Patterns of Change in Perceptions of Information Systems: A Longitudinal Case Study

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When a firm makes a significant investment in an information system [IS], there will be pressure to measure user perceptions fairly quickly after the introduction of the system. Will perceptions be stable at that time? Galleta and Lederer (1989) showed that beliefs about an IS can be unstable, although they did so in an artificial environment in the context of instrument development. But how could we describe the change of user perceptions during the months following the introduction of a complex IS in a complex, functioning, real organization? This paper reports on a six month longitudinal study using four repeated measurements of user perceptions of an IS introduced throughout a comprehensive state University with approximately 14,000 students.

Since users' perceptions are often employed as a surrogate for IS success, they must be measured accurately and reliably. Straub (1989) and Hufnagel and Conca (1994) have provided guidelines for the development and administration of relevant instruments. *Usefulness* and *ease of use* scales meeting these guidelines were developed by Davis, Bagozzi, and Warshaw (1989). Further tests by Mathieson (1991), Adams, Nelson and Todd (1992) and others have shown these scales to be valid and reliable. Therefore when a new University IS was introduced, a survey instrument containing these scales was developed for evaluating perceptions of end users.

The University IS tracked data on student demographics, admissions, account balances, and grades. Survey questions addressed IS usefulness, ease of use, and the importance of tasks involving system use to the users' overall job requirements. By repeating the survey, the researchers could test for any significant change in user acceptance over the six months following system introduction. System administrators and key members of the end-user community were interviewed.. Three groups of end-users participated: [1] a group of admissions officers (n=7), [2] student records personnel within the registrar's office (n=8), and [3] a campus-wide network of academic advisors (n=21).

This study used twenty-four survey items measuring system usefulness and ease of use in specific task accomplishment (derived from Davis' (1989) technology acceptance model). Each item also asked the subjects to compare the new system with the previously used system, thereby providing a known anchor for their judgments. Items measuring the importance of the task to the respondent's overall job were also included. Seven-point Likert scales were used.

Results

Repeated-measures ANOVAs compared response profiles over the four measurement periods. A significant main effect of improvement in user acceptance over time was found for seven of nine summary variables (see Table 1). Despite the small survey population, F ratio probabilities were significant at the 0.001 level in each instance. The significant changes included system usefulness and ease of use for two specific tasks, as well as overall scales measuring system usefulness, ease of use and attitude towards the system.

Table 1. ANOVA F Ratio Probabilities

	Within Subject	**Between Subjects**	
	Time of Measure	User Group	Group x Period
Usefulness, Task 1	< 0.001	0.077	0.474
Usefulness, Task 2	< 0.001	0.024	0.181
Usefulness, Overall	< 0.001	0.125	0.572
Ease of Use, Task 1	< 0.001	0.091	0.362
Ease of Use, Task 2	< 0.001	0.085	0.097
Ease of Use, Overall	< 0.001	0.019	0.381
Attitudes, Overall	< 0.001	0.199	0.576
Task Importance, Task 1	0.093	0.617	0.453
Task Importance, Task 2	0.258	0.023	0.154

Profiles of each of the user acceptance scales over the six months after system introduction were quite similar (see Figure 1). Initial evaluations of system usefulness and ease of use were all below 3.5 on a 7.0 scale. Evaluations became more positive during the first interval. Profiles were flat during the next interval, however. Thereafter, means increased again. Nearly all of the between subject effects, comparing user groups at each time period, were not significant. Further, there were no significant interaction effects between user groups and measurement period, so there is no statistical evidence that user acceptance patterns were different for the three user groups. Data were also collected from users regarding their estimated use of the system. Since users had no valid way to keep track of actual use, the analysis was a relative comparison of these perceptions by measurement period. Results were consistent with the suggestion that users can estimate relative use, although they may not be able to estimate absolute use levels (Straub, Limayem and Karahanna-Evaristo, 1995).

Discussion

This case study demonstrates that user acceptance can change significantly during the months following system introduction. There was a pattern indicative of increasing system acceptance, or, perhaps, a demonstration that the users were "learning" to

accept the system at the same time as they were learning to *use* it. Academic advisors and admissions officers needed access to the IS data base in order to carry out their advising and decision making responsibilities. Records personnel consistently interacted with the data base. Thus, changes in user acceptance must be evaluated in the presence of cognitive influence of task importance (Hufnagel and Conca, 1994). Users found that the system was very important to their jobs, and had to pay attention to it, thus investing effort in forming positive beliefs about the system.

Since the system was little used between measures two and three, users received little new information about it, so their beliefs did not change much. Belief changes accelerated again once use of the system increased between measures three and four. According to the users' task requirements, there should have been relatively moderate use of the system between periods two and three of the case measurements. This was confirmed by the perceived usage data. Perceived usage was lowest in the period preceding the third measure. Thus, perceptions of a system may not depend not so much on passage of time, but on the amount of information received by users that is relevant to their beliefs (see for example, Compeau and Higgins, 1991).

Markus (1983) has suggested that systems which centralize control over data may be resisted by users in organizations with decentralized authority. At the university, academic advisors work independently, in considerably decentralized authority settings. For these workers, information processing is not subject to supervisory control. This may affect both levels and variability in user acceptance. Future longitudinal research ought to compare users' perceptions and acceptance of a new IS just prior to, immediately after, and some time after introduction in both centralized and decentralized settings.

IS research has begun to examine the complex relationships between beliefs about and behavior towards IS (e.g., Davis, et al., 1989; Melone, 1990; Mathieson, 1991; and Hufnagel and Conca, 1994). These issues are complicated by the fact that, as this study has shown, perceptions may become more positive over time. Examining perceptions using a longitudinal repeated measures design can help illuminate complexities of user behavior that accompany the development, introduction, and fine tuning of a new information system.

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Note: A complete paper, including instrument development, is available from the authors.

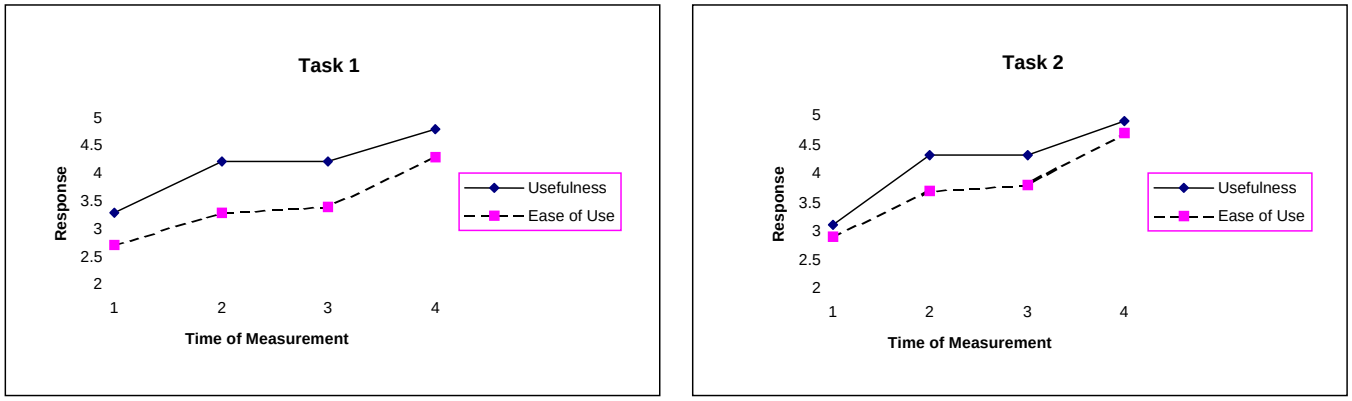

Figure 1. Usefulness and Ease of Use for Two IS Supported Tasks