learning from its own and others' experiences. Indicators of knowledge management practices (a = .878 for e-auction, and a = .909 for e-learning) included statements related to the existence of a plan for knowledge management, as well those referring to mechanisms for exchanging or sharing knowledge and those regarding resources for the implementation of knowledge management that serves to institutionalize valuing of innovation processes.

The collaborative networks variable was measured to indicate the degree to which each organization participated in collaborative networks. The indicators of collaborative networks (a = .862 for e-auction, and a = .851 for e-learning) included five items: the number of collaborative networks an organization belonged to, collaborative format and activities, and the number and frequency of collaborative activities.

Sunk costs of innovation were represented by the investments of an organization in innovation. Sunk costs of innovation (a = .751 for e-auction, and a = .830 for e-learning) were measured by five items addressing the size of investment, its potential sales and the payback period (Astebro and Michela, 2005). Thus the size of investment variable included the budget for implementing an innovation, the budget for personnel development, the resources invested in the innovation, the results of comparison of these investments with potential sales, and the payback period.

Control variable: The organization size variable was initially represented by the reported number of employees. However, owing to a number of missing values and apparent poor reliability of this aspect of the survey data, total approved budget of the organization was used instead (LeRoux et al, 2010). The source of this data was from the Annual Budget in Brief FY 2006-2010 prepared by the Bureau of the Budget. Thus the organization size variable in the current study was measured by the five-year annual budget (FY 2006-2010) of each organization. Owing to the highly-skewed distribution of the sizes of the organizations, this variable was transformed using a log scale (LG_SIZE). Innovation experience was measured as the number of years of working with an innovation.

ANALYSIS AND RESULTS

Of the 568 questionnaires distributed, 327 completed responses were obtained (response rate 58%). A total of 292 of these surveys contained complete responses to the questions of interest in this study. Of these responses, 149 cases were obtained from the units in charge of e-auction and 143 cases were from units responsible for e-learning. The desired range of means and standard deviation was used to screen the data. Although there were few missing data and the pattern of distribution was random, these missing values were substituted using the group mean value in order to reduce the variance. From the factor analysis, it was found that the Kaiser-Meyer-Olkin value, which was

used to measure the suitability of the data for both e-auction and e-learning studies, lay between 0.72 and 0.94, above the 0.5 threshold. Therefore, factor analysis was an appropriate tool for use in the study of these data sets.

Tables 1 and 2 present the descriptive statistics and the correlation coefficients of all variables in this study. The mean of innovation discontinuation for e-auction was 2.37 and that of the e-learning was 2.57. All correlations between the independent variables fall below the 0.70 threshold for both the e-auction and e-learning sample sets. The variance inflation factors (VIFs) are in the range of 1.010-1.735 for the e-auction model and 1.002-1.933 for the e-learning model respectively, indicating that there are no grounds for concern with respect to multicollinearity (Hair et al., 1998).

Table 1: Correlation Matrix and Summary Statistics (E-auction set) (N = 149)

Variables	Mean	S.D.	1	2	3	4	5	6	7
1. Innovation Discontinuation	2.37	0.65							
2. Cultural Compatibility	2.34	0.75	-0.54**						
3. Innovation Legitimacy	2.74	0.60	-0.52**	0.49**					
4. Sunk Costs of Innovation	1.75	0.64	-0.28*	0.18*	0.23**				
5. Knowledge Management	1.95	0.69	-0.46**	0.40**	0.42**	0.46**			
6. Collaborative Network	2.04	0.70	-0.31**	0.28**	0.31**	0.40**	0.49**		
7. LG_SIZE	3.02	0.66	-0.19*	0.13	0.22**	0.10	0.24**	0.14*	
8. Innovation Experience	2.72	0.81	-0.18*	0.31**	0.24**	0.13	0.21**	0.23**	0.10

*** p<.001; **p<.01; * p<.05 (two-tailed test)

Table 2: Correlation Matrix and Summary Statistics (E-learning set) (N = 143)

Variables	Mean	S.D.	1	2	3	4	5	6	7
1. Innovation Discontinuation	2.57	0.60							
2. Cultural Compatibility	2.68	0.53	-0.52**						
3. Innovation Legitimacy	2.61	0.45	-0.52**	0.49**					
4. Sunk Costs of Innovation	1.91	0.64	-0.60**	0.43**	0.34**				
5. Knowledge Management	2.28	0.60	-0.65**	0.44**	0.45**	0.62**			
6. Collaborative Network	2.51	0.54	-0.47**	0.26**	0.33**	0.48**	0.40**		
7. LG_SIZE	2.92	0.69	-0.24**	0.10	0.16*	0.34**	0.22**	0.16*	
8. Innovation Experience	3.10	0.70	-0.21**	0.42**	0.21**	0.21**	0.26**	0.11	0.04

*** p<.001; **p<.01; * p<.05 (two-tailed test)

Before running multiple regressions, procedures for checking for violations of the assumptions of the regression analysis were conducted. These procedures showed that errors in the e-auction and e-learning datasets were normally distributed. The variance of the error was also stable and linear. By comparing a normal plot of the residuals with a normal line, it was found that the distribution of the residuals of these two datasets lay almost on a straight line. Finally, standardized residuals were plotted against predicted values. The residuals were randomly distributed in a band clustered around the horizontal line.

Table 3 illustrates the results of multiple regression analyses for the e-auction and the e-learning discontinuation models. Models 1a and 2a are the base models that include the two control variables. The results indicate that this combination of variables has a statistically significant impact on innovation mortality in the e-auction model (R^2 = 0.060; $p < .001$) and in the e-learning model (R^2 = 0.097; $p < .001$). Models 1b and 2b capture the direct effects of cultural compatibility, innovation legitimacy, and sunk costs of innovation. These findings are statistically significant at the $p < .001$ level (R^2 = 0.400 in e-auction model; R^2 = 0.503 in e-learning model).

In Models 1c and 2c, all the effects are simultaneously analyzed. These models explain an additional 36.1 and 48.8 percent of variance, respectively, over what the control variables alone can explain in the e-auction model (R^2 = 0.421; $p <.001$) and in the e-learning model (R^2 = 0.585; $p < .001$), . It was found that the adjusted R^2 value of the e-auction dataset was 0.392 ($p < .001$) and that of the e-learning dataset was 0.564 ($p < .001$). Hypotheses 1, 2 and 4 are fully supported, and hypotheses 3 and 5 are partially supported, by these findings. That is, for both the e-auction and e-learning data sets, innovations with higher cultural compatibility, innovation legitimacy, and knowledge management practices have significantly less prone to discontinuation. Within the e-learning data set, but not within the e-auction data set, innovations with high sunk cost of innovation and greater collaborative networks were less prone to discontinuation.

Table 3: Multiple Regression Results of E-auction and E-learning Discontinuation

Variable	e-auction (N=149)			e-learning (N=143)		
	Model 1a	Model 1b	Model 1c	Model 2a	Model 2b	Model 2c
Control variable						
Log Size	-0.170*	-0.059	-0.037	-0.234**	-0.079	-0.032
Innovation Experience	-0.161*	0.032	0.042	-0.195*	0.054	0.051
Independent Variables						
Cultural Compatibility		-0.364***	-0.324***		-0.228**	-0.182*
Innovation Legitimacy		-0.304***	-0.267***		-0.173***	-0.180**
Sunk Costs of Innovation		-0.144*	-0.073		-0.401***	-0.223**
Knowledge Management			-0.173*			-0.282***
Collaborative Networks			-0.026			-0.179**
R^2	0.060	0.400	0.421	0.097	0.503	0.585
Adjusted R^2	0.047	0.379	0.392	0.084	0.485	0.564
R^2 Change	0.060	0.339	0.021	0.097	0.406	0.082
F	4.665*	19.062***	14.650***	7.483***	27.709***	27.199***

*** p<.001; **p<.01; * p<.05 (two-tailed test)

DISCUSSION AND IMPLICATIONS

The present study attempts to extend knowledge and understanding of the determinants of innovation discontinuation within organizations by developing and testing a framework from the convergence of population ecology and institutional theories. The empirical results lend moderate support for e-auction model and strong support for e-learning model. The results provide evidence to the negative effect of cultural compatibility, innovation legitimacy, and knowledge management on e-auction discontinuation. However, the findings do not support the influence of sunk cost of innovation and collaborative networks on the discontinuation of compulsory innovation. The effects of sunk cost of innovation and collaborative networks may be less pronounced when occurring in compulsory climate. Consistent with the hypotheses, cultural compatibility, innovation legitimacy, sunk cost of innovation, knowledge management, and collaborative networks have negative effects on e-learning discontinuation. The results are interesting, suggesting that the role of structural inertia (sunk cost of innovation) can explain innovation discontinuation very well under the competitive environment, like voluntary innovation. When competitiveness is compromised, the institutional perspective seems to be more useful than population ecology (Hatch & Cunliffe, 2006).

The result is opposite of previous studies (e.g. Baum & Oliver, 1991), in this study the collaborative networks does not decrease innovation discontinuation in compulsory innovation model. Such inconsistency can be explained by using type of innovation as the context of the innovation. The coercive pressures of innovation may be too strong for collaborative networks to facilitate the

life of compulsory innovation. More interestingly, knowledge management has significantly negative effect on innovation discontinuation in both e-auction and e-learning models, but higher in e-learning model. The reason is probably because organizational climate would certainly affect the knowledge creating and sharing. The compulsory innovation can limit the potentiality of knowledge management in reducing innovation discontinuation.

By introducing types of innovation, the current study contributes a potential solution to the problem of the instability of the results of previous innovation studies. Further studies, with appropriate methodological refinement, will be needed to establish the extent of usefulness of this study's conceptual and methodological innovations, and establish grounds for their broader acceptance or discontinuation.

This paper suggests that the environmental selection and legitimacy are not the only factors influencing the discontinuation rate of innovation, as proposed by population ecology and institutional perspectives respectively. Innovation discontinuation may also depend on institutional adaptability, including knowledge management practices and collaborative networking. However, the effect of such collaborative networking only occurs in voluntary innovation. The coercive pressures may be too strong for a similar trend to occur with compulsory innovations, resulting in collaborative networking having no substantial impact on innovation discontinuation.

The findings of this study have modest policy and managerial implications. In terms of policy implications, this paper set out to address the pro-innovation bias attached with the policy. Compulsory innovation policy can speed up the implementation and lower the rejection rate of the innovations, but the implementation of such policy does not a guarantee that the innovation benefits the organization. E-auction was initially expected to protect against collusion, to reduce corruption and to increase the efficiency of the procurement process. Now that e-auction has been implemented, corruption still occurs—but only before the auction process begins. Although the government of Thailand has attempted to make a number of legal improvements in order to address this issue, these have further complicated the e-auction process. This pro-innovation bias should be recognized and its consequences taken into account in future policy and planning.

Another policy implication involves the organizational cultural influences on innovation implementation and discontinuation. There is a paucity of innovation in public organizations because their culture is one of sustenance of hierarchy and rather than openness to new ideas. If innovations are to succeed in public organizations, culture change within these organizations is needed. This could be facilitated by the government should encouraging public institutions to network with talented and creative people and organizations from a wide variety of fields and by opening up the innovation process to the public. Since innovation legitimacy has been shown to increase social acceptance (Meyer and Scott, 1992) and to extend the life of an innovation, the government should use mass media to support innovation. If the government has the political will to institute such measures, they might have a substantial effect on innovation implementation processes and rates of innovation discontinuation within public organizations.

The third policy implication deals with knowledge management practices. If the government intends that innovations should be successfully implemented and sustained in public organizations, it should continue to strongly support collective networks for knowledge management by continually supporting learning and by sharing the experiences in innovation implementation among public organizations. External sources of knowledge can be integrated with existing organizational knowledge creation systems, thus promoting and sustaining innovation (Caloghirou, Kastelli, and Tsakanikas, 2004).

The fourth policy implication concerns sunk costs of innovation. The Thai government has launched countless policies regarding innovation by acting simultaneously on implementation in every public organization across the nation. It is recommended that, before investing resources to adopt innovations, there should be small scale pilot projects to evaluate the performance of these innovations. If the public sector has invested a lot of money in ineffective innovations, the sunk cost of these investments can hinder organizational change which might otherwise lead to discontinuation on rational grounds. Eventually, public organizations will be full of ineffective innovations.

With regard to managerial implications, this study proposes that an organization might use adaptive strategies to decrease the risk of failure of an innovation. Managers should use their influence for institutionalization of the innovation-compatible aspects of their organizational culture in the interests of

nurturing and promoting the adopted innovations and reducing the likelihood of their failure by identifying the cultural conditions for innovation success and promoting those conditions. Managers should support processes involving learning from the best and the worst practices of innovation implementation. Innovations need to be managed by learning and sharing knowledge across collaborative networks in order to deal with innovation complexity and to increase the sustainability of innovations.

Limitations and Further Research

The present study has inherent limitations in terms of its research design. Firstly, this study used a single respondent from each division, which gives rise to two potential concerns: respondent bias and limited knowledge base. However, because the participants were e-auction or e-learning administrators, their inclusion may offset these concerns to some degree. Secondly, most variables were measured subjectively, and a cross-sectional survey was used, which may have biased the findings. Such limitations might be addressed by intensive research design involving collection of multisource data at several points of time to examine innovation development more systematically. The data collected and the statistical methods of data analysis do not provide a basis for imputations regarding causal influence, and the recommendations made need to be made considered in the context of this limitation. It may be that consideration of issues of influence, especially with respect to the political aspects of influence, will necessitate development of paradigmatically appropriate qualitative research methodologies.

Future research might be informed by other related organizational theories, such as resource dependency and interorganizational relations, in order to model processes of innovation discontinuation more comprehensively. Resource dependency helps address the question of whether or not the dependence of resources on other organizations will have a relationship with rates of innovation discontinuation. Interorganizational relations can assist the investigation of relationships between organizations to enhance innovation life. Future research could potentially be based on a framework expanded to cover political aspects of innovation discontinuation, provided that appropriate qualitative research methods are developed to address such influences. The framework used in this present study could be further developed for use in a comparative study of innovation discontinuation across public and private

sector organizations, addressing other types of innovation, including incremental and radical innovations.

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