Organizational Learning Platform and New Product Development

Wee-Liang Tan and So-Jin Yoo

Singapore Management University

Abstract

Many countries are keen for their SMEs to innovate and develop new products and services. To innovate requires the firm to acquire new skills and or knowledge whether it seeks to make incremental or radical innovations. Organizational learning is critical to innovations in SMEs. In an increasingly complex business environment, organizations have been confronted with rapid changes in technology, competition, regulation and customer needs and demands. This has caused managers and researchers alike to search for new ways of developing organizational capabilities by continuous adaptation and anticipation of the need for change. Organizational learning, which promotes continuous adaptation and change, has therefore captured the imagination of managers seeking to survive the current turbulent operating environments.

Despite its importance and impact overarching an organizational performance, there has not been much attention paid to how to implement and apply this tenet to organizations. Implementing organizational learning requires a recognition and identification of facilitating factors. This study, therefore, aims to empirically examine 1) how both facilitating factors and inhibiting factors affect organizational learning, and 2) how organizational learning influences performance of new product development.

1. Introduction

In an increasingly complex business environment, organizations have been confronted with rapid changes in technology, competition, regulation and customer needs and demands. This has caused managers and researchers alike to search for new ways of developing organizational capabilities by continuous adaptation and anticipation of the need for change. Organizational learning, which promotes continuous adaptation and change, has therefore captured the imagination of managers seeking to survive the current turbulent operating environments.

Despite its importance and impact overarching an organizational performance, there has not been much attention paid to how to implement and apply this tenet to organizations. Implementing organizational learning requires a recognition and identification of both facilitating and impeding factors. Although recent studies have provided a number of facilitating factors for learning in organizations, they tend to be rather descriptive or suggestive, employing small number of samples or case-based studies in nature (Senge, 1990; Nevis et al., 1995; Goh and Richards, 1997). Similarly, although prior studies have revealed a number of factors, presumably inhibiting organizational learning, they are more or less likely to be either conceptual or small number of case-based studies (Adams et al., 1998;

Bierly and Hamalainen, 1995). As a result, the findings derived from those studies are required to be validated from large sampled, quantitative researches.

This study, therefore, aims to empirically examine 1) how both facilitating factors affect organizational learning, and 2) how organizational learning influences performance of new product development.

The current paper is structured as follows. First, relevant literature on organizational learning will be reviewed, and research model and hypotheses developed. Research methodology then will be discussed, and analysis and findings will be provided. Results will be discussed and implication will be provided.

2. Relevant literature and hypotheses development

Garvin (1993) provides the normative definition of learning organization as: "an organization skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect knowledge and insights." He asserted that "new ideas are essential if learning is to take place, and whatever the sources, these ideas are the trigger for organizational improvement. Without accompanying changes in the way that work gets done, only the potential improvement exists." This definition of organizational learning reflects three overlapping stages of learning process: 1) cognition; 2) behavior; and 3) improvement in performance.

Whether consciously choose or not, all organizations learn via their individual members. Organizations may be able to learn independent of any specific individual but not independent of all individuals. Organizational learning is thus affected either directly or indirectly by individual learning (Kim, 1993). Though individual learning is important to organizations, organizational learning is not simply the sum of each member's learning (Fiol and Lyles, 1985; Hedberg, 1981). Organizations, unlike individuals, develop and maintain learning systems that not only influence their immediate members, but also are then transmitted to others by way of organization histories and norms (Fiol and Lyles, 1985). Collective learning is one of the major features that differentiate organizational learning from individual learning. Even when organizational members leave and leadership changes, knowledge and skills developed and shared among the members through learning can be accumulated and preserved in organizations' memories. Consequently, these routines and memories stored in the form of manuals, procedures, symbols, rituals and myths, influence and determine the direction and scopes of individual and organizational learning (Kim, 1993; Romme and Dillen, 1997).

Most authors refer to two kinds of learning processes: single-loop learning (adaptive, lower-level; feedback) and double-loop (generative, higher-level; feed-forward) learning. Single-loop learning, resulting from repetition and routines, involves processes in which errors are tracked down and corrected within the existing set of rules and norms (Fiol and Lyles, 1985), and primarily concentrates on a specific activity or direct effect (Romme and Dillen, 1997). This type of learning is particularly important in situations in which the organization controls its environment (Duncan and Weiss, 1979). On the other hand, double-loop learning involves changes in the fundamental rules and norms underlying action and behavior (Argyris and Schon, 1978), and generally has long-term effects with consequences for the whole organization. This type of learning occurs through the use of heuristics, skill development, and insights, and it is thus more cognitive than is lower-level learning. The desired con-

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sequence of this type of learning often is not any particular behavioral outcome, but rather the development of frames of reference, or interpretative schemes, new cognitive frameworks within which to make decisions. Since changes in higher-level learning are intertwined with structural change making organizational changes or adjustments does not and should not automatically assume the existence of learning. In fact, "unlearning" may be the one of the most important consequences of higher-learning (Fiol and Lyles, 1985). Because higher-level learning can be a costly and painful process, it is normally elicited only by major difficulties (Miller and Friesen, 1980). Argyris and Schon (1978) emphasize double-loop learning as an important, often missing, level of learning in contrast with single-loop learning, which they have found to be more common. They further asserted that organizational performance problems are more likely due to a lack of awareness and inability to articulate and check underlying assumptions than to a function of poor efficiency. Senge (1990) argues that the prevailing view of learning organizations emphasizes increased adaptability, which is only the first stage in moving toward learning organizations. He further suggests that leading companies are focusing on generative learning, which is about creating, as well as adaptive learning, which is about coping. In this study, we employ double-loop learning as our definition for organizational learning rather than single-loop learning.

2.1 Antecedents to Implementing Organizational Learning

Although organizations are assumed to learn, the impacts derived from the learning would be different accordingly by the input and resources invested in. Organizational learning starts with the intention and willingness to learn, which is articulated and supported by top management and shared by the members of organizations. Without providing appropriate tools and platform for learning to be implemented in organization, effective learning won't take place in organizations. Developing effective learning organization requires a deliberate intervention by leaders to establish the necessary internal conditions for the organization to operate in a learning mode (Garvin, 1993; Goh and Richards, 1997). Learning takes time, and thus early identifying and assessing the impact of the factors leading to learning could help managers focus on specific interventions required to improve learning within organizations.

A number of factors have been listed considered to promoting organizational learning in past studies. For example, McGill and Slocum (1993) suggest that openness to different experiences, a willingness to acknowledge failures and to learn from them, and an orientation to continuous experimentation are important behaviors that promote organizational learning. Pedler et al., (1989) list a set of conditions describing a learning organization as: 1) individuals, groups and departments exchanging and sharing information on expectations and feedback on satisfactions to assist learning; 2) information systems that enable members to question current operating assumptions and seek information for individual and collective learning; and 3) culture and management style within the organization encourage experimentation, learning and development from success and failures. By analyzing the commonalities among the various recommendations found in the literature, Goh and Richards (1997) provide five major underlying organization characteristics and management practices: 1) clarity of purpose and mission; 2) leadership commitment and empowerment; 3) experimentation and rewards; 4) transfer of knowledge; and 5) teamwork and group problem solving. Nevis et al., (1995) have de-

veloped a comprehensive model of organizational learning and suggested ten facilitating factors focusing on practices in the organizations: 1) scanning imperative; 2) performance gap; 3) concern for measurement; 4) experimental mind-set; 5) climate of openness; 6) continuous education; 7) operation variety; 8) multiple advocates; 9) involved leadership; and 10) systems perspective. Senge (1990) suggested the use of five component technologies for promoting learning in organizations: 1) systems thinking; 2) personal mastery; 3) mental models; 4) shared vision; and 5) team learning. Fiol and Lyles (1985) provide four contextual factors which affect the probability that learning will occur: 1) corporate culture conducive to learning; 2) strategy that allows flexibility; 3) organizational structure that allows both innovativeness and insight; and 4) the environment. Sinkula et al., (1997) conceptualize learning orientation as "set of organizational values that influence the propensity of the firm to create and use knowledge," and suggest three organizational values routinely associated with the predisposition of the firm to learn: 1) commitment to learning; 2) open-mindedness; and 3) shared vision. Slater (1995) describes three essential features of learning organizations: 1) facilitative leadership; 2) a market-driven, entrepreneurial culture; and 3) open, organic structure.

Those above factors considered enhancing organizational learning are deemed to be rather broad, descriptive and perceptual, and lack more practical aspects such as investment and budgeting in learning or systemic support and appraisal for learning. By referring to the various recommendations found in the literature and interview with practitioners, we developed three major factors enhancing implementation of organizational learning: 1) learning commitment; 2) learning readiness; and 3) open-mindedness.

Organization learning requires commitment on part of the firm. While learning intent reflects the decision on the part of the firm in its "mind" and "will" that it intends to engage in organization learning, organization commitment refers to its implementation of its intent. Whereas intention is the equivalent of vision and an antecedent to action, we call the firm's action in carrying out its intention, learning commitment. Here we use the word "commitment" in the sense of a firm's dedication to its learning intent. It is the firm's sincere and steadfast adherence to the goal of learning. Such commitment is action-oriented. It would manifest itself in actions such as the setting aside and devoting a portion of its resources towards learning infrastructure, systems, activities, training and development, policies and procedures amongst other things, needed for organization learning. Our definition of "learning commitment" is different from the one of Sinkula et al., (1997) who viewed it as a value toward learning. In fact, learning commitment in learning orientation (Sinkula et al., 1997) is more likely to be cognitive and perceptual whereas our approach emphases on actual investment in learning to occur. Recent study (Yoo and Tan, 2008) suggests that learning intent (commitment in Sinkula et al., 1997) was not related to the learning outcomes in inter-firm collaboration.

Although organizations may commit resources, efforts and address organization learning, the difference between different organizations in their actual learning may be because of different levels or organization readiness. Much like units in the military that, with their training and preparation for mobilization for war, are at differing levels of operational readiness, organizations depending on the activities, resources and commitment would be at differing levels of learning readiness. Organizations that have yet to build the capabilities required for learning would be less ready that those that have. It includes appropriate and timely feedback and appraisal on learning and value shared among the members of organizations.

Open-mindedness is the willingness to critically evaluate the organization's operational routine and accept new ideas (Calantone et al., 2002). Mental models, deeply held images of how the world works, limit us to familiar ways of thinking and acting (Day and Nedungadi, 1994). When organizations proactively question long-held routines, assumptions, and beliefs, they are engaging in the first phase of unlearning. Unlearning is at the heart of organizational change, and open-mindedness is an organizational value that may be necessary for unlearning efforts to transpire. (Sinkula et al., 1997).

As discussed, organizational learning starts with the intention and willingness to learn. Without providing appropriate tools and platform for learning to be implemented in organization, effective learning won't take place in organizations. Therefore, it is hypothesized that

H1a: Organizational learning will be facilitated by its level of commitment to learning.
H1b: Organizational learning will be facilitated by its level of readiness for learning.
H1c: Organizational learning will be facilitated by its level of open-mindedness to learning.

2.2 Barriers to Organizational Learning

Prior to designing learning culture in organization, it is necessary to recognize and identify the possible barriers to learning to occur in organization. Early detecting and eliminating factors inhibiting implementing learning in organization is equally important as building platform for learning to occur. There has been a small number of attempted made in identifying the barriers to organizational learning compared to those focused on facilitating factors.

Bierly and Hamalainen (1995) suggested four impediments to organizational learning: 1) environmental stability, 2) structure of organization, 3) organizational culture, and 4) the need for organization to unlearn. According to them, an open decentralized structure is typically more flexible, adaptive, and responsive to external and internal stimuli. Not only affecting the inter-functional communication and learning, the organizational structure but plays a role in determining who communicates most frequently with, and influences, the top management. The organization's culture can either facilitate or impede the different types of learning. The culture that values such as risk-taking, openness in communication, and teamwork are shared and rewarded throughout the organization will facilitate internal learning (Starbuck, 1992).

Organizational "inertia" is one of the greatest barriers to learning. Organizational change is difficult. Inertia is resistance to change, or, at least, resistance to changes that run counter to a fundamental existing orientations (Miller, 1993). A firm's prior history (memory) constraints its future behavior in that learning tends to be premised on local processes of search (Levitt and March, 1988). Organizations often resist change even when their environments threaten them with extinction (Thompson, 1967), because a whole learning system is bound together by a theory of action. Radically new situations require that theories of action be replaced, but organizations have difficulties doing this (Argyris and Schon, 1978). Evolutionary and contingency theorists have suggested that there are integral relationships among environmental, organizational, and strategy-making variables, and changing only one or two key elements might upset the balance, destroying complementarities (Miller and Friesen, 1980). Organizational myths, norms, and procedures that have worked well in the past are very difficult to change. Thus, many successful organizations tend to become complacent, learn too little, and

eventually fail (Nystrom and Starbuck, 1984). Unlearning is a prerequisite for generative learning to take place. Unlearning is the process through which learners discard knowledge and make room for new responses and mental maps (Hedberg, 1981). Unlearning takes time and resources, and in the meantime they are quite disoriented or paralyzed. Organizations, which have been poisoned by their success, are often unable to unlearn obsolete knowledge in spite of strong dis-confirmation (Nystrom et al., 1976). Unlearning is needed in order to make room for more adequate interpretative frameworks and responses in organizational memory.

Another impediment to learning is "compartmentalized thinking." Many large, established organizations break tasks down into separate steps, and give people a clear role to play and set of requirements to meet. The shared mental models that develop in these organizations reflect different functional thoughts worlds (Dougherty, 1992). Thus, different groups in these organizations often have different targets and tend to evaluate the same outcome differently (Levitt and March, 1988). These routines lead to compartmentalized thinking (Kanter, 1983), and each department focuses on its own goals and as a result, information either does not cross the boundary or is interpreted quite differently on the other side. A poor communication between people and between organizations can be a major block to learning and quality improvement. (Stata, 1989) Intra-organizational knowledge sharing refers to collective beliefs or behavioral routines related to the spread of learning among different units within an organization (Moorman and Miner, 1998). It keeps alive the knowledge and information gathered from various sources and serves as reference for future action (Lukas et al., 1996).Thus, it is hypothesized as

H2a: Organizational learning will be inhibited by its level of inertia.
H2b: Organizational learning will be inhibited by its level of compartmentalized thinking.

2.3 Consequences of organizational learning

As discussed earlier, organizational learning is believed to engender improvement in performance. A number of studies have investigated the effects of organizational learning on organizational performance (Calantone et al., 2002; Sadler-Smith et al., 2001; Baker and Sinkula, 1999; Bontis et al., 2002). Baker and Sinkula (1999) posited that learning orientation will indirectly influence organizational performance through product innovation because learning orientation is expected to facilitate the type of higher-order learning that leads to technologically driven shift in product paradigms. New product success is the dimension of performance that involves the firm's ability to adapt to changing conditions and opportunities in the environment (Walker and Ruekert, 1987). Day (1994) suggests that various market sensing information processes are crucial inputs to new product activities in learning firms. Prior studies suggest that how organizational information processes affect timeliness depends on which information process is being considered. Information acquisition processes are crucial in sensing signals of environmental change (Klein and Newman, 1980) and thus allow organizations to generate timely strategies. Likewise, effective information transmission should speed the process of strategy development because it ensures that all parties involved are aware of relevant information that is crucial to the new product (Cooper and Kleinschmidt, 1994).

Successful organizations rely on external information to detect opportunities emerging in the environment and respond with creative solutions (Aguilar, 1967). When such information is transformed through internalizing process and creates new knowledge, organizational learning can contribute to the development of novel products. Therefore, it is hypothesized as

H3a: Organizational learning will positively influence the timeliness of new product development.
H3b: Organizational learning will positively influence the creativity of new product development.

3. Methodology

This study employed a mail survey and data was collected from the multiple sources to tackle the problems of common method variance. Although the nature of the data collection (retrospective responses to both independent and dependent variables via mailed questionnaire) opens up the issue of common methods variance problems, several actions were taken to limit them. To the issue of knowledge, respondents were jointly selected to identify those that were most knowledgeable about the specific projects being studied. For example, information on antecedents (learning commitment and readiness, open-mindedness and sharing value) and barriers to learning was collected from the top/owner managers whose opinion has been generally highly reflective of the organization as a whole (Hambrick, 1981). Meanwhile, information on the consequences of learning such as new product development performance (speed and creativity) was obtained from R&D manager (or marketing manager) of the organization. To the issue of information recall, only relatively recent projects were requested (within three years). Moreover, various checks were undertaken to limit such biases. We took Parkhe (1993)'s recommendation and performed post hoc single factor test. The results of un-rotated factor analysis revealed neither a single nor a general factor, suggesting that the threat to validity posed by systematic variance common to the measures is lacking.

3.1 Research Sample

Korean Innovation Business (Inno-Biz) was selected as the research population. The Korean government has selected a certain number of innovative businesses biannually since 2001 employing the OECD Oslo Manual, which is the internationally recognized standard for measurement of innovation. The sample frame was derived from 368 firms classified as the Innovation Business in 2002. The questionnaires with cover letter were mailed to top/owner managers of 358 firms after excluding 10 firms used for the pre-test.

16 questionnaires out of 358 that had either failed to reach the organization or refused to participate in were excluded from the population count of the initial mailing-out, yielding a relevant population of 342. A total of 173 respondents from two mailings returned, giving an overall response rate of 50.6%. After excluding 50 firms, which had incomplete responses, 123 usable questionnaires were used for the analysis of the data. The response rate was considered to be very satisfactory for a mail survey, particularly with only two waves of mail-out although there were pre-notification and encouraging phone-calls for participation. Several two-sample t-tests were performed to investigate sample biases such as non-response bias and control variable bias (firm age and size), and no bias was found.

No single industry dominated the respondent firms (information and communication, 31.7%; machinery and metal, 23.0%; electric and electronic, 20.6%; medical equipment, 8.7%; biochemical, 4.8%, and others, 11.2%). The types of businesses were - manufacturers (65.1%), service (12.7%) and both (22.2%). Majority of the firms have been in business less than 10 years (86.5%) and had less than 100 employees (90.0%). 86.5% of the firms had total sales less than 10 million dollars in previous year. The respondents firms were considered to be new and small in size.

3.2 Measuring Variables

The measurement scales were derived from the organization learning and new product development literature, and some items developed by the authors. Organizational learning scale was composed of five items, adapted from Bontis et al., (2002) and Baker and Sinkula (1999). Since organizational learning involves embedding individual and group learning into non-human aspects of the organization and assimilates new learning (feed forward) (Crossan et al., 1999), we employed items reflecting individual, group learning, and feed-forward learning. With respect to commitment for learning we were interested in the systemic support for learning and budget for training and learning. Five items were either employed from Bontis et al., (2002) or developed by the authors. Readiness for learning included fair treatment of ideas, relevant feedback from the managers, and shared value at organizational level. Five items measuring organizational readiness for learning were adapted from Sadler-Smith et al., (2001), Goh and Richards (1997), and Baker and Sinkula (1999). Three items measuring open-mindedness was adapted from Baker and Sinkula (1999) and Goh and Richards (1997). The respondents were asked to indicate their perception on a 7-point Likert-type scale, ranging from of 'strongly disagree' to 'strongly agree.'

Barriers to learning were measured by eight items, adapted from Adam et al., (1998) - four items for compartmentalized thinking in disseminating information and four items for inert.

Moorman (1995)'s 7-item scale was employed to measure performance of new product development. Two items measured timeliness of new product development (timelines to develop and market) and five items measured creativity of new product developed.

3.3 Validity and Reliability

All constructs were considered to have face and content validities derived from the literature (Baker and Sinkula, 1999; Sadler-Smith et al., 2001; Bontis et al., 2002; Goh and Richards, 1997; Adam et al., 1998; Moorman, 1995). Discriminant validities for the constructs were assessed by the exploratory factor analysis, using principal component factor method with varimax rotation. All 16 items for antecedents to learning and organizational learning scales were factor analyzed and clearly loaded on the four separate constructs as anticipated, supporting discriminant validities of these constructs. 7 items for timeliness and creativity of new product development were also loaded on two separate factors as anticipated. A coefficient alpha test was performed to investigate the internal reliability of the measuring scales. All scales (commitment, 0.80; readiness, 0.81; open-mindedness, 0.74; organizational learning, 0.72; compartmentalized thinking, 0.83; inertia, 0.70; speed, 0.90; and creativity, 0.94) were above the cut-off of 0.70 (Nunnally, 1978). Means, standard deviations and correlations among the variables were provided in table 1.

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4. Analysis and Results

Hypothesized model was examined by two stages of analysis. First, hypotheses were examined by path analysis (structural equation modeling), which can simultaneously measure each path coefficients for causal-effects whilst providing overall fit of goodness for the model. For path analysis, the adequacy of the model was first investigated and then significance of each path coefficients was examined. The goodness of fit measures well met the minimum requirement for the adequacy of the model (e.g., GFI= 0.97, AGFI =0.89, NFI = 0.93, IFI = 0.98, TWI = 0.93, CFI=0.97, RMSEA=0.06). The significance of path estimates was examined using a critical ratio (C.R.), and six out of eight coefficients were significant ($p<0.1$ to 0.01). Significance and effects of each path coefficients were provided in the table 2. Path coefficients for learning commitment (0.19, $p<0.01$), learning readiness ($r=0.32$, $p<0.01$), and open-mindedness ($r=0.20$, $p<0.1$) were all significant and positive, supporting hypothesis 1a, 1b and 1c. Meanwhile, path coefficients for organizational inertia was significantly and negatively related to organizational learning ($r=-0.21$, $p<0.01$) and thus hypothesis 2a was supported. However, compartmentalized thinking to organizational learning was not significant. Hence, hypothesis 2b was not supported. Finally, the path coefficients for organizational learning to speed ($r=0.15$, $p<0.01$) and creativity ($r=0.46$, $p<0.01$) of new products development were significant and positive, supporting both hypothesis 3a and 3b.

5. Discussion and Implications

The purpose of this study is to investigate the possible effects of factors both considered to enhance and inhibit organizational learning. A number of interesting findings emerged from the analysis for discussion and implications.

As predicted, those three factors - learning commitment, learning readiness, and open-mindedness - were found to enhance organizational learning. Unlike the prior studies, we employed more practical, action-based items for measuring facilitating variables for learning. Organizational learning starts with the intention and willingness to learn. Without providing appropriate platform for learning to take place, learning intent will never be realized. This study aimed to reveal the variables considered to be important in designing implementation of learning in organizational level. In contrast to our expectations, inertia was the only variable proved to have a negative effect on organizational learning, and compartmentalized thinking was not considered to have any significant effects on that. Indeed, it is the organizational inertia that impedes learning to occur, particularly in case of generative (high-level, double-loop) learning, which requires unlearning and discarding the long-held mental models. It would seem that compartmentalized thinking could be reduced to some level by encouraging risk-taking and experimentation or by restructuring the organizational systems and structure. As expected, organizational learning was found to have a positive effect on the performance of new product development (NPD).

This study contributed to the research in organizational learning by empirically investigating the effects of facilitating variables on organizational learning. Both managers and researchers can benefit from the finding provided in this study for designing effective learning organizations.

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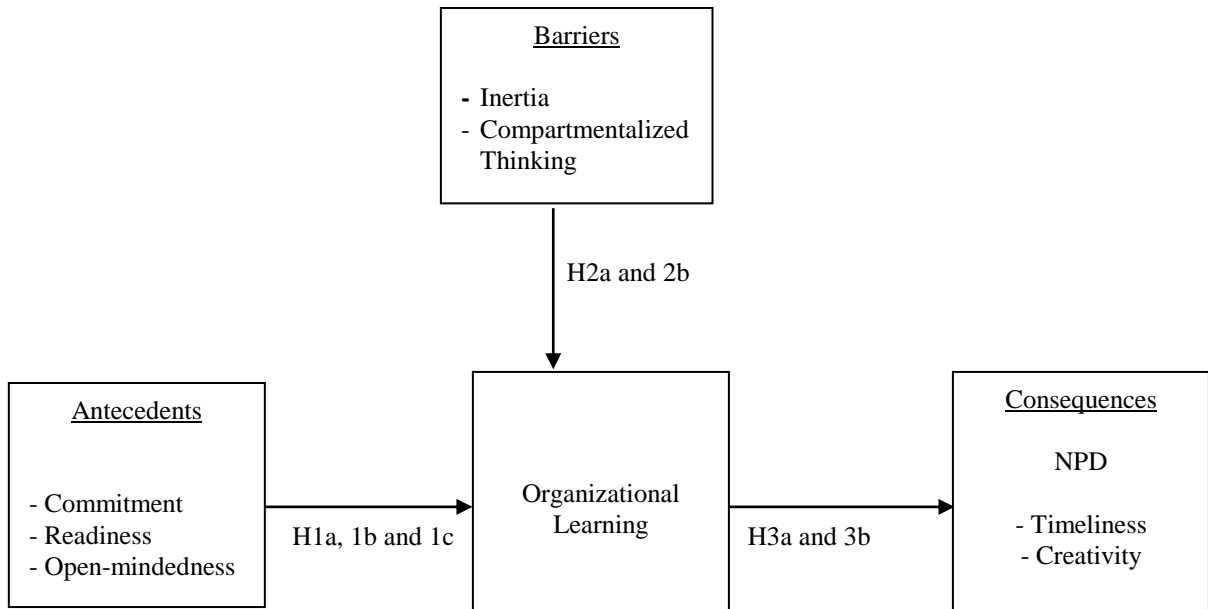
Figure 1 Hypothesized Model

Table 1 Means, Standard Deviations and Correlations among the Variables

Variables	Means	SD	1	2	3	4	5	6	7
1. Commitment	22.71	5.86	-						
2. Readiness	26.52	4.31	0.56**	-					
3. Open-mindedness	16.36	2.72	0.34**	0.46**	-				
4. Organizational Learning	23.84	3.97	0.49**	0.55**	0.41**	-			
5. Compartmentalized Thinking	12.89	3.59	-0.19*	-0.33**	-0.38**	-0.37**	-		
6. Inertia	14.42	3.64	0.12	0.08	-0.15	-0.16	0.45**	-	
7. Speed	8.56	2.49	0.29**	0.23**	0.16	0.28**	0.06	0.09	-
8. Creativity	26.34	6.09	0.09	0.20*	0.27**	0.37**	-0.07	-0.04	0.19*

*p<0.05 **p<0.01

Table 2 Results of Estimated Path Coefficients and Critical Ratio

	Estimate	S.E.	C.R
Commitment → Organizational Learning	0.19**	0.06	3.19
Readiness → Organizational Learning	0.32**	0.08	3.72
Open-mindedness → Organizational Learning	0.20*	0.12	1.59
Compartmentalized Thinking → Organizational Learning	0.01	0.09	0.07
Inertia → Organizational Learning	-0.21**	0.09	-2.28
Organizational Learning → Speed	0.15**	0.05	2.79
Organizational Learning → Creativity	0.46**	0.13	3.48

*p<0.1, **p<0.01