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COMMUNICATION COMPETENCE FACTORS AS MODERATORS TO THE RELATIONSHIP BETWEEN USER PARTICIPATION AND INFORMATION QUALITY

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ABSTRACT

The objective of this study was to find the factors that influence information quality of the system by utilizing participative decision-making theory and communication competence framework. Based on this framework, this study tested the effects of certain users' characteristics on information quality. Results indicated that there was a positive correlation between user participation and information quality. Moderated regression analyses showed that users' job experiences negatively moderated the relationship, while a component of communication competence--modeling cognition--positively moderated it. The findings of this study have implications for selecting users to participate in information systems projects.

Keywords: communication competence, cognitive knowledge, user participation, information quality.

INTRODUCTION

Communications between users and system developers have recently been an interesting area in User Participation area of study. Users are considered sources of knowledge and information for system developers. If the users cannot competently communicate their knowledge with system developers, important information for developing a successful system may be missing, which, in turn, can attenuate the quality of information systems. The objective of this study is then to investigate the impacts of users' communication competence on the information quality of an information system in the user participation context.

Past user participation researchers based their studies upon participative decision making theory.

Wagner, Leana, Locke, and Schweiger [40] explained that "participation has such effects due to increases in information, knowledge, creativity, and understanding that grow out of improved communication, joint decision making, and a fuller grasp of job demands and organizational policies." Developed from this theory, user participation studies are predicated on the premise that the more users share their knowledge with system developers, the more knowledge the developers have about developing an information system, and consequently the better the system meets its requirements. However, factors influencing the extent to which users share their knowledge during their participation have not been adequately investigated.

It is indisputable that knowledge and information sharing cannot take place without some kind of communications between users and system developers. The objective of this study is to examine communication-related factors (derived from a communication competence framework) that may influence the relationship between user participation and system outcomes. Past research mostly focused on the effects of user participation on user satisfaction. A problem with using user satisfaction as a surrogate to system success is that it merely measures user's attitude on his/her systems and does not reflect the actual quality of the system outcome [30]. According to the participative decision making theory, participation increases job performances and productivity. It follows that user participation should also increase performances, herein viewed as the quality of systems. According to the DeLone and McLean [6]'s system success model, there are two types of quality: system quality and information quality. System quality is not the variable of interest in this study because system quality is more affected by the system developers' capabilities than by participation of users. The contribution that users can make is to share their expectations and useful knowledge with the system developers to improve the quality of the informational outputs of an information system. Therefore, information quality of an information system is, in the context of this research, a more appropriate surrogate for system success.

This research attempts to fill this gap by answering questions: A.) "Does user participation affect the information quality of a system?" and B.) "Do communication-related factors of users, who participated in system development, affect the information quality of systems?"

LITERATURE REVIEW

The relationship between user participation and system success has long been studied in the MIS field. Although user participation has been found to have a positive impact on system success (e.g., DeBrabander and Thiers [5]; Franz and Robey [12]; Guimaraes and Igbaria [17]; Kappelman and McLean [18], some empirical evidence has shown the opposite (e.g., King and Lee [20]; Robey and Farrow [33]; Tait and Vessey [39]). Some research has found that user participation has both negative and positive impacts on system success. For example, Lawrence, Goodwin and Fildes [22] laboratory study and found that user participation had a positive effect on satisfaction but a negative effect on accuracy of the output.

A way to solve the problem of conflicting results in the user-participation arena is to take into account possible contingencies. Contingency variables affecting the relationship between user participation and system success are of two types: personal and situational contingencies. Prior research has delved into the effect of user's psychological factors and capabilities. For example, Kappelman and McLean [18] found an interaction effect between user participation and user involvement. Saleem [34]found that users' system-related functional expertise moderates the relationship between user participation and system acceptance. Tait and Vessey[39], studying situational contingencies, found significant moderator effects of system complexity and resource constraint on the relationship. McKeen and Guimaraes [28] found that task complexity and system complexity moderate the relationship between user participation and user satisfaction. Moreover, Lin and Shao [23] found that the relationship was contingent upon system impact, system complexity, and development methodology.

In spite of extensive research to determine when and how participation increased satisfaction, very little of this research emphasized the communication component of participation. Many researchers agreed that effective communication played an important role during user participation in predicting the success of the outcome (Edström [10]; Guimaraes, Staples, and McKeen [15]; McKeen, Guimaraes, & Wetherbe [29]; Robey and Farrow [33]. Edström [10] found that ineffective communication had a negative effect on system success. McKeen, Guimaraes, and Wetherbe [29] found that user-developer communication has a direct positive impact on user satisfaction. Nonetheless, past research integrating participation and communication has left room for future research. McKeen, Guimaraes, and Wetherbe [29] urged future researchers to further investigation of the interactions between communication constructs and user participation.

Impacts of Communication Factors in User Participation Context

Information sharing has been considered as an important component of participation. As Latham, Winters, and Locke [21] stated, "If subordinates have task-relevant knowledge and are allowed to *share* and implement it, the resulting decisions should have a positive effect on performance. [*italics* added]" Because information sharing is an indispensable process during user participation, it is important to study the factors influencing the sharing of user's information.

It has also been recognized that effective communications between users and system developers plays a vital role in information sharing during participation (Cavaye [3]; Edström [10]; Gallivan and Keil [13]; Guimaraes, Staples, and McKeen [15]; McKeen, Guimaraes, & Wetherbe [29]; Mumford and Henshall [31]; and Robey and Farrow [33]. Davis [4] also stated that communications between users and system analysts and user's unwillingness to provide requirements are some of the important obstacles in requirements determination.

Although a few studies tested the effects of user-developer communications (both as moderator and as independent variable) on system success, results were mixed. For example, McKeen et al. [29] found that user-developer communication was both a significant moderator to the relationship between user participation and user satisfaction and a significant predictor of user satisfaction. However, Guimaraes et al. [15] did not find a significant relationship between user-developer communication and system quality. A limitation of the user-developer communication construct was the fact that it had been measured by a set of questionnaire items pertinent to system developers' communication only. Communication from the users' perspective has been absent from prior research. Moreover, past research that studied the effects of communications in the user participation context lacked strong theoretical foundation.

To address these research gaps, this study will focus on the communication factors from the users' perspective. Specifically, this study will address the question: "Which factors affect the extent to which a user shares his/her information with a system developer?" The communication competence framework, which will be discussed in the following section, may provide an answer to this question. This framework attempts to find the elements of competency in an individual's communications. The following sections present the literature on communication competence and its elements.

Communication Competence Framework

The term communicative competence was coined by Dell Hymes, a respected socio-linguist. He posited that communication competence is a combination of the knowledge of communication and the ability to communicate. Hymes [16] also incorporated social rules and norms into the communicative competence framework, as competent communicators need to learn to adapt his/her communications to the rules and norms in the society to which they belong in order to communicate effectively and appropriately. Hymes' conceptualization of competence was criticized for lacking detailed formulation from which future researchers could work. Later, to clarify Hymes' formulation, Wiemann and Backlund [41] reviewed the work in communication competence and suggested that communication competence is a combination of the *knowing what to say* and the *knowing how to communicate*. The concept of communication competence has been extended over time in order to clarify its definition. While many other researchers focused only on the communicator's knowledge and skills, Spitzberg and Cupach [37, 38] added another important element of competence, *motivation to communicate*, and posited that there should be three components of communication competence: cognitive knowledge (i.e., subject and knowledge how to communicate) , communication skills (or communication competence), and motivation. Motivation is the impetus for communicators to transfer their knowledge into behaviors they actually perform. In other words, "an individual must desire to interact competently with a particular individual in a specific context" [36].

The moderators proposed in the research model (shown in Figure 1) are derived from this formulation of communication competence by Spitzberg and Cupach [37, 38] as their formulation taps into an important ingredient of competence -- motivation. The following section discusses the literature related to each element and how it is related to the participation concept.

Cognitive Knowledge: This element is described in communication literature as representing the knowledge one has available to communicate with others. It has been observed in past research using participative decision-making theories that the sharing of an individual's expertise with others who lack such knowledge can produce a positive impact on the quality of outcome. For example, Scully, Kirkpatrick, and Locke [35] found support for their hypothesis that participation could produce positive outcomes when subordinates possessed useful information to bring to the decision-making situation. In the user participation arena, studies have been conducted investigating the effects of user's knowledge on system success. For example, Saleem [34] found that "users who perceive themselves as functional experts are unlikely to accept a system unless they exerted a substantive influence on its design." Kawalek and Wood-Harper [19] reported that users served as the source of intelligence for the system development process. Another study by Guimaraes et al. [15] found that user's expertise in using a system, measured by user experiences, could impact the system quality in a favorable way. Such experiences can be deemed a surrogate for user's tacit knowledge, as the tacit knowledge is formed by experiences. However, only the user's experiences in using the system were measured, while the user's experiences in their tasks or jobs were omitted.

Communicative Skills: Communicative skills deal with knowledge of how one delivers his/her knowledge in an appropriate and effective way. Communicative skills include the interactant's ability to perceive and interpret facets of any situation [11]. Moreover, a skillful communicator should "be capable of monitoring the progress of an interaction" and "able to engage in a reflective process immediately following one interaction" [9]. In the user participation literature, few studies addressed the communication skills of those interacting during participation. One of the few studies was done by Yoon, Guimaraes, and O'Neal [42]. They investigated factors associated with expert systems and found that quality of domain experts was a predictor of user satisfaction. The quality of domain experts was measured by asking project managers to rate their experts on cooperation, availability, computers background, education level and work experience, and communication skills. Communication skills was treated as a part of the quality of domain experts construct, and its direct effect on expert system success was not tested. Although it has been realized that communications between users and developers are important, users' communicative skills that facilitate effective communications have been inadequately investigated.

Motivation to Communicate: Spitzberg [36] posited that motivation is an important element of communication competence, because without it, though one may possess the necessary knowledge and communication skills, he/she may be reluctant to communicate with others. Some researchers associated motivation or willingness to communicate with personality traits, while others thought it was more related to situational variables [27]. In the user participation context, although few studies have been done on the motivation to communicate, a few researchers have expressed their concerns on ineffective communications caused by users' inhibition to share knowledge [5, 13]. From their case study, Gallivan and Keil [13] suggested that "Project managers should try to ensure that users feel empowered to share their ideas freely and should recognize the greater risks that accompany situations in which users are *reluctant to share* their opinions. [*italics* added]" They further observed that future researchers should find out the antecedents to open communication between users and system developers.

An important factor that influences motivation to communication is communication apprehension, defined as "an individual's level of fear or anxiety associated with either real of anticipated communication with another person or persons" [25]. Past research found that communication apprehension had a strong negative impact on the communicator's willingness to communicate [24]. McCroskey and Richmond [27] posited that communication apprehension was probably the single best predictor of willingness to communicate.

In the user participation literature, it has been observed that communication barriers should be removed to facilitate user participation. However, no studies have been found investigating the effects of users' communication apprehension.

The next section presents the proposed model, the hypotheses, and elaborates on the effects of these moderator variables on the relationship between user participation and system success.

HYPOTHESES

The research questions that this study attempts to answer are: 1.) "Does user participation affect the information quality of a system?" and 2.) "Do communication-related factors influence the relationship between user participation and the quality of informational outputs of a system?" To answer these questions, the theories presented in the literature review section are applied to the user-participation context. The following section presents the hypotheses and their rationale.

The Main Effect of User Participation on Information Quality

The surrogate for system success used in this study was the quality of informational outputs of a system. The main reason for selecting this dimension of quality was that users share knowledge about their jobs and system usages with systems developers. Such knowledge helps improve the quality of informational outputs such as quality of interfaces and contents of the informational outputs rather than the quality of system, which is rather influenced by systems developers' skills and expertise. Consequently, the first hypothesis states that:

H1: There is a positive correlation between user participation and information quality of a system.

User's Experiences, Communication Skills, and Communication Apprehension as Moderating Effects

The participative decision-making theory posits that participation allows one to share his/her useful information with another, and, information sharing increases productivity. A question needed to be investigated is: "What then influences the information sharing process during user participation?"

It is indisputable that sharing information from one person to another requires some kind(s) of communications among them. According to Spitzberg and Cupach [37, 38], the concept of communication competence suggests that a competent communicator must a.) possess the cognitive knowledge, b.) be able to deliver his/her messages skillfully (i.e., appropriately and effectively), and c.) be motivated to communicate. In the user-participation context, the knowledge of users that are useful for the system development is measured here by the users' work experiences on their jobs, the current systems, and the organization. It is assumed in this study that the more experienced a user is, the more knowledge the user possesses. The second hypothesis proposes that the user's relevant experiences (i.e. their cognitive knowledge on the subject matters that is important for developing a successful system) will positively moderate the relationship between user participation and information quality. In other words, when a user, who is highly experienced—thus possessing a great deal of knowledge —participates in system development, the user is expected to have more useful information to share with the system developers. In turn, the system developers are expected to learn more from the highly-experienced users than from those with low experiences. Thus, they have more knowledge to produce a system that provides users with better quality of informational outputs.

There are two types of experiences including in this study: experiences in current system and current job. Users who have experiences in current systems or systems in the same nature are likely to know limitations and problems of informational outputs from the systems better than those who do not have such experiences. Therefore, they should be able to give suggestions to system developers on how to improve the informational outputs of the new systems. Figure 1 summarizes all hypotheses being tested in this study.

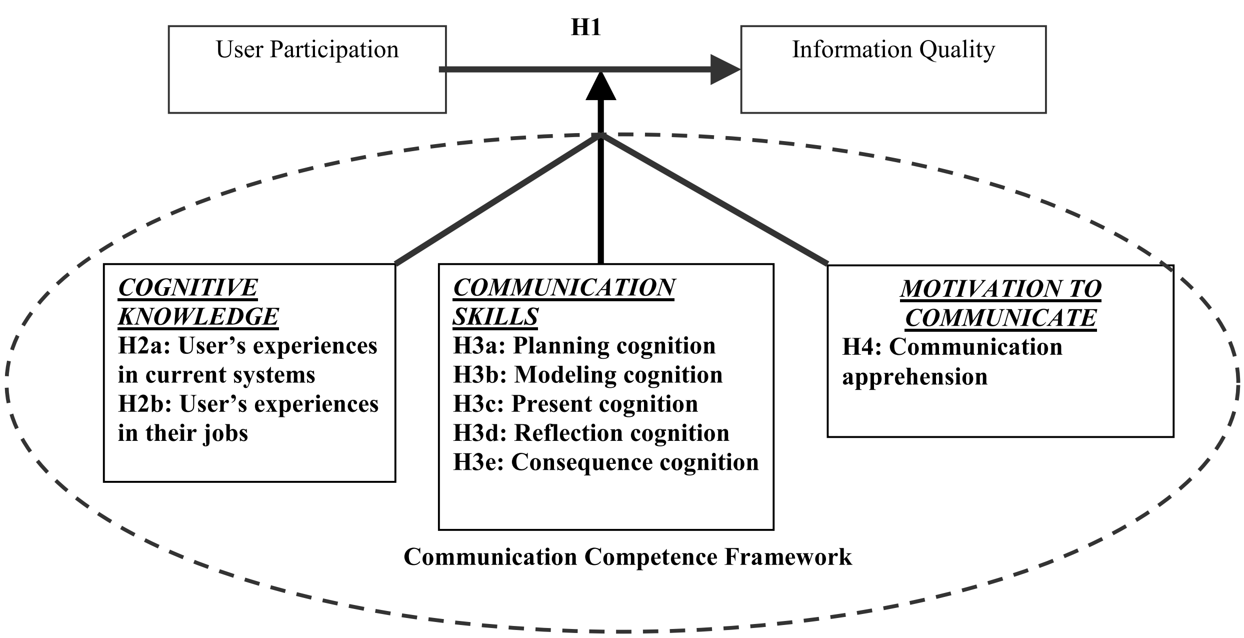

Figure 1: Communication Competence Framework

User's experience in his/her current job may be beneficial to system development, as system developer can acquire job-related knowledge from these users and know what kind of information these users need. This kind of acquired knowledge, in turn, results in a system that provides high-quality information. The second hypothesis is stated as follows:

H2a: The more experience a participating user has with the current system (or of systems of a similar nature), the stronger the relationship between user participation and information quality of a system.

H2b: The more experience a participating user has with the current job, the stronger the relationship between user participation and information quality of a system.

While the second hypothesis is about *what* a user knows, the third hypothesis is about *how* competently a user delivers their messages. According to the communication competence concept, "competence" bears two meanings: appropriateness and effectiveness. In the user-participation context, a user with communicative competence or skills must not only be able to say what they intend to say but also realize when to say what to whom. Interacting with users with higher communicative competence during user participation, a system developer should have clearer understandings of the system requirements than he would with those with lower communicative competence. Hence, users' degrees of communicative competence are proposed to moderate the relationship between user participation and information quality of the system's outputs. In other words, the more competently a user communicates with system developers during participation, the stronger the relationship between user participation and information quality of a system.

There are 5 components of the communication competence: planning, modeling, presence, reflection, and consequence cognitions. The following is the definitions of these five cognitions as defined by Duran and Spitzberg [9]:

- **Planning cognitions** reflect the anticipation, mental rehearsal, and monitoring of topics of conversation.
- **Modeling cognitions** reflect an awareness of contextual variables that provide information that serves to inform interaction choices.
- **Presence cognitions** reflect an awareness of how the other is reacting to a conversation.
- **Reflection cognitions** tap a process of reflecting upon a performance with the objective to improve one's self-representation.
- **Consequence cognitions** reflect a general awareness and concern for the effects of one's communication performance.

The third set of hypotheses tests the moderating effect of each cognition defined above and are stated below:

H3a: The more a user possesses planning cognition, the stronger the relationship between user participation and information quality of a system.

H3b: The more a user possesses modeling cognition, the stronger the relationship between user participation and information quality of a system.

H3c: The more a user possesses present cognition, the stronger the relationship between user participation and information quality of a system.

H3d: The more a user possesses reflection cognition, the stronger the relationship between user participation and information quality of a system.

H3e: The more a user possesses consequence cognition, the stronger the relationship between user participation and information quality of a system.

For some people, communications with their colleagues are held back because of their intrinsic inhibitions, such as apprehension to communications. Fears or apprehensions to communicate with others can obstruct the information sharing process between users and system developers because such apprehensions cause the users to withhold useful information. As a result, the fifth hypothesis proposes that user's communication apprehension can attenuate the strength of the relationship between user participation and information quality.

H4: The more user is communicatively apprehensive, the weaker the relationship between user participation and information quality of a system.

SAMPLING METHOD AND MEASUREMENTS SECTION

Sampling

Senior IT managers of ten mid-sized to large organizations in the Southern U.S. were contacted to participate in this study. Five of them agreed to participate: two universities, a large global logistic company, a large nationwide retail company, and a large global chemical manufacturing company. The senior managers assigned one to three experienced system developers to work together with researchers. Each of the system developers were asked to list titles of systems and some information about the systems and names and contact information of users, whom he/she had worked with during the development of those systems.

A total of 114 names of users were provided by the system developers, and these 114 users were contacted via email, asking them to fill out an online survey. Five item Likert-type scales were used for all instruments. Once completed the survey, the users received some monetary rewards, unless they chose to turn down the rewards. 19 information systems were included in this study. 49 users responded to the survey, but one of them was incomplete and was removed from the data. (See Appendix A for the demographics of survey participants.)

Measurements

A discussion of the instruments used to measure the constructs in the above hypotheses is given below.

User Participation: The end-user participation is adapted from Guimaraes, Staples, and McKeen [15], which was originally developed by Doll and Torkzadeh [8]. It asks users to rate their participation on each of nine activities (see Appendix 3). The original instrument asks: "Regarding participation in the development of this system. You and other user(s) were primary players in…" According to this statement, a user would have to rate his/her as well as others' participation in each activity on one scale, resulting in a "double-barreled" question. To avoid this problem, this study asked users to rate only their own participation on each of the nine activities on a scale from 1 to 5; where 1 is "not at all" and 5 is "to a great extent." (See Appendix B.)

Information Quality: Originally, Bailey and Pearson [2] developed a 39-item instrument to measure system success. Based on Bailey and Pearson's work, Raymond [32] later reduced the number of items down to 20 items and factor-analyzed them. four factors emerged, namely output quality, user-system relationship, support, and user relationship with EDP staff. Yoon, Guimaraes, and O'Neal [42] further adapted the instrument to measure expert system success by excluding the items measuring the last two factors (i.e., management support and user relationship with EDP staff). The instrument was subsequently used by Guimaraes, Staples, and McKeen [15] with minor adaptation to Yoon et al.'s instrument. Their adaptation of the system quality instrument, comprised of 10 items, was intended to measure user satisfaction with the quality of an information system. However, because this study is intended to measure the quality of informational outputs, instead of asking users to rate their satisfaction on their systems, users were asked to rate the factual quality of information received from the systems. Three items related to user-system relationship are dropped from Guimaraes et al.'s instrument because they are not related to the quality of information. In addition to the items from Guimaraes et al., three items measuring the quality of contents of the information provided by the system were added to the instrument. The three items were adapted from Doll and Torkzadeh [7]'s measure of end-user computing satisfaction. Thus, users will be asked to rate 9 items in the instrument, on a scale from 1 to 5 (where 1 = "not at all" and 5 = "great extent"), which measures the following aspects of information quality: a.) output value, b.) timeliness, c.) reliability of the output, d.) response/ turnaround time, e.) accuracy of the output, f.)completeness of the output, and g.) content-preciseness, h.) content-achievement, and i.) content-sufficiency. (See Appendix C.)

User's Experiences: Originally, this instrument was developed by Igbaria, Guimaraes, and Davis [17]. It was later adapted from by Guimaraes, Staples, and McKeen [15]. In this study, the measure of user experiences were adapted from Guimaraes, Staples, and McKeen [15] The User Experiences instrument asks users to rate the extent of their experiences, relative to their peers, in using the systems under the study. There are five dimensions in the original instrument (see Appendix D, item numbers 1 to 5). However, it is hypothesized here that users' knowledge, not only their knowledge of the systems they are currently using but also their knowledge of their job and organization, has an effect on the relationship between user participation and information quality. Thus, in this study, there are two components in the instrument measuring user experiences: users' experiences in: a) working in their jobs in this organization, and b) using the information system; the latter component is added to the instrument (see Appendix D, item numbers 1 to 3). Users will be asked to rate their experiences on the scale from 1 to 5; where 1 is "not at all" and 5 is "great extent."

Cognitive Communication Competence: Cognitive communication competence is measured by the instrument developed by Duran and Spitzberg [9]. This measure taps into the following mental processes: 1.) anticipation of situational variables influencing one's communicative behaviors, 2.) perception of the consequences of one's communication choices, 3.) immediate reflection one one's communication choices, and 4.) continued reflection on the communication choices one has made. The instrument is intended to test the 5 components of the communication competence: planning, modeling, presence, reflection, and consequence cognitions.

Users will be asked to rate the extent to which they apply the cognitions when they interact with other people, on the scale from 1 to 5; where 1 is "never true of me" and 5 is "always true of me." (See Appendix E.)

Communication Apprehension: Communication apprehension is measured by the Personal Report of Communication Apprehension instrument developed by McCroskey [26]. The instrument measures personal communication apprehension in the following four contexts: public speaking, dyadic interaction, small groups, and large groups. Users will be asked to rate their levels of personal communication apprehension on a scale from 1 to 5, from "Strongly disagree" to "Strongly Agree." (See Appendix F.)

RESULTS

Reliability Test

Cronbach's alpha was used to measure the reliability of each variable. Table 1 presents the alpha coefficients for both before and after items deletion. Five of the variables (i.e., user's experiences in current system, planning cognition, modeling cognition, presence cognition, and communication apprehension) needed to be modified by dropping some items to improve their convergent validities. All variables before deletion showed alpha coefficients at satisfactory level (>0.70), except for presence cognition. However, the coefficient of presence cognition was improved after deleting some items that did not load well on the corresponding factor (from 0.5941 to 0.7363). On the other hand, the alpha coefficient of user's experiences in current system was above 0.7 before deletion but dropped to 0.6974 after deleting some items that had low loading to the corresponding factor.

Validity Test

Descriptive statistics for each variable are presented below. Table 2 and 3 show the descriptive statistics for each of the cognition in the communication competence construct.

Table 1: Cronbach Alpha Before and After Dropping Select Items

I don't want to k	Before Deletion		After Deletion	
Variables	Number of Items	Cronbach alpha Coefficient	Number of Items	Cronbach Alpha Aoefficient
User participation	9	0.96	no deletion	
Information quality	9	0.96	no deletion	
User's experiences in current system	5	0.73	2	0.7
User's experiences in current job	3	0.81	no deletion	
Planning cognition*	5	0.74	2	0.81
Modeling cognition*	4	0.81	3	0.84
Presence cognition*	4	0.59	2	0.74
Reflection cognition*	5	0.92	no deletion	
Consequence cognition*	4	0.89	no deletion	
Communication apprehension	24	0.96	21	0.96

** Variables in cognitive communication competence*

Table 2: Descriptive Statistics for Communication Competence Variables

	Planning Cognition	Modeling Cognition	Presence Cognition	Reflection Cognition	Consequence Cognition
Sample Size	48	48	48	48	48
Missing Value	0	0	0	0	0
Mean	6.6458	11.02	7.85	18.29	16.17
Median	7.0000	12.00	8.00	19.00	16.00
Std. Deviation	1.61758	2.274	1.238	4.005	2.504

Table 3: Descriptive Statistics for User Participation, Information Quality, User's Experiences and Communication Apprehension

	User Participation	Information Quality	User's Experience In Current System	User's Experience In Current Job	Communication Apprehension
Sample Size	48	48	48	48	48
Missing Value	0	0	0	0	0
Mean	25.35	32.67	5.83	12.06	45.10
Median	24.50	35.00	6.00	12.00	45.00
Std. Deviation	11.606	8.869	2.337	2.637	13.713

To test the construct validities of the variables in this study, the total of 72 items were factor-analyzed by using Principal Component Analysis, using Varimax rotation. Table 4 showed the summary of factor loadings for each variable. (Note: Loadings below 0.4 were not shown in the table.) The eigenvalue and percentage variances explained of each factor are shown at the bottom of the table. Items with loadings below 0.4, the criterion for deleting items, were deleted. After deleting items with loadings below 0.4, the rest of the items within each variable were summed to represent that variable.

Table 4: Factor Loadings

Variables	Variable Items	Component								
		1	2	3	4	5	6	7	8	9
User Participation	1		0.85							
	2		0.89							
	3		0.85							
	4		0.81							
	5		0.85							
	6		0.86							
	7		0.86							
	8		0.86							
	9		0.76							
Information Quality	1			0.78						
	2			0.88						
	3			0.90						
	4			0.86						
	5			0.84						
	6			0.88						
	7			0.88						
	8			0.88						
	9			0.91						
User's Experiences in Current Systems	1								0.64	
	2								0.82	
	5		0.64							
User's Experiences in Current Job	1						0.83			
	2						0.89			
	3	-0.48					0.46			

Table 4 (continued)

Variables	Variable Items	Component								
		1	2	3	4	5	6	7	8	9
Cognitive Communication Competence- Planning Cognition	1				0.49					
	2				0.76					
	4					0.44				
Cognitive Communication Competence- Modeling Cognition	1							0.78		
	2							0.67		
	3							0.72		
	4	-0.5				0.43				
Cognitive Communication Competence- Presence Cognition	1									0.60
	2									0.64
	3					0.53				
Cognitive Communication Competence- Reflection Cognition	1				0.76					
	2				0.86					
	3				0.91					
	4				0.89					
	5				0.76					
Cognitive Communication Competence- Consequence Cognition	1					0.80				
	2					0.88				
	3					0.84				
	4					0.78				

Table 4 (continued)

Variables	Variable Items	Component								
		1	2	3	4	5	6	7	8	9
Communication Apprehension	1	0.54								0.48
	2	0.73								
	3	0.74								
	4	0.84								
	5	0.79								
	6	0.82								
	7	0.88								
	8	0.83								
	9	0.73								
	10	0.70								
	11	0.83								
	12	0.76								
	13	0.68								
	14	0.59								
	15	0.73								
	16	0.74								
	17	0.67								
	18	0.78								
	22	0.47								
	23	0.62								
	24	0.61								
Variables										
	Percentage of Variance	22.76	13.42	11.80	6.99	4.98	3.76	3.16	2.58	2.16
	Eigenvalue	16.39	9.66	8.50	5.03	3.59	2.71	2.28	1.86	1.56

Testing the Hypotheses

A Pearson correlation was performed to test the first hypothesis (relationship between user participation and information quality). Significant positive correlation between user participation and information quality was observed ($r = 0.319$; significance value = 0.027, p-value $\leq$ 0.05), thus lending support for the first hypothesis.

Hypotheses 2 through 4 were tested by using moderated regression analysis (following Aiken and West [1]). All variables (except the dependent variable, information quality) were centered to avoid problems with multicollinearity [1]. Centering a variable is accomplished by subtracting its mean off each value of the variable. First, the predictor variables (user participation and the moderating variables proposed in Hypotheses 2 through 4) were entered in the regression equation. Then, the interaction term between user participation and a moderating variable was entered to the regression equation. The hypotheses 2 through 4 will be supported (i.e., the hypothesized variables significantly moderate the relationship between user participation and information quality), if the incremental R^2 is significant. Each of the changes in R^2 provided by adding an interaction term to the equation and its significance are shown in Table 5.

Table 5: R-Squared Report

Hypothesis	N	R^2 Before Adding Interaction Term	R^2 After Adding Interaction Term	ΔR^2	Significance F Change
H2a: User's Experiences in Current System	48	0.149	0.177	0.028	0.226
H2b: User's Experiences in Current Job	48	0.102	0.178	0.076	0.05**
H3a: Planning Cognition	48	0.107	0.133	0.026	0.259
H3b: Modeling Cognition	48	0.112	0.178	0.066	0.067*
H3c: Presence Cognition	48	0.110	0.116	0.006	0.587
H3d: Reflection Cognition	48	0.104	0.104	0	0.973
H3e: Consequence Cognition	48	0.106	0.107	0.01	0.845
H4: Communication Apprehension	48	0.102	0.102	0	0.927

* $p \leq 0.1$ **$p \leq 0.05$

The results in Table 5 show that there are only two variables that moderate the relationship between user participation and information quality—user's experiences in current job and modeling cognition in the cognitive communication competence construct. The former is significant at 0.05 level, while the latter at 0.1 level. Therefore, H2b is supported, and H3b is partially supported. However, the beta coefficient of the interaction term between user participation and user's experience in current job turned out to be negative, suggesting that the higher a user rated their job experiences, the lower he/she rated the information quality. A more detailed explanation will be provided in the Discussion section. The statistics suggest that H2a, H3a, H3c, H3d, H3e, and H4 are not supported.

DISCUSSION

In addition to the previous studies which focused on the impact of user participation on system quality, this study empirically suggested that user participation significantly contributes to information quality. The significant correlation between user participation and information quality in hypothesis 1 implied that when users participated in system development, the information quality of the systems could be improved. In other words, systems would deliver outputs that were reliable, accurate, complete, and valuable to the users in a timely manner. Moreover, the content of the information delivered by the systems would be more precise, meet users' needs, and provide sufficient information.

This study did not find the moderating effect of user's experiences in using current systems or the systems of the same type and nature on information quality. However, the regression analysis revealed that such experiences was a rather weak predictor to information quality (β coefficient = 0.948, significant at 0.1 level, *p*-value = 0.092). This result suggests that user's experiences in using current systems can partially explain the quality of information delivered by the systems. One explanation is when users have experiences in the current systems or systems of the same nature, they know what kinds of data they want to collect from the systems as well as the informational outputs they want to see. Therefore, they tend to be able to share with system developers their expectations on the system requirements and specifications.

While the regression analyses showed that users' experiences on current systems have a positive direct effect on information quality of a system, users' experiences on current jobs did not. Surprisingly, it added a negative moderating effect on the relationship between user participation and the information quality (β coefficient = -0.081, significant at 0.05 level, *p*-value = 0.05). One reason could be that because they have a lot of experience in their current job, they tend to build higher expectations on what new systems should deliver. Alternatively, they resist changes made to their current working systems. Such resistance may cause them to perceive the quality of information delivered by the new systems to be lower than their expectations.

Of all five types of communication competence cognitions, the modeling cognition is the only variable that was a significant moderator to the relationship between user participation and information quality. According to this result, it is reasonable to assume that a user's communication competence in studying the situation and their conversational partners when first entering the situation positively influences the effect of user participation on information quality. A possible explanation to this result is that a user, who is competent in sizing up the communication situation, including the people involved in such a situation, tends to know how to communicate his/her needs appropriately. In other words, he/she knows how to effectively deliver their needs in such a way that others can completely understand.

Finally, communication apprehension did not have a significant moderating effect on the relationship between user participation and information quality. Although in theory, a person who is communicatively apprehensive is more likely to be unwilling to communicate than a person who is less communicatively apprehensive, there might be other factors that can overcome one's communication apprehension, which were not captured in this study. For example, a system developer with a high level of communication skills may be able to lessen the apprehensiveness in users.

There are some limitations with this study. First, the sample size is small. A problem we encountered was many of the system developers who participated in this study typically worked with user representatives rather than a large community of users. Therefore, only a few users were selected and involved in system development projects. Second, although every system developer who participated in this study was told to list all names of users that had been involved in system development projects, we could not be certain whether the system developers did so. Some system developers might list only those users whom they knew well or they felt would give positive responses about the system development project. Consequently, this potential bias could potentially cause a problem of under-representing the end users who participate in system development. Finally, the results of this survey study were based on both the ability of respondents to recall (that is, rating their degrees of participation in a system development project, which had happened in the past couple of years) as well as on self-assessments of the respondents' experiences, communication competence, and communication apprehension.

IMPLICATIONS TO SYSTEM DEVELOPMENT RESEARCH AND PRACTICES

Implications to System Development Research

Previous research found that, in general, user participation can influence system quality. The main objective of this study was to find those specific factors that would improve information quality of a system. It was found that user participation also positively affects information quality. However, the information quality measured here is merely a perception by users. Future research should look for measurements that take other stakeholder perspectives into consideration, for example perspectives of those who are not end-users such as managers or even top managers, who indirectly use the information from the systems.

It was found in this study that users' experiences with using current systems and current job (used as surrogates for knowledge) had some effects on the information quality (i.e., the former had a direct impact, while the latter had a moderating effect). Because knowledge is such a broad and often tacit concept, more studies should be done to delineate different kinds of user's knowledge that will help system developers develop a successful system.

This study only tested the moderating effects of cognitive communication competence on the relationship between user participation and information quality. Future studies should test the effects of communication competence of users on other success measures such as project success. It seems logical to think that users who communicate effectively and appropriately can help save project time and cost in developing a system. For example, system developers do not have to spend a lot of time on clarifying system requirements.

There was no significant result found on the moderating effect of communication apprehension. Future studies should incorporate into their models factors that help alleviate communication apprehension in users, for example, system developers' communication skill, users' relationships with system developers, or organizational cultures that promote open communications.

Implications to System Development Practice

The results of this study indicate that user participation can influence the quality of information delivered by a system in terms of reliability, accuracy, completeness, value, and content that meet users' needs.

Therefore, if information quality is a goal for a system development, user participation should be encouraged. Selecting users who participate in system development activities plays an important role in developing systems that deliver high-quality information. Users' previous experiences in systems of the same nature should be one of the criteria in selecting users to participate in system development. However, users who possess significant experience in their job positions may also have higher expectations for the new system. In other words, they may perceive information quality to be lower than it actually is.

Another criterion for selecting users is the user's communication competence. In the system development context, users who participate should have skill in analyzing situations, including communication partners and how others interact with each other. This skill helps the users to know how to communicate effectively and appropriately. Training users to better at this skill may be another way to improve the communications between users and system developers.

CONCLUSIONS

The objective of this study was to find the factors that influence information quality of the system by utilizing participative decision-making theory and communication competence framework. Results showed that: 1) user participation had a significant impact on information quality; 2) user's experiences in their job negatively moderated the relationship between user participation and information quality, while user's experiences in a system or system in the same nature positively affected information quality; and 3) modeling cognition in communication competence framework positively moderated the relationship. These results can have implications in training and selecting suitable users to participate in a system development.

If information quality is a goal of a system, participating users can help system developers achieve the goal. Selecting users, who have suitable knowledge (i.e., knowledge in system) and can competently communicate to others (i.e., those who learn the situations and communication partners and are able to adapt their communications to suit the situation and person), to participate in a system development project can possibly determine the information quality.

Since the results of this study were derived merely from statistical analyses of survey data, which are intended to serve the predictive purpose, more research should be done to describe the user participation phenomenon and the effects of different types of user's knowledge and experiences and communication skills on system success.

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APPENDICES

Appendix A: Demographics of Participants

	No. of Participants
Age Group	
26-30	1
31-35	3
36-40	8
41-45	10
46-50	13
51-55	4
56-60	8
61-65	1
Gender	
Male	29
Female	19
Race	
Caucasian	34
Hispanic	0
African American	2
Middle-East Asian	1
South Asian	2
East Asian	2
Others	7
Education	
High School	2
Some College	7
Finished College	15
Some Graduate School	10
Finished Master's Degree	13
Finished Ph.D.	1
Experience	
Average of Number of Years in the Organization	14.13
Average of Number of Years in the Current Job	6.49

Appendix B: User Participation (UP)

Respondents will be asked, "Please respond to the following questions based on your feeling about your participation in developing a system. If you have participated in more than one system development projects, please refer to the one that you had the most interactions with the system developers. Regarding participation in the development of this system, rate yourself on the extent to which you are a primary player in the following activities using the scale:" (scales: 1 = not at all; 2 = minor extent; 3 = moderate extent; 4 = major extent; 5 = great extent)

Item Number	Question Wording
1	Initiating the project
2	Establishing the objective of the project
3	Determining the users' requirements
4	Assessing ways to meet users' requirements
5	Identifying the sources of information
6	Outlining information flows
7	Developing the input forms/screens
8	Developing the output forms/screens
9	Determining the system availability/access

Appendix C: Information Quality (IQ):

On a scale from 1 to 5, where 1 = not at all; 2 = minor extent; 3 = moderate extent; 4 = major extent; and 5 = great extent, respondents will be asked, "Rate the extent to which each of the following statements applies to you:"

Item Number	Question Wording
1: Output Value	The output of this system is perceived as having high value.
2: Timeliness	This system provides timely output.
3: Reliability	This system provides reliable output.
4: Response/Turnaround Time	This system provides fast response/ turnaround time.
5: Accuracy	This system provides accurate output.
6: Completeness	This system provides complete output.
7: Content-Preciseness	This system provides the precise information you need.
8: Content-Achievement	The content of the information provided by this system meets your needs.
9: Content-Sufficiency	The system provides sufficient information.

Note: Item numbers 1 to 6 were adapted from Yoon, Guimaraes, and O'neal (1995); Item numbers 7 to 9 were adapted from Doll and Torkzadeh (1988)

Appendix D: User Experiences:

Respondents will be asked, "Based on the number of years of experience you have and the intensity of your experience, rate yourself along the following items using the scale:" (scale: 1 = not at all; 2 = minor extent; 3 = moderate extent; 4 = major extent; 5 = great extent)

Item Number	Question Wording
1	Experience using systems of this type and nature
2	Experience using this particular system
3	Experience using computers in general
4	Experience as a member of system development teams
5	Your ability to fulfill your duties as a member of development team for this system.
6	Experience as a worker for this organization
7	Experience working on this present job
8	Your ability to fulfill your duties of this present job

Note: Item numbers 6, 7, and 8 were added to the User Experience measurement items.

Appendix E: Cognitive Communication Competence:

Respondents will be asked, "Rate the degree to which each of the following statements applies to you, using the scale:" (scale: 1 = never true of me; 2 = rarely true of me; 3 =sometimes true of me; 4 = often true of me; 5 =always true of me)

Types of Cognitions	Question Wording
Planning Cognitions	Before a conversation I think about what people might be talking about.
	Before a conversation I mentally practice what I am going to say.
	Before a conversation I think about what I am going to say.
	When I first enter a new situation I think about what I am going to talk about.
	During a conversation I think about what topic to discuss next.
Modeling Cognitions	When I first enter a new situation I watch who is talking to whom.
	When I first enter a new situation I try to "size up" event.
	Generally, I study people.
	Generally, I am aware of people's interests.
Presence Cognitions	During a conversation, I am aware of when a topic is "going nowhere."
	During a conversation, I am aware of when it is time to change the topic.
	During a conversation, I pay attention to how others are reacting to what I am saying.
	During a conversation, I know if I have said something rude or inappropriate.
Reflection Cognitions	After a conversation, I think about what the other person thought of me.
	After a conversation, I think about my performance.
	After a conversation, I think about what I said.
	After a conversation, I think about what I could have said.
	After a conversation, I think about what I have said to improve for the next conversation.
Consequence Cognitions	Generally, I think about how others might interpret what I say.
	Generally, I think about the consequences of what I say.
	Generally, I think about how what I say may affect others.
	Generally, I think about the effects of my communication.

Appendix F: Personal Report of Communication Apprehension:

Respondents will be asked, “Indicate the degree to which each statement applies to you by marking whether you: Strongly Disagree = 1; Disagree = 2; are Neutral = 3; Agree= 4; Strongly Agree= 5.

Item Number	Question Wording
1	I dislike participating in group discussions.
2	Generally, I am comfortable while participating in group discussions.
3	I am tense and nervous while participating in group discussions.
4	I like to get involved in group discussions.
5	Engaging in a group discussion with new people makes me tense and nervous.
6	I am calm and relaxed while participating in group discussions.
7	Generally, I am nervous when I have to participate in a meeting.
8	Usually, I am comfortable when I have to participate in a meeting.
9	I am very calm and relaxed when I cam called upon to express an opinion at a meeting.
10	I am afraid to express myself at meetings.
11	Communicating at meetings usually makes me uncomfortable.
12	I am very relaxed when answering questions at a meeting.
13	While participating in a conversation with a new acquaintance, I feel very nervous.
14	I have no fear of speaking up in conversations.
15	Ordinarily, I am very tense and nervous in conversations.
16	Ordinarily, I am very calm and relaxed in conversations.
17	While conversing with a new acquaintance, I feel very relaxed.
18	I’m afraid to speak up in conversations.
19	I have no fear of giving a speech.
20	Certain parts of my body feel very tense and rigid while giving a speech.
21	I feel relaxed while giving a speech.
22	My thoughts become confused and jumbled when I am giving a speech.
23	I face the prospect of giving a speech with confidence.
24	While giving a speech, I get so nervous I forget facts I really know.