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Knowledge Management as an antecedent of Enterprise System Success

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ABSTRACT
Organisations invest substantial resources in Enterprise Systems (ES) expecting positive outcomes for the organisation and its functions. Yet, many ES projects have reported nil or detrimental impacts. The effective management of ES-related knowledge has been suggested as a critical success factor for these ES projects. This paper analyses the impact of managing knowledge on Enterprise System success and studies the relative importance of the knowledge management process (i.e. knowledge creation, retention, transformation and knowledge re-use). A path model is developed to test the above premise using the Adaptive Structuration Theory and a framework grounded in sociology of knowledge. Preliminary results indicate a strong relationship between effective knowledge management processes and Enterprise System success.

Key Words: Enterprise Systems, ERP systems, Knowledge management, Adaptive Structuration Theory, Sociology of Knowledge

INTRODUCTION
Organisations make large investments in Enterprise Systems (ES) expecting positive impacts to the organisation and its functions. Yet, there exists much controversy surrounding the ‘potential’ impacts of these systems. In the context of Enterprise Systems, Knowledge Management has been suggested as a critical success factor. ES literature advocates that knowledge must be carefully managed throughout the ES lifecycle in order to maximize benefits. Steadman (1998) highlighted the implications of insufficient knowledge management procedures in the renowned Hershey food Enterprise System implementation. Conversely, there have been reports on organizations achieving greater success with ES with effective knowledge management procedures (Al-Mashari and Zairi 2000; McNurlin 2001). However, knowledge management programs are struggling with the difficulty of assessing the effectiveness and the importance of such activities, with no empirical and quantitative evidence of knowledge management process being an important antecedent of ES success.

The main objective of this paper is to theoretically assess the impact of the knowledge management process on the Enterprise Systems success. Knowledge management process discussed in this study, based on a framework grounded in sociology of knowledge (Berger and Luckman 1967; Gurvitch 1971; Holzner and Marx 1979), is adapted to identify the dimensions of knowledge management (Alavi and Leidner 2001). A path model is then developed based on the Adaptive Structuration Theory (AST) to understand the impact of knowledge management on ES success (DeSanctis and Poole 1994). The paper begins with a brief review on knowledge, knowledge management, knowledge management process and ES success. Next, the research model, the methodology and the data collection procedures are described followed by the path model. Thirdly, the results of the path analysis are presented and validity / reliability procedures are described. The paper concludes with an outlook of future research analysis to be completed in this study.

1 For an in-depth discussion on Enterprise Systems see Shanks, Seddon and Wilcocks 2003 and Klaus, Rosemann and Gable 2000
LITERATURE


Literature on knowledge management and Enterprise Systems are mainly classified into two broad streams: (1) Enterprise Systems for knowledge management, whereby the implemented ES offers knowledge management tools and new organisational knowledge; and (2) knowledge management for Enterprise Systems, where emphasis is on understanding the impact of knowledge management that is required for ES lifecycle-wide health and longevity3. This study belongs to the latter classification.

Managing ES is a knowledge intensive task as it requires a great amount of experience from a wide range of people with diverse knowledge capabilities. Davenport (1998) emphasised the importance of a comprehensive knowledge management process for ES and state “having made costly errors by disregarding the importance of knowledge, many firms are now struggling to gain a better understanding of what they know, what they need to know and what to do about it” Many organizations focused on rapid implementations and were reluctant to retain external parties (i.e. consultants and software vendors) post implementation for ‘knowledge management’ activities. The increased demand for ES expertise, especially in the late 1990s, has further aggravatated this problem with many ES staff switching for better employment conditions. A survey conducted by KPMG (1998) reported that over 50% of the surveyed companies reporting significant losses from losing staff and therefore hindering knowledge management activities. Davenport (1993) identifies three ES specific knowledge types: (1) software specific knowledge, (2) business process knowledge and (3) organizational specific knowledge. Gable, Heever, Erlank, Scott (1997) identified three key players associated with the phases of ES lifecycle: (1) client organization, (2) software vendor and (3) external consultants. Sedera, Gable, Chan (2003b) combined the knowledge types (Davenport 1993) and the key players (Gable et al., 1997) and proposed a 2x3 matrix for managing knowledge.

KNOWLEDGE MANAGEMENT PROCESS

Based on the framework of sociology of knowledge, knowledge management involves (1) development of knowledge, (2) distribution of knowledge, (3) retention of knowledge and (4) usage of knowledge (Berger and Luckman 1967; Gurvitch 1971; Holzner and Marx 1979; Alavi and Leidner 2001; Boekhoff 1996). The development phase (knowledge creation) of the knowledge management process corresponds with the planning and implementation stages of the ES lifecycle and entails all three key players identified by Gable et al., (1997): consultant, vendor and client organization. It involves developing new content and replacing existing content within the organization’s tacit and explicit knowledge (Pentland, 1995; Alavi and Leidner, 2001). The external players bring in new knowledge on the software, and business processes (Davenport, 1998) to the client organization and the client organization shares organizational knowledge with the external parties. Gupta and Govindarajan (2000) conceptualized knowledge transformation in terms of five elements and emphasized the importance and the richness of the channels of knowledge transfer4. Knowledge transfer channels can be informal or formal (Holtham and Courtney 1998). Unscheduled meetings, informal gatherings and coffee break conversations are some examples for the informal transfer of ES related knowledge. Although the informal transformation promotes socialization and could be beneficial in small organizations, it precludes wide dissemination (Alavi and Leidner 2001; Holtham and Courtney 1998). Formal transfer, such as training programs may ensure wider distribution of knowledge and suits highly context specific knowledge. Knowledge retention constitutes organizational and personal knowledge retention. The individual knowledge retention is developed based on person’s observations, experiences and actions (Sanderlands and Stablein 1987). Organizational knowledge retention, which can be classified into semantic or episodic (Stein and Zwass 1995), includes articulated knowledge, context-specific knowledge and situated knowledge. An important aspect of the knowledge-based theory is that the source of competitive advantage resides not in the knowledge it self, but in the application (re-use/re-use). In the context of ES, knowledge re-use plays a vital role in every phase of the ES lifecycle, especially in maintenances and upgrades.

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2 Tacit knowledge which comprised of both cognitive and technical elements (Nonaka 1994, Alavi and Leidner 2001) is sourced in action, experience and involvement in a specific context. The cognitive elements in tacit knowledge refer to an individual’s mental models and technical component consists of know-how, skills and crafts that apply to a specific context (Nonaka 1994, Alavi and Leidner 2001). The explicit dimension of knowledge is articulated, codified and communicated in symbolic form and/or natural language.

3 Shanks et al., (2000) defines ES lifecycle phases as (i) planning, (ii) implementing, (iii) stabilizing and (iv) improvement

4 The other elements discussed by Gupta and Govindarajan (2000) include (1) perceived value of the source unit’s knowledge, (2) motivational disposition of the source (i.e. their willingness to share knowledge), (3) motivational disposition of the receiving unit, (4) the absorptive capacity of the receiving unit
RESEARCH MODEL

Figure 1 depicts the preliminary research model with the dependent variable Enterprise Systems Success and independent variable Knowledge Management Processes. The dependent variable (ES success) is measured using the ES success measurement model (Gable Sedera Chan 2003; Sedera Gable Chan 2003a). The ES success measurement model is the first comprehensive, empirical, quantitative assessment of ES success reported in the academic press. It employs 27 validated success measures arranged under 4 mutually exclusive constructs derived from two survey rounds. The knowledge management processes are defined using the sociology of knowledge framework discussed above. The knowledge creation construct is disbanded to illustrate the knowledge creation sources (Gable et al., 1997) and the types of knowledge (Davenport 1993) (Sedera, Gable Chan 2003b).

To adequately explain the impact of Knowledge Management Processes on Enterprise Systems Success, the Adaptive Structuration Theory (AST) has been used (DeSanctis and Poole 1994). Khalifa, Lam and Lee (2001) employed the Adaptive Structuration Theory in a similar context to assess the impact of knowledge management structures on the organisational performance. AST hypothesises that social outcomes (e.g. decision making effectiveness, organisational performance) do not result directly from the effects of input variables such as technology. Rather, the outcomes – in this research Enterprise Systems Success – reflect the manner in which an organization appropriates the structures of the input variables within a specific context.

According to Gopal, Bostrom and Chin (1993) appropriation is the manner through which technology and other social structures are adapted by an organization for its own use through a process called Structuration. Structures in AST include such aspects like: rules, resources, tasks, technology, organizational culture, group norms, and the knowledge held by the participants in a social system. In the context of this research, appropriation accounts the effectiveness of the knowledge management processes of the sample organizations. According AST the existence of knowledge management processes in an organization does not necessarily lead to higher success of ES, unless the knowledge management process is effective.

The relationship between knowledge management process and ES success is moderated by appropriation. However, the objectives of this study are to illustrate the importance of knowledge management processes on the success of an Enterprise Systems application, to identify the relative importance of the elements of knowledge management processes, rather than the moderating effect of appropriation. As explained by Khalifa et al., (1991), excluding appropriation may seem like a weakness of the analysis, if the relationship between knowledge management and ES success is insignificant.

\[\text{Significant relationship between the variables verifies the reasonable appropriation. Insignificant relationship between knowledge management processes and ES success perplex the results by not knowing whether the result was due to ineffective knowledge management processes or due to the moderating effect of appropriation.}\]
RESEARCH METHODOLOGY

The survey instrument consists of 27 items to measure ES success and 10 items to gauge the impact of knowledge management process on ES success (See appendix A for the survey items). Criterion items were used to make an overall assessment for both knowledge management process and ES success. No prior study has empirically tested the relationship between knowledge management and ES success. Therefore, all knowledge management related items were carefully derived by the authors. Twenty-seven (27) public sector organizations responded to the survey resulting three-hundred and ten (310) valid responses. Nine responses were removed due to missing values or perceived frivolity. The instrument and the research model are then validated; first establishing the validity and the reliability of measures and then testing the model using a path analysis.

INSTRUMENT AND MODEL VALIDATION

Content Validity

The instrument items related to knowledge management were derived from two preceding studies. These items were then associated with the AST and sociology of knowledge framework. Prior studies of information systems success and related instruments were thoroughly and carefully analyzed, with many instrument items being based on prior validated instruments to assess the ES success. To comply with the second aspect of content validity, a series of expert workshops (with leading academics and industry representatives in the study domain) were conducted and amendments were made to the instrument items.

Construct Validity

Construct validity seeks evidence that the selected constructs are true depicters that describe the event, not merely artefacts (Cronbach, 1971; Campbell & Fiske, 1959). Construct validity of an instrument can be assessed through multi-trait-multi-method (MTMM) techniques (Campbell and Fiske, 1959) or techniques such as confirmatory or principal component factor analysis (Long, 1983; Nunnally, 1967). The final factor solution of knowledge management process items explained 65% of variance of the overall model. One item was dropped obtain a parsimonious solution. Furthermore, the variables display a strong discriminate validity by showing strong correlations between them (Sedera et al, 2003b).

Results and Discussion

Figure 2 depicts the analysis conducted in LISREL. For all constructs of the knowledge management process there are reasonably high loadings, providing further evidence of convergent validity. The highest loading was reported in use/re-use dimension, which confirms the knowledge-based theory. Table 1 provides all related statistics to assess the model fit. All fit indexes of the model are sufficient to demonstrate the empirical connection between knowledge management process and ES success.
CONCLUSION AND FUTURE RESEARCH

This paper reported preliminary findings of a study that investigated the impact of knowledge management on ES success. The validated model illustrated knowledge management having a significant impact on the level of ES success. The analysis and the validation of the model constructs suggest the existence of four distinct and individually important dimensions of knowledge management process that the authors believe are applicable to any knowledge management evaluation. Further, to the best of our knowledge this is the first study to empirically measure such a relationship and explain the importance of knowledge management based on a strong theoretical foundation, in the academic press.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Best Range</th>
<th>Reported Value</th>
</tr>
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<tbody>
<tr>
<td>Absolute Fit Measures</td>
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<td></td>
</tr>
<tr>
<td>Root Mean Square</td>
<td>RMR</td>
<td>Close to 0</td>
</tr>
<tr>
<td>Standardized Root Mean Square</td>
<td>SRMR</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Root Mean Squared error of approximation</td>
<td>RMSEA</td>
<td>&lt;0.1 Good, &lt;0.05 Very Good</td>
</tr>
<tr>
<td>Goodness of Fit Index</td>
<td>GFI</td>
<td>&gt;0.9</td>
</tr>
<tr>
<td>Adjusted Goodness of Fit Index</td>
<td>AGFI</td>
<td>&gt;0.9</td>
</tr>
<tr>
<td>Chi Sqr / DF</td>
<td>X2/df</td>
<td>&lt;5 Good, &lt;2 Over specified</td>
</tr>
<tr>
<td>Comparative Fit Measures</td>
<td></td>
<td></td>
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<tr>
<td>Normed Fit Index</td>
<td>NFI</td>
<td>&gt;0.9</td>
</tr>
<tr>
<td>NonNormed Fit Index</td>
<td>NNFI</td>
<td>&gt;0.9</td>
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<tr>
<td>Incremental Fit Index</td>
<td>IFI</td>
<td>0 to 1</td>
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<td>Parsimonious Fit Measures</td>
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<td>Parsimonious Goodness of Fit Index</td>
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Table 1: LISREL model fit indicators

REFERENCES


13 For the analysis purposes knowledge creation was separated into two constructs.
APPENDIX A

Knowledge Management Process Survey Measures

1. SAP knowledge by the vendor
2. SAP knowledge by the consultants
3. SAP knowledge by the agency
4. SAP knowledge re-use
5. SAP staff and knowledge retention strategies
6. Knowledge of the agency, possessed by the vendor
7. Knowledge of the agency, possessed by the consultants
8. The agency's knowledge of itself
9. Training in SAP has been appropriate.
10. The agency has retained the knowledge