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The Role of Organizational Leadership and IT Leadership in Achieving IS Success

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The Role of Organizational Leadership and IT Leadership in Achieving IS Success

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ABSTRACT

The role of Leadership to improve IT management has been extensively discussed at both corporate and academic level. However, a model that relates both Organizational and Information Technology (IT) Leadership with the achievement of Information Systems (IS) success is not readily available. This paper discusses the preliminary findings of a study that assesses the effect of leadership on IS success. Leadership is measured at the organizational level as a component of the Malcolm Baldridge National Quality Award (MBNQA) and at the IT level as a part of IT-Business alignment structure. Instruments to measure Leadership and IS success are devised and an empirical study within a municipal government is conducted. Structural Equation Modeling (SEM) is used to evaluate the proposed “IS Leadership Success” model. The preliminary results of the study empirically validated the instruments and provided support for the relationship between leadership and IS success.

Keywords

IT Leadership, Organizational Leadership, Information Systems Success, and Quality

INTRODUCTION

For many years, academic researchers and business practitioners have searched for tools that allow organizations to improve organizational performance. Information Technology (IT) is usually embraced as a solution for this quest. Millions of dollars are spent in IT under the assumption that greater spending in IT will ultimately increase efficiency and leverage the return on investment. However, the relationship between IT spending and return on investment is not always clear. While early research found no or negative relationship between IT and organizational performance/productivity (Brynjolfsson, 1993; Landauer, 1995; Loveman, 1994; Strassmann, 1990, 1997; Weill, 1992), later studies supported the importance of IT to enhance organizational performance (Brynjolfsson & Hitt, 1996, 1998; Rai, Patnayakuni, & Patnayakuni 1997).

The linkage between leadership and organizational performance has been increasingly discussed in the management literature (Prybutok & Stafford, 1997; Prybutok & Spink, 1999). Although some researchers in the behavioral sciences argue that the boundaries of the leadership construct are still not clear (Bass, 1997 and Chemers, 1997), the Malcolm Baldridge Quality Award (MBNQA) (Figure 1) offers an organizational-wide perspective for understanding and evaluating organizational leadership from a quality and productivity viewpoint (Carruba, 1992, Dean and Bowen, 1994; Bemowski, 1995, Chong, 2001).

According to Stone (1994), organizational leadership is considered important not only to achieve organizational effectiveness but also IS success. He states that organizations require effective leadership to manage the development and implementation of IS in order to take advantage of IT as a competitive weapon. Prybutok, Richards, and Cutshall (2001) also pointed out the relevance of leadership for the IS success suggesting that the influence of leadership is not only in what information organizations collect but also in how information is used. Even though some research supports the relationship between leadership and IS success, the empirical validation of this relationship has been difficult since both constructs still lack consistent and agreed upon definitions (Armstrong & Sambamurthy, 1999; Lewis & Bernard, 2003; McLean & Smits, 2003, Watson & Brohman, 2003).
BACKGROUND
Information Systems Success
The IS success taxonomy proposed by DeLone and McLean (1992) was based in the information theory of Shannon and Weaver (1949), the information theory of Mason (1978), and the analysis and classification of MIS research studies from 1981 to 1987. The levels of analysis that comprise this framework are viewed from three categories: the technical level, the semantic level, and the effectiveness level. The validity of the IS success framework has been amply examined by researchers around the world (e.g., Goodhue and Thompson, 1995; Igbaria and Tan 1997; Seddon and Kiew, 1994; Teo and Wong 1998; Trokzadeh and Doll 1999). Such assessments mostly provided support for their validity.

Although DeLone and McLean’s framework is widely accepted, researchers have suggested the inclusion of new dimensions or the modification of the current dimensions. Myers, Kappelman, and Prybutok (1997) proposed an expansion of DeLone and McLean to include the emerging IS success dimensions of service quality and work group impact. Seddon and Kiew (1994) critically examine the meaning of their individual effect dimensions and the evidence of relationships among them. He proposed three main changes to the DeLone and McLean’s framework: First, usefulness to replace use as an IS success measure; second, system importance is added to help explain variations in users’ perceptions of usefulness and user satisfaction; and third, the effect of use on user satisfaction and vice versa in DeLone and McLean's model is replaced by one-way causality. Seddon and Kiew (1994) also warned that many researchers have used “use” as an objective measure of system success implying that if a system is used, it must be useful, and therefore successful. However, he posits that when usage is compulsory the number of hours a system is used conveys little information about system usefulness and success. Seddon emphasizes that non-use does not necessarily mean a system is not useful, it may simply mean that the potential user has other more pressing tasks. In connection with the appropriateness of the dimension “use” “in IS success assessment, DeLone and McLean propose that “usage, either perceived or actual, is only pertinent when such use is voluntary” (pg. 68). A review of the Delone and McLean IS success Framework was published in 2003. The new framework attempts to incorporate the dimensions suggested by other researchers, but it has not empirically validated (DeLone and McLean, 2003). The areas of assessment considered in the IS success construct in this study are presented in Table 1.
IS SUCCESS: KEY AREAS OF ASSESSMENT

| Overall quality of information provided by the IS. |
| Overall quality of data and information provided by the IS. |
| Overall satisfaction with the organization’s IS |
| Overall impact of IS in performance. |
| Overall impact of IS on organizational performance |

Table 1. Key areas of assessment in the IS Success area

Organizational Leadership

The Malcolm Baldrige National Quality Award (MBNQA) is considered a comprehensive framework for world-class performance (Flynn, and Saladin, 2001). According to the National Institute of Standard and Technology (NIST), the government organization that oversees the MBNQA award, the criteria in the award are designed to help organizations use an integrated approach to organizational performance management that result in; delivery of ever-improving value to customer, contributing to marketplaces success, improvement of overall organizational effectiveness and capabilities, and organizational and personal learning. Each criterion in the MBNQA framework has a certain weight assigned for quality experts according to the relevance of the criterion. (NIST, 2003). The key areas of assessment in the organizational leadership dimensions are presented in Table 2.

Table 2. Key areas of assessment in the Organizational Leadership Dimension

Research concerning the MBNQA framework is divided in two categories; (1) the development and validation of instruments to measure the constructs in the model, and (2) the validation of the model itself.

Validation of the MBNQA model is provided in the research conducted by Flynn and Saladin, 2001; Prybutok and Stafford 1997; Prybutok and Spink, 1999; Prybutok, Richards, and Cutshall, 2001; Wilson and Collier, 2000.

Sammon and Terziovski (1999) analyzed some of the constructs in the framework using multiple regressions with “operating performance” as a dependent variable. They concluded that leadership, people management, and customer focus were significant and positive related to operating performance.

Wilson and Collier (2000) assessed a measurement and structural model based on the MBNQA criteria,. They tested the underlying theory of the MBNQA philosophy that “leadership drives the system that creates results” (pg 363). They also focused in the analysis of the specific direction of causation in their model. Not surprisingly, the conclusion of this study supported the theory that Leadership is the most important driver of system performance. They also found that although Leadership has no effect on financial results, it influences overall performance. As a result, the authors reported that the MBNQA criteria were consistent predictors of organizational performance, and they validated the hypothesis that leadership drives the system that causes results.

IT Leadership

Increasingly, academic and business researchers are claiming that IT plays the crucial roles of business partner and strategic enabler (Henderson and Venkatraman, 1993; Luftman, Papp, & Brier, 1999). Nevertheless, researchers suggest that a successful use of IT/IS sometimes is more associated with people than IT/IS itself (Roepke, Agarwal, and ferrat, 2000). In a study conducted by Igbaria and Nachman (1991), they showed that leadership styles of IT are positively and significantly related to user satisfaction. Ross, Beath, and Goodhue (1996) propose that the key for successful IT for the 21 century lies in its ability to be adaptive, responsive, and aligned to business needs.

Numerous studies suggest that IT leadership is a key factor in the achievement of IS success (see for example, Luftman, Papp, and Brier, 1999; Sambamurthy and Zmud, 1999). This successful use of IT has also been associated with the
alignment between business objectives and IT objectives. Those researchers studying alignment between business and IT objectives have found that there are some elements that can facilitate or hinder the achievement of this alignment. Luftman, Papp, and Brier (1999) named them “enablers” and “inhibitors” of alignment. In the same study, Luftman et. al (1999) found that support from senior executives was the most important enabler of IT business alignment. Teo and Ang (1999) studied similar elements and called them “critical success factors.” Among these factors, they found that IT leadership was crucial not only to enable organizations to improve the use of IT but also to achieve the alignment of IT and business objectives. Although there is not and accepted definition of IT leadership, a preliminary definition of IT leadership will have their foundations on the preliminary findings of McLean and Smits (2003) which suggested that IS leaders depend on multiple sources of power - positional, knowledge and personal- to accomplish organizational goals. They also added that transformational and transactional leadership roles are essential to guarantee the strength of the IS function. Moreover, Armstrong and Sambamurthy (1999) found that IT transformational leadership is positively associated with the informal association of Senior IT leaders with the top management team and business knowledge.

In this study, the key areas of analysis for IT leadership are presented in Table 3.

<table>
<thead>
<tr>
<th>IT LEADERSHIP: KEY AREAS OF ASSESSMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT leader use IT to communicate value and expectations?</td>
</tr>
<tr>
<td>IT leader use IT to set goals and objectives?</td>
</tr>
<tr>
<td>IT leader use IT to set plans and strategies to achieve goals and objectives?</td>
</tr>
<tr>
<td>IT leader use IT to reinforce an environment for empowerment and innovation?</td>
</tr>
<tr>
<td>IT leader use IT to evaluate the performance and capabilities of all function of the organization?</td>
</tr>
</tbody>
</table>

Table 3. Key areas of assessment in IT Leadership

RESEARCH MODEL

The main constructs considered in this research are organizational leadership, IT Leadership and IS success. The foundation as well as the operationalization of the constructs was derived from the previous literature, and a model of the relationships among the constructs is proposed and empirically tested. The major premise of this “IT Leadership-Success” model, and the theory embodied in it, is that better organizational leadership and/or IT Leadership will influence positively information systems success.

This study uses the leadership dimension of the MBNQA framework as a theoretical base for leadership. Since organizational leadership is a concept that is not directly measurable but can be indirectly measured by survey questions, we chose to use the leadership criteria in the MBNQA framework as the theoretical framework for these questions and the operationalization done by Prybutok and Spink (1999). The IT leadership (ITL) construct is used to incorporate the idea that leadership at different levels of the organization is required for IT to effectively support the organizations vision, and innovative ideas.

The IS success construct was operationalized using measures based upon the DeLone and McLean model of IS success. The controversy about the dimension “use” discussed in the previous section as well as preliminary analysis of the data suggests that use does not provide a better understanding of the success construct, and on the contrary, use reduces the content validity of the IS success construct.

This study assesses a hypothesized model of the relationship among the Organizational Leadership, IT Leadership, and IS Success. Researchers have suggested that organizational leadership, as defined by the key areas of assessment, is associated with the assimilation of IT in firms and their success (Armstrong and Sambamurthy, 1999). The model and the specific relationships among the constructs is tested by the two following hypothesis (figure 2)

H1: A high level of organizational leadership is linked to a high level of perceived IS success.

Similarly, researchers in the MIS field have argue that IT leaders play different roles which define the long term viability of the IS organization (Armstrong and Sambamurthy, 1999; McLean and Smits, 2003; Lewis and Bernard, 2003). The second hypothesis is:

H2: A high level of IT Leadership is linked to a high level of perceived IS success.
Instrument Development

This research used three instruments; one to measure each of the three constructs in the model: Organizational leadership, IT Leadership, and IS success. The scale used in the three instrument was a seven point Likert-type scale with 1 = Strongly Disagree to 7 = Strongly Agree, with a Not Applicable (N/A) also included. The organizational leadership instrument used was a slightly adapted version of the leadership portion of the MBNQA instrument developed by Prybutok and Spink (1999). The instrument consists of five items that were content validated by several qualified experts in quality issues and MBNQA. The instrument’s validity and reliability was established by Prybutok and Spink (1999) and Prybutok, Richards, and Cutshall (2001).

A new instrument was developed to measure IT leadership. The questions to operationalize this construct were chosen based on the analysis of the literature concerning leadership and IT business alignment (Burn and Szeto, 2000; Henderson and Venkatraman, 1993; Kearns and Lederer, 2000; Sabherwal and Chan, 2001; Flynn and Saladin, 2001; Prybutok and Spink, 1999; Prybutok, Richards, and Cutshall, 2001). Professors in the areas of IT, Management, and Psychology content validated the items.

The third instrument used in this research was the IS success instrument. The questions in this instrument were based on the IS success model developed by DeLone and McLean. In this model, the authors attempted to combine individual measures from IS success categories to create a comprehensive measurement instrument. This study used direct questions from all the dimensions in the DeLone and McLean model to build the instrument, except for the dimension “use” that was not included in the final version of the instrument because the validity of this dimension is not well substantiated. Seddon (1997) states that “in the relationship from System Quality, Information Quality, and User Satisfaction to IS Use, and from Use to Individual Impact, IS Use does not play the role of a success measure” (pg. 251). The instrument attempted to measure five of the six dimensions in the original DeLone and McLean model.

A panel of experts, including IS researchers, doctoral students, and selected city employees participated in a pilot test. Completion time and the clarity of the items in the instruments were measured in this test. The final version of the instruments incorporated the feedback from the pilot study.

Sample and Data Collection

The final version of the instrument was included in a Internet-based survey of all employees in a city government serving a population of about 70,000. An invitation letter and a password to access the survey was sent to 1,100 employees by e-mail in all of the different areas of the government. Overall, 339 questionnaires were returned. However, only 249 responses were useful for data analysis with a response rate of 22.7%. The exclusion of some respondents was due to the lack of response in some items, the checking of reversed and redundant questions, or their selection of the “not applicable” answer. Some important information about the respondents indicated that 58.7% of the respondents had 10 or more years of experience with IT with only 1.5% of the respondents having less than a year of IT experience. A significant proportion, 68.4%, use IT more than 40% of their working time. The distribution of job categories of the respondents in this study shows that nearly 25% of the respondents were at the professional level, 42.4% of the respondents were at the operational level (field service, office and clerical, technical and supervisory) while 23.9% of the respondents belong to managerial or supervisory positions.

Data Analysis

The instruments were content validated by a panel of experts. Exploratory factor analysis of all three instruments together found no multiple loadings for any item indicating unidimensionality of constructs, and independence of the three measures.
Sample size was sufficient considering the number of items in relationship to the constructs in the model (Torkzadeh, and Doll, 1999).

The Cronbach alpha internal consistency reliability coefficient was used to assess the reliability of the instruments. This coefficient indicates the consistency of responses to the items by the subjects. As shown in Table 4, all alpha coefficients exceeded 0.80, ranging from .88 to .96. These results indicate a high level of internal consistency among items that measure each construct.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational Leadership</td>
<td>.88</td>
</tr>
<tr>
<td>IT-Business Leadership</td>
<td>.96</td>
</tr>
<tr>
<td>IS success</td>
<td>.94</td>
</tr>
</tbody>
</table>

Table 4. Cronbach’s Alpha as reliability measures

Construct validity of the instruments was measured using Factor. In particular, the factor structure of the constructs was assessed using Principal Axis Factoring (PAF) with Promax rotation. The PAF with Promax rotation extracted three factors with eigenvalues greater than one (Table 5). The range for factor loading was .767 to .854 for organizational leadership, .753 to .991 for IT Leadership, and .794 to .948 for IS success. The three-factor model explained 79.6% of the variance.

Model Assessment

Model assessment was performed through the validation of both the measurement and structural model. Structural Equation Modeling (SEM) was the statistical technique applied to determine the fit of hypothesized model. The main purpose in this assessment is to establish how close the estimated covariance matrix is to the sample covariance matrix. LISREL 8.52 was the software used to assess the validity of the hypothesized model.

<table>
<thead>
<tr>
<th>INSTRUMENT</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Org. Leadership</td>
<td>OGLEAD1</td>
</tr>
<tr>
<td>Org. Leadership</td>
<td>OGLEAD2</td>
</tr>
<tr>
<td>Org. Leadership</td>
<td>OGLEAD3</td>
</tr>
<tr>
<td>Org. Leadership</td>
<td>OGLEAD4</td>
</tr>
<tr>
<td>Org. Leadership</td>
<td>OGLEAD5</td>
</tr>
<tr>
<td>IT Leadership</td>
<td>ITBLEAD1</td>
</tr>
<tr>
<td>IT Leadership</td>
<td>ITBLEAD2</td>
</tr>
<tr>
<td>IT Leadership</td>
<td>ITBLEAD3</td>
</tr>
<tr>
<td>IT Leadership</td>
<td>ITBLEAD4</td>
</tr>
<tr>
<td>IT Leadership</td>
<td>ITBLEAD5</td>
</tr>
<tr>
<td>IS Success</td>
<td>SYSQ</td>
</tr>
<tr>
<td>IS Success</td>
<td>INFQ</td>
</tr>
<tr>
<td>IS Success</td>
<td>USESAT</td>
</tr>
<tr>
<td>IS Success</td>
<td>INDIMP</td>
</tr>
<tr>
<td>IS Success</td>
<td>ORGIMP</td>
</tr>
</tbody>
</table>

Table 5: Rotated Factor Matrix
The general rule for SEM is that 5 to 10 observations are required for each parameter estimated (Hair, Anderson, Tatham, and Black, 1995), and a sample size recommended by Maximum Likelihood Estimations is within the range of 100 to 200. A model with a low chi-square or high p-value indicates a better fit.

Researchers use a number of criteria to ascertain the acceptability of the fit of a model: (1) Non-significant chi-square (at least \( p > 0.05 \)), (2) incremental fit indices such as Normed Fit index (NFI) or Tucker-Lewis Index (TLI) greater than 0.90; (3) low Root Mean Square Error of Approximation (RMSEA) with acceptable values less than 0.05, and (4) parsimony indices that portray the proposed model as more parsimonious than an alternative model. A good indicator of absolute fit is the goodness of fit index (GFI), which is based on the ratio of the sum of the squared discrepancies to the observed variance. The GFI ranges from 0 to 1, with values exceeding 0.9 indicating a good fit to the data (Schumacker, and Lomax, 1996). Figure 3 shows the assessed model using LISREL 8.52. This model consists of three latent variables (Organizational Leadership, IT Leadership, and IS Success). Each latent variable has five indicating variables.

Analysis of the model shows a chi-square value 64.94 (\( p=.903 \)) with \( df = 81 \). The ratio of the Chi-Square to Degree of Freedom is 0.8 and shows that it is acceptable because it is below 2.0. Table 6 shows a summary of the statistics for the model.

### Table 6: Overall Model Fit Statistics

<table>
<thead>
<tr>
<th>Overall Model Fit Statistic</th>
<th>Criteria</th>
<th>Final Model Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degrees of Freedom (df)</td>
<td></td>
<td>81</td>
</tr>
<tr>
<td>Chi-Square value/df</td>
<td>(&lt; 2.0)</td>
<td>0.8</td>
</tr>
<tr>
<td>Root Mean Square Error of approximation (RMSEA)</td>
<td>Below 0.05</td>
<td>0.00</td>
</tr>
<tr>
<td>Goodness of fit index (GFI)</td>
<td>Above 0.9</td>
<td>0.92</td>
</tr>
<tr>
<td>Comparative Fit Index (CFI)</td>
<td>Above 0.9</td>
<td>1.0</td>
</tr>
<tr>
<td>Normed Fit Index (NFI)</td>
<td>Above 0.9</td>
<td>0.97</td>
</tr>
<tr>
<td>Incremental Fit Index (IFI)</td>
<td>Above 0.9</td>
<td>1.01</td>
</tr>
</tbody>
</table>

![Figure 3. Model Results](image-url)
Overall, most of the statistic shows a good fit of the data to the model. The structural model was examined to determine if the relationships were significant. All the coefficients were significant at the 5%. Figure 4 shows the standardized values as well as the t-values.

![Figure 4. Structural Model](image)

* t-value significant at the 0.01 level

The results of this research provide support for the hypothesized model. The underlying theory that Organizational as well as IT Leadership are predictors of IS Success is supported, and every one of the hypothesis were accepted. Table 7 shows the statistical analysis used to assess the validity of the hypotheses.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Causal Paths</th>
<th>Statistic Criteria</th>
<th>Hypothesis Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Org. Leadership to IS Success</td>
<td>t-value = 2.48</td>
<td>Yes</td>
</tr>
<tr>
<td>H2</td>
<td>IT-B. Leadership to IS Success</td>
<td>t-value = 3.16</td>
<td>yes</td>
</tr>
</tbody>
</table>

Table 7: Hypothesis statistical analysis

**Limitations and Future Research**

Limitations of this research are related to its reliance on perceptual data, the lack of conclusive theories on the topic, and the research design and data collection process. Additionally, the instruments used in this study were fairly new and despite following all recommended instrument development procedures, there remain some uncertainties about their validity. The use of an on-line survey can also lead to a respondent bias due to the technological gap among various groups of respondents. However, the most important limitation that we acknowledged is the use of a single organization to assess the model. The preliminary assessment of the model can be regarded as methodologically dangerous since the sample come from a single organization, and consists of the self-reported opinion of its employees. Future assessments of the relationships in the model must be done considering more organizations and different stakeholders.

Regardless of the limitations, the researchers believe that this preliminary study makes an important contribution to the current body of knowledge about IS success. Some possible research issues for future investigations are as follows: Expand the analysis of IS success to include other stakeholders; Adapt the instruments for use in non-government enterprises; Validate the instruments in other organizational settings across other industries, sizes, and types of enterprises; and, Expand the analysis of organizational factors affecting IS Success to include other dimension of the MBNQA.
Conclusions

This study makes some novel contributions to the understanding of the factors affecting IS Success. First, it presents a theoretical model to explain the causal relationship between Organizational Leadership, IT Leadership, and IS Success. While previous studies have speculated on the importance of organizational factors in the achievement of IS success, this study identifies the organizational factors with the aid of the MBNQA criteria of performance excellence and focuses attention on the Leadership factor. Second, it proposes and preliminary validates the instruments to measure the constructs in the model. Third, it tests the assumptions about the relationship between Organizational Leadership, IT Leadership and IS Success. Finally, this research represents the beginnings of finding a comprehensive theory and model for understanding causal relationships among organizational factors and IS success.

REFERENCES


