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USING EQUITY THEORY TO UNDERSTAND USER SATISFACTION WITH ERP SYSTEMS: EXTENDING AND ADVANCING THE EQUITY-IMPLEMENTATION MODEL

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Abstract

Research on the user satisfaction dimension of information systems (IS) success has typically focused on the technical characteristics of the system being studied and has not emphasized user attitudes toward the system. IS researchers have noted both the omission of user attitudes and the weak theoretical foundation in research on user satisfaction with IS. Joshi’s equity-implementation (E-I) model (1991), based upon equity theory, incorporates user attitudes and provides a framework for understanding satisfaction with a new IS. An extended E-I model is proposed as a theoretical foundation for investigating user satisfaction with an IS. Measures for the E-I model constructs have been developed and refined through pretests and a pilot test administered to users of enterprise resource planning (ERP) systems in three different organizations. The full data collection has been administered, and results will be presented at the conference.

Keywords: Equity theory, fairness, implementation, user satisfaction, enterprise resource planning (ERP) systems

1 INTRODUCTION

Information systems (IS) researchers have been investigating user satisfaction with IS as a surrogate for IS success for over three decades. The majority of the research on the user satisfaction dimension of IS success has focused on the technical characteristics of the system being studied and has not emphasized user attitudes toward the system. As a result, the theoretical foundation for research on user satisfaction with IS has been described as weak (Melone 1990). Similarly, researchers have noted the lack of emphasis on cognitive issues in IS implementations (Griffith and Northcraft 1996), and the influence of attitude on user intentions and use of new IS (Barki and Hartwick 1994; Karahanna et al. 1999). Joshi’s equity-implementation (E-I) model (1991), based upon equity theory, incorporates user attitudes and provides a theoretical framework for addressing these concerns.

The objective of this research is to develop and test an extension of the E-I model that incorporates both behavioral and technical aspects of user satisfaction with a new IS. Enterprise resource planning (ERP) systems were selected as the domain for this investigation due to the widespread use of these systems, the large number of users, the involuntary nature of these systems, and the lack of research on user satisfaction in this domain. A survey instrument has been developed and refined through pretests and a pilot study, and the final version of the instrument has been distributed. The research model and hypothesized relationships for this investigation are presented and excerpts of the survey instrument are provided.
2 THEORETICAL FOUNDATIONS

In the context of recent models and taxonomies on IS success (DeLone and McLean 1992; Seddon 1997), the current study focuses on an individual who wants to be better off by using a specific type of IS, an ERP system. This two-dimensional classification of IS effectiveness or success aligns with the dependent variable selected, user satisfaction with an IS. There have been numerous studies that have focused on user satisfaction with some aspect of an information system or function. Due to the scope of this research and page limitations, only satisfaction research in the context of a specific IS (not the IS function, service quality, or user information satisfaction) is presented. The reader is referred to the aforementioned articles on success models and taxonomies for a detailed literature review.

2.1 User Satisfaction with an IS

Within the classification of individual user and type of IS, the end-user computing satisfaction (EUCS) model (Doll and Torkzadeh 1988; Doll et al. 1994) has been widely applied. This model focuses on five physical system attributes (content, format, accuracy, ease of use, and timeliness) that influence user satisfaction with a system. While confirmatory studies of the EUCS instrument have provided evidence of good reliability and validity, the instrument only includes measures of the technical qualities and capabilities of a system. In a review of the user satisfaction construct, Melone (1990) notes that measuring a user’s attitude toward a system based only upon system attributes can offer a distorted view of the user’s perceptions. Melone also criticizes existing research on user satisfaction with a specific system for not incorporating the influence of behavior on a user’s attitude toward an IS. This point is particularly valid for involuntary IS as use of the system (behavior) is required and is thus likely to influence the user’s attitude toward the system.

Many of the more recent information technology trends, such as ERP and customer relationship management systems, are typically involuntary systems, meaning that employees must use these systems in fulfilling their daily job requirements. New implementations of these large-scale systems can significantly impact users’ job requirements, and accordingly, their attitudes toward these systems and their jobs. User satisfaction issues with these organizational systems have not, however, been the focus of much research.

2.2 Equity Theory

Joshi’s E-I model (1991), based upon equity theory (Walster et al. 1978), provides an alternative theoretical foundation for investigating how users respond to a new IS implementation. The E-I model suggests that users assess the equity, or fairness, of the new system at three levels. At the first level of analysis, users assess the change in their own inputs and outcomes as a result of using the new system compared to the old system. At the second level of analysis, users assess whether the benefits of the new system have been shared fairly between the user and the organization by comparing their own net change in inputs and outcomes with the net change experienced by the organization. At the third level of analysis, the users evaluate whether all users have been impacted similarly by the new system by comparing the net change in their own inputs and outcomes with the changes experienced by their co-workers. The user’s perceptions of equity at these three levels are believed to affect whether the user evaluates the system favorably or unfavorably. The inclusion of inputs (e.g., effort required, time required) within the model implicitly incorporates the influence of behavior on the user’s attitude toward the system, addressing Melone’s criticism of previous user satisfaction research.

The E-I model focuses on distributive fairness and does not include other fairness dimensions such as procedural or reciprocal fairness. This exclusion does not unduly limit the model as studies of fairness/justice have shown that perceptions of distributive fairness have a stronger effect on personal outcomes such as job and pay satisfaction while perceptions of procedural fairness impact organizational outcomes such as organizational commitment (McFarlin and Sweeney 1992). Given the individual level of analysis inherent in studies of user satisfaction, the focus on distributive fairness seems appropriate. In addition, prior attempts to differentiate the dimensions of fairness with respect to IS have been unsuccessful (Joshi 1989).

Empirical support for the E-I model is currently limited to a case study that demonstrates how the model can effectively serve as an integrating framework for understanding IS implementation, resistance to change, user satisfaction, and acceptance issues (Joshi and Lauer 1999). The constructs in this were not operationalized, the relationships were not specified and tested, and a specific dependent variable was not included. The usefulness of equity theory in explaining satisfaction issues in related areas or disciplines, however, has been empirically supported. Fairness was found to have a significant influence on user satisfaction.
with the IS function (Joshi 1989). Equity theory has been similarly applied to understand an individual’s evaluation or attitude toward the exchange of services in the context of job satisfaction (Janssen 2001; O’Neill and Mone 1998). A marketing application of equity theory carried out by Oliver and Swan (1989) is similar to the E-I model in that it proposes two levels of equity analysis with regard to a consumer purchase of an automobile and includes satisfaction with the automobile as the dependent variable. Additional dimensions of fairness/justice were similarly not included in this marketing application.

3 RESEARCH MODEL

The research model shown in Figure 1 depicts the three levels of equity analysis introduced in Joshi’s E-I model as mediating the effects of the changes in inputs/outcomes on user satisfaction. The three levels of equity, along with the EUCS factors, were included as determinants of user satisfaction with the ERP system. The EUCS factors and the structure of the model, including the mediating relationship of the three equity levels and the selection of satisfaction as a dependent variable, are extensions to the E-I model but are in keeping with other applications of equity theory (Oliver and Swan 1989). Due to space limitations, written hypotheses are not presented, but are instead represented by the paths specified in the model.

Figure 1. Extended E-I Model: User Satisfaction with an Involuntary IS

[Diagram of the research model showing the relationships between user inputs, outcomes, organizational inputs, outcomes, co-worker inputs, outcomes, and equity levels with user satisfaction with the ERP system]
4 RESEARCH METHODOLOGY

The research model will be tested with a field survey. AMOS 4.0 will be used to first test the model fit and then the paths included in the model. The existing scales for the five dimensions of EUCS were used with slight modifications. New scales for the equity constructs in the model were developed using an existing instrument from a marketing context (Oliver and Swan 1989) for general structure and content guidance. Given the lack of existing IS scales, a formal instrument development plan was followed (Table 1). Three different organizations (referred to as A, B, and C) that had implemented an ERP system in the past 12 to 18 months participated in the instrument development phase of the project. No data were collected from these organizations during the stabilization phase (Ross and Vitale 2000) of the ERP implementation. Several different ERP modules were used at each organization.

### Table 1. Instrument Development Plan

<table>
<thead>
<tr>
<th>Phase</th>
<th>Organization</th>
<th>Instrument</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest I</td>
<td>A, B, C</td>
<td>Initial Draft</td>
<td>Complete</td>
</tr>
<tr>
<td>Pretest II</td>
<td>A</td>
<td>Major Revision</td>
<td>Complete</td>
</tr>
<tr>
<td>Pilot Study</td>
<td>C</td>
<td>Minor Revision</td>
<td>Complete</td>
</tr>
<tr>
<td>Full Data Collection</td>
<td>C</td>
<td>Final Version</td>
<td>Analysis Underway</td>
</tr>
</tbody>
</table>

4.1 Pretests and Pilot Study

During the pretests, interviews were held with IS managers, system trainers, and system users at all three organizations to assess the content and construct validity of the instrument. A draft instrument was also distributed to 75 users at Organization B, with 37 users responding. While the sample size was small, preliminary reliability and exploratory factor analysis tests were run to provide an initial assessment of construct validity and reliability. After revising the instrument, additional interviews were held, and several employees were asked to complete the revised instrument and provide comments.

During the pilot study, a refined version of the instrument was distributed to 200 randomly selected ERP users at Organization C with 54 users responding. Preliminary analyses were again run to assess construct validity and reliability, and final revisions were made to the instrument.

4.2 Final Version of Survey

The final version of the survey instrument includes three items to assess the change in inputs and three items to assess the change in outcomes for each of the three levels of equity analysis (user, employer, and co-workers). The instructions and items to assess the change in inputs and outcomes rather than consider the individual dimensions of inputs and outcomes due to the inherent difficulties in calculating overall measures from these dimensions (Farkas and Anderson 1979). For example, one user may place more importance on pay as an outcome, whereas, another user may view the use of one’s abilities as the most important outcome. For this reason, we included an explanatory list of possible inputs and outcomes in the survey and developed scales to measure the users’ overall perceptions of the change in inputs and outcomes. The example inputs and outcomes and the nature of the scale items were developed based upon other equity research (Joshi 1991; Oliver and Swan 1989). Three scale items were included in the final instrument to provide an overall measure of each level of equity analysis. The instructions and items to assess overall equity at level one (the user) and level three (user versus co-worker) are provided in Figure 3. Scale items to measure an individual difference variable related to equity, equity sensitivity (Miles et al. 1994), were included in the instrument along with demographic questions on age, percentage of time spent using the ERP system, length of employment, etc.
The questions in this section focus on the inputs (requirements) for the new SAP system as compared to the previous system or paper-based process. Some example inputs are listed below:

- The amount of time required to complete the same work
- The manual and cognitive effort used to complete the same work
- The amount of work required
- The level of responsibility required
- The accountability for the work performed

Please circle the response that best represents your inputs with the new SAP system as compared to the previous system or paper-based process:

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Strongly Disagree</th>
<th>Neither Disagree nor Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inputs have increased.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. I have fewer inputs with the new SAP system.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. More is required of me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Please circle the response that best represents your co-workers’ inputs (workers in your same department) with the new SAP system as compared to the previous system or paper-based process:

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Strongly Disagree</th>
<th>Neither Disagree nor Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Inputs have increased.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. Their inputs are lower with the new SAP system.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. More is required of them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure 2. Survey Items Used to Assess the User’s Perceptions of the Change in Inputs and Outcomes for the User and Co-Workers

The questions in this section focus on your overall evaluation of the new SAP system.

1. I have been treated equitably with the new SAP system.
2. The new SAP system was NOT fair to me.
3. I am no better or worse off with the SAP system.

With regard to the new SAP system and the co-workers in your same department:

1. I am no better or worse off than my co-workers.
2. My co-workers and I have NOT been treated the same.
3. My co-workers and I have been impacted similarly.

Figure 3. Survey Items Used to Assess the User’s Perceptions of Equity at Two Levels of Analysis
5 CURRENT STATUS, LIMITATIONS, AND CONTRIBUTIONS

The revised instrument was distributed to the remaining 1,500 ERP users in Organization C; 297 surveys were completed and returned, for a response rate of 20 percent. The conference presentation will include a complete analysis of the data and testing of the model.

Limitations of the current study include (1) the lack of generalizability due to having one data source, (2) procedural and reciprocal fairness were not included in this initial study and could affect user satisfaction, and (3) the 20 percent response rate allows for the possibility of nonresponse bias. The development and testing of the E-I model should extend research on user satisfaction with an IS along several dimensions. The incorporation of user attitudes addresses theoretical concerns with the user satisfaction construct and emphasizes the cognitive elements of IS implementations. The development of scales to measure user perceptions of changing inputs/outcomes with a new IS has value for organizations that want to identify specific user concerns both pre- and post-implementation. Finally, the model is grounded in a well-established theory that has been applied in numerous disciplines in support of the satisfaction construct.

6 REFERENCES