Improving the Communication Skills of IS Developers during Requirements Elicitation using Experiential Learning

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ABSTRACT

The improvement of communication skills among Information Systems (IS) developers can be considered as a strategy to mitigate the risk of project failure during IS design. This paper addresses issues on various communication barriers normally encountered during its requirements elicitation (RE) stage. This study aims to adopt experiential learning as a method to improve the communication skills of IS developers during RE techniques such as prototype presentations. As such, an educational multimedia, which teaches communication skill enhancement among professionals during presentations, served as an interventional tool for experiential learning. Using a longitudinal quasi-experiment, the developers' self-assessments of their communication skills during prototype presentations at pre- and post-intervention were compared and analyzed using the WordStat® software. Responses showed significant improvements on the presentation skills especially on keywords-in-context related to the audience, information, interest, prototype, room, summary, and talk. This signifies the influence of such learning method to the developers at post-intervention. Further, the study implies that experiential learning can be empirically supported to effectively motivate IS developers in improving their presentation skills after receiving a learning intervention. Thus, experiential learning can be used by project managers as an effective training strategy to improve the communication skills of their IS developers in preparation to current and future projects on IS design especially during prototype presentations of the RE stage.

Keywords: Agile Software Development, Information Systems Development, Requirements Elicitation, Experiential Learning, Project Management

1. INTRODUCTION

Many failures in the development of Information Systems (IS) are reported to be attributed to several factors such as incomplete requirements specification, lack of appropriate development methodology, poor design, miscommunication, and non-existence of information architecture vision (Ramani et al., 2006; Feghali and Zbib, 2007). Agile practices in systems development have addressed these issues through the creation of the Agile Manifesto which covers better ways of developing software. In brief, the manifesto tackles basic principles and agile methods during software development which puts high priority on the users through effective communication. It also adheres to the principle that the most effective way of conveying information is through face-to-face conversation (Lindstrom and Jeffries, 2004). As such, Requirements Elicitation (RE) could be seen as the stage where the communication process is relatively intensive (Coughlan and Macredie, 2002; Coughlan et al., 2003). With this, RE represents the foundation of a shared understanding between developers and users about a proposed system which is necessary to achieve project success (Al-Ani, 2002). The most notable of these problems in IS design is the existence of communication barriers during RE (Coughlan et al., 2003; Coughlan and Macredie, 2002).

Agile software development practitioners consider communication barriers such as socio-cultural and language differences among stakeholders as a global challenge (Holmstrom et al., 2006; Lindstrom and Jeffries, 2004). As such, ineffective communication skills among system developers may lead to miscommunication that contributes to the inability to gather complete requirements (Thanasankit and Corbitt, 1999; Qurban, 2008). Correspondingly, ineffectual communication during RE is considered to be one of the most critical factors in the failure of IS projects (Coughlan and Macredie, 2002; Nuseibeh and Easterbrook, 2000). Also, many obstacles such as complex and changing requirements as well as the various levels of interactions

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between users and developers hinder the successful communication during the RE phase (Nuseibeh and Easterbrook, 2000; Valenti et al., 1998). Hence, project managers handling multiple IS design initiatives should strategically supervise the efficiency of their developers in communicating with the users during RE.

In a study, most IT projects are more likely to be unsuccessful; where only about one out of five IT projects is likely to bring full satisfaction. Also, the larger the project is, the more likely the failure would be. Moreover, it is estimated that nearly 40% of these projects would fail to achieve their business case within one year of implementation (Nauman et al., 2005; Heeks, 2002). Since RE is largely about communication, techniques relevant to understanding requirements remain to be valuable for project success especially during elicitation techniques such as prototyping (Nuseibeh and Easterbrook, 2000). Correspondingly, the need to improve the communication among stakeholders in systems design is evident among various researches (Urquhart, 2001; Coiera et al., 2002). As such, the communication techniques play a central part during RE to manage time and cost of an IS design project (Sindre, 2005; Majchrzak et al., 2005). Similarly, improving the communication process through skill enhancement is essential during RE management (Coughlan et al., 2003).

In the recent IT Governance Global Status Report conducted by the Price Waterhouse Coopers and IT Governance Institute (2008), the communication between IT professionals and users is said to be improving, but slowly. Correspondingly, in order to solve this existing problem, an efficient method of improving the communication process through skill enhancement is necessary (Coughlan and Macredie, 2003). Fortunately, among various learning modalities such as self-directed learning, transformative learning and contextualized learning as enumerated by Herod (2003), Kolb's experiential learning has been considered as an effective strategy to improve various skills of physical therapists (Sellheim, 2006), nurses (Papai et al., 1999) and students (Bandy and Young, 2002; Ross and Lukow, 2004; Healey and Jenkins, 2000) among others. In addition, Kolb (1984) mentioned its influence over computer science professionals in developing their skills and assessing their learning style. Hence, this study seeks to improve the communication skills, particularly the presentation skills, of IS developers during RE initiatives such as prototype presentations using Kolb's experiential learning theory.

2. THEORETICAL BACKGROUND

2.1 Communication Process during IS Design

Agile software development practices reiterate the importance of communication among stakeholders during systems development (Meso and Jain, 2006; Lindstrom and Jeffries, 2004). It recognizes the value of face-to-face conversation as the most effective way of conveying information. However, detailed communication processes among stakeholders in the healthcare environment remain vague since these agile practices are generic in nature or seem applicable mostly to industry setting (Talby et al., 2006; Vinekar et al., 2006).

Most researches on the communication process during IS design focused on the development of communication skills among users but less on the side of the developers. In particular, Saleem et al. (2006), Wyatt (1995) and Al-Rawas and Easterbrook (1996) recommended several guidelines to improve the communication skills of the users during the development of IS. Similarly, Majchrzak et al. (2005) suggested the cooperative learning strategy called collaborative elaboration, developed by educational psychologists, to provide the theoretical and practical basis for stimulating client learning during the systems design process. Moreover, the current trend in the IS education is focused on the development of communication skills among IT students and graduates (Crews and McCannon, 2000; Sindre, 2005; Rahman et al., 1999) with less emphasis on practitioners which tend to sacrifice best practices in the workplace. Because of such demand for best practices, Coughlan et al. (2003), Miller and Luse (2004) as well as Hornik et al. (2003) and Puri et al. (2004) responded by suggesting practical communication skills needed by IS staff during systems development especially during RE such as creation of communicative framework, better stakeholder interaction and participative design process. Hence, this study focuses on the development of practices in improving the communication process among IS developers through communication skill enhancement particularly during the prototype presentation aspect of RE in order to ensure systems development efficiency at an early stage. This is in line with the Agile Manifesto which considers face-to-face conversation (such as those taking place during prototype presentations) as the most suitable form of communication among stakeholders participating in systems design (Lindstrom and Jeffries, 2004; Meso and Jain, 2006). This aim is suggested to be accomplished using the theory of experiential learning which has been proposed by Sewchuk (2005) and Kolb (1984) to potentially improve certain skills of computer science professionals such as IS developers.

2.2 Experiential Learning

In experiential learning, knowledge is acquired through the transformation of experience. Importance is placed on the integration of new experiences with past ones through the process of reflection (Kolb, 1984; Sewchuk, 2005; Richmond and Cummings, 2005). Kolb's experiential learning theory provides a framework for analyzing the experiences and transforming new ways of looking at practice, then submitting this new theory of practice to the test of experience. Kolb (1984) presented experiential learning as a four-step cyclical process in which each step depends on the completion of the previous one (Figure 1). Kolb (1984) mentioned that a learner should undergo the four learning stages in order for experiential learning to completely occur. As such, a successful learner functions in all these domains. Thus, learners should go through the cycle in a sequence beginning with the concrete experience, moving to the reflective observation, then to abstract conceptualization and finish at active experimentation (Ross and Lukow, 2004; Healey and Jenkins, 2000).

A concrete experience (CE) is the starting point of the cycle. As such, the learner is offered an experience (Figure 1). In the second phase, reflective observation (RO), the learner would be able to reflect on and observe the experience. Papai et al. (1999), Sellheim (2006) and Healey and Jenkins (2000) reiterated Kolb's ideas that the purpose of such self-

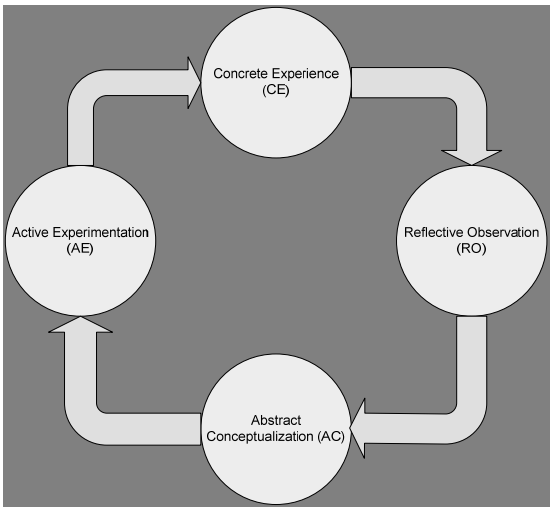

Figure 1. Kolb's four cyclical stages of experiential learning

ACCOMMODATING	DIVERGING
Educational administration	Design
Government	Journalism
Human Resources	Literature
Management	Media
Marketing	Nursing
Public Finance	Psychology
	Public policy
	Social Work
	Theater
CONVERGING	**ASSIMILATING**
Computer Science	Biology
Economics	Educational Research
Engineering	Law
Environmental Science	Mathematics
Farming	Physical Sciences
Forestry	Sociology
Media technology	Theology

Source: Based on Sewchuk (2005, p.1312)

Table 1. The experiential learning styles associated with different careers

reflection is to recapture the full experience of the event and the feelings associated with it. This process can be facilitated by writing it down or reporting it to a group. The ability to raise effective questions is essential in this process. Such questions could help the participants to see relationships, link the unknown to the known and develop autonomy in thinking. Moreover, the thought process of understanding the experience is followed by a conceptual interpretation of that experience called Abstract Conceptualization (AC). During this phase, the reflection focuses on logic, ideas, and concepts. It emphasizes thinking as opposed to feeling and a concern to develop symbolic representations or explanations of what has been experienced. The last phase of the cycle, Active Experimentation (AE) emphasizes the active involvement whereby the new perspectives on experience or changes in the behavior are applied and tested in new practical situations. Therefore, this phase focuses on the practical application as opposed to simply reflective understanding (Papai et al., 1999).

Another major premise in experiential learning is that individuals use and prefer different learning styles or strategies that correspond to how effective and comfortable they are when learning occurs (Ross and Lukow, 2004). Similarly, Sewchuk (2005) reiterated Kolb's theory that certain professions tend to attract a preferred learning style. Table 1 shows the learning preference among various professionals. This indicated that computer science practitioners are convergent learners (Kolb, 1984; Sewchuk, 2005). Since Computer Science Professionals are closely related to Computer Information System Professionals (Guarino, 1998), it is assumed that both professionals would have similar learning styles and preferences.

Learners who prefer the accommodative style excel at accomplishing tasks by following directions, meticulously planning, and ultimately seeking new experiences (Kolb, 1984). They are also opportunistic, action driven, and risk takers. They have the ability to adapt to changing circumstances and typically solve problems in an intuitive trial-and-error manner rather than through careful examination of facts. They also rely heavily on other people for information rather than their own analytic ability. Hence, the learning modes associated with the accommodative learners include the concrete experience and active experimentation (Richmond and Cummings, 2005).

Divergent learners are best in their "imaginative ability and awareness of meaning and value" (Kolb, 1984, p.77). These people have the ability to identify concrete examples of a concept and to generate numerous qualities about this concept from many perspectives. They are able to organize these qualities by how each quality interrelates to one another which then provides a meaningful overview of the concept. They are also considered as "brainstormers" in that they observe rather than act, are emotionally-oriented and tend to be very creative. Divergent learners prefer the learning modes of concrete experiences and reflective observation (Richmond and Cummings, 2005).

Convergent learners depend on their ability to efficiently solve problems, make decisions and apply practical ideas to solve problems. These learners do well on standard conventional intelligence tests because they can organize knowledge by hypothetical deductive reasoning and thus are able to converge to one given answer (Richmond and Cummings, 2005; Kolb, 1984). In addition, these people are well adapted to controlling their emotions and prefer dealing with technical tasks and problems rather than with issues that involve interpersonal and social interactions. Lastly, they draw their learning modes based from abstract conceptualization and active experimentation (Richmond and Cummings, 2005).

Assimilative learners have the ability to reason out inductively. They can create theoretical models in assimilating disparate observations into an integrated explanation (Kolb, 1984). Also, they are more concerned with ideas and abstract concepts rather than with people and social interactions as well as highly interested with abstract and logical aspects of theory instead of its practical aspects. Assimilators incorporate learning modes using reflective observation and abstract conceptualization (Richmond and Cummings, 2005; Kolb, 1984).

Despite a number of learning modalities, this study tries to adopt experiential learning to improve the communication skills of IS developers during prototype presentations at pre- and post-intervention. This is in response to the claim of Kolb that computer science professionals could successfully adopt experiential learning as a learning modality. Moreover, based on this, HIS practitioners, as computer science professionals, prefer the converging style (Sewchuk, 2005; Kolb, 1984). Hence, this study would then verify if IS developers could adopt experiential learning effectively and thereafter confirm their preferred learning style which is converging.

It should be noted however that Kolb's theory of experiential learning has its limitations. Rogers (1996) argued that "learning includes goals, purposes, intentions, choice and decision-making, and it is not at all clear where these elements fit into the learning cycle"(p.108). Moreover, John Dewey advocated for the concepts of experiential education instead of experiential learning where according to him, experiential learning could lead to "mis-educative experiences" in that experience doesn't necessarily lead to education. Hence, there is a need for continuity and interaction for learning to occur (Dewey, 1938). However, the merits of the experiential learning are also evident in previous researches proposing a level of applicability in improving certain skills among various practitioners (Sellheim, 2006; Papai et al., 1999; Bandy and Young, 2002; Ross and Lukow, 2004; Healey and Jenkins, 2000). These researches could be the basis for pursuing the applicability of experiential learning for IS developers even though, as a theory, it has its own limitations and weaknesses but would still be worth evaluating and undertaking through a research process.

2.3 Research Framework

The research framework is based on the communicative interaction between users and developers of IS. The framework provides a comprehensive account of the communication scenario between users and developers within a healthcare environment especially during the development of IS. Since communication is at its peak during RE, one of the best ways to improve the comprehension of ideas is through the use of prototypes. Mannio and Nikula (2001) referred to prototyping as a method to increase the mutual understanding among stakeholders during the prototype demonstration session. This creates an RE session that is more focused and systematic than the one without. In particular, the presentation of cases and design options could facilitate the understanding of the specific problems related to the proposed system. Moreover, agile software practices considered that face-to-face conversation is the best and the most ideal communication process (Holmstrom et al., 2006; Meso and Jain, 2006). Hence, prototype presentations could act as one of the best forms of face-to-face conversation between users and developers during the RE phase of IS development.

The research framework also illustrates that upon adopting experiential learning, IS developers could potentially communicate better during RE especially on its prototype presentation aspect where user-developer interaction is at its peak. The improvement in the communication

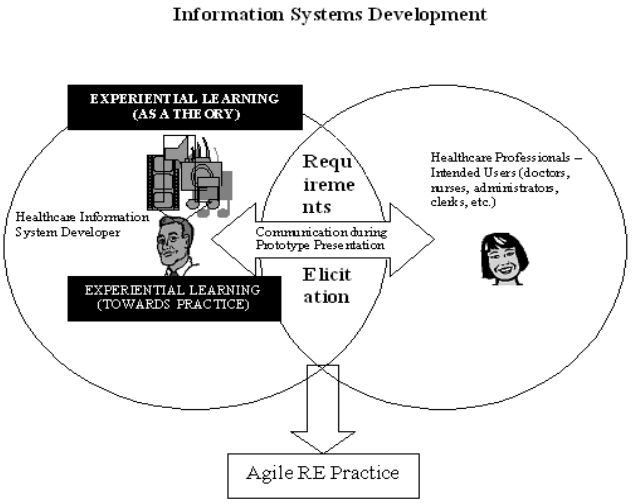

Figure 3. The research framework on using experiential learning towards the success of better RE practice

skills could then facilitate a better rapport between stakeholder groups towards the realization of an "Agile RE practice" during IS development. Correspondingly, the enhanced communication skills among IS developers could facilitate a collaborative approach between developers and users during RE. Bandy and Young (2002) mentioned that knowledge could be transferred on the basis of organizational action that creates learning laboratories. Such learning laboratory can be represented by the merging of the circles presented in the framework. Such merge creates an area where active collaboration could take place especially during the communication process taking place at the prototype presentation aspect of RE. Further, this learning laboratory promotes problem-based dialog, places the responsibility for thinking and problem-solving on the participants, promotes application of previous experience, requires active participation, and places participants in a naturally-occurring problem context (Bandy and Young, 2002). Hence, the experiential learning experience of IS developers could potentially improve their communication skills and would represent a learning laboratory which encourages better interaction between the users (audience) and IS developers (presenters) during the prototype presentation aspect of RE.

3. METHODOLOGY

This research used a longitudinal quasi-experimental (one-group pretest-posttest) design similar to the study of Gaudine and Saks (2004), Harris et al. (2006) and Jenson (2007) in order to ensure that the participants would completely undergo the four stages of experiential learning (CE, RO, AC, and AE). Five IS developers from the Computer Services Department at King Fahd Military Medical Complex in Dhahran, Kingdom of Saudi Arabia were selected as participants of this study. Such small sample size can be considered as sufficient, as supported by Glik et al. (2006) who mentioned that the nature of an in-depth study is intensive which could be done even with small

sample size especially during quasi-experiments (Harris et al., 2006). Similarly, Tan and Hunter (2002) considered small sample size as sufficient for intensive constructs during qualitative studies to approximate "the universe of meaning" regarding a domain of discourse such as answers to open-ended questions. This means that no new constructs can be added even if the sample size is increased. Moreover, the research analyzes the collective responses of developers into two groups-pre-intervention and post-intervention instead of their individual responses. Hence, higher sample size is irrelevant since these two groups of textual responses are the primary concern during the textual data analysis instead of their individual responses.

The mode of analysis of these responses is based on semiotics. This indicates that "words or signs can be assigned to primary conceptual categories, and these categories represent important aspects of the theory to be tested. The importance of an idea is revealed in the frequency with which it appears in the text it is based on."(Myers, 1997). This analysis is accomplished using content analysis which searches for the structures and patterned regularities in the text and makes inferences on the basis of these regularities (Myers, 1997). As such, since answers to open- ended questions are voluminous, the WordStat® software was used to aid in searching for the frequency of Keywords-in-context (fKWIC) as introduced by Macer (2005). fKWIC is a technique in qualitative data analysis that seeks to analyze textual responses into frequency-based approach similar to that of quantitative studies (Kaki, 2005). This is a form of content analysis based on the foundation of semiotic research (Myers, 1997). It gives a handful of information related to the most prominent themes dominant in the text corpus based on the frequency of the reoccurrence of words or contexts (Kaki, 2005; Provalis, 2005). As such, WordStat®, among any other qualitative data analysis software (QDAs), is considered as the most ideal software that uses fKWIC as a method during textual content analysis of answers to open-ended questions (Macer, 2005).

Each of the five developers was asked to present to users a software prototype that they had prepared (Concrete Experience) while being videotaped. The videotape is an essential tool to aid in providing a visual document for thick description. Such description was made by the developers to assess their performance (Rosenstein, 2002). The recorded activity was shown thereafter to each of the developers for their self-assessment of performance (Reflective Observation) based on the methods of Roter et al. (2004). As such, videos are considered to be essential tools for reflection and evaluation. It has also been used in research for observational, distance learning and a way of giving feedback (Rosenstein, 2002). Afterwards, an open-ended questionnaire (Appendix 1) was given to the developers for the self-evaluation of their communication skills during the presentation similar to the methods of Marita et al. (1999). Correspondingly, the textual responses gathered were considered as the pre-intervention data.

The developers were then given an educational multimedia, Teaching-You Communication Skills by Focus Multimedia (Appendix 2) to serve as the tool (intervention) for learning (Abstract Conceptualization). Afterwards, they were asked to provide another presentation so that it could serve as the venue for re-assessment of their communication skills after viewing the educational material aforementioned (Active Experimentation). During such follow-up presentation, they were videotaped once again so that they could view their performance for another self-assessment. The same open-ended questionnaire (Appendix 1) was given to them in which their textual responses would serve as the post-intervention data.

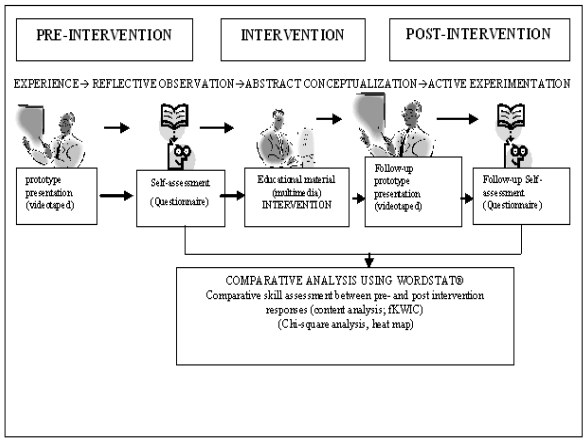

Figure 4 Flow of the activities, from experience to content analysis (pre-intervention, intervention, post-intervention and content analysis)

The textual responses (pre- and post-intervention data) were then encoded in MS Excel® and uploaded to the SimStat® software where the same were processed for content analysis using WordStat®. SimStat® and WordStat® are both software products of Provalis Research. Categorizations were based on the automatic dictionary-based coding of keywords that frequently occur in the text corpus by using initially the phrase–finder of the software. Then the specific keywords were identified using the Keyword-In-Context feature of the software as based from the methods of Provalis Research (2005) and Peladeau and Stovall (2005). WordStat® has been used in various researches such as those of Son (2005), Peladeau and Stovall (2005), Marion (2001) and Macer (2005). Moreover, automatic processing steps such as lemmatization, exclusion, and inclusion were also undertaken. Correspondingly, twenty-seven keywords-in-context (KWIC) served as the indicators of communicative performance at pre- and post-intervention (Appendix 3). These KWICs were checked for consistency in its meaning in context. Lastly, Chi-square test (at 95% confidence level) and heatmap analysis were used as the analytical methods to differentiate the responses at pre- and post-intervention based on the frequency of co-occurrences among the keywords-in-context used.

4. RESULTS AND DISCUSSIONS

The longitudinal quasi-experiment generated two sets of textual responses (pre-and post-intervention) that have been compared. In general, the text corpus analyzed is composed of a total of 12,442 words where 779 of it are unique. Also, the total occurrence of the 27 keywords-in-context associated with the communication category is 498. Table 2 shows the

percent occurrence of keywords-in-context as indicators for the improvement of the communication skills at pre- and post-intervention. The chi-square value of 78.72 is highly significant ($p<0.001$) which indicates improvement of communication skills, particularly the presentation skills, at post-intervention compared with its pre-intervention counterpart. This implies that experiential learning is an effective strategy to motivate developers in using the educational multimedia (CDROM) to improve their presentations skills at post-intervention. Similarly, the developers perceived the keywords-in-context surrounding the audience ($\chi2=61.611$), information ($\chi2=13.235$), interest ($\chi2=7.2$), prototype ($\chi2=11.845$), room ($\chi2=8.909$), summary ($\chi2=10$), and talk ($\chi2=7$) as significantly different between pre- and post-intervention responses. However, the other twenty keywords-in-context did not significantly differ, proposing similar perceptions at pre- and post-intervention. As such, these seven keywords-in-context represent the comprehensible aspects that can be learned by IS developers while using the educational material. Hence, the extent of the learning process is also based on the comprehensible ideas gained from the experience and the educational material used.

CATEGORY	Occurrence of Keywords at Pre-Intervention**	Occurrence of Keywords at Post-Intervention**	Chi-square	p-value (2-tailed)
COMMUNICATION	30.10%	69.90%	78.723	<0.001*
Keywords-in-Context:				
ATTENTION	0.60%	0.40%	0.2	0.905
AUDIENCE	10.80%	34.50%	61.611	<0.001*
BODY_LANGUAGE	0.40%	1.20%	2	0.368
CLARITY	0.20%	0%	1	0.607
CONCENTRATION	0%	0.40%	2	0.368
CONSCIOUS	0%	0.40%	2	0.368
CONTROL	0%	0.40%	2	0.368
CONVERSATION	0.20%	0%	1	0.607
DIAGRAM	0%	0.40%	2	0.368
DISCUSSION	1.60%	0.80%	1.333	0.513
ENGLISH	2.00%	0.40%	5.333	0.069
EXECUTION	0.20%	0.40%	0.333	0.846
FEEDBACK	0.60%	0.40%	0.2	0.905
IMPLEMENTATION	0.20%	0.40%	0.333	0.846
INFORMATION	0.20%	3.20%	13.235	0.001*
INTEREST	0.80%	3.20%	7.2	0.027*
OBJECTIVE	2.00%	3.60%	2.286	0.319
PREPARATION	0.40%	0%	2	0.368
PROFICIENCY	0.80%	0%	4	0.135
PROTOTYPE	4.20%	10.00%	11.845	0.003*
REHEARSAL	0%	0.40%	2	0.368
ROOM	0.80%	3.60%	8.909	0.012*
SPEAKING	2.20%	2.40%	0.043	0.978
SUMMARY	0%	2.00%	10	0.007*
TALK	1.40%	0%	7	0.03*
TONE	0.20%	1.20%	3.571	0.168
VOCABULARY	0.20%	0%	1	0.607

*significant at 95% confidence level, 2-tailed; ** percentage based on 498 total occurrence of keywords-in-context

Table 2. Statistical analysis of occurrence of keywords-in-context at pre- and post-intervention

Heatmap plot is another analytical diagram constructed using WordStat® which provides an overview of the relative frequencies based on variation in color brightness or tones and on clustering applied to reorder rows (KWIC) and columns (pre-intervention and post-intervention). The heatmap analysis revealed that the perceptions on the keywords-in-context associated with the prototype and audience highly differed between performances at pre- and post-intervention (Figure 2). This indicates that such keywords-in-context were highly recognized by the developers during their self-assessment of communication skills at pre- and post-intervention. Further, this strengthens the findings that the IS developers provided very high importance on the involvement of users during RE. As such, it is essential that users get involved during the implementation and evaluation of new IT services and applications especially during RE.

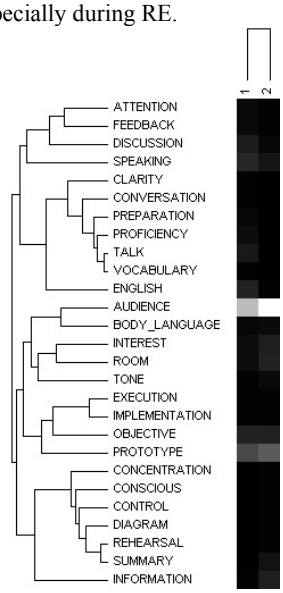

Figure 2 Heatmap diagram among the keywords-in-context associated with the pre-intervention (1) and post-intervention (2) responses

Bernstein et al. (2007) provided five constants for IT adoption in healthcare which included the audience or users. Moreover, Davis (1992) considered prototype as a quality assurance tool during systems development since it acts as the change-control board. In this way, decisions about the relative priorities of changes are resolved for any conflict between these changes. Each change made by the prototyper represents fulfillment of a new user requirement. The changes themselves are not worth saving, but the requirements that they represent are. The prototyper records these requirements as change requests. These change requests are then funneled into the normal configuration-management process. Hence, perceptions on the keywords-in-context surrounding the audience and prototype have been highly influenced by the intervention (educational CDROM) which discussed best practices in dealing with the audience during presentations in the workplace such as this kind of prototype presentation engagements.

Perceptions on the keywords-in-context surrounding the summary, room, interest, talk, and information also differed between pre- and post-intervention responses though relatively minimal as shown on the shift on the degree of shading in the heatmap diagram (Figure 2). This is particularly relevant to the recommendations provided by the multimedia CDROM which also tackled best practices during presentations in the workplace. These included proper delivery of content (e.g. information and summary), conversation styles (e.g. talk), rapport (e.g. interest), and environment (e.g. room).

Wyatt (1995) mentioned that information is necessary for all decisions and the benefits of good information management are ubiquitous that affect stakeholders. Similarly, Bernstein et al. (2007) noted that the attention to the incentive of the system should be clearly explained to the users. Moreover, Davidhizar and Dowd (1997) mentioned

that room size, seating arrangements, and environmental conditions affect the presentation. Correspondingly, the speaker should create an environment that will enhance the presentation. In addition, the educational material justified the practice of focusing on the "bottom-line" of the discussion. Similarly, Eppler and Mengis (2003) elaborated on the concepts of information overload. The authors mentioned that the new ways of collaboration between developers and users have resulted in organizations deluged with information to an unprecedented degree resulting in information overload. This then requires the presentation of the summary. Hence, all of these best practices in the delivery of presentations were also discussed by the educational multimedia which evidently affected the performance of IS developers during the follow-up prototype presentation.

The results support the cognitive enhancement in the interpersonal capabilities (collaboration with the users), as well as on the presentation skills (prototype development) of the IS developers. This corroborates with the previous findings of Richmond and Cummings (2005), Bandy and Young (2002) and Ross and Lukow (2004) where interventions have also been used in improving skills during experiential learning. As such, this indicated that experiential learning could motivate the use of educational materials (multimedia CDROM) for experiential learning. Thus, IS developers tend to prefer the converging style of experiential learning due to their inclination to learn using educational tools such as multimedia interventions. This then confirms earlier claims of Kolb (1984) that computer science professionals, such as IS developers, prefer the converging style of experiential learning (Sewchuk, 2005).

The IS developers were more inclined at post-intervention to involve the users during systems design. This is showed by the relative dominance of the keyword-in-context related to the audience during the follow-up presentation. This is shown if we are to compare responses between pre- and the post-intervention. With this, it can be interpreted as an improvement on the perception of importance of the audience during IS development. This is necessary for mutual understanding on the functional requirements of the proposed IS. As such, experiential learning theory provides clear benefits of improving the communication skills, particularly the presentation aptitude of IS developers. Evidently, this gives an opportunity to IS developers to enhance their interpersonal relationships with users especially during prototype presentations where the communication process of RE is at its peak. Indeed, the learning intervention has given them substantial idea on the proper presentation strategies that should be practiced during such an engagement especially on concepts related to the keywords-in-context of audience, information, interest, prototype, room, summary, and talk. However, the relative influence of the intervention on the cognitive performance among IS developers seems to be dependent on its content. This indicates that the extent of learning is also influenced by the topics discussed by the educational material being used during the experiential learning process.

The improvements could justify the efficacy of experiential learning in developing communication skills among IS developers. This could then be used by project managers to motivate their IS developers in learning through experience and establishing better communication process with users through skill enhancement especially during RE efforts such as prototype presentations. The improvement of communication skills is expressed based on the responses of the developers who participated during this longitudinal quasi-experiment. It should be noted however that the extent of such cognition is relatively predicted due in part to the perceived enhancement of skills gained by implementing best practices presented in the multimedia. As such, such manifestation of improvement could be based on the performance showed during the video playback. Hence, the idea behind such a claim of improvement can be supported by the videotaped activity.

Rosenstein (2002) considered video playback as a form of "stimulated recall". This allows for the learner to stimulate their recollection of events at a certain time. This strategy addresses the need for objective assessment of performance while considering a relative psychological inclination among the IS developers for self-upliftment. This is relevant to the theory presented by Festinger and Carlsmith (1959) who mentioned that people when faced between two conflicting ideas tend to experience dissonance which would allow for a person to reduce such state by struggling and finding a way to change the belief to be consistent with one another. Hence, this cognitive dissonance portrays a theory of consistency. That is, people try to make a sense out of what they are doing to portray a sensible and meaningful way of life- their self-worth. As such, with this assumption, developers are most likely to deny the lack of improvement in their communication to resolve dissonance. If this took place, then responses would show bias to show a relative improvement in their communication skills to satisfy the developers' effort on self-worth. However, viewing the videotape material could facilitate a confirmation on the actual performance as this would induce a "stimulated recall" of the true performance reducing a bias self-assessment (Rosenstein, 2002; Marita et al, 1999).

Relating the quasi-experiment to the theory of cognitive dissonance, the developers could be confronted with their consistency in their desire to improve their communication skills. This would most likely lead to denial of poor performance. As such, improvement of communication skills would satisfy their dissonance and would eventually lead to misleading responses on a belief of improvement to project self-worth. However, the videotaped activity would act as the direct evidence on performance with less opportunity to deny the actual result of presentation. This is one of the key benefits of using videotapes in assessing performance because the material creates a confirmation and validation of improvement, change or strategies (Rosenstein, 2002). Hence, the use of training materials and the subsequent improvement of communication skills among developers can be added to the pool of knowledge under the agile IS development practices.

5. CONCLUSIONS

The study showed that experiential learning can be used as a strategy to improve the communication skills, particularly the presentation skills of IS developers during RE activities such as prototype presentations. The perception on the keywords-in-context related to the audience, information,

interest, prototype, room, summary, and talk were all found to be significantly different between responses at pre-and post-intervention. This indicates that improvement on the presentation skills of IS developers could be accounted to their motivation on learning the concepts presented in the educational CDROM (intervention). This confirms earlier claim of Kolb that experiential learning can be used by computer science professionals, such as IS developers, as a learning strategy (Sewchuk, 2005; Kolb, 1984). Also, this validates that the preferred learning style among IS developers is the converging mode. Such preferred learning style (converging) suggests that it would be best to use educational tools to teach IS developers about best practices towards its practical application during the active experimentation stage as shown by their relatively improved performance during the follow-up prototype presentations. Hence, managers who are handling multiple IS design projects should encourage their developers to improve their communication skills, particularly their presentation skills, using experiential learning with the aid of educational materials. In this way, IS development would be more efficient in communicating and detecting errors at an early stage while still within the RE phase of IS development. This is especially important during prototype presentations where face-to-face interaction is at its peak. Hence, these findings could be considered as valuable information to add on the merits of continuous training and adept communication process among stakeholders during systems design. It elaborates on the need for sufficient, practical, easy to use practices in improving the communication skills using experiential learning towards agile systems development through improved RE practices.

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7. REFERENCES

Al-Ani, Ban. (2002) "System's Requirements: Once captured, are slaughtered", AWRE 2002 Incubator Study, Vol. 69, pp. 249-254.

Al-Rawas, A. and Easterbrook, S. (1996) "Communication Problems in Requirements Engineering: A field study", Proceedings of the First Westminster Conference on Professional Awareness in Software Engineering, Royal Society, London.

Bandy, K.E. and Young, J.I. (2002) "Assessing Cognitive Change in a Computer-Supported Collaborative Decision-Making Environment", Information Technology, Learning, and Performance Journal, Vol. 20, No. 2, pp. 11-23.

Bernstein, McCreless, T. and Cote, M.J. (2007) "Five Constants of Information Technology Adoption in Healthcare", Hospital Topics, Vol. 85, No. 1, pp. 17-25.

Coiera, E.W., Jayasuriya, R.A., Hardy, J., Bannan, A and Thorpe, MEC., (2002).Communication Loads on clinical staff in the Emergency Department" MJA, Vol. 176: 415-418.

Coughlan, J., Lycett, M. and Macredie, R.D. (2003) "Communication issues in requirements elicitation: a context analysis of stakeholder experiences", Information and Software Technology, Vol. 45, No. 8, pp. 525-537.

Coughlan, J. and Macredie, R.D. (2002) "Effective Communication in Requirements Elicitation: a Comparison of Methodologies", Requirements Engineering, Vol. 7, pp. 47-60.

Crews, T.B. and McCannon, M. (2000) "Comparison of Communication Skills Needed by Information Systems Undergraduates and Graduates as Perceived by Information Systems Professionals" Journal of Information Systems Education, Vol. 1, No. 3-4, pp. 151-155.

Davidhizar, R, and Dowd, S.B. (1997) "The Art of Giving an effective Presentation", The Health Care Supervisor, Vol. 15, No. 3, pp. 25-31.

Davis, A.M., 1992. "Operational Prototyping: A new Development" Approach. IEEE Software. 70-78.

Dewey, J. (1938). "Experience and education". New York: Collier Books.

Eppler, M.J. and Mengis, J. (2003) "A Framework for Information Overload Research in Organizations", Insights from Organization Science, Accounting, Marketing, MIS, and Related Disciplines, Vol 1, pp. 1-38.

Feghali, T. and Zbib, I.J. (2007) "Global information systems failure sphere: a forecasting model", J. Global Business Advancement, Vol. 1, No. 1, pp. 140-152.

Festinger, L. and Carlsmith, J.M. (1959). "Cognitive consequences of forced compliance" Journal of Abnormal and Social Psychology" Retrieved on December 15, 2007, from http://www. fpce.uc.pt/niips/novoplano/ps1/ documentos/Festinger&Carlsmith_1959.pdf.pdf

Gaudine, A. P., & Saks, A. M. (2004) "A Longitudinal Quasi-Experiment on the Effects of Post-training Transfer Interventions", Human Resource Development Quarterly, Vol. 15, pp. 57-76.

Glik, D.H., Parker, K., Muligande, G. and Hategikama, B. (2006) "Integrating Qualitative and Quantitative Survey Techniques", Int'l Quarterly of Community Health Education, Vol. 25 No. 1-2, pp. 115-133.

Guarino, N. (1998). "Formal Ontology and Information Systems", Proceedings of FOIS'98, Trento, Italy, Amsterdam, pp. 3-15. Retrieved on December 15, 2007, from http://www.loa-cnr.it/Papers/FOIS98.pdf

Harris, A.D., McGregor, J.C., Perencevich, E.N., Furuno, J.P., Zhu, J., Peterson, D.E., and Finkelstein, J. (2006). "The Use and Interpretation of Quasi-experimental Studies in Medical Informatics." Journal of the American Medical Informatics Association, Vol. 13 (1), pp. 16-23.

Healey, M. and Jenkins, A. (2000) "Learning Cycles and Learning Styles: Kolb's experiential learning theory and its application in geography in higher education", Journal of Geography, Vol. 99, pp. 185-195.

Heeks, R. (2002) "Failure, Success and Improvisation of Information Systems Projects in Developing Countries",

Development Informatics, Retrieved on December 15, 2007, from http://unpan1.un.org/ intradoc/groups/public/ documents/NISPAcee/UNPAN015601.pdf.

Herod, L. (2003). "Adult Learning: From Theory to Practice" Retrieved on October 11, 2008, from http:// www.nald.ca/adultlearningcourse/pdf/al_cours.pdf

Holstrom, H., Fitzgerald, B., Agerfalk, P. and Conchuir, E.O. (2006). "Agile practices reduce distance in global software development" Information Systems Management. Summer Issue, pp. 7-18.

Hornik, S., Chen, H.G., Klein, G. and Jiang, J.J. (2003) "Communication Skills of IS Providers: An expectation gap from three stakeholder perspectives", IEEE Transactions on Professional Communication, Vol. 46, No.1, pp. 17-31.

Jenson, J.M. (2007) "Longitudinal research in Social Work: A Call to Action", Social Work Research. Vol. 31, No. 2, pp. 67-70.

Kaki, M. (2005). "fKWIC: Frequency based Keyword-in-context for filtering web search results." Department of Computer Sciences , University of Tampere, Retrieved on October 11, 2008 from http://www.cs.uta.fi/ reports/dsarja/D-2005-3.pdf

Kolb, D.A. (1984) "Experiential Learning: Experience as the Source of Learning and Development", Englewood Cliffs, NJ: Prentice Hall Inc.

Lindstrom, L. and Jeffries, R. (2004). "Extreme Programming Software Development Methodologies" Information Systems Management. Summer Issue, pp. 41-52.

Macer, T. (2005). WordStat Reviewed. Market Research Society. Retrieved on October 11, 2008, from http:// www.meaning.uk.com/arts/110.html

Majchrzak, A., Beath, C.M., and Lim, R.A. (2005) "Managing Client Dialogues during Information Systems Design to Facilitate Client Learning", MIS Quarterly, Vol. 29, No.4, pp. 653-672.

Mannio, M. and Nikula, U. (2001). "Requirements Elicitation Using a Combination of Prototypes and Scenarios" Retrieved on October 11, 2008, from http://www.wer.inf.puc-o.br/WERpapers/artigos/ artigos _WEROI /mannio.pdf

Marion, L. (2001). "Digital Librarian, Cybrarian, or Librarian with Specialized Skills: Who Will Staff Digital Libraries?". ACRL Tenth National Conference, Denver, Colorado, 15-18 March 2001.

Marita P., Leena L. and Tarja K. (1999), "Nurse's self-reflection via videotaping to improve communication skills in health counseling", Patient Education and Counseling, Vol. 36, pp. 3-11.

Meso, P. and Jain, R. (2006). "Agile Software Development: Adaptive Systems Principles and Best Practices" Information Systems Management, Summer Issue, pp. 19-30.

Miller R.A. and Luse D.W. (2004) "Advancing the IS curricula: The identification of important communication skills need by IS staff during systems development", Journal of Information Technology Education, Vol 3.

Myers, M.D. (1997). "Qualitative Research in Information Systems" Association for Information Systems Retrieved on Dec 20, 2007, from http://www.qual.auckland.ac.nz/

Nauman, A.B., Aziz, R. and Ishaq, A.F.M. (2005). "Information Systems Development Failure: A Case study to Highlight the IS Development Complexities in Simple and Low Risk Projects in Developing Countries", The Second International Conference on Innovations in Information Technology (ITT'05).

Nuseibeh, B. and Easterbrook, S.(2000) "Requirements Engineering: A Roadmap", Retrieved on Dec 20, 2007, from http://www.cs. toronto.edu/~sme/papers/2000/ ICSE2000.pdf.

Papai, P., Bourbonnais, F.F. and Chevrier, J. (1999) "Transcultural Reflection on Clinical Teaching Learning Model", The Journal of Continuing Education in Nursing, Vol.30, No.6, pp. 260-266.

Peladeau, N. and Stovall, C. (2005) "Application of Statistical Content Analysis Text Mining to Airline Safety Reports" Provalis Research, Retrieved on Oct. 7, 2007, from http://www. provalisresearch.com/wordstat/bWord Statstudies.php.

Price Waterhouse Coopers and IT Governance Institute. (2008) "IT Governance Global Status Report-2008", Retrieved on Feb. 10, 2008, from http://www.itgi.org/AMTemplate.cfm?Section=ITGI_ Research_Publications&Template=/ContentManagement/ ContentDisplay.cfm&ContentID=39735.

Provalis Research. (2005) "WordStat v5.1 Manual: Content Analysis Module for SIMSTAT and QDA Miner", Provalis Research, Retrieved on Oct 7, 2007 from http://www.provalisresearch.com/ Documents/wordstat51.pdf

Puri, S.K., Byrne, E., Leopoldo, J., and Quraishi, Z.B. (2004) "Contextuality of Participation in IS Design: A developing country perspective", Proceedings of Participatory Design Conference, Toronto, Canada, pp. 42-50.

Qurban, M.H. (2008). "Improving the Communication Skills of IS Developers using Experiential Learning" PhD Dissertation, Brunel University, UK

Rahman, M.N.A., Rahim, M.M., Seyal, A.H., and Awg Mohamed, A.Y.H. (1999) "Interpersonal Skills Requirements for Fresh Computer Programmers: Expectation of Brunei-based Organizations", Malaysian Journal of Computer Science. Vol. 12, No. 2, pp. 10-18.

Ramani A., Ramani K., Uikey, N., Pandey, G., Bahutra,P., Wable, S., Lakkad, C., Upadhyay, S. and Gupta, D. (2006) "Hospital Information System: PULSE Implementing IT in health-care". Proceedings of 18th National Computer Conference Information Technology and Sustainable Development. Riyadh, Saudi Arabia pp. 349-357.

Richmond, A.S, and Cummings, R. (2005) "Implementing Kolb's learning styles into online distance education" International Journal of Technology in Teaching and Learning, Vol.1, No.1, pp. 45-54.

Rogers, A (1996). "Teaching Adults", Open University Press: UK

Ross, C.M. and Lukow, J.E. (2004) "Are Learning Styles a Good Predictor for Integrating Instructional Technology into a Curriculum", Journal of Scholarship of Teaching and Learning, Vol. 4, No. 1.

Rosenstein, B. (2002). "Video use in social science research and program evaluation." International Journal of qualitative Methods 1(3). Article 2. from http://www.ualberta.ca/~ijqm

Roter, D.L., Larson, S., Shinitzky, H., Chernoff, R., Serwint, J.R., Adamo, G. and Wissow, L. (2004) "Use of an Innovative Video Feedback Technique to Enhance

Communication Skills Training", Medical Education, Vol. 38, pp. 145-157.

Saleem, N., Jones, D.R., Van Tran, H., and Moses, B. (2006) "Forming Design Teams to Develop Healthcare Information Systems", Hospital Topics, Vol. 84, pp: 22-30.

Sellheim, D.O. (2006) "Influence of Physical Therapist Faculty Beliefs and Conceptions of Teaching and Learning on Instructional Methodologies", Journal of Physical Therapy Education, Vol. 20, No. 2, pp. 48-60.

Sewchuk, D.H. (2005) "Experiential Learning- A Theoretical Framework for Perioperative Education", Association of Operating Room Nurses Journal, Vol. 81. No. 6, pp. 1311-1318.

Sindre, G. (2005) "Teaching Oral Communication Techniques in RE by Student-Student Role Play: Initial Experiences" Proceedings of the 18th Conference on Software Engineering Education and Training.

Son, B.G. (2005) "WordStat 5.0 Software Review" OR/MS Today " Retrieved on October 11, 2008 from http://www.lionhrtpub.com/orms/orms-10-5/frswr.html

Talby, D., Hazzan, O., Dubinsky, Y. and Keren, A. (2006). "Reflections on reflection in agile software development" Agile Conference, pp 23-28.

Tan, F.B. and Hunter, M.G. (2002) "The Repertory Grid Technique: A Method for the Study of Cognition in Information Systems", MIS Quarterly, Vol. 26, No.1, pp. 39-57.

Thanasankit, T. and Corbitt, B. J. (1999) "Towards an understanding of the impact of Thai culture on requirements engineering, Proceeding of Information Technology in Asia, IFIP WG 9.4, Sarawak, Malaysia, 420-440.

Urquhart, C. (2001) "Analysts and Clients in organizational contexts: a conversation perspective", Journal of Strategic Information Systems, Vol. 10, pp.243-262.

Valenti S., Panti M and Cucchiarelli A. (1998) "Overcoming communication obstacles in user-analyst interaction for functional requirements elicitation", ACM SIGSOFT, Software Engineering Notes, Vol 3, No.1.

Vinekar, V., Slinkman, C.W., and Nerur, S. (2006). "Can agile and traditional systems development approaches coexist? An ambidextrous view" Information Systems Management Summer. pp. 31-42.

Wyatt, J.C. (1995) "Hospital Information Management: the need for clinical leadership" BMJ. Vol. 311, pp.175-178.

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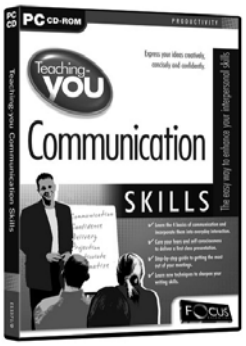
APPENDIX 1
Open-ended Questions used for self-assessment of performance

1. What can you say about your presentation?
2. What were the problems that you encountered?
3. What skills do you think need to be improved?
4. Considering the problems you identified, what steps or actions do you intend to do or avoid in future presentation engagements?
5. How will you rate your presentation skills? Justify your answer.
6. What can you say about your communication skills?

APPENDIX 2
Educational Multimedia (Teaching You Communication Skills by Focus Multimedia) used as an intervention for experiential learning



Appendix 3
Dictionary-based keywords-in-context used during the content analysis in WordStat®v5.1.9c

- COMMUNICATION(1)
- ATTENTION (1)
- AUDIENCE (1)
- BODY_LANGUAGE (1)
- CLARITY (1)
- CONCENTRATION (1)
- CONSCIOUS (1)
- CONTROL (1)
- CONVERSATION (1)
- DIAGRAM (1)
- DISCUSSION (1)
- ENGLISH (1)
- EXECUTION (1)
- FEEDBACK (1)
- IMPLEMENTATION (1)
- INFORMATION (1)
- INTEREST (1)
- OBJECTIVE (1)
- PREPARATION (1)
- PROFICIENCY (1)
- PROTOTYPE (1)
- REHEARSAL (1)
- ROOM (1)
- SPEAKING (1)
- SUMMARY (1)
- TALK (1)
- TONE (1)
- TONE (1)
- VOCABULARY (1)

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