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Using meta-abilities and tacit knowledge for developing learning based systems

A case study approach

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Abstract

Purpose – Research has found that the implementation of learning-based systems development is a complex issue since it requires the input of employees at all levels of an organization. Successful implementation is a challenge for organizations as the basic training and education offered by them and the particular experiences of the individuals on their own and other factors such as fear and ignorance prevent such actions. For this purpose, the addition of other elements is also required. This research aims to identify and explain the usage of the elements that can encourage employees to contribute the inputs necessary for learning-based systems development.

Design/methodology/approach – To achieve this aim, this research developed a conceptual framework based on the concepts of meta-abilities and tacit knowledge externalization and sharing. To illustrate the application of the framework in a real life setting, a case study approach that involved a large manufacturing organization in Malaysia was employed.

Findings – The processes undertaken in the novel conceptual framework of this research should ensure that organizational information systems are subject to continual re-examination and modification. By internalizing a system's operations, individuals can improve actions by acquiring better knowledge and understanding, which is the learning process. It was concluded that the future focus for the management of information in organizational learning should be towards the development of an individual's meta-abilities and creating a suitable organizational culture and infrastructure such that knowledge sharing is promoted.

Originality/value – Generally, this paper offers a contribution by illustrating the application of a conceptual framework in a practical situation; thereby demonstrating a theoretical and practical understanding of the integration of staff members into the IS development process.

Keywords Learning organizations, Tacit knowledge, Knowledge sharing, Malaysia

Paper type Research paper

Introduction

Currently organizations are facing turbulent environments and need to develop all the resources that they have (Stewart, 1997). Available resources include land, technology, money, plant, and employees. Presently one of the most important resources for an organization is its employees (Saint-Onge, 1996). However, it has also been found that the human aspects of knowledge creation are critical for sustaining learning-based systems within organizations. An organization's knowledge is considered to be derived from its employees (Von Krogh *et al.*, 2000). In this case, organizational knowledge is

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the staff members' capability (tacit knowledge) that they have developed to draw distinctions in the process of carrying out their work, in particular concrete contexts, by enacting sets of generalizations (propositional statements) whose application depends on historically evolved collective understandings and experiences (Tsoukas and Vladimirou, 2001). Managing this aspect of knowledge means that a company must strive to sustain a spirit of community at work, to encourage employees to improvise and undertake initiatives of their own, as well as actively maintain a sense of corporate mission (Tsoukas and Vladimirou, 2001). Therefore, inquiries based upon the divergence of meanings and perspectives are then facilitated (Courtney *et al.*, 1998).

Previous research within the learning-based systems area has identified one of the factors that causes the failure of learning-based systems as being attributable to the earlier frameworks of organizational learning (OL). These frameworks have not addressed the issue of the process of tacit knowledge, which is deeply rooted in an individual's actions, experiences, ideals, values or emotions (Malhotra, 2004). Utilizing such reasoning, this research attempts to propose a conceptual framework that identifies and discusses the aforementioned issues and eases the process of developing learning-based systems. To achieve this aim, this research assumes that there are two main aspects to be considered:

(1) the ability to externalize and share knowledge and skills; and

(2) self-documentation.

These two aspects are emphasized as they can encourage employees to contribute inputs towards learning-based systems development (Karhu, 2002).

To better understand the purpose of this research, a research question has been developed: how do we include individuals in the learning-based systems development process? Why use meta-abilities in order to include individuals in the learning-based systems development process?

The concept of meta-abilities has been stated in the aforementioned research question. This research proposed the concept of meta-abilities as they have been considered important for the development of employee confidence and a willingness to contribute inputs for learning-based systems development (Butcher *et al.*, 1997). The term "meta-abilities" has been defined in various ways; however, for the purposes of this research, "meta-abilities" is a term that refers to personal attributes that underpin and determine how and when knowledge and skills will be used (Meldrum and Atkinson, 1998). In general, meta-abilities are considered pertinent as these are higher-level abilities obtained from knowledge and skills, which, when combined with the experiences of managers, allow them to be much more effective than would otherwise be the case. In other words, this concept has the potential to increase an individual's creativity and interpretivity, which then impacts other areas of an organization and overall, an organization's performance (Choudrie and Selamat, 2005). Practically, the use of meta-abilities in OL-based information systems (IS) is a novel idea. Nevertheless, meta-abilities have been used extensively in organizational development literature (Butcher *et al.*, 1997). In the organizational development area, meta-abilities were considered pertinent for the development of staff members' confidence and willingness to participate in organizational development. In this research, meta-abilities were developed by using the elements of understanding organizational roles, internal strengths, formal and informal discussions and rational

discourse. These elements are combined in a manner such that a novel framework is formed, which is then applied in a real life setting using a case study approach.

When research is undertaken there are also benefits associated with it. For industry this research is beneficial as it will provide it with a guideline that explains how to embed staff members' knowledge and skills within the organizational system. For academia, the conceptual framework provides a theoretical and practical understanding of the integration of staff members into the IS development process.

To familiarize the reader with this paper, a description of its structure is provided. The paper begins by offering an examination of the main concept of meta-abilities in the organizational development and management literature. The IS, management and organizational development literature is then surveyed for specific guidance in relation to tacit knowledge externalization, OL and meta-abilities. The section also develops and presents a framework synthesizing the previous research. This is followed by a description of the research approach, which then leads to a depiction of the case study. Thereafter, the theoretical concepts and conceptual framework are then studied in the context of an organizational setting. The paper then draws to a close with conclusions and suggestions for further research.

Theoretical overview

There are underpinning concepts that can be employed to understand how the externalization and sharing of tacit knowledge and meta-abilities can be used to support OL-based systems. The following subsections provide this.

The difficulty in tacit knowledge externalization and sharing

OL based systems support requires tacit knowledge. However, tacit knowledge is not easily externalized due to its transparent and subjective nature (Augier and Vendelo, 1999). Tacit knowledge is knowledge that appears obvious and natural to an individual and difficulties do arise when expressing or documenting such knowledge (Haldin-Herrgard, 2000). Further, the difficulties in the externalizing and sharing of tacit knowledge are also linked to language, time, value and distance (Haldin-Herrgard, 2000). However, these are not the only specific factors. There are also factors that prevent individuals from sharing their tacit knowledge or seeking clarification from colleagues and peers, including the lack of confidence, anxiety, unwillingness, confusion, and being carried away by strong feelings (Harvey and Butcher, 1998).

In the aforementioned discussion a review of the factors that are critical for the externalization of tacit knowledge is provided. Further, it can be learnt that in order to obtain inputs from employees an understanding of to the encouragement of individuals to externalize, share and document their tacit knowledge is imperative.

Frameworks in organizational learning

OL-based systems are founded upon the concept of OL. Organizational learning is defined as the process of detection and correction of errors (Argyris and Schön, 1978). Based upon this understanding, it is argued that organizations learn using certain employees, who act as agents for the organizations. However, it is also assumed that employees are willing to interactively learn and change, which is not always the case in a practical situation (Harvey and Butcher, 1998). Senge (1990) defines a learning organization as an organization "in which you cannot not learn because learning is so

insinuated into the fabric of life". However, this aspiration gradually diminishes if there is no teamwork amongst the staff members.

Huber (1991) considers four constructs to be integrally linked to OL:

(1) knowledge acquisition;

(2) information distribution;

(3) information interpretation; and

(4) organizational memory.

However, Huber's (1991) framework is built on the belief that staff members have self-confidence, a sense of responsibility and feelings of belonging to the company in order to externalize and share their tacit knowledge. As a result, Huber's (1991) framework has the potential to fail if there is no commitment from the staff members when supporting it. To overcome this issue, this research incorporated the concept of meta-abilities in the learning-based systems developmental framework.

Klimecki and Lassleben (1998) conceptualize OL as a communication-based process where the organization overcomes its previous boundaries of knowledge and ability by allowing its members to share knowledge, interact, influence each other and cope with difficult situations. Combining Huber's (1991) and Klimecki and Lasslebens' (1998) perspectives, Nonaka and Takeuchi (1995) viewed OL as involving the generation, absorption and sharing of tacit knowledge, and they emphasized the importance of interaction amongst people towards the development of OL capabilities. In other words, OL is the process of continuous innovation through the creation of new knowledge. It is an ongoing process that takes place as staff members engage in knowledge work (Davenport *et al.*, 1998). These views illustrate the importance of having continuous IS updates using the medium of communication amongst the employees. However, to enable the communication process, employees have to be self-confident and to be encouraged to talk to others in the workplace. The lack of confidence and anxiety will demotivate an individual from communicating with others and consequently reduce the effectiveness of the framework (Harvey and Butcher, 1998).

It has also been argued that learning emanates from the iterative process of knowledge externalization and internalization (Meso and Smith, 2000). Externalization occurs when an individual's tacit knowledge is captured as explicit knowledge (e.g. through business reports, written descriptions or instructions). Internalization occurs when this captured explicit knowledge is then transformed into another individual's tacit knowledge. In this case, OL occurs at the intersection of tacit and explicit knowledge during the interaction of various employees, departments or teams in an organization. However, this framework still relies on the ability of staff members to externalize and internalize knowledge (Haldin-Herrgard, 2000).

To summarize, the capability to externalize, share and document tacit knowledge is of paramount importance to OL frameworks. This in turn illustrates that employees should be instilled with that capability. Therefore, at this point it is declared that individual development should become the starting point in an OL-based IS developmental framework. This research intends to use this reasoning to illustrate the role of meta-abilities, understanding organizational roles, internal strengths, formal and informal discussion and rational discourse in OL, which is discussed further in the next section.

Individual development and learning-based systems

To develop an organization, it has been suggested that competencies should be generic rather than organization-specific (Butcher *et al.*, 1997). Additionally, competencies cannot be usefully specified in terms of neatly identifiable, observable or measurable behaviors (Butcher *et al.*, 1997). Therefore, competencies should involve increasing self-knowledge and improving "meta-abilities" – those personal, acquired abilities which underpin and determine how and when knowledge and skills will be used (Butcher *et al.*, 1997).

Butcher *et al.* (1997) found that there are four meta-abilities that are critical in organizational development:

(1) cognitive skills;

(2) self-knowledge;

(3) emotional resilience; and

(4) personal drive.

The description of each meta-ability is offered in Table I.

As meta-abilities enable individuals to use their tacit knowledge effectively, it is argued that they are relevant for enabling tacit knowledge externalization and sharing. Therefore, this research utilizes them as a basis in its conceptual framework.

However, meta-abilities do not develop on their own. The presence of various elements is required (Butcher *et al.*, 1997). This research proposes the following elements that are required to develop the above meta-abilities:

- understanding organizational roles;
- internal strengths;
- formal and informal discussion; and
- rational discourse.

Meta-abilities	Description
Cognitive skills	Includes the ability to notice and interpret what is happening in interpersonal situations; to entertain multiple perspectives and integrate them; to envision strategic futures; and to sort and analyze data. These skills allow employees to "read situations, understand and resolve problems"
Self-knowledge	Seeing oneself through another's eyes, knowing one's own motivations and values and distinguishing one's own needs from those of others. These skills allow employees to consider a range of options in their own behavior and to make better judgments of what to do. They allow other skills and knowledge to be used more flexibly
Emotional resilience	Includes self-control and discipline, the ability to use emotion well to cope with pressure and adversity, and balance feelings about oneself. These skills allow employees the personal robustness to direct their energies, deal with intense situations and manage challenges healthily
Personal drive	This involves self-motivation and determination, a willingness to take responsibility and risks. This helps employees to persist, motivate others and meet targets

Source: Butcher *et al.* (1997)

Table I.
Description of meta-abilities

These elements were selected as they are more focused upon developing the employees' communication skills, assertiveness and dealing with conflict, persuading others and managing organizational politics, which are relevant to achieve the objective of this research. To acquaint the reader to the elements, the definitions, descriptions and justifications of each element are provided in the following paragraphs.

This research asserts that employees need to understand three fundamental aspects when working in organizations:

(1) personal responsibility;

(2) task priority; and

(3) personal targets (Butcher *et al.*, 1997; Choudrie and Selamat, 2005).

This understanding is essential as it promotes the judicious use of accumulated experience and is beneficial when considering learning activities. Therefore, this understanding should be emphasized when developing effective OL frameworks.

Further, we propose that eight internal strengths should be instilled within employees in order to develop meta-abilities and thus establish a learning environment. These eight internal strengths were chosen as they enable the use of knowledge and skills in an effective manner.

The first internal strength that is proposed in this research is personal confidence. Personal confidence is a self-belief in undertaking and accomplishing organizational tasks (Harvey and Butcher, 1998). As one of the elements that prevent staff members from externalizing and sharing their tacit knowledge is lack of confidence (Harvey and Butcher, 1998), this element should be emphasized when understanding an OL framework. The second internal strength proposed in this research is observing accepted organizational approaches. By observing accepted organizational approaches, staff members can undertake tasks based upon "the right approach for the right situation" (Srikantaiah and Koenig, 2000). As this internal strength promotes sharing information with, and obtaining clarification from, other parties, it needs to be emphasized in creating a learning environment (Karhu, 2002). Therefore, this understanding should be emphasized when developing effective OL frameworks.

The third internal strength was identified as undertaking tasks with commitment and self-discipline. The most important thing that every staff member has to bear in mind in the workplace is that "we must do the job". Without these values, employees tend to undertake a job hastily and carelessly. This in turn will badly affect the quality of organizational operations. In short, this internal strength is the backbone of enabling knowledge and skills utilization amongst staff members. Therefore, this internal strength has the potential to enable a learning process thriving within the organizations and in turn should be emphasized when developing effective OL frameworks.

The fourth internal strength was recognized to be self-awareness. Self-awareness is defined as "an ability to determine the tasks that need to be accomplished at the current time and accomplish the determined tasks according to an accepted organizational approach" (Butcher *et al.*, 1997). In other words, it is related to the phrase "do the right things at the right time". These processes involve actively sharing and externalizing knowledge and obtaining a clarification process from others. Therefore, self-awareness is a relevant consideration when establishing an effective OL framework.

The fifth identified internal strength is self-remembrance. For the purposes of this research, self-remembrance is defined as "the value that requires staff members to mind their actions when undertaking a task so that it can be accomplished effectively and to remember that through their effective actions the company can achieve a good profit and consequently give them a good salary and bonus" (Choudrie and Selamat, 2005). The combination of these two values can motivate a person and others to work hard and work smart. From this description, it can be seen that self-remembrance enables staff members to actively utilize their knowledge and skills in the process of decision making. Therefore, this internal strength is applicable in the process of creating an environment conducive for learning, and in turn an OL framework.

Compassion was viewed to be the sixth element. In this research, compassion is defined as having "a feeling that the whole organization is like a family" (Choudrie and Selamat, 2005). Each staff member should appreciate the other members' efforts, since all of them have the same aim and objective in terms of job security. Being equipped with this value, staff members can then trust each other and consequently neutralize the feelings that prevent them from sharing information with other members. This situation is critical in establishing a learning environment and therefore needs to be considered in this research.

To ensure that every employee has the feeling that he/she works for the sake of the company and for fulfilling his/her responsibility to the company, the element of sincerity is pertinent. Sincerity can motivate employees to work collectively and harmoniously in the workplace. This scenario is critical in creating a learning environment in the organization and therefore should be emphasized in this research.

Finally, employees must have the willingness to change whenever the need arises. This is due to rapid changes in organizational life and the business environment. This process is like continuous improvement in an organization, so that its competitiveness does not deteriorate. As willingness to change is related closely to learning; this value also needs to be considered in this research.

Another element that is proposed by this research when developing the meta-abilities is the ability to conduct formal and informal discussions within the organization. This is because staff members face various tasks in daily activities – routine, non-routine, official and unofficial (Malhotra, 2004). Formal approaches are procedures such as meetings, progress reports and performance evaluation reports. Within organizations there are also instances of "chats around the water fountains" or "in the corridors", which are also known as informal discussions. Other forms of informal approaches include dialogue, face-to-face interaction, corridor meeting, lunch table chats and coffee/tea table chats. Through good communication, learning and teaching activities can be undertaken actively amongst staff members. Therefore, this value should be emphasized in order to create an effective OL framework.

When considering the establishment of a platform in an individual's mindset, particularly when creating a learning environment in an organization, the presence of another element is required; this is rational discourse. A rational discourse can legitimize the selection of a design ideal because it ensures that the arguments of all interested parties are heard, that the choice results in an informed consensus about the design ideal, and the formal value choice is made only by the force of the better argument (Klein and Hirschheim, 1996). These values are critical for developing cognitive skills and self-knowledge. In addition, they are able to promote active tacit

knowledge externalization and sharing amongst staff members, especially in meetings and dialogue. Therefore, rational discourse should be considered for establishing a platform in an individual's mindset for creating learning environments in an organization.

From the previous discussions, it is declared that the concept of meta-abilities in this research is developed based on the elements of understanding organizational roles, internal strengths, formal and informal discussion and rational discourse. This is something that prior research such as that by Butcher *et al.* (1997) has not undertaken. Additionally, the concept of meta-abilities in this research is utilized for developing an effective OL framework and not organizational development, as proposed by Butcher *et al.* (1997). This strategy makes this research different to that of Butcher *et al.* (1997). Therefore, for the first element of this research's conceptual framework, an understanding of organizational roles, internal strengths, formal and informal discussion and rational discourse is required. The second element is considered to be meta-abilities.

Enabling tacit knowledge externalization

Based on the aforementioned discussion, it can be seen that the elements of understanding organizational roles, internal strengths, formal and informal discussion, rational discourse and meta-abilities can assist in building a confident and responsible individual (Choudrie and Selamat, 2005). These values, in turn, create three important competencies:

(1) influencing skills;

(2) sharing attitudes; and

(3) inquisitive tendencies (Choudrie and Selamat, 2005).

In other words, influencing skills, sharing attitudes and inquisitive tendencies are the third element of this research's conceptual framework.

It was also found in the earlier sections that there are problems when developing OL-based IS, which is the need to develop an individual's ability when externalizing and sharing tacit knowledge. In such an instance, understanding organizational roles, internal strengths, formal and informal discussion, rational discourse, meta-abilities, influencing skills, sharing attitudes and inquisitive tendencies are the humanistic elements that should be considered when considering means of overcoming the difficulties in externalizing and sharing tacit knowledge. This is because by practising the above influencing skills, sharing attitudes and inquisitive tendencies, individuals can generate creative ideas (I), actions (A), reactions (R) and reflections (R) (Choudrie and Selamat, 2005). The terms ideas, actions, reactions and reflections represent forms of activities within an organization. These activities then allow the externalizing and sharing of tacit knowledge that can provide synergistic inputs for a continuous development of IS. Therefore, the I-A-R-R continuum is the fourth element of this research's conceptual framework.

However, for this the tacit knowledge must be initially documented. This can be achieved by the value of self-documentation, which is also developed by meta-abilities (Butcher *et al.*, 1997). Due to the development of the elements of understanding organizational roles, internal strengths, formal and informal discussion, rational discourse and meta-abilities, the willingness to question implicit assumptions, explore

new possibilities and directing energies toward higher standards enables a staff member to be well prepared and to use good quality documented progress reports or working papers. In the longer term this then ensures that there is a tangible means of verifying and validating tacit knowledge. Therefore, tacit knowledge documentation is the fifth element of this research conceptual framework.

Reflecting on the above discussion, it can be determined that individual development is the starting point of an OL framework. Additionally, it can be learnt from the previous discussion that understanding organizational roles, internal strengths, formal and informal discussion and rational discourse should become the starting point for the individual development.

Developing learning-based systems

As explained earlier, tacit knowledge must be documented. This knowledge is then transformed into explicit knowledge (e.g. through business reports, written descriptions or instructions). All these self-documentation is then given to the systems officers. At this stage, the system officers study the documented inputs provided by staff members and codify them. By the time the inputs are transformed into codified domains within the systems, they become information that assist staff members in fulfilling their responsibility. This is the sixth element of this research conceptual framework.

A conceptual framework

To understand the relationship between the six elements mentioned earlier, a diagrammatic representation has been developed (see Figure 1). As shown in Figure 1, individual development is initially fostered by the elements of understanding organizational roles, internal strengths, formality and informality, and rational discourse. In this case, the first element of the framework is represented by Stage A in the diagram. The element of understanding organizational roles increases the motivation to work diligently and thoroughly in the organization amongst the employees (Butcher *et al.*, 1997). This, in turn, increases the employees' concern with the relevancy of the information provided in order to accomplish organizational tasks. Therefore, the element of understanding organizational roles should be included in OL-based IS development.

The internal strengths proposed earlier by this research (i.e. personal confidence, observing accepted organizational approaches, undertaking tasks with commitment and self-discipline, self-awareness, self-remembrance, compassion, sincerity and willingness to change) were selected as employees equipped with these elements determine how and when knowledge will be practised within the organization, which is critical to the learning process (Choudrie and Selamat, 2005). These characteristics, in turn, increase the applicability of the proposed eight internal strengths in developing an OL-based IS.

Another element that is proposed by this research when developing individuals is the ability to conduct formal and informal discussions within the organization. When equipped with the ability to conduct formal and informal discussions, it is argued that staff members can assess situations, understand and resolve problems, and consider a range of options in a collective manner (Malhotra, 2004). These values can highlight the need to continuously re-examine and modify the contents of the system. Therefore, it is

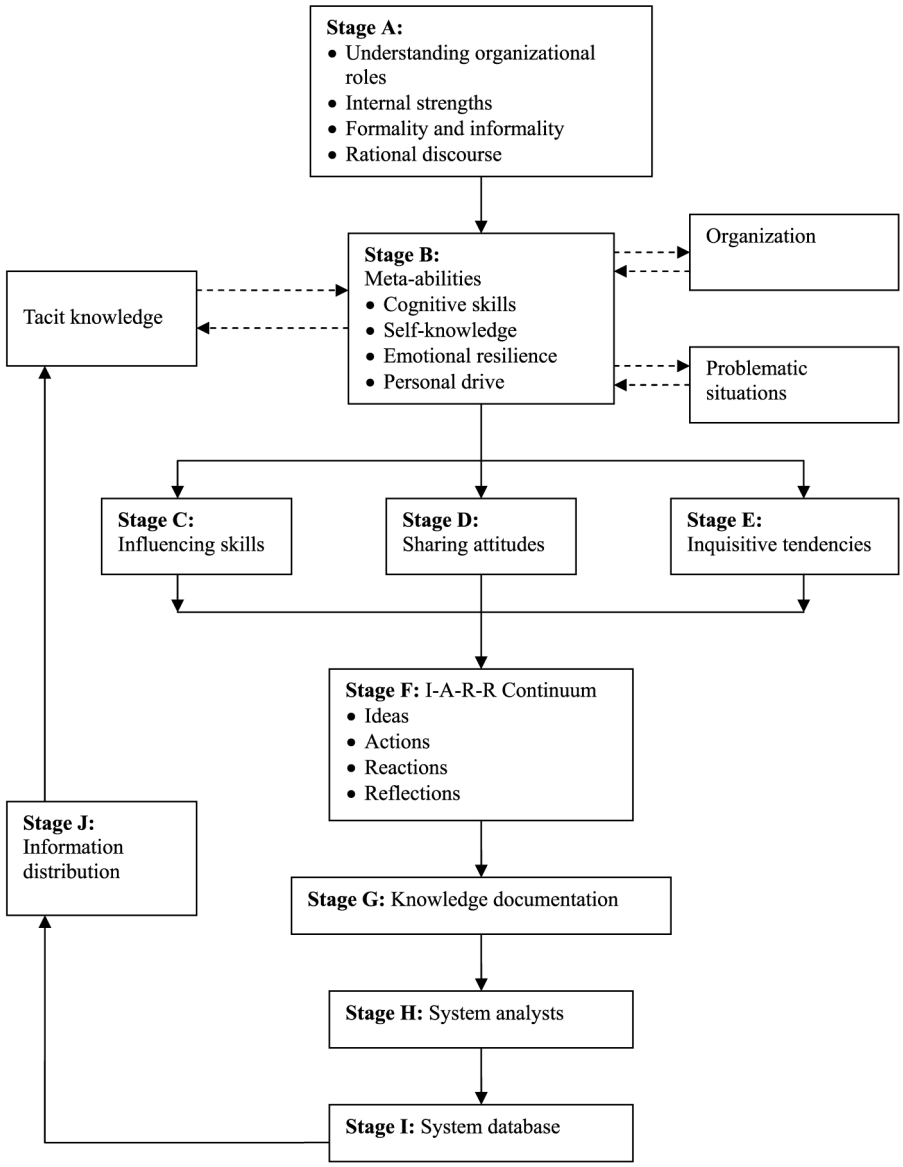

Figure 1.
Framework for learning-based information systems

beneficial to include the element of formal and informal discussions in OL-based IS development.

The final individual developmental element that is proposed by this research is rational discourse. Rational discourse was selected due to the fact that whenever an IS is applied, it serves some human interests; therefore, the design choices are made to serve some interests at the expense of others and involve moral value judgments (Klein

and Hirschheim, 1996). This means that practical advice concerning the design of a learning-based IS must not be limited only to technical aspects, but must also address moral issues, such as what is ethical, good or bad, or what is right or wrong in any particular application. Therefore, there is a need to establish a platform to approach such value judgments in a rational way.

As the elements of understanding organizational roles, internal strengths, formal and informal discussions and rational discourse enable the use of knowledge and skills in an effective manner (Choudrie and Selamat, 2005), they are pertinent for the development of meta-abilities (Stage B). Stage B of the diagram represents the second element of the framework (as noted above). Four main meta-abilities were identified in the organizational development area:

(1) cognitive skills;

(2) self-knowledge;

(3) emotional resilience; and

(4) personal drive (Butcher *et al.*, 1997).

Being equipped with these competencies, staff members can face the difficulties in the externalization and sharing of tacit knowledge and in obtaining information from colleagues, and can consequently become the enablers of tacit knowledge externalization and sharing.

Additionally, it can be seen that the elements of understanding organizational roles, internal strengths, formal and informal discussions, rational discourse and meta-abilities can assist in building a confident and responsible individual (Butcher *et al.*, 1997; Choudrie and Selamat, 2005). This can be learned from these three competencies:

(1) influencing skills (Stage C);

(2) sharing attitudes (Stage D); and

(3) inquisitive tendencies (Stage E).

These three stages represent the third element of the aforementioned theoretical framework. Being equipped with these competencies, staff members can face the difficulties in the externalization and sharing of tacit knowledge and in obtaining information from colleagues. Consequently this can provide externalized tacit knowledge for OL-based IS development.

When undertaking influencing, sharing and inquiring activities, an individual implicitly expresses tacit knowledge. This expression is either in physical form (actions and reactions) or verbal form (ideas and reflection) (Choudrie and Selamat, 2005) (Stage F). This ideas-actions-reactions-reflections continuum provides externalized tacit knowledge for OL-based IS development (Choudrie and Selamat, 2005). Stage F of Figure 1 represents the fourth element of the framework (as noted above).

However, the externalized ideas, actions, reactions and reflections must initially be documented. This process is undertaken at Stage G and represents the fifth element of the theoretical framework. At this stage, the externalized tacit knowledge is documented and transformed into explicit knowledge (e.g. through business reports, written descriptions or instructions). Knowledge documentation can be achieved by the

value of self-documentation, which is also developed by meta-abilities (Butcher *et al.*, 1997; Choudrie and Selamat, 2005). This is due to the development of meta-abilities: the willingness to question implicit assumptions, explore new possibilities and direct energies toward higher standards enables staff members to be well prepared, using good, documented progress reports or working papers. All these self-documented facts in turn provide inputs for continuous IS update.

As noted above, the task of updating the system is the responsibility of system officers. At this stage, the system officers study the documented inputs provided by staff members and codify them (Stage H). By the time the inputs are transformed into codified domains within the systems, they become information that assists staff members in fulfilling their responsibilities. In Figure 1, this process is represented by Stage I. Stages H and I represent the sixth element of the theoretical framework.

Stage J details the tangible information in the system that can be disseminated within an organization using networked systems. By obtaining new information, a staff member is able to identify an operational progress, to access new operational approaches, and ultimately internalize them. At this stage, staff members can improve their actions utilizing better knowledge and consequently undertake their tasks effectively – the learning process. Through the learning process, an individual's understanding of the organization's activities (tacit knowledge) is enriched. This new understanding in turn becomes a platform for continuous IS re-examination and modification processes.

In this section the framework for OL represents a framework for developing learning-based systems and was also used to guide the research process. The framework illustrates the elements that should be considered in order to create a learning environment within the organization. By developing and explaining this framework this research answers the following questions:

- How do we include individuals in the learning-based systems development process?
- Why use meta-abilities in order to include individuals in the learning-based systems development process?

What is also learned from this research is that the cooperation between individuals, the systems officer and the organization is also an important attribute to include in the process of developing learning-based systems.

Research approach

To undertake this research an approach was required, and this section details that. Although the aim of this research was clear, the novelty of the topic under study for the IS discipline meant that many of the questions were unknown and would evolve over the duration of this project. This presented many challenges for the research process as the questions had to be grounded in the "real world". Further, as this research involved studying the behaviours of employees, a deep understanding of the humanistic elements (Myers and Avison, 2002) was required. For this a qualitative approach that involved data focused upon words (Miles and Huberman, 1994) rather than numbers was undertaken (Myers and Avison, 2002). An in-depth case study process was used and involved employing a large Malaysian organization that was committed to the project; that is, full access and participation was offered to the researcher. The

organisation recognised the importance of meta-abilities from earlier discussions and sought to explore the application of the concept in an environment that consisted of technology, people and information.

The research activities consisted of preparing a training module, conducting the training program and collecting data within a duration of approximately a year. The module contained the descriptions of the elements of understanding organizational roles, internal strengths, formal and informal discussion and rational discourse, and was utilized to instil the concepts of meta-abilities amongst the respondents during the training program.

The participants used in this research consisted of 31 engineers and eight system officers. The engineers were selected as they were the critical group in ensuring the smooth operation of the plant; therefore the learning process was emphasized to them. Alternatively, the system officers were selected because they were the critical group for information processing; therefore it was relevant to study the impact of the framework in information processing and consequently the learning process. The participants consisted of the Centralized Maintenance Management System (CMMS).

Two months after the training session, face-to-face interviews were conducted. A two-month period was allocated to enable the progress review process and to enable the participants to understand and utilize the elements that were discussed in the program. A face-to-face interview approach was utilized as it provided flexibility in the questioning process, control of the interview situation and the opportunity to obtain additional information, such as background information or the natural reactions of the participants (Nachmias and Frankfort-Nachmias, 1996). The interviews were tape-recorded and transcribed on the same day. This approach was utilized to ensure that all the information and any further details that were imperative for this research were recorded and not omitted (Nachmias and Frankfort-Nachmias, 1996). The data were analyzed using a manual analysis process due to the small number of participants.

Describing the case study

As stated earlier the research had identified several elements that are necessary for individual development. However, they still lacked effectiveness, thus necessitating the need to incorporate meta-abilities. This section of the paper describes the application of the framework in a real-life setting. A leading Malaysian steel manufacturer, Perwaja Steel Pte Ltd (Perwaja), agreed to and was used for this research. The organization has two plants, Kemaman plant and Gurun plant, with the headquarters being based in Kuala Lumpur. As a manufacturing company, one of the main activities of interest was establishing an effective and efficient maintenance operation. Maintenance operations in Kemaman plant are undertaken in six different departments:

(1) instrumentation;
(2) mechanical services;
(3) water;
(4) electrical;
(5) crane; and
(6) maintenance planning.

Gurun plant, on the other hand, has two maintenance departments:

(1) maintenance solutions; and

(2) utilities.

Due to the increasing utilization of the machinery, any delays in repairing any machinery breakdown affects production and, consequently, steel delivery.

To assist with the management of the maintenance activity, Perwaja developed CMMS. Instead of recording and processing maintenance data, CMMS was also utilized to perform maintenance planning. Therefore, in every maintenance department, there was a system officer responsible for CMMS and accountable to the IS department.

An interview with the management personnel of the organization revealed that there was a gap between the production, maintenance and materials departments. The production department blamed the maintenance department for any delays in production due to machine breakdown or ineffective maintenance operations. Contrastingly, the maintenance department's members attributed delays to ineffective materials management, which subsequently caused the unavailability of spare parts. The materials department, as predicted, blamed the vendor and last-minute details of orders being provided for its incapability to provide the spare parts. Such instances have created havoc in the plant's operations. From the analysis, it was found that the main factors that contributed to this phenomenon are the lack of effective communication amongst employees and the sense of responsibility during the decision making process.

After identifying the causes of the problems, a discussion was held with the human resources director to determine a solution to the above issues. This was also undertaken bearing in mind the research question and the aim of this research. During the meeting, the concept of meta-abilities was shared and described. The importance of meta-abilities within the organization and tacit knowledge sharing and externalization were also emphasized to the employees. The impact of this process for organizational development was also highlighted. After the meeting, the director agreed to participate in a research training program. For this purpose, 39 immediate stakeholders of the CMMS were selected. The following section explains more of the training program's details.

Perwaja's training program

The training program was undertaken after understanding the background of the research site. Before the training program could be undertaken, preparation was conducted for the following:

- program materials such as the modules, presentation slides and program outline;
- undertaking the program; and
- undertaking the progress review.

To prepare the module, the researcher undertook intensive library research at Universiti Utara Malaysia and referred to some material from the Cranfield University General Management Program, and Butcher *et al.*'s (1997) *Developing Businesses Through Developing Individuals*. These sources were referred to because they provided

basic descriptions and definitions of meta-abilities, which were essential in determining the elements that were relevant in developing meta-abilities. The module was based on the acquisition of understanding of organizational roles, internal strengths, the ability to handle formal and informal discussions, and the ability to conduct rational discourse. Based on the completed module, the presentation slides and program outline were then prepared.

The training program was underpinned by seven competency sets:

(1) influencing skills;
(2) sharing attitudes;
(3) asking habits;
(4) cognitive skills;
(5) self-knowledge;
(6) emotional resilience; and
(7) personal drive.

The first three sets were groupings of specific competencies that were pertinent for the externalization and sharing of tacit knowledge. The remaining four were meta-abilities. Based on the aforementioned theoretical discussion, the training program was also underpinned by the elements of understanding organizational roles, internal strengths, formal and informal discussion, rational discourse and meta-abilities. In short, the program was based on the acquisition of knowledge about an individual's competencies to deal with conflict within an organization. The number of training days for each plant was limited to six due to the policy of the company on industrial training.

The program incorporated a variety of features and activities to enhance the learning experience and maximize the personal benefits. These included:

- interactive lectures;
- syndicate group work;
- work on live business and IS issues;
- profiling questionnaires;
- case studies;
- one-to-one tutorials or coaching;
- individual work; and
- a one-day follow up.

On the final day of the program, the participants constructed a comprehensive one-month action plan, such as the targeted number of machinery breakdowns and the targeted length of repairing services. This formed the basis of the progress review. Generally, for the progress review, the researcher met the research participants individually in order to further develop the elements of understanding organizational roles, internal strengths, formal and informal discussions and rational discourse by discussing their achievements on the targeted actions. The implication of the training program was that it developed individuals' motivation and willingness to externalize and share their tacit knowledge effectively. It is suggested that being equipped with

these elements enables staff members to provide ideas or views (inputs) for a continuous re-examination and modification of IS (Choudrie and Selamat, 2005). Being continuously updated, it is argued that the systems can promote learning because staff members can gain new insights in performing tasks (Choudrie and Selamat, 2005). This is due to the current information or contents that the system has. This relationship, in turn, could answer the research questions of this research:

- How do we include individuals in learning-based systems development?
- Why use meta-abilities in order to include individuals in learning-based systems development?

Two months after the training program, the collection of data assessing the value of the conceptual framework in practice commenced. The next section describes the findings.

Discussion of the data

From the aforementioned discussions, the research intended to investigate whether the elements of understanding organisational roles, internal strengths, formal and informal discussion and rational discourse can develop meta-abilities, influencing skills, sharing attitudes and inquisitive tendencies in practice. Additionally, the research was aimed at investigating the impact of meta-abilities, influencing skills, sharing attitudes and inquisitive tendencies on tacit knowledge externalisation and OL-based IS development. The answers to these research questions are offered in the following subsections. Further, the following discussion will detail the functioning of the framework illustrated in Figure 1.

Meta-abilities

From the responses received there was an indication that there will be change across all the seven competency sets of the individual development process. With regards to the cognitive skills, the participants interviewed indicated improvements. For example:

> This program was really beneficial from my point of view. This is because I am not rushing to complete my tasks any more. Instead, I take time to think about the problem, discuss with colleagues or managers and eventually implement the decision (Mr Anuar).

> Before the attendance on the program, I was unsure of how to solve a problem effectively. After the course, I could see the systematic flows in the decision making process in the organization. The element that assisted me in this was the ability to communicate with my staff or colleagues. By communicating with others, I could know the problem in detail and discuss its solution in a collective manner (Mr Mohd Adi).

Mr Anuar highlighted the ability to notice and interpret what is happening in interpersonal situations. Contrastingly, Mr Mohd Adi highlighted the ability to envision his strategic actions in the workplace. These skills allowed the employees to read situations, and to understand and resolve problems (Butcher *et al.*, 1997). All these abilities, in turn, developed their cognitive skills (Butcher *et al.*, 1997). Therefore, it can be seen that the training program had successfully developed the research participants' cognitive skills.

The research participants also described increased self-knowledge as an outcome of the training program. For example:

> Frankly speaking, before this I didn't know how to wisely solve problems. However, by practising the elements of the program, I gained a lot of improvement. I am able to communicate with my staff in a friendly situation and solve problems in a collective manner. My current strength is the confidence to solve problems through formal or informal discussions. I am not known for fighting but for having a discussion. I am confident that I can do it (Mr Abdul Rahim).

> Another important impact of the program on me is that I became more open with my colleagues. I am aware that everyone has their own expertise and characteristics. I will utilize these expertises and characteristics for the sake of the company through the medium of discussion. If my staff has problems, I will ask them personally and assist in overcoming the problems. I always remind them that personal stuff cannot be mixed up with working stuff (Mr Mohd Azmi).

In the above statement, Mr Abdul Rahim highlighted the ability to judge an approach to different situations by helping him to distinguish between his personal needs, the needs of the situation and of other people. Mr Mohd Azmi, on the other hand, experienced a profound development of the ability to consider a range of options in his own behavior and to make better judgments of what to do. These skills allowed other skills and knowledge to be used more flexibly (Butcher *et al.*, 1997). Therefore, all these skills illustrated a significant development of self-knowledge amongst the research participants. Subsequently, it can be seen that the training program successfully developed the research participants' self-knowledge.

As a result of the training program the research participants also described increases in emotional resilience. For some, the focus was on self-discipline:

> The course improved my internal strength to work hard in the company. In this case, I looked at the trust perspective. The company entrusted me with critical jobs. Therefore, it is my responsibility to observe and fulfill the given trust. This course enabled me to be patient and steadfast in facing the difficulties in the workplace, especially the human-related difficulties. In addition, it improved my motivation to do my best in the company. Through all these values, I am sure that the opportunity to develop my career is wide open in the company (Mr Norazlan).

For other research participants, the impact of emotional resilience was upon how to manage feelings. For example:

> This program has made me more mature in terms of my feelings and thoughts. I became good at staying calm in difficult situations, especially when it is related to the interrelationship between staff in the department. Sometimes it really hurts but after a few days it just disappears. To dissipate the hard feeling, I continue to keep in touch with them. The program has made me stronger in facing all these scenarios (Mr Azize).

By far the most dominant theme in the responses on emotional resilience concerned personal confidence. The research participants felt a great deal more confident as a result of the training program. For example:

> Yes of course. This course has increased my internal strength to face everything in the workplace and improve my communication skills. I always work under pressure because my boss keeps giving me tasks, although I am still not finished with the current one. But I manage to control myself, do the high priority one and no compromise on work quality (Mr Mohd Wahyudi).

From the above statements it can be seen that Mr Norazlan, Mr Azize and Mr Mohd Wahyudi experienced a profound development of self-control and discipline, the ability to use emotion well to cope with pressure and adversity and balance feelings on oneself. In other words, the research participants experienced a profound development of emotional resilience. In turn, this development illustrated that the training program had successfully developed the research participants' emotional resilience.

The research participants also described increases in personal drive as a result of the training program. For example:

> The impacts of the program are various. The most significant one in myself is that I have become more effective and committed in work and also became more responsible in everything I do. I manage to organize myself and my tasks more systematically and according to the company's procedure, and also to view a problem from a wider perspective (Mr Samsulisam).

From the above statement it can be seen that Mr Samsulisam experienced a significant development in self-motivation and determination and a willingness to take responsibility and risks. These values helped him to persist, motivate others and meet targets (Butcher *et al.*, 1997). In other words, he experienced a significant development in personal drive. This development illustrated that the training program had successfully developed the research participants' personal drive.

To recapitulate, the empirical results demonstrate a significant development of meta-abilities (cognitive skills, self-knowledge, emotional resilience and personal drive). This verified that the elements of understanding organizational roles, internal strengths, formal and informal discussion and rational discourse are capable of developing meta-abilities. From these findings, it can be said that the foundation of this research, the conceptual framework, has been successfully established (Stages A and B of Figure 1). This, in turn, justified the relevancy of the elements of understanding organizational roles, internal strengths, formal and informal discussion, and rational discourse in developing the concept of meta-abilities for this research. The following subsections will discuss the impact of meta-abilities on tacit knowledge externalization and sharing and, in turn, OL-based IS development.

Influencing skills, sharing attitudes and inquisitive tendencies

After being questioned about post-training meta-abilities, the respondents were asked about the impact of meta-abilities on their post-training influencing skills, sharing attitudes and inquisitive tendencies. The research participants described increases in influencing skills as a result of the program. For example:

> After the course, I was able to improve my influencing skills. I lead one team in my department and I want it to be the best. To achieve this goal, every unit member should also appreciate it. Before this, teamwork in my unit was not so good. After the program, I started playing an important role in instilling this understanding amongst my staff. All the problems were settled in the meeting. Thank God, it was a most fruitful strategy. Everybody has started to work together now (Mr Azize).

From the above statements it can be seen that Mr Azize experienced a significant development in communication skills and a willingness to persuade others. These values helped him to utilize knowledge and skills effectively in order to influence

others in the organization. This development illustrated that the training program had successfully developed the research participants' influencing skills.

As well as this, the research participants significantly commented on the development of sharing attitudes. For example:

> On returning from the program, I felt that all the staff members were like one big family. It is my responsibility to help others, share the information that I possess and establish a good relationship with others (Mohamed Ridzuan).

In the above statement, Mr Mohamed Ridzuan highlighted the ability to inform others about the need for changes or improvements. This ability helped him to explain to others everything that needs to be undertaken during operations. This development illustrated that the training program had successfully developed the research participants' sharing attitudes.

With regards to the inquisitive tendencies, the research participants indicated improvements as a result of the program. For example:

> The course has changed my behavior from timid to friendly. Before this I was not very sociable. After delegating the tasks to my subordinates, I would concentrate on my own work. But after the course I always meet my subordinates to ask about work progress, problems and internal feeling due to heavy work burdens. In addition, I became confident in facing my colleagues in the meeting and expressed my views if necessary (Mr Abdul Rahim).

The empirical results demonstrated a significant development of Mr Abdul Rahim's ability to ask others more effective questions. This ability helped him to undertake tasks according to the accepted procedures. Therefore, it can be seen that the training program had successfully developed the research participants' inquisitive tendencies in this research.

From the aforementioned discussions it is clear that a significant development of meta-abilities (as mentioned above) is followed by significant developments in influencing skills, sharing attitudes and inquisitive tendencies. These findings illustrate that Stages A, B, C, D and E of the research conceptual framework (as illustrated in Figure 1) have been achieved. In other words, the elements of understanding organizational roles, internal strengths, formal and informal discussion and rational discourse had successfully developed meta-abilities, influencing skills, sharing attitudes and inquisitive tendencies in the research participants' mindsets.

At this point, the impact of the elements of understanding organizational roles, internal strengths, formal and informal discussion and rational discourse on the development of meta-abilities, influencing skills, sharing attitudes and inquisitive tendencies have been discussed. However, the externalization of tacit knowledge has not yet been investigated. For this the next subsection will describe the externalization of tacit knowledge through the medium of ideas, actions, reactions and reflections.

Externalized tacit knowledge: ideas, actions, reactions and reflections

One of the greatest issues of concern in this research was improving the research participants' ability to externalize their ideas. The following example offers an overview of the improvements described by the research participants:

> After the program, expressing ideas has become a norm in my daily activities. However, I will also encourage others to do the same. If the ideas come from only one source, it is risky,

> because every idea has its weakness. So, before making a decision, I will listen to and understand other people's ideas so that a comparison could be made. This strategy is much safer than relying on one source of ideas (Mr Nordin).

Mr Nordin highlighted the ability to externalize ideas. In this case, he mentioned the importance of sharing ideas with others in the workplace. Therefore, it can be seen that the training program had successfully developed the research participants' ability to externalize ideas.

With regard to actions and reactions, the following is an example illustrating the participants' ability to externalize and express them:

> By observing what I learnt from the program, I was able to rationalize my working style and consequently improve its effectiveness and efficiency. Having an idea of the work of 10 people is much better when improving our actions and reactions (Mr Yaakop).

The above empirical results reveal that Mr Yaakop described changes in his ability to perform ideal actions and to change his perceptions or working techniques in order to cope with changes in the environment (reaction process). This value, in turn, enabled an active re-examination and revaluation process of the necessary information. In turn, this development illustrated that the training program had successfully developed the research participants' ability to generate actions and reactions in the workplace.

As a result of the training program, the participants described changes in their ability to reflect upon problems and, in turn, determine a suitable solution. These changes were the result of the participants' responsibility and awareness in improving their organization. An example is as follows:

> By asking somebody, I knew how to solve problems effectively and knew the correct contact person. I faced so many types of problems before including human-related problems. All of these needed acute responses, and communication was the safest approach to be utilized. This was what the program had significantly helped me with (Mr Abdul Halim).

From the above statements it can be seen that Mr Abdul Halim experienced a significant development of the ability to reflect upon problems and, in turn, determine a suitable solution. This ability helped him to effectively utilize knowledge and skills in order to reflect upon problems in the organization. This development illustrated that the training program had successfully developed the research participants' ability to reflect effectively upon problems.

The above results illustrating the formulation of ideas, actions, reactions and reflections represent the ability of the participants to effectively externalize and share of their tacit knowledge. This was further supported by three findings. The first was that the participants were motivated to share their work progress with others. In this case they were not restricted to asking only the CMMS officers for any specific technical assistance. Second, the participants were actively involved in documenting their ideas, actions, reactions and reflections. These documented inputs were then shared with the system officers for the purpose of updating the CMMS. This iterative link between the users and systems enabled synergistic inputs to be provided for continuous CMMS development. Third, the CMMS officers described undertaking sole responsibility and an awareness for updating and utilizing the contents of CMMS. Updating and utilizing the CMMS's contents in many cases involved having active communication and face-to-face meetings with the users. All these changes enabled

CMMS to obtain new inputs and, as a result, to be able to provide current progress of the maintenance jobs to the users (Stages F and G in Figure 1).

Implicit in the above findings was that the elements of understanding organizational roles, internal strengths, formal and informal discussions, rational discourse, meta-abilities, influencing skills, sharing attitudes and inquisitive tendencies did provide a platform to the participants for externalizing their tacit knowledge in a creative and spontaneous manner. This was evident from the ideas, actions, reactions and reflections that they documented and shared with the system officer. Therefore, it is declared that Stages F and G of this conceptual framework formulated in this research (as illustrated in Figure 1) have been substantiated.

When relating the above tacit knowledge externalization issue to IS development, all the participants agreed that there could be a basis for establishing learning-oriented information. In this case, there was a significant relationship between the documentation of the externalized tacit knowledge and the continuous re-examination and modification of the contents of an IS. It is argued that this type of IS content is capable of promoting OL. A statement made by the one of the system officers was the best example of this issue:

> The course gave me guidance on how to build a good relationship with users in my department. Before this, when I got a complaint I always considered the users' views from the negative side, such as "they are trying to blame me or damage my reputation". But after the course, I had a positive outlook of them and was also willing to collectively solve the problem.

This result supports Stages H, I, J and tacit knowledge development of this research's conceptual framework (as illustrated in Figure 1), which is that the externalized and shared tacit knowledge led to OL through updating and progressive IS contents.

To summarize the lessons that have been obtained from the above discussion, it is clear that the development of the elements of understanding organizational roles, internal strengths, formal and informal discussions, rational discourse, meta-abilities, influencing skills, sharing attitudes and inquisitive tendencies can assist in developing an OL-based IS. This is because they create a willingness amongst staff members to provide knowledge-based inputs to the systems. These inputs, in turn, enable continuous IS re-examination and modification, given the changing reality. Continuously challenging the current "company norm", such systems are expected to prevent the core capabilities of yesterday from becoming the core rigidities of tomorrow (Malhotra, 1997). By obtaining access to the current "company norm" and internalizing it, staff members can improve their actions through better knowledge. Consequently, tasks can be undertaken effectively – the learning process. Therefore, at this point it is declared that the conceptual framework used in this research can be applied to diffuse staff members' knowledge and expertise effectively within an organization.

Conclusions

There are many humanistic elements that prevent individuals from externalizing, expressing and sharing their tacit knowledge, such as lack of confidence, anxiety, unwillingness, confusion, and being carried away by strong feelings. This problem is critical in the process of building learning-based systems as involvement and participation from staff members are of paramount importance. This research

attempted to shed light on this matter by focusing on the elements that can encourage individuals to participate in the process of building learning based systems. To undertake this, two research questions are proposed:

(1) How do we include individuals in learning-based systems development?

(2) Why use meta-abilities in order to include individuals in learning-based systems development?

In other words, this research has attempted to recognize and capitalize on the critical role that individual development plays in OL-based IS development.

To achieve the aim of studying the elements that can encourage staff members to contribute inputs for learning-based systems development, this research developed a conceptual framework based on the concepts of meta-abilities and tacit knowledge externalization and sharing. Meta-abilities, in turn, are developed by using the elements of understanding organizational roles, internal strengths, formal and informal discussions and rational discourse. To enable validation of the above research issues, an in-depth, longitudinal case study was presented.

From the research undertaken, it was found that the elements of understanding organizational roles, internal strengths, formal and informal discussions and rational discourse enabled the development of meta-abilities, influencing skills, sharing attitudes and inquisitive tendencies. These abilities, in turn, improved the participants' responsibility and awareness to externalize and share their tacit knowledge effectively. By documenting the externalized and shared tacit knowledge, the research participants can provide inputs to the system analyst for updating the system (Choudrie and Selamat, 2005). Continuously updating the current "company norm", such systems are expected to prevent the core capabilities of yesterday from becoming the core rigidities of tomorrow. In short, the active involvement of staff members in contributing views or ideas enables the contents of organizational IS, such as maintenance management, accounting and finance, quality management, multiple-level production and human resource systems, subject to continual re-examination and modification given a changing environment. Being continuously updated, it is argued that the systems can promote learning because staff members can gain new insights into performing tasks. These findings illustrate that the research questions of this research have been answered successfully. Therefore, the main focus of this research for IS should be towards the development of an individual's meta-abilities, which develops a willingness to contribute views or ideas that further update the contents of the IS continuously.

The elements of understanding organizational roles, internal strengths, formal and informal discussions, rational discourse, meta-abilities, influencing skills, sharing attitudes and inquisitive tendencies can also be used to assist organizations to harness their staff members' expertise in the system. This is due to the fact that tacit knowledge remains the property of a human being (Tsoukas, 2002). Such knowledge is lost when staff members leave the organization. It is suggested that being equipped with these elements enables staff members to provide ideas or views (inputs) for a continuous re-examination and modification of the IS. Through this process, organizations can establish an effective knowledge management system and can solve the problem of "reinventing the wheel".

A limitation of this research is that it was undertaken in Malaysia, and therefore it is restricted to a certain context. This includes the elements of culture, faith, perception, values and norms, which are different in that country. Therefore, a future direction that this research should take is to examine the application of the framework in a different context and determine how much would be relevant in that instance. Another limitation of this research is that it could only be undertaken in IS development due to the time restrictions. This limitation can be overcome in the future by extending the contexts to other areas, such as IS effectiveness and managing the human aspects of systems development and implementation. Further areas where this can be used are issues pertaining to group coordination and communication and managing the impact of information technologies on organizations planning and control strategies. By doing so, there would be a benefit by obtaining an understanding of meta-abilities. This is achieved by encouraging the people who surround the systems to contribute inputs for systems development. All these areas have the potential to be introduced with meta-abilities, since they are bound to a human being's awareness and willingness for successful implementation.

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