# Towards an organizational learning framework for IS development

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**Abstract**

Information systems (IS) development has been one of IT managers' concerns for decades. To improve the effectiveness of IS development, many studies argued that development methods need the continuous learning mechanism to better utilize the knowledge along with all development stages. In this study, we discoursed the essential important of organizational learning for development team to deal with the complexities of IS development. The development team failed to learn from the experience in prior IS development projects because of limits of individual learning. Knowledge management concepts are gradually mature and will be fundamental theories to integrate the organizational learning mechanism into IS development. This paper illustrated all related literature and theories and proposed an organizational learning framework for IS development. The framework could aid the development team to recognize the value of organizational learning in the IS development activities and guide for devising the mechanisms for acquiring, maintaining and transferring that knowledge.

*Keywords:* IS development, organizational learning framework, knowledge management

## 1 Introduction

The rapid development of Information Technology (IT) increased enterprises' difficulty in the planning, development and management of Information System [1]. SIM had conducted a series of studies on the IT managers concerns in order to analyse the evolvement of the significant issues; in fact, this also represented enterprises' needs derived from their adaptation to environmental changes [2-5]. To facilitate further analysis, Niederman et al., [6] classified the issues along three dimensions and categorized them into four groups:

1) Business Relationship Issues: Including issues of data resources, IT and business strategy alignment, strategic planning, investigation of the role and contribution of IT, organizational learning, competitive advantage, and business process redesign etc.

2) Internal Effectiveness Issues: Including issues of system development, IT human resources management, measurement of IT effectiveness and system transfer etc.

3) Technology Infrastructure Issues: Including issues of information infrastructure, distributed systems, enterprise architecture, and communication networks etc.

4) Technology Application Issues: Including issues of end-user computing system, computer-aided software engineering, executive/decision system, office automation, and group support etc.

The study summarized the managers concerns on IS planning and development over the years and found out that IT and business strategy alignment was one core issue that received most attention from IT managers. Within recent 8 years, it ranked the top for 6 times. Nevertheless, issues related to it including business process redesign, strategic planning of information technology and enterprise architecture also received much attention [3-5]. IS development was reported as another key issue of internal effective group. Improving the effectiveness of IS Development, as a core concern of IT managers, had varied in importance since the studies in the early 1980 [2]. The emergent technologies kept developers on a steep learning curve. High volume of IS development backlog and dynamic nature of development also contributed to this core issue. Lyytinen and Robey [7] noted IS Development projects remain susceptible to failures because organizations fail to learn from their own experiences. Therefore, to improve the effectiveness of IS development, IS development methods need the continuous learning mechanism to better utilize the knowledge and integrate new technologies into the IS development.

## 2 Learning perspective on IS development

IS development methods were designed to be suitable for different environment and purposes. In general, IS development is a set of iterative procedures, which involved continuous change and recycling. This enables the flexibility of IS structures and functions toward the dynamic context. Beside the different operational logic of software engineering methods, the developers have to face the problems caused by the implementation in different environments. The skills of the problem solving mostly are based on their related experiences. Therefore, integrating the mechanism of organizational learning into the

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development process could not only support the problem-solving ability but also enhance the development effectiveness.

IS development in fact was a series of continuous development process (the development cycle and maintenance recycle) and not a single cycle of system development activities. This study emphasized that for the IS development and maintenance process, we needed organizational learning to share the experiences from different development stages. Hayes [8] noted that the learning organizations constantly strive to be better, placing great emphasis on experimentation, integration, application and the building of critical organizational capabilities in all operations. That the effectiveness of each development project will gradually improve through learning behaviours will be a challenge in the future and a critical factor to maintain its effectiveness. This perspective showed the potential value of learning mechanism.

It is essential for IS development to upgrade the individual learning to organizational learning. Organizational Learning is mediated by the learning of individual of organizational members. The difference between them seemed to be varied on different research positions. Popper and Lipshitz [9] clarified the distinction between the two conceptions of individual learning in organizations and learning by organizations, which was also called organizational learning. To maximize the benefits of organizations, it was necessary that individual learning was extended to organizational learning for organizations to systematically collect, organize, and share the valuable experience and knowledge [10]. Lyytinen and Robey [7] also mentioned that IS development was a complicated project activity involved with many team members' collaboration. The nature of learning behaviour (individual and organizational levels) was to extract, save, integrate, and pass these related experiences and adjust or increase habitual domain by feedback information.

## 3 IS Development and learning mechanism

In the IS development context, the professionals also need to learn the problem solving in situations where technical and contextual information are inseparable. The traditional IS development methods put much emphasis on the management of development document, but IS development methods of learning orientation put much emphasis on the organization and sharing of accumulated experiences in addition to the management of development document. The main difference was that the latter one must be based on the results of the former one, and of course this must satisfy cost consideration; because if the results of the former one couldn't assist the effectiveness of the redevelopment procedure and it couldn't be assisted by the former experiences, and then it would be greatly restricted by the former system. However, system development methodology needed to interact with the sub-models of organizational learning and hence the activities of the experience of introduction, the evaluation and synthesis of experience and feedback of application information must be added in each stage.

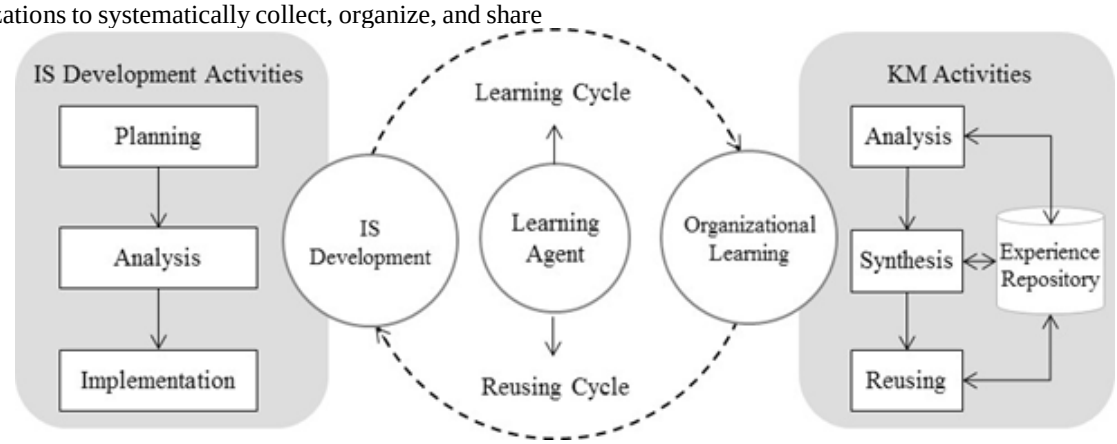


FIGURE 1 Organizational learning oriented IS development model

IS development methods by which developers accumulate knowledge about action-outcome relationships and the effect of the environment on these relationships [11]. Organizational learning oriented IS development model (Figure 1) was to formalize learning behaviours inside the system development process (individual learning level) and make them a part of organizational learning (elevated to organizational learning level). This would make a development method have the ability to learn and evolve; the main part of this model was a learning sub-model, and it enhanced the potential ability of a development sub-model and further improve the overall effectiveness of a development sub-model through the analysis, refinement, integration and reuse of related experiences of a development sub-model. Furthermore, regarding IS development as learning system from which the team members could learn and overcome the inherent biases established among the professionals.

### 3.1 EXPERIENCES AS KNOWLEDGE ELEMENT

The existed development methods for IS majorly focus on the system documents and artifacts management for collaboration in the development context. It causes that IS development organizations tend not to view development activities as organizational learning from prior experiences;

rather, as documents management. In the IS development context, the knowledge to learn are a set of assumed causal relationships between actions taken during IS development stages and desired outcomes [7]. In addition to considering the development documents and artifacts, this study placed direct attention upon the lesson-learn knowledge, named experience-based knowledge elements. By doing so, the IS development is able to adjust its actions based upon knowledge elements gained from internal and external experiences.

For the experiences processed in learning model including action-outcome relationship in system development stages and the contextual information, these experiences were required to be communicable, consensual and integrated. This type of relationship originated from the development process and outcome of IS development methods. Saving these relationships would assist developers' learning about these methods. Martin [12] used encyclopaedia to archive the experiences of action-outcome relationship produced in the development process to support the overall development cycle.

### 3.2 KNOWLEDGE MANAGEMENT MODEL FOR ORGANIZATIONAL LEARNING

Utilizing the mapping of knowledge management mechanism could present how organizational learning theory could be introduced into the IS development stages and also reflect what learning activities should be included in the IS development method with learning mechanism [13, 14]. Organizational learning mechanism could be simply divided into demand loop, supply loop, and feedback loop; using these 3 loops could assist the process of knowledge creation, accumulation and sharing. This study integrated Moore's learning cycle theory [15] and knowledge management model and used this theoretical structure as the basis to construct a new organizational perspective on IS development (Figure 2).

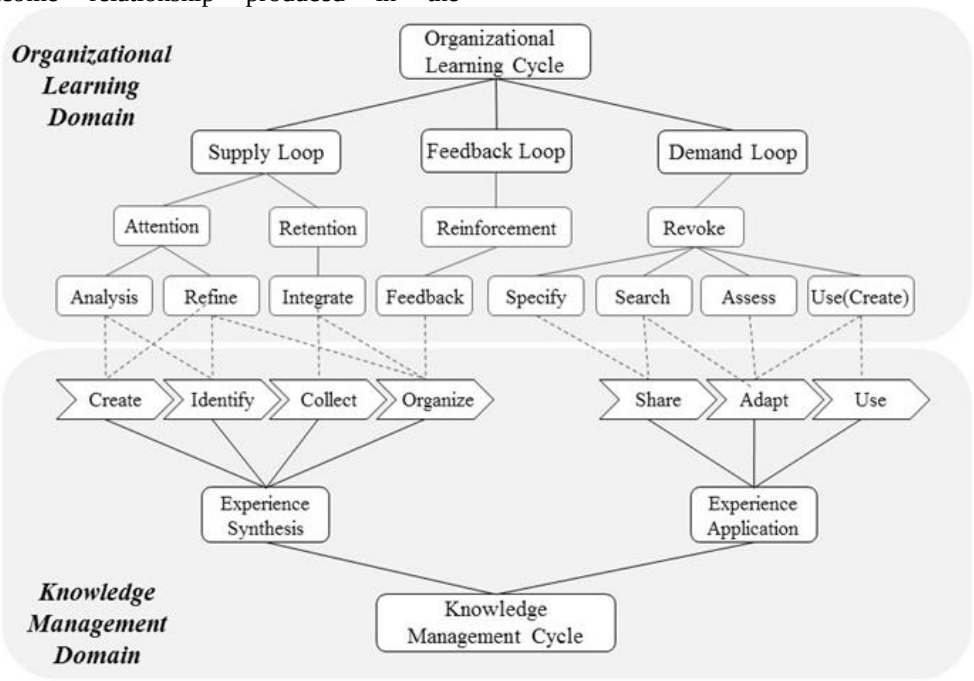


FIGURE 2 Mapping of knowledge management and organizational learning

1 Supply Loop:

This loop could complete learning activities of knowledge attention and retention.

- Analysis: analysing the value of knowledge;
- Refine: refining knowledge and make it more generalized;
- Integrate: integrating knowledge into knowledge repository.

2 Demand Loop:

This loop could revoke knowledge for learning purpose.

- Specify: specifying knowledge in demand;
- Search: searching knowledge satisfying the demand;
- Assess: assessing knowledge found;
- Create: applying knowledge to future context.

3 Feedback Loop:

This loop could reinforce learning activities; its main purpose was to provide feedback about the status of knowledge introduction to be the basis of repository renewal so that its adjustment and activation could improve the core competence of organizational learning.

## 4 Organizational learning framework for IS development

In general, IS development is considered as a systematic and complex activity towards specific project objectives. It can be enhanced by an experience-repository for helping one developer learn from the others in difference stages of IS development. Shortening learning curve for IS development knowledge would be one of critical success

factors [7]. To implement learning mechanism into IS development cycle, knowledge management is a fundamental concept from which to build it up. Sanchez [16] noted that knowledge management is much more effective at leveraging the organizational knowledge and also become better at systematically driving organizational learning.

We proposed an organizational learning framework for IS development in order to improve IS development with learning mechanism. The learning mechanism was divided into experience reusing cycle and experience synthesis cycle. Using these two cycles enabled the development stage to contain learning activity; i.e. experience reusing cycle and experience synthesis cycle were the important tasks to make development activity to have learning mechanism. Utilizing the interactive model of IS development could present how organizational learning theory could be introduced into IS development and also reflect what learning activities should be included in the development stages with knowledge management mechanism (Figure 3).

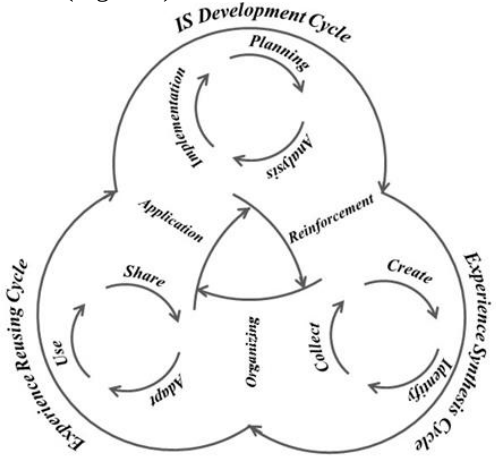


FIGURE 3 Organizational learning framework for IS development

The organizational learning framework of IS development addressed more on the experience synthesis and reusing to make the value of learning from experience.

1. Experience Synthesis Cycle:

Nonaka [17] noted that organizational knowledge was created as involving a contextual interplay between the tacit and explicit dimensions of knowledge and a synthesis flow as knowledge moves through individual and group levels. In the IS development context, experience is identified and synthesized from different IS development stages. The IS development group would perform synthetic analysis and summary in the group meeting about the problem cases and related solutions accumulated by the developers (as learning agents). The feedbacks collected after using related experiences were saved in organizational repository to enhance or reduce the cause-and-effect degree of the experience in cause-and-effect relationship model. Fu and Anderson [18] proposed a reinforcement learning mechanism to provide an integrated explanation of enhancing the recognition level of knowledge.

2 Experience Reusing Cycle:

An important aspect of the knowledge management was reusing the knowledge rather than knowledge itself [19]. The reusing cycle was spread in the development stages. After a problem emerged in the development activity, developers would reuse the related experience.

Besides, utilizing formal technology of experience extraction and presentation model could integrate these experiences into the basic structure of IS development methods. By doing so, it would formally transfer individual learning activity to organizational learning activity. It also can further improve the performance of IS development methods.

## 5 Conclusions

For improving the IS development, some researchers claimed to advance development technologies. Some identified a critical reason for IS development failures, an absence of organizational learning applied to the complexities of IS development activities. The existed development methods for IS majorly focused on the system documents and artifacts management for collaboration in the development context. It caused that IS development organizations tend not to view development activities as organizational learning from prior experiences; rather, as documents management. Many different IS development methods had far distinct rules and logics under different context and personnel quality, and if we could integrate and share the development experiences of these methods so that they could promote the organic growth of organizational level and assist future tasks of system development and maintenance, and this would finally build up significant resources for organizations. Finally, an organizational learning framework for IS development was proposed. For IS development methods with learning mechanism, all related experiences in the process needed to be identified and archived for reusing in the recycling the IS development stages.

## References

[1] Farwell D W, Kuramoto L, Lee D, Trauth, E M, Winslow C 1992 *Information Systems Management* **9**(2) 7-14
[2] Brancheau J C, Janz B D and Wetherbe J C 1995 in MISRC
[3] Luftman J N 2004 *MIS Quarterly Executive* **4**(2) 270-286
[4] Luftman J N and BenZvi T 2010 *MIS Quarterly Executive* **4**(9) 263-73
[5] Luftman JN and Derksen B 2012 *in CIOnet*
[6] Niederman F, Brancheau J C and Wetherbe J C 1991 *MIS Quarterly Executive* **15**(4) 475-500
[7] Lyytinen K, Robey D 1999 *Information Systems Journal* **9** 85–101
[8] Hayes R H, Wheelwright S C, Clark K B 1988 *Dynamic Manufacturing: Creating the Learning Organization*
[9] Popper M, Lipshitz R 1998 *Journal of Applied Behavioral Science* **34**(1) 61–78

[10] Nolan Norton Institute 1998 Putting the Knowing Organization to Value
[11] Rau D, Haerem T 2010 *Information Systems Frontiers - ISF* **12**(3) 287-97
[12] Martin J 1995 *Technology, Strategy Amacom*
[13] Lorino P 2001 *Knowledge Management and Organizational Competence* 177-209
[14] Argote L 2013 *Organizational Learning: Creating, Retaining and Transferring Knowledge*
[15] Moore J M, Bailin S C 1991 *Domain Analysis and Software Systems Modeling*
[16] Sanchez R 2005 *Knowledge Management and Organizational Learning: Fundamental Concepts for Theory and Practice*
[17] Nonaka I 1994 *Organization Science*, **5**(1) 14-37
[18] Fu W T, Anderson J R 2006 *Journal of Experimental Psychology: General* **135**(2) 184-206
[19] Alavi M, Leidner D E 2001 *MIS Quarterly Executive* **25**(1) 107-36

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