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ABSTRACT

Hypothesis testing through controlled experiment is the dominant approach to studying information technology in the United States. In order to produce generalizable, reproducible results, effects of context are removed, in so far as is possible, both from the experiment and from data analysis. Another approach, qualitative research, is characterized by immersion in context. Using qualitative methods to interpret information technology in terms of social action and meanings is becoming more popular as evidence grows that information systems development and use is a social as well as technical process.

In other fields, there has been a move towards combining qualitative and quantitative methods to provide a richer, contextual basis for interpretation and validation of results through triangulation. This paper describes how qualitative methods and quantitative methods were combined in the first phase of a longitudinal study. Despite difficulties stemming from differences in the authors' research orientations, the research findings were enriched substantially by this combining of methods.

1. SITE, DESIGN, AND SUBJECTS

Research was conducted at a 650 bed midwestern urban university medical center. A commerical laboratory computer information system was installed for use by all nine laboratories within the clinical laboratory division. Results are presented from the phase of the study conducted during the year when the computer information system was installed.

Just before the computer system replaced manual methods of reporting the results of clinical laboratory tests, researchers conducted open-ended interviews with directors from all laboratories and some supervisory personnel concerning their expectations pertaining to the new system. Starting three months later, one author was a participant observer at weekly meetings where directors and head supervisors discussed laboratory management problems. Six months after system implementation, researchers observed work in each laboratory. The following month, a survey questionnaire was distributed to all 248 members of the laboratory staff. Data from 119 (48 percent) of the questionnaires were analyzed. As is typical of laboratory technologists, most respondents were women (83 percent) and most had college degrees (72 percent).

The survey instrument was composed of scaled-response measures adapted from standard job characteristic instruments and also from measures of expectations, concerns, and perceived changes that may be related to the use of the computer information system. Most of these latter measures were developed by analyzing the interviews and observations. The survey instrument concluded with four open-ended questions to assess changes caused by the computer system and to elicit suggestions for improved system use. These questions also were derived from the observations and interviews.

2. ANALYSIS AND RESULTS

Factor analysis was done on the scaled response questionnaire items. This analysis resulted in identifying factors very similar to themes found in the qualitative data from interviews and responses to open-ended questions. These themes centered on increases in technologists' workload and improvements in laboratory test results reports. Qualitative data analysis indicated important differences between individual technologists and between laboratories in their assessments of the computer information system; there also were statistically significant differences among laboratories on questionnaire data pertaining to the computer information system.

No systematic differences were found among the job characteristics measures due to individual or environmental factors. There were no correlations between job characteristic measures and computer system measures. It seemed as though the computer system had had no impact on users' jobs. Consequently, an explanation was needed for the differences among laboratories in response to the computer information system.

A theoretical explanatory model of these differences was derived from the qualitative data in the interviews and responses to open-ended questions. An interview finding (laboratory directors did not expect technologists' jobs to change, despite the changes in what technologists would be doing) lead to examining how laboratory technologists viewed their jobs. The two repeated themes--computer system benefits through improved results reporting and disadvantages due to increased workload--suggested that a group of technologists corresponded to each. According to the model, one group saw their jobs in terms of producing results reports. This group was oriented towards the outcomes or products of laboratory work and thought of their work as providing a service. The other group saw their jobs in terms of the laboratory bench work necessary to producing those results reports; they thought of their work as doing laboratory tests.

Two variables, each the sum of an individual's scores on all questionnaire items comprising relevant factors, were then created to measure whether technologists' responses differed according to the computer system's impact on process versus product aspects of their jobs. These two variables exhibited a significant negative correlation, thus indicating that respondents tended to have high scores on one variable and low scores on the other.

An orientation score for each respondent was computed by subtracting that person's score on one of these variables from the score on the other. When the orientation score was regressed on laboratories, statistically significant differences in orientation were found across laboratories. Thus, some laboratories, like some technologists, were process oriented while others were product oriented. Moreover, the laboratories rating the strongest process orientation were the ones in which the respondents expressed the most hostility towards the computer information system on open-ended questions, whereas respondents from the most strongly product oriented laboratory expressed strongest satisfaction with the computer system.

These results suggest that the explanatory model is correct. Further, the model indicates why there were no correlations between job characteric and computer system measures: job characteristic measures did not measure the relevant particularistic aspects of how a respondent views a job.

3. CONCLUSIONS

This study illustrates how qualitative and quantitative research methods can be combined. The study has four methodological implications. First is the value of combining methods. This combination increased confidence in the results because the same themes were repeated in both qualitative and quantitative data. Furthermore, the contextual, qualitative data led to the discovery of a theoretical model for interpreting the quantitative results.

The remaining points follow from this discovery. The second finding is that standard job characteristic measures are inadequate for determining revelant aspects of the interaction between a user's job and a computer information system. Context-specific measures better assess how a computer user's definition of a job differs among users with "the same job." Third is the need to move beyond outcome measures in evaluating the interrelationship between a computer system and work, so that the processes of work are distinguished from its outcomes. Finally is the difficulty of studying system impacts on users or the impact of users' characteristics on system implementation. Such impacts are unidirectional and static; they do not take into account the interaction between the information system and those who use it. Relationships and interactions, rather than impacts, provide a deeper understanding of the role and use of information technologies.

Despite the normative nature of these points, the most important conclusion is the desirability of a variety of approaches for studying information systems. No one approach can provide the richness that information systems, as a discipline, need for further advancement.

4. ENDNOTES

1. This paper has been accepted for publication by *MIS Quarterly*.

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