

# THE IMPACT OF ‘MODIFICATION ROUTINES’ ON THE INITIATION OF IT INNOVATION IN FAST-CHANGING INSTITUTIONALIZED FIELD: KOREAN STOCK-TRADING INDUSTRY

*Research-in-Progress*

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## Abstract

*This paper tries to explain the phenomena of the IT (Information Technology) innovation of firms in a fast-changing institutional field (industry), with the theoretical perspectives of organizational change with population ecology and especially “modification routines”, proposed by Amburgey et al. (1993). We suggest that in a fast-changing industry, firms should become the initiator of IT innovation when they have built “modification routines” by past experience of innovation in IT-related operating domains, and that the initiators of such IT innovation should have better performance. We also suggest that technological similarity between the required and previous changes should positively moderate the relationship between the modification routines and the likelihood of becoming the initiator of IT innovation. The tentative empirical study design is suggested with the operationalization of variables and possible research field – the Korean stock trading industry. Data analysis will be presented in full paper.*

**Keywords:** Modification routine, IT innovation, population ecology, institutional theory, technological innovation, initiator of change, firm performance, similarity between current and previous changes

## Introduction

Firm innovation through Information Technology (IT) has captured the focus of several scholars in the disciplines of Information Systems and Strategy, and a number of studies have explained the phenomena of “What leads to innovation through IT?” For instance, King, Gurbaxani, Kraemer, McFarlan, Raman, and Yap (1994) proposed a list of institutional forces that lead to firms’ IT innovation, such as governmental authorities, international, professional, and research-oriented institutions, and trend-setting firms. Also, there are numerous studies that investigate how IT innovation is diffused (e.g., Cooper and Zmud 1990; Fichman 1992). These studies have provided us with a good understanding about “What leads to the adoption of IT innovation?” or, “How is IT innovation diffused?” Instead, in order to better understand the phenomenon of “the initiation of IT innovation in an institutional field,” this study tries to answer the question of “What makes an individual firm become an initiator of IT innovation?” based on two complementary theoretical perspectives of organizational change: *institutional theory* and *population ecology*, as innovation is a subset of organizational change (Hage 1999; Woodman, Sawyer, and Griffin 1993), so that the organizational changes that follow (or are followed by) firms’ new technological innovation should be explained by the theoretical perspectives of organizational change.

In a fast-changing business environment, organizations have to innovate to gain short-term performance advantage and long-term survival (Haveman 1992). However, organizational change or innovation results in improved performance or leads to survival only when the organization moves to a more attractive destination state and is able to absorb the costs of undertaking the change (Kim, Oh, and Swaminathan 2006). There are many different views that explain the forces, triggers, antecedents, or even constraints and barriers of organizational change (or organizational innovation). However, this paper focuses on two important theoretical perspectives in organization theory to explain IT innovation in a fast-changing technological environment: population ecology (Hannan and Freeman 1977) and institutional theory (DiMaggio and Powell 1983; Meyer and Rowan 1977). While institutional theory holds a good position in explaining “why organizations change?” (Tolbert and Zucker 1983), population ecology theory is regarded as one of the theories that explain “why it is not easy to change an organization?” (Hannan and Freeman 1984). Population ecology argues that even though organizations want to adapt themselves to the environment, it is not easy to change, or the change is not beneficial to the organizations because of structural inertia (Hannan and Freeman 1984). Also, it posits that organizational change is beneficial only when the transformation of environmental conditions makes firms’ previous strategies and orientations obsolete and when the change meets new environmental demands (Haveman 1992; Tushman and Romanelli 1985).

An important contribution made by Amburgey et al. (1993) is that they incorporate the concept of *modification routines*, which refer to the procedures for changing and creating operating routines (Nelson and Winter 1982) in order to explain “why firms change, even though there is structural inertia.” Organizations learn to change by changing, so that if organizations have built modification routines well, it should be easier for them to adapt themselves to external change by making similar changes they have done before (Amburgey, Kelly, and Barnett 1993). Tolbert and Zucker (1983) argued that the changes in the formal structure of organizations derive from internal or institutional sources, and that if firms are early adopters of innovation in the institutionalized field, then they are likely to seek “internal process improvement,” but if firms are late adopters of innovation, then they are likely to seek “social legitimacy.”

Based on these perspectives, this study tries to answer the research questions of “How and why do some firms initiate (or other firms follow) IT innovation in a fast-changing institutional field?” In detail, this study tries to answer the questions of “What makes an individual organization become an initiator of IT innovation?” and, “How does the status of the initiators of IT innovation influence firm performance?” This paper looks at an institutional field that confronts fast environmental and technological changes, which require firms in the field to make changes so as to improve performance in the short term and survive in the long term. The possible research field will be the stock trading or banking industry because the organizations in this field have made many previous IT innovations (e.g., ATMs, Internet Banking, Web-trading, etc.) and have confronted a very fast-changing environment in terms of services, clients, technologies, and operations.

The rest of this paper is organized as follows. The next paragraph covers a brief description about the industrial field of interest. The following paragraphs cover the two theoretical perspectives of this paper: organizational change in population ecology, and organizational change in an institutionalized field. Afterwards, the research model is presented, followed by possible research methods and potential contributions.

## **Theoretical Backgrounds**

### ***Organizational change with the theory of institutionalization***

*Institutionalization* is defined as the process through which the components of a formal structure become widely accepted and serve to legitimize organizations (Tolbert and Zucker 1983). This is a kind of social change, and this process occurs in two different ways (Hernes 1976). Initial endogenous change can take place through the problems of coordination and control, and is normally gradual. Or, exogenous change may take place later because it is required by the institutional environment. When changes in the formal structure come from internal sources, the triggers of change are normally problems of internal coordination and control (Blau 1970; Woodward 1969) or power, leadership, and socialization to specific organizational roles for mediating environmental effects (Child 1972; Pfeffer and Salancik 1978; Thornton and Nardi 1975). On the other hand, changes in formal structure can be triggered by external institutional influences (Meyer and Rowan 1977; Zucker 1983). In this situation, firms try to make change in accordance with the way they operate, in order to conform to what is defined as appropriate, without actually investigating whether the change they make can be beneficial to them (Meyer and Rowan 1977).

### **The early adopters of change**

Tolbert and Zucker (1983) argue that if an organization is an “early adopter” of an innovation in a formal structure, it is likely to seek the improvement of internal processes, for example, by seeking new innovations, streamlining procedures, or reducing conflict. Even though this change by early adopters may improve their internal processes, unless it is widely accepted by their institutional field, the change may not become institutionally accepted within the field. Therefore, early adopters of innovation need to make their change penetrate into the institutional field to which they belong. The question of how early adopters make it possible is somehow answered in Leblebici et al. (1991). They argue that powerful players in the institutional field force their immediate relational network to adapt to their practices, and they attempt to build their goals and procedures directly into society as institutional rules (Leblebici, Salancik, Copay, and King 1991; Meyer and Rowan 1977). DiMaggio (1988) also answers the penetration of a new institution by an initiator of change by suggesting that the success of an institutionalization process creates new legitimized actors who tend to delegitimize and deinstitutionalize aspects of the institutional forms to which they owe their autonomy and legitimacy (DiMaggio 1988). In sum, the early adopters within an institutional field 1) initiate change in order to seek internal process improvement or solve problems or conflicts, and then 2) try to make their changed practices penetrate into their institutional field by forcing other players to adapt to their practice by using their power (Westphal, Gulati, and Shortell 1997).

### **The late adopters (followers) of change**

After changes in an institutional field are initiated by early adopters and these changes from the initiating firms (early adopters) are accepted into the institutional field, they are widely understood to be appropriate and necessary components of efficient and rational organizations, regardless of each organization's internal values (Tolbert and Zucker 1983). Under this situation, many organizations are under pressure to conform to their formal structures to gain social legitimacy. Also, once an innovation gains legitimacy, others (the followers of change) imitate the practice and accept its validity and value uncritically (Leblebici et al. 1991). Tolbert and Zucker (1983) argue that this phenomenon happens for later adopters (the followers of institutional change). Since the followers of innovation may fulfill the symbolic requirement rather than their task-related requirements, the adoption of an innovative measure may have little or no effect on the actual efficiency of an organization's operation (Meyer and Rowan 1977; Tolbert and Zucker 1983).

### ***Organizational change with a population ecology perspective***

#### **Adaptation perspective and structural inertia**

The central assumption of population ecology is that the environment optimizes and selects an optimal combination of organizations (Hannan and Freeman 1977). Isomorphism in ecology suggests that the diversity of organizational forms is isomorphic to the diversity of the environment. Also, the competition of organizations in an organizational population results from the limitation of resources available to each form of organization. Organizations under this organizational population normally scan the environment, formulate strategic responses, and adjust their organizational structures if necessary, which we refer to as an “adaptation perspective”. In this perspective,

organizations are affected by their environment according to the ways in which managers, leaders, or dominant coalitions make and implement strategic decisions (Hannan and Freeman 1977). Another important concept that affects organizational change is the concept of “structural inertia,” which limits the adaptive flexibility of organizations. Structural inertia is affected by internal (structural arrangements of a firm) and external (environment constraints) factors. Sunk costs, incomplete information, internal political constraints, and historical constraints are examples of internal constraints affecting structural inertia, while legal and fiscal barriers to entry and exit, legitimacy constraints, and collective rationality problems are types of external constraints.

### **Detrimental impact by organizational change**

With the concept of structural inertia, Hannan and Freeman (1984) argue that organizational change is constrained by strong structural inertia, and that this inertia is a property of all organizational forms. Their theory predicts that highly inert organizational forms will have lower failure rates. Haveman (1992) interprets this argument in a way that frames organizational change as detrimental to survival, by arguing that change will hurt performance and survival chances because the liability of newness clock is reset (Stinchcombe 1965). That is, when an organization, which is inert to some extent, makes a non-trivial change, then it must learn new patterns of information communication, it must integrate new members and learn new work routines, and it should manage the altered flow of work. Therefore, the effort involved in the aforementioned activities may lower the efficiency of the organization’s operation and may lead to poor performance in the short term, thereby lowering its survival chances (Haveman 1992). Therefore, in the population ecological perspective, non-trivial change is generally regarded as detrimental.

### **Change beneficial to an organization under a fast-changing environment**

Then, what makes change beneficial to an organization in a population ecological view? Or, what makes firms ever change? Research suggests that it is beneficial under punctuational environmental transformation (Eldredge and Stephen 1972; Gould 1980). Punctuational environmental change requires different output by individual organizations, which may cause significant change in the input available for a firm to produce any outcomes by its quality, quantity, or relative proportions. Or, it may cause change in the processes used to transform inputs into outputs. Then organizations will be forced to adjust in order to achieve stable performance (Haveman 1992). If a firm does change in response to this punctuational environmental transformation, there are two possible outcomes. First, as previously mentioned, change may hurt performance because the liability of newness clock is reset (Hannan and Freeman 1984; Stinchcombe 1965). However, this performance loss can be the price to pay for long-term survival if “not changing at all” will lead to certain failure in the long run (Haveman 1992). Therefore, the changes made by a firm in punctuational environments are inevitable and should meet the requirement of the new environment.

### ***Modification (Change) routine (learn how to change by changing)***

Amburgey et al. (1993) define *organizations* as structured systems of routines embedded in a network of interactions with the external environment, which is similar to Hannan and Freeman (1984)’s definition of organizations. The concept of “operational routines” can explain why organizational change may increase the failure rate of organizations because if a firm changes its operational routines that do not directly interact with the environment, then the change can be disruptive. Operational routines also explain why older firms have more of a disruptive effect in terms of organization change because it is assumed that once routines are set and legitimized to the external environment, such an environment does not change, so that the changes can threaten the legitimacy of the organization.

However, Amburgey et al. (1993) expand the meaning of “routinization.” In addition to operational routines, they suggest “modification routines,” which refer to procedures for changing and creating operating routines (Nelson and Winter 1982). These operating routines are standard patterns of organizational activity in a given context, while modification routines are patterns of activity that systematically change the operating routines of an organization. The major role of modification routines is to govern the process through which organizations search for solutions to their problems (Levitt and March 1988). Organizations can learn how to change from the previous changes they have made. The more an organization changes its operating routines, the more likely it develops modification routines to make further and similar changes (Amburgey et al. 1993). This implies that the same types of changes made in the past are likely to be repeated in the future. Once an organization learns how to change by previous

changes, it tries to change in response to their perceived problems. If they are successful after making changes, they become more competent about the types of changes they have made. Also, their competence in making a certain type of change may lower their marginal cost of making other changes of similar types. Because of lower costs than other types of change, an organization that has built modification routines may try to solve broader types of problems with the same types of changes. That is, the modification routines could also be inert, so that firms may fall into “competency traps,” in which organizations do “what they know how to do,” even when other actions would be preferable in the long run (Levitt and March 1988). Therefore, having “modification routines” may not always be beneficial to an organization. They are only beneficial when the types of changes required by environmental conditions are similar to the types of changes that are embedded in the modification routines. However, firms that have built several modification routines in different domains are more likely to change when the environment requires changes, than those that have not. In the next section, we will argue that in a fast-changing field, modification routines of IT innovation built by a firm actually enhance the likelihood that it will become the initiator of IT innovation in the institutional field, which in turn, positively influences firm performance.

## **Research Model and Hypotheses**

### ***The impact of modification routines on the choice to be the initiator of IT innovation***

The theory of institutional change argues that the early adopters of an innovation will be more likely to seek to improve internal processes, while late adopters try to conform to the legitimacy made by the early adopters (Tolbert and Zucker 1983). If a firm has built modification routines (Nelson and Winter 1982) that make it easier to implement similar changes with lower costs and effort, then the firm will be more likely to engage in the process of change when it sees its own internal problems, or when it acknowledges that environmental conditions require changes in its operation (Amburgey et al. 1993). If we think about the fast-changing technological environment, such as the Korean stock trading industry confronting the dot-com boom, the fast penetration of new technology (e.g., wired and wireless Internet connections), and new client groups, firms in this field need to innovate themselves in many different domains, such as products, brokerage fees, and technology. Another important argument to support the relationship between modification routines and being an initiator of IT innovation is the “competency-trap” (Levitt and March 1988). Since the firm with modification routines has habitualized themselves in a certain type of innovation within a certain operational domain (e.g., IT), they try to innovate in the way they used to whenever it was necessary, without knowing that the IT innovation they make is actually beneficial to them. Thus, those firms that have established “modification routines” by innovating their operating routines with regard to IT and that have survived after the changes will be more likely to be an initiator of IT innovation in their institutional field, because they already know how to innovate with IT in different operating domains. With this perspective, we hypothesize that:

*H1: Firms with a high degree of established modification routines are likely to be the initiators of IT innovations in their institutional field, rather than followers of IT innovations.*

### ***The impact of being the Initiator of change on firm performance***

Westphal et al. (1997) argue that the early adopters of new technology are more likely to customize themselves to the unique problems and opportunities facing their organizations, while the later adopters of new technology are more likely to conform to what is already institutionalized (Westphal et al. 1997). They also argue that if firms modify (customize) their processes rather than conform to societal legitimacy, they gain higher efficiency. Under a fast-changing environment, where the institutional field is relatively unstable, in the early stages of institutional change, firms are relatively freer from isomorphic pressures (because the environment itself keeps changing) and they are more motivated by the opportunity for efficiency gains (DiMaggio and Powell 1983; Wezel and Saka-Helmhout 2006; Zucker 1983). In sum, initiators of change will try to improve internal processes and will engage in mindful IT innovation, which will lead to better performance related to innovation than those who follow institutionalized IT innovation mindlessly (Swanson and Ramiller 2004). With these arguments, we hypothesize the following:

*H2: If firms become initiators of IT innovation in their field, they are more likely to have better innovation performance.*

### ***The moderation effect of the similarity of new changes to the old ones***

When we investigate the impact of modification routines on the choice of a firm to be the initiator of IT innovation, we may have to consider whether the new IT innovation required by a firm (or external environment) can actually be eased by the modification routines built by the firm. In other words, we should consider the similarity between the previous changes (innovations) upon which a firm has built its modification routines and *the innovations required by the current situation*. For example, suppose that a firm has built modification routines in the technological area of “front-office systems” (e.g., user interface of web-trading systems), but has not made much innovation in the technological area of “back-office systems” (e.g., financial database systems or inter-firm transaction systems). For this firm, if internal needs or external influences (environmental changes) require an IT innovation in the area of “front office systems,” their modification routines may play an important role in the firm’s choice of becoming an initiator of an IT innovation in the field, as the firm’s modification routines built by its previous experiences of IT innovation fit the required innovation by the new environments. However, if this firm confronts the need for change in back-office systems, it might not take the initiative to be the first mover of that particular innovation (the IT innovation in “back-office systems”), as the modification routines it built may not play much of a role in the technological area of “back-office systems.”

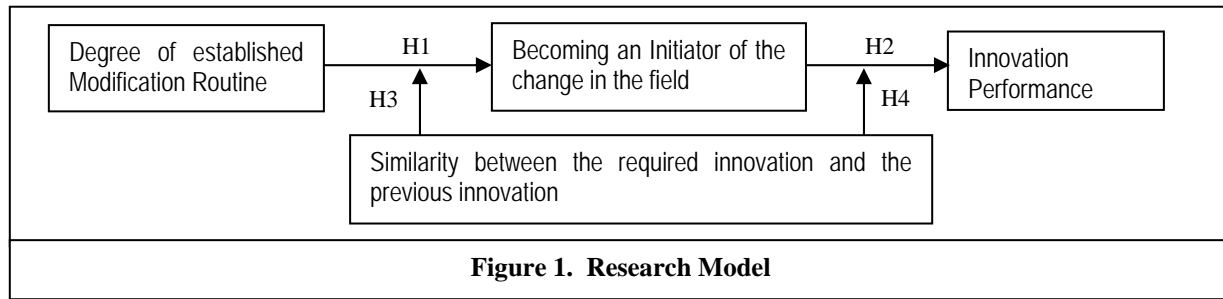
This argument can also be explained by the phenomenon of the “competency trap” – the phenomenon that “firms do what they know how to do” (Amburgey et al. 1993; Levitt and March 1988). That is, if an innovation required in a current situation can be easily fulfilled by a firm’s competency that comes from the firm’s modification routines, the modification routines of the firm will have a stronger impact on the firm’s choice of becoming an initiator of that particular innovation, because the innovation can be easily made by its modification routines. With these perspectives, we propose that the similarity between “the previous changes (innovations) upon which a firm has built its modification routines” and “the innovations required by the current situation” can positively moderate the relationship between the established modification routines and the firm’s choice of being an initiator of an IT innovation.

*H3: The similarity between the types and domains of an innovation that a firm has previously made and the types and domains of change that are required by the current environment positively moderates the relationship between the degree of the established modification routines and the choice of becoming an initiator of IT innovation.*

We can also argue another moderation impact of the similarity between new changes and the old ones on the relationship proposed in Hypothesis 2. Due to the “competency trap”, sometimes organizations will apply their modification routines to become an initiator of the change in the field without really thinking about whether the change initiated by their modification routine actually fit the requirement of current (or near future) institutional environment. In this case, whether or not a firm’s act of becoming the initiator of an IT innovation become successful (which is reflected to innovation performance) really may depends on the similarity between the innovation required by the external institutional environment and the firm’s prior innovations (which form the basis of the organization’s modification routines). As such, the level of similarity between the types and domains of an innovation that a firm has previously made and the types and domains of change that are required by the current environment should also moderate the impact of the choice of becoming an initiator of IT innovation on the firm’s innovation performance (H2). Given some anecdotal evidences that the first movers (the initiators of innovation) are not always successful in high-tech industries (so-called, innovators’ dilemma) (Christensen 2011), the similarity between the required innovation and the previous innovation can be an important contingent factor that moderates the impact of being initiator in IT innovation on firm performance. With these perspectives, we hypothesize that

*H4: The similarity between the types and domains of an innovation that a firm has previously made and the types and domains of change that are required by the current environment positively moderates the relationship between the choice of becoming an initiator of IT innovation and innovation performance.*

Figure 1 illustrates the research model. The degree of modification routines established in a firm is positively related to the firm’s decision to be an initiator of IT innovation in its institutionalized field (H1). If a firm becomes an initiator of change in its institutional field rather than a follower, then it is more likely to have better performance (H2). Finally, the similarity between the types of changes upon which a firm has made its modification routines and the types of changes that are required by the institutional field moderates the relationship in Hypothesis 1 and Hypothesis 2 (H3 and H4).



## Tentative Research Methodology

The data will be gathered *at the firm level*, but the unit of analysis will be the “IT innovation events” of firms. The possible research site can be a field, which has undergone punctuational change in various domains of operation and has enough of a population. The research field of this study is the Korean stock trading industry from the late 1990s to the late 2000s, with the following reasons. First, during this period, a great deal of IT innovation events have taken place, such as the launch of web-based trading and mobile trading services. Second, according to the KRX (Korea Exchange), there are approximately 80 stock trading service firms, which include traditional stock exchange companies, online trading companies, and banks with stock-trading service divisions<sup>1</sup>. Finally, firms in this field recently released various versions of mobile stock-trading systems. Some of firms initiated the release of mobile stock-trading systems, and others have followed the release of these systems. Mobile stock-trading systems are now widespread in Korea, and most stock-trading companies offer these services so that offering these services is by now institutionalized. Therefore, this research field provides a good source of data because it has 1) the variation of being initiators (or followers) of IT innovation events, 2) the possibility of variation in the modification routines, and 3) enough sample size, and 4) the possibility of getting performance data.

### *Description of research site: Korean stock trading industry as a fast-changing institutional field*

Since this paper looks at a fast-changing environment, the environmental conditions require firms to make changes and release innovative products and services very frequently. The institutional field in this paper is the Korean stock trading (and banking) industry (ReportWorld 2007). The participants of this industry consist of 1) traditional stock trading firms, 2) online trading firms, and 3) the banks that have their own stock trading divisions. Since the infrastructure of Internet connectivity became widespread and the Dot-com boom emerged in the mid 1990s in Korea, the competitive environment has changed significantly. Because of the Dot-com boom, new client groups were created. That is, a new customer group 1) with relatively less money to invest, 2) needing only trading services, and 3) without an individual advisory service. However, this customer group is very important for firms because many individual investors in this group do so-called “day-trading,” which generates significant revenue from online brokerage fees. Because of this new customer group, firms have often had to change their service structure and offer cheaper and more convenient online-trading services. Also, the ever-changing IT infrastructure (broadband Internet) and new telecom devices (e.g., cell-phones, Smartphones, Tablet PCs, etc.) have required firms to frequently re-design their trading services. As a result, the firms in this industry have had to make quite a few IT innovations.

### *Data gathering, measurement, and data analysis*

Data will be gathered from secondary archival data, such as news articles or financial databases. Although the measurements will be modified after we have several in-depth interviews with key informants from this industry, the tentative plan for measuring the constructs of this study are as follows.

*Initiator of the change in the institutionalized field:* In this research, we will focus on three important innovation events related to mobile stock-trading services: 1) *the mobile-trading systems on PDA (or cellular phones with first-generation mobile Internet) in the early 2000's*, 2) *mobile-trading systems on first-generation smartphones (before*

<sup>1</sup>The number of firms is from the internal document in the KRX (Korea Exchange).

iPhones and android phones) in the mid 2000s, and 3) mobile trading apps on iPhones or android phones (on 3<sup>rd</sup> generation mobile networks) in the late 2000s. For each of these three IT innovation events, we will find a time when each firm launched one of these mobile stock-trading services in the market. If a firm released each of these three mobile stock-trading services for the first time in the industry, then this firm gets 100% of the scores on “being an initiator for the innovation event” (the first initiator). If another firm released the service after all other firms, this firm gets 0% of the scores on “being an initiator for the event” (the last follower). The other firms who are between the first initiator (100% in “being an initiator score”) and the last follower (0% in “being an initiator score”) will be given scores in-between, according to the time when each firm released its particular innovation.

Innovation performance: In order to measure the innovation performance of each innovation event, we will measure the “market share in number of transactions” or the “market share in trading volume” at the time when each of three stock-trading services is institutionalized (we will talk with key informants in the industry about when the best time will be for measuring these market shares). In detail, the market share in terms of the number of transactions can be calculated by “the number of transactions made with a focal stock-trading service by a firm” divided by the “total number of transactions made with the mobile trading service by all firms in the market,” and the market share in terms of trading volume can be calculated by “the volume traded with a focal stock-trading service by a firm (in \$) divided by the total market volume traded with the mobile trading service by all firms in the market.”

Degree of modification routines established: Modification routines refer to how much innovation events in various operation areas are routinized. Then, we have to define what the operating routines are. Nelson and Winter (1982) argued that operating routines restrict an organization’s available procedures for 1) producing outputs, 2) acquiring resources, 3) selecting among lower-level routines, and 4) coordinating the activities of members. Haveman (1992) mentions that organizational forms can be encompassed by domains, which include 1) the clients a firm serves, 2) the goods and services the firm produces, and 3) the technologies the firm employs. Combining these two perspectives, we propose that operational routines in general should include 1) the way a firm produces its goods and services for its clients, 2) the way it acquires resources from its suppliers, 3) the way it applies technology, and 4) the way it manages employees. In addition, as this study focuses on IT innovation, the operating routines should be related to IT-related activities. Combining these perspectives, we suggest that the operating domains of previous innovations for this study should include 1) client (user) interfaces, 2) IT-enabled supplier management, 3) back-office technologies, and 4) the administration of IT personnel.

Therefore, this construct should capture the intensity of the modification routines that each firm has built, prior to the release of the three mobile stock-trading services mentioned above, by measuring 1) the number of previous IT innovation events made by a firm and 2) the mean time elapsed between the previous IT innovation events and the release of the mobile-trading systems (for which we measure the variable “being an initiator”) in the four operating dimensions mentioned above. In more detail, we will search the secondary database to code the dates and types of IT innovations made during one (or two) year(s) prior to the release of the three mobile trading services. For example, if a firm released its first mobile stock-trading system in January 2002, then we will search the archival database between Jan. 2000 (or Jan. 2001) and Dec. 2001 to code the date and the types of IT innovations made in the four dimensions of operating routines above. We will repeat this procedure for the other two focal IT innovation events (the release of mobile-trading systems on first-generation smartphones and the release of mobile trading applications on iPhones or android phones). Then, some necessary ways to combine the numbers of and time elapsed after those IT innovation events will be developed.

The similarity between the previous IT innovation and the required IT innovation by the current environment: To measure the similarity between the previous IT innovation made by a firm and the IT innovation required by the current environment, we will compare the types (e.g., operating domains) of IT innovations made by a firm prior to the release events of the three mobile stock-trading services and the types of IT innovations required to be successful in each of the mobile trading services. For example, if a firm made an IT innovation related to the focal mobile-trading services during one (or two) years prior to the release of the mobile-trading system, then the firm’s similarity scores will be higher, but if it made an IT innovation that may not have much to do with mobile-trading systems during this period, then its similarity score will be lower.

The exact scheme of operationalization of this construct will be elaborated later. To assure that these measurements are feasible, interviews with key informants will be conducted. Data will be analyzed with a regression-based model. Details of the data gathering and analysis will be presented in the full paper.



## **Discussion of Possible Contributions**

The possible contributions to the literature are as follows. Firstly, this research suggests the theoretical model and tests an empirical model of the impact of modification routines on a firm's role in the institutional field. This theoretical model combines the concept of organizational learning (Levitt and March 1988), population ecology (Amburgey et al. 1993; Hannan and Freeman 1984), and institutional change theory (Tolbert and Zucker 1983). Basically, this model suggests that if a firm learns how to innovate by previous innovation, then it habituates itself in some patterns of innovation (modification routine established). Then, this modification routine will influence the firm's choice to be the initiator of innovations in an institutional field. If the innovations required by the environment are similar to the previous innovations upon which the firm built its modification routines, then the firm will have a higher chance to be the initiator of institutional change. This model can enrich the knowledge of firms' innovation-related behaviors with the organizational learning and ecological perspectives. Secondly, this paper first suggests the construct of "the degree of modification routines," which captures a firm's experience of successful previous changes in different domains of IT innovation: IT services released, client (user) interfaces, IT-enabled supplier management, other back-office technologies, and the administration of IT personnel. This construct can be modified and used by future researchers who want to study the impact of a firm's previous innovation on new innovations, as well as on firm performance.

One practical implication is that if a firm wants to innovate, in order to confront the fast-changing environment, it has to first know what types of innovations are required and what types of innovations it is good at. If the firm is good at the similar types of changes required by the environment, it is better for the firm to be an initiator of the change. However, if it does not have competency in the change required by the environment, then the firm may be better off if it waits until the changes are made by others and are institutionalized; then, it should follow the institutionalized changes in order to avoid the detrimental effect of innovation. Another practical implication is that firms should build modification routines in various operating routines in order to confront an external fast-changing environment to gain benefit by being initiators of change and to survive in the long term.

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