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UNDERSTANDING END-USER COMPUTING
THROUGH TECHNOLOGICAL FRAMES

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The objective of this research was to investigate the effect of technological frames of reference on end-user satisfaction. A large multi national corporation with regional headquarters in Singapore participated in this research effort, which used a combination of quantitative and qualitative methodologies. An end-user survey instrument was used in the quantitative phase of the study to measure the effectiveness of the computer systems at the organization, while at the same time measuring the level of end-user support satisfaction with that system. Grounded theory techniques for qualitative analysis were used to assess the technological frames of three functional groups (MIS, management, and end-users) across four dimensions (technology in use, technology strategy, ownership of technology, and nature of technology). Once the frames of reference had been developed, the level of congruence among the three groups for each of the four domains was determined. Orlikowski's work on technological frames of reference was expanded to study the effects that the congruence of these frames of reference had on the level of satisfaction with end-user support. The software package NUD*IST was utilized to assist in the content analysis of a series of in-depth interviews for the qualitative portion of the study. Congruence was determined for two domains: technology strategy and nature of technology. Partial congruence was found for the technology in use domain, and incongruence was determined for the ownership of technology domain. The level of congruence was shown to be related to user satisfaction. For those domains that displayed congruence, the end-user survey indicated satisfaction. For the domains that displayed incongruence and partial incongruence, the end-user survey indicated dissatisfaction.

RESEARCH OBJECTIVES AND QUESTION

This paper is targeted at examining the impact of technological frames of reference on end-user satisfaction. Dissatisfaction surrounding end-user support has been well documented (Bowman, et al 1993; Brancheau and Wetherbe 1992; Buyukkurt and Vass 1993; Lederer and Spencer 1988; Mirani and King 1994; Ranier and Carr 1992; Rivard and Huff 1988; Torkzadeh and Doll 1993; Trauth and Cole 1992;). The objective of this study is to determine if incongruence among the technological frames of reference of the MIS staff, management, and end-users in an organization can explain this dissatisfaction. Techniques to bring incongruent frames of reference into congruence are discussed.

THEORETICAL FOUNDATIONS OF THE STUDY

The concept of frame of reference or cognitive structures is not new in social cognitive research. Orlikowski and Gash (1994) were the first to apply this concept in a technological context. Members of a social group as a whole will come to have an understanding of particular technological artifacts, including not only knowledge about the particular technology, but also local understanding of specific uses in a given setting. This research is concerned with the cognitive structures held by different groups in an organization toward end-user computing. This paper expands on Orlikowksi and Gash's original research on groupware technology: applying the concept of technological frame

of reference to end-user computing and assessing the effect of these frames of reference on end-user satisfaction. The contention of this paper is that the following dimensions taken together (shown in Figure 1) portray the technological frame of reference of an individual or a group toward end-user computing.

The frames of reference were explored with interview questions specifically designed to assess each dimension. Views on the nature of technology dimension were assessed by gathering perceptions concerning the perceived value of the personal computer in contributing to job performance. Questions concerning technology strategy discussed interpretations as to why the organization acquired and implemented certain technologies. Respondents answered questions on how the technology was used on a day-to-day basis and the likely or actual conditions and consequences associated with such use to assess the technology in use dimension. The ownership of technology dimension was appraised by questions referring to an understanding of who actually owns the technology and who is responsible for the technology.
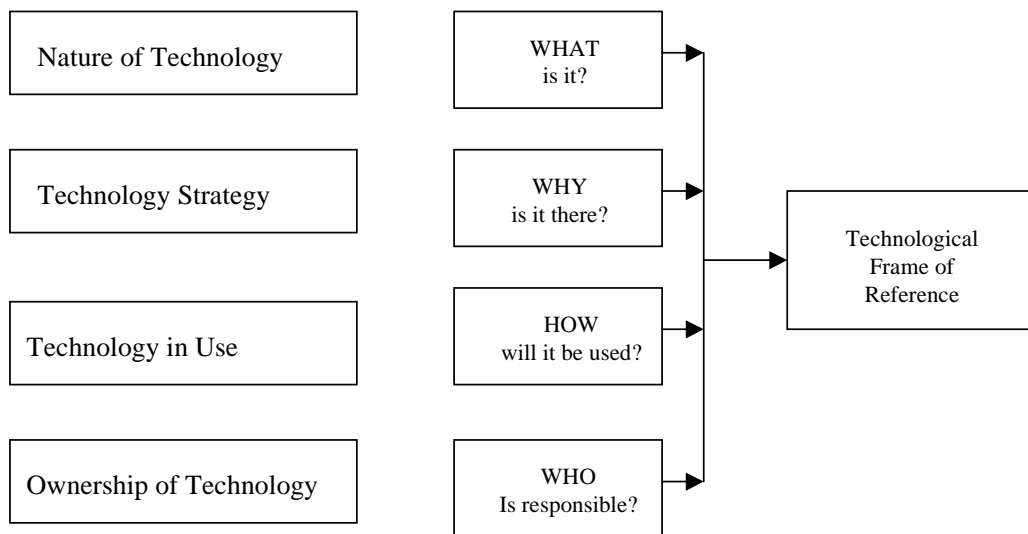

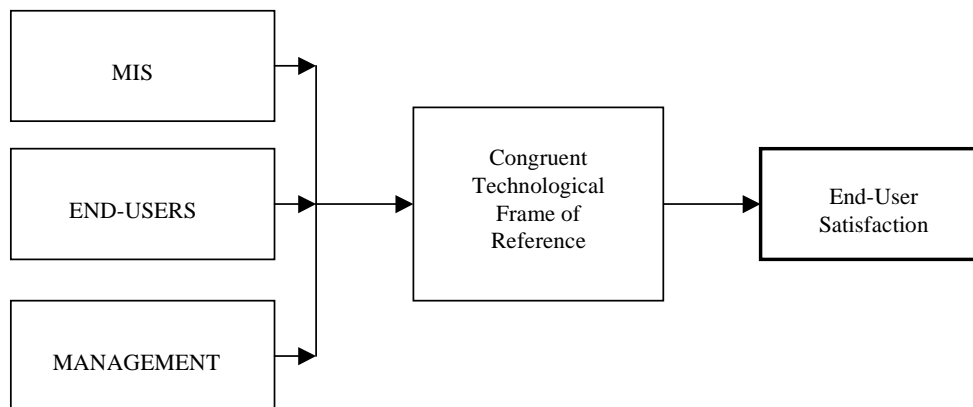**Figure 1. Technological Frame of Reference for EUC**

Figure 2. Research Framework

When two or more groups possess different technological frames of the same artifact, they are considered to be incongruent. The belief hers is that congruence in the frames of reference held by different groups of people in an organization toward end-user computing should result in end-user satisfaction, as shown in Figure 2.

RESEARCH METHODOLOGY

Otis Elevator, a multi-national corporation with regional headquarters in Singapore, agreed to participate in the study. The headquarters site consists of approximately 85 end-users, running a variety of IBM compatible PCs on a Novell Netware LAN. The majority of the end-users utilize Microsoft applications in a Windows 3.1 environment. The data gathering was carried out in two phases. The first phase combined two survey instruments, while the second phase was an in-depth case study using grounded theory techniques.

Phase One: The objective of this phase was to measure the effectiveness of the computer systems at Otis, while at the same time measuring the level of end-user satisfaction with that system. The Remenyi and Money (1994) instrument was used to establish the effectiveness of the computer service and to identify any key problem areas. The Doll and Torkzadeh (1994) measurement of end-user computing satisfaction measured satisfaction for end-user computing as a whole at Otis. A total of 57 survey instruments were returned, for a response rate of 67%.

Phase Two: The objective of this phase was to assess the technological frames for the three different groups for each of the four dimensions and then determine the level of congruence among them. Respondents comprised a mix of satisfied and dissatisfied respondents, with a cross section among the three different functional groups. Fourteen primary respondents were identified and interviewe, and additional theoretical sampling was conducted. Techniques for qualitative analysis (Miles and Huberman 1994) and grounded theory (Glaser and Srauss 1967; Martin and Turner 1986; Strauss 1987) were used in the development of the descriptive categorizations used for the technological frames of reference. The software package NUD*IST was used to assist in the content analysis of the interviews.

Constructs for each dimension of the frames of reference were developed. An attempt was made to develop a separate frame of reference for each functional group, for each dimension, if possible. When separate frames of reference could not be developed, it was determined that the frames were congruent. The constructs for each dimension were then related back to survey question(s) that addressed that construct. In this way, the satisfaction level for each construct (hence each dimension) could be assessed. For example, the constructs identified through grounded theory for the ownership of technology dimension were maintenance responsibility and fiscal responsibility. A separate frame of reference for each functional group was developed for this dimension—resulting in the conclusion that these frames of reference were incongruent. In the survey portion of the research, the items that were used to assess the satisfaction level with ownership and responsibility issues were "data security and privacy" and "fast response time from IS staff to remedy problems." Both of these items scored high levels of dissatisfaction.

CURRENT STATUS OF THE PROJECT AND PRELIMINARY RESULTS

In the first phase, a general profile of end-users was developed, the support needs of these users were determined, and the performance of the IS department in meeting these needs was rated. When asked to indicate which department (their department vs. MIS department) should be responsible for 12 different support functions, the users determined that the MIS department should be responsible for 10 of the 12 functions. The users rated 22 various support activities according to the contribution of that activity to the importance of their jo, and the MIS support staffs' performance in providing that support activity. The activities that surfaced the highest level of dissatisfaction were response time of MIS support staff, data security and privacy, and end-user training. Overall, survey results indicated satisfaction with end-user support at Otis.

The second phase included interviews of respondents from all three functional areas. Analysis of the interviews resulted in the development of the frames of reference for each group across the four dimensions. The major findings of the research support the findings by Orlikowski and Gash (1994) and by Davidson (1996) that the level of congruence among the technological frames of reference for different functional groups within an organization is related to end-user satisfaction within that organization. However, it is only when the technological frames of reference are considered individually by particular dimension that the relationship between congruence level and satisfaction is explainable. When each dimension is considered separately, the analysis resulted in the following conclusions:

Nature of Technology (What): Fully congruent frames of reference. All three functional groups share the same assumptions, knowledge, and expectations regarding their image of the technology and its value to the organization. The survey indicated satisfaction for the constructs used to assess this dimension.

Ownership of Technology (Who): Fully incongruent frames of reference. Each of the three functional groups have their own separate assumptions, knowledge, and expectations regarding ownership and responsibility issues surrounding the technology. The survey indicated dissatisfaction for the constructs used to assess this dimension.

Technology Strategy (Why): Fully congruent frames of reference. All three functional groups share the same assumptions, knowledge, and expectations regarding the motivation for adoption of the technology and its current contribution to the organization. The survey indicated satisfaction for the constructs used to assess this dimension.

Technology in Use (How): Partially congruent frames of reference. A similar frame of reference is shared by the end-users and management, which is different than the frame of reference held by the MIS staff. This frame of reference refers to the assumptions, knowledge, and expectations of how the technology will be used on a day to day basis and the actual conditions and consequences associated with such use. The survey indicated dissatisfaction for the constructs used to assess this dimension.

Several aspects of the technology in use dimension are highlighted as an example of incongruent frames of reference (Figure 3). The theoretical category of "time" is used to display the marked incongruence found between the two groups (MIS and end-users/managers). When this category was analyzed, a distinct difference arose in how time was viewed by these groups. For instance, the MIS staff expressed the view that taking courses (e.g., a two or three day training course in Excel) would save "time." They felt that it would eliminate the time they had to take to answer user's questions on Excel. The end-users/managers, however, felt that taking the course took too much "time" on their part and it was easier for them to just pick up the phone and call MIS if they had a specific question, rather than "wasting" two or three days in a course. Of the five aspects shown in Figure 3, the two groups were only congruent in one aspect. They both agreed that hiring more MIS staff would save time for everyone. Four of the six survey questions used to assess the five constructs of technology in use indicated dissatisfaction.

The initial assumption that the congruence level for all four dimensions as a whole is directly related to user-satisfaction was not borne out. Even though Otis displayed partial incongruence when the dimensions were combined, their general user satisfaction level was high. Only when the dimensions were separated, and the satisfaction levels determined for each dimension, were the implications of an incongruent frame of reference apparent. In addition, functional characterizations could not be used to automatically align individuals into groups. Individuals would align themselves to different groups when different aspects of technology were analyzed. Figure 4 shows a profile of the technological frames of reference for the three functional groups across all four dimensions at Otis Elevator.

From the above discussion for each frame of reference, when the dimensions are considered separately, the relationship between congruence level and satisfaction level is readily apparent. For the dimensions that surfaced incongruence or partial incongruence, the level of end-user satisfaction with support for that particular dimension

	Courses	Vendor Support	More Staff	Point of Contact	After Hours Support
MIS	saves time	saves time	saves time	MIS is POC because it saves user time	Not required
End-Users/ Managers	takes time	takes time	saves time	MIS is not POC because it takes time	Heavily requested

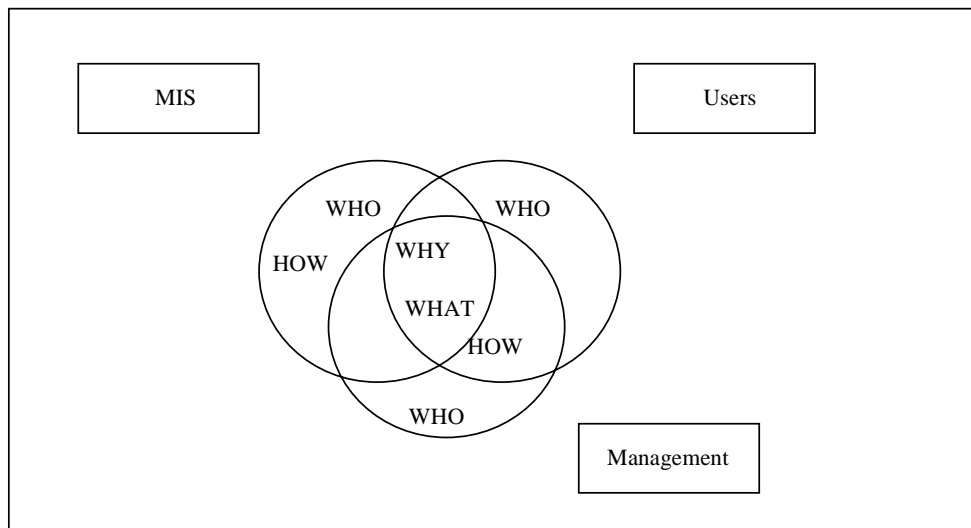**Figure 3. Frame of Reference—Technology in Use**

Figure 4. Partially Congruent Technological Frames of Reference

was low. Conversely, for the dimensions that surfaced congruence, the level of end-user satisfaction with support for that particular dimension was high. At Otis, the combination of the four frames of reference resulted in a mixed level of congruence, with an overall high level of satisfaction, as shown in Figure 5.

EXPECTED CONTRIBUTION

This research concluded that congruence level among the technological frames of reference held by functional groups within an organization can affect satisfaction with end-user support. The discovery the effect frame of reference can have on any MIS issue is only relevant if those frames of reference can be altered. Tyre and Orlikowski (1994) posit that there are "windows of opportunity" that exist where adaptation of a particular technology can be altered. There are certain "triggers" (e.g., new system releases, frustration with existing systems, exposure to new ideas) that can open a window of opportunity that will allow existing technology to be re-examined and modifications made to the level of adaptation and implementation patterns currently in use. For this project, identifying the dichotomy between users unmet expectations regarding after-hours support versus support staff perception that it was not required triggered a pending adjustment in the support structure. Identifying frames of reference and their effect is crucial
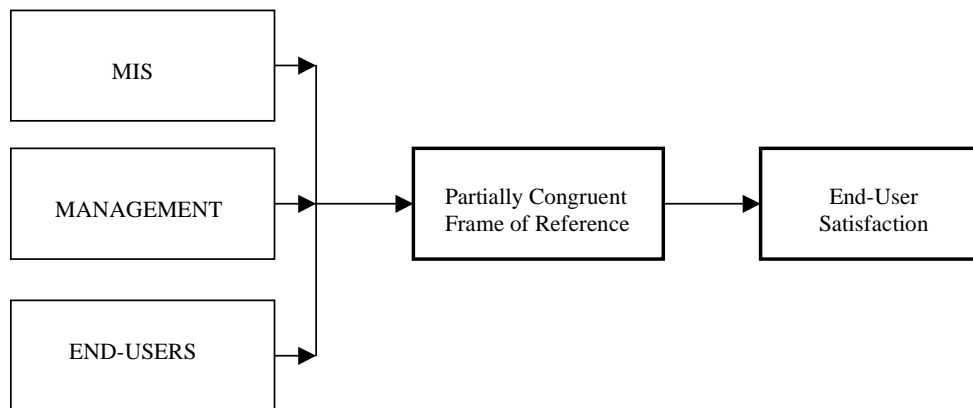
Figure 5. Effect of Congruence Level on User Satisfaction—Otis

to a deeper understanding of any phenomena. This socio-cognitive thread has not been fully explored as it applies to technology or MIS in general.

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