USER PERSONNEL FACTORS THAT INFLUENCE INFORMATION SYSTEM DEVELOPMENT SUCCESS

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ABSTRACT

This paper proposes a model of user-related factors that may impact one another and ISD success. The objective of this study was to analyze how these factors impact the ISD process and ultimately ISD success. This model can then be used by researchers to further explore these relationships and by managers to improve the likelihood of success by guiding the selection of users for ISD project team members.

Keywords: information systems development, project success, user participation, user involvement

INTRODUCTION

Cost overruns, missed deadlines, inaccurate features, and out-and-out failure still plague the software development industry despite advances in the development process [11]. Much research has been performed to investigate the affect that user participation and user involvement has on the success of information systems development (ISD) projects, e.g. [1]. However, the detailed mechanisms and antecedents to the successful participation of users in ISD are still unknown. Based on prior research [4, 5, 7], this paper proposes a model of user-related factors that may impact one another and ISD success. The objective of this study was to analyze how these factors impact the ISD process and ultimately ISD success. This model can then be used by researchers to further explore these relationships and by managers to improve the likelihood of success by guiding the selection of users for ISD project team members.

An earlier study proposed an ISD project success model that identified a broad set of factors that influence ISD project success [5]. The method used to identify the project success factors for ISD was a nominal group technique. This method has been used successfully in several domains including systems development [6, 13]. The output of these focus groups include a set of factors that can be used by managers to improve the development process or by researchers to further investigate the relationships among the various factors. To this end, the factors identified by the six focus groups were classified into ten separate categories: system, team, process, domain, project, organizational, management, user personnel, information systems (IS) personnel, and communication. This paper focuses on the user personnel factors identified in this earlier study. Using prior research as a guide and the results of informal interviews conducted for this study, the relationships among the user personnel factors are analyzed and discussed and a research model is proposed.

USER PERSONNEL FACTORS

The factors identified related to user personnel were bias, commitment, communication skills, computer literacy, ownership, participation, procedures, understanding of the current system, and

understanding of needs [5]. These characteristics and attributes of the users of the system being developed are expected to influence the project's success in a variety of ways. Each of these user personnel factors is described below.

Bias was defined as the users' "willingness to change." This includes the users' willingness to try new technological approaches to support the work system or changes to the business processes that make up the work system itself. It is generally accepted that most individuals have a natural tendency to resist change. This may impact a project's success by users insisting that the new system work the same way the old one did, e.g. that a printed report must be in the exact same format or that a printed report is required at all.

User commitment was defined as the level of importance the users being affected by the application place on the project's successful completion. This reflects their level of emotional or psychological obligation to the project. This construct is expected to be similar to team motivation and management commitment. The users' commitment to the project would be expected to directly impact the project's success by influencing the amount of time users are willing to dedicate to the project. Users that want the project to succeed will be more willing to provide documents, answer questions, and perform other development activities.

Users' communication skills were defined as the writing, speaking, and listening skills of the users participating in the ISD project. The primary reason for user participation in systems development is to transfer their job knowledge. Without an adequate level of communication skills, the communication and interaction between the users and IS personnel may be difficult. Without adequate communication skills, the users' may be willing to provide the information needed for a successful project, but not able to express their requirements to the IS personnel, other users, or management.

Users' computer literacy is defined as the level of knowledge and understanding that the users' possess regarding computers, software, and technology in general. If users are more computer literate, communication between IS personnel and users may increase because the users can understand some of the computer jargon. Also, as computer literacy increases users may be more likely to accept new technology, i.e. the may display less bias. Also, if users tend to be computer savvy they may have more realistic expectations with regard to what can and cannot be accomplished using information technology as well as toward the amount of time and money needed to design, construct, and implement new software.

User ownership was defined as a psychological attachment to the system or business process for which a new system or software is being developed or implemented. Similar to user commitment, but focused on the business activities, user ownership may have a positive or negative impact on ISD project success. If a user with a strong feeling of ownership believes that a new system will help them perform their activities better or quicker, this may increase user commitment to the project and positively impact project success. However, if a user with a strong feeling of ownership to the business process sees the project as threatening the process, increasing their workload, or eliminating their job; this would decrease user commitment and negatively impact project success.

User participation is defined as the active, substantive participation of the actual users of the application in the development process. This includes identifying the correct end users and their performance of specific tasks and activities during ISD. The proper type and amount of user participation in ISD is still a matter of debate within industry and the academic world. New techniques such as extreme programming, that minimizes the user's participation, are being suggested as the most productive ISD methods while at the same time the socio-technical approach is still popular and has many dedicated advocates. User participation in the ISD process has had a great deal of attention [1, 2, 3, 8, 9, 10, 12] and yet the effect of participation on project success is not well understood. It would seem likely that a contingency approach for user participation in ISD based on the type of system, management goals, etc. is appropriate.

Users' understanding of the current system was defined as the level of knowledge that the users participating in the ISD process have regarding current manual and computer based processes and procedures used to perform their duties. Users that have a high level of understanding of the current system should be able to point out specific problems and areas for improvement that can be incorporated into the new system. One the other hand, users that do not understand the current system or how it is related to other operations of the business may not be able to provide the details needed to automate processes and may resist efforts to streamline or eliminate redundant processes or system outputs.

The users' understanding of needs was defined as the level of knowledge that the users who are participating in the development process have regarding the information required to perform their duties. This includes knowledge about the information outputs required and the processing and data required to produce this output. Again, the primary reason for the participation of users in the ISD process is to determine the information requirements needed for the users to perform their job activities. For this transfer of knowledge to occur, the users must have some idea of what these information requirements are. This emphasizes the point made in prior research that the selection of which users to participate in ISD is a critical one.

ANALYSIS OF USER PERSONNEL FACTOR INTERACTION

Table 1 presents a grid made up of the user personnel factors identified and expected to influence ISD success. Each user factor is shown down the left hand side of the grid and across the top. The construct ISD success was also added as a "target" of the user factors across the top for discussion purposes. The intersection indicates the potential impact of the factor listed on the left hand on the factor given across the top. The influence of each factor on each of the others has been given a rating of "+" (a positive influence), "-" (a negative influence), or 0 (no influence or no clear direction) to describe the expected influence of one factor on the other. For discussion purposes, it is assumed that more than one user is participating in the ISD project and that a factor may therefore influence itself, i.e. different participation users may have different values for each of the factors. The analysis of the user factors in this manner reveals several interesting propositions and a potential model for further research.

TABLE 1 – USER PERSONNEL FACTORS INTERACTION GRID

Interaction of User Personnel Factors on One Another	Bias	Commitment	Communication Skills	Computer Literacy	Ownership	Participation	Understanding of Current Syster	Understanding of Needs	ISD Success
Bias	0	-	0	0	0	-	0	0	-
Commitment	-	0	0	0	+	+	0	0	+
Communication Skills	0	0	0	0	0	+	0	0	0
Computer Literacy	0	0	0	+	0	+	+	0	+
Ownership	0	0	0	0	0	0	+	+	0
Participation	-	0	0	+	+	+	+	+	0
Understanding of Current Systen	0	0	0	+	+	0	+	+	+
Understanding of Needs	0	0	0	0	+	0	0	+	+

User bias can be expected to influence user bias both positively and negatively. Given a user on the ISD team that has a strong resistance to change it would be expected that their attitude would influence other users on the team. Oppositely, if there is a user with some resistance to change but most of the other users appear to be comfortable with the proposed changes it would seem likely that the resistant user would be persuaded to accept the changes. However, this user may still have a negative affect on the project's success. User bias would most likely have a negative influence on user commitment. If a user is uncomfortable with change or new technology, they would seem less likely to have high commitment to the project and more likely to display the attitude of "why is this project necessary?" Interestingly, however, if a user has a low level of "bias" toward the project this would probably have a neutral impact on their commitment to the project. A user may not resist change, but still see no valid reason or " business case" for the project. User bias would also be expected to have a negative influence on user participation. If a user is resistant to change or new technology they would probably not participate in an active and substantive manner. It would be expected that the user would procrastinate on performing the activities requested and provide low quality input to the ISD process. The relationship between user bias and communication skills, computer literacy, understanding of the current system, and understanding of needs is proposed to be nil. Each of these constructs is more in the manner of a skill or a knowledge state. It does not seem logical that the user's bias would change these constructs. Similarly, user bias probably does not affect user ownership either. The user's bias may be strong, but their level of ownership toward the process or system may be still be high or low. Lastly, it seems likely that user bias has negative influence on ISD success. Through its relationship with the other factors and directly by resisting the project's progress and

ultimately the implementation and acceptance of a new system a user with bias would impede the project's success.

User commitment would be expected to have a negative influence on user bias. If a user has a high level of commitment to the project they would be expected to have a low level of bias. Even if a user is resistant to change or new technology in general, on a project that they are committed to for other reasons their bias would tend to be lowered. The influence that one user's commitment to the project has on others is unclear. If a user "leader" is on the project, his or her commitment to the project will most likely influence other users' commitment positively, therefore it is proposed to be positive. Identical to the impact of user bias, user commitment would not appear to influence communication skills, computer literacy, understanding of current system, and understanding of needs. User commitment is proposed to positively influence ownership. If the user is committed to the ISD project it would be expected that they would also feel a strong ownership toward the business process that the project is being undertaken to support. Similarly, it is expected that a user with a high level of commitment to the project will participate in an active and substantive manner during the ISD project. Overall, it seems self-evident that user commitment to the project should have a positive influence on ISD success.

The communication skills of users are proposed to have a positive relationship with participation. A user's communication skills, i.e. the ability to read, write, and speak, would obviously be positively related to the user's ability to actively, substantively participate. However, it does not appear that a user's communication skills would influence any of the other factors. There may be a general relationship between user communication skills and computer literacy or bias, but it does not seem likely that the ability to communicate will have an impact on these constructs during the ISD process. Similarly, it does not appear that a user's communication skills would impact their commitment, ownership, understanding of the current system, understanding of needs, or the communication skills of other users. Theoretically, user communication skills may be a moderating factor in some of the other relationships, i.e. a user with good communication skills may be able to persuade other users or IS personnel to their position, thereby increasing the effects that other factors may have on one another and ISD success. Therefore, the relationship between user communication skills and ISD success appears to be variable, positive or negative, depending on the values of the other factors and is probably not a direct relationship.
Similar to communication skills, computer literacy is considered something of a "state" of knowledge of the user. As such, it would be expected that there exist a negative relationship between computer literacy and bias. The reasoning being that as a user becomes more computer literate they would become less inclined to resist change or new technologies. This may not always be the case, a user may become an "expert" in a specific technology and then try to use this technology to solve every problem and resist learning others. Computer literacy is not likely to influence a user's commitment to a specific project, their ownership of a specific business process, or even the user's understanding of needs. However, it would seem logical that a user's computer literacy would influence their level of understanding of the current system due to their higher level of technical knowledge in general. It would also seem logical that the user's computer literacy would be positively related to the user's active, substantive participation and ISD success. As the user has a better understanding of technology, they should be able to perform design and development tasks with higher quality and should also have more realistic expectations for the system being developed.

User ownership toward the business system for which a new system or software is being constructed appears to influence all of the other factors except communication skills and computer literacy. As ownership is defined as the user's psychological commitment to the business system or process, its relationship with the other factors is complex. For example, if a user has a strong feeling of ownership toward the business system they may have a strong bias or a very low bias. If they feel that the new system being developed by the project will help them do their job more efficiently they would have low bias and probably strong commitment to the project. In the case where a user feels that the new system may reduce their control or eliminate the process (or their role in it) they will most likely demonstrate high bias and low commitment. Therefore, it is difficult to determine whether the user's ownership will have a negative or positive influence on ISD success.

User participation in the ISD process would be expected to be a positive influence on ISD success. It does appear to have many positive affects. It is proposed that high user participation would reduce user bias. By participating in the ISD process, users should become familiar with the tools, techniques, and methods used to build systems and to discover that there is "nothing to fear, but fear itself." By being part of the change process, it is believed that resistance to change will be lowered. User participation should improve user's computer literacy by educating the user with regard to technology. User participation should increase the user's ownership of the business system because they are then "invested" in the computer-based information system used to support the business processes. User participation should in the same was increase the user's understanding of the current system and the user's understanding of their needs. It is also argued that participation breeds participation. By seeing the influence other users have by participating, some users feel compelled to become more "involved." However, the ultimate result on ISD success in not so clear. User participation also carries costs; constantly changing requirements and scope creep are two common risks.

Users' understanding of the current system is proposed to have a positive influence on several other factors. Users that have a deep knowledge of how the current system works will most likely have a strong feeling of ownership toward the business system and processes. They will also have a good understanding of their needs. This may be positive or negative for the project success. If the current system is outdated and needs replaced the users may have high commitment, low bias, and strong participation. If the users are satisfied with the system and have few unmet needs they may have strong bias, etc. Therefore the impact on ISD success again appears to depend on the other factors.

The last user personnel factor identified is the users' understanding of their needs. Again, this appears to have a complex relationship with the other factors. If the users have a high level of understanding of their needs they should be able to clearly explain what is needed in a new system. However, this may increase bias if the users feel the system may replace jobs. Regardless, if seems logical that ISD success cannot occur if users do not know what their needs are, therefore this seems to be a necessary but not sufficient factor for success.
This paper proposes a set of relationships among user-related factors believed to influence ISD project success. These propositions could be used for further research or by managers to improve the selection of users for ISD project teams. The paper clearly highlights several

challenges that need to be addressed in the future. One is the problem of the unit of measure for this type of research. Should these constructs be measured aggregately for each project or should they be measured at the individual level.

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