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Identifying the Knowledge Management Structures in Enterprise Systems Projects

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Abstract

Enterprise System (ES) implementation and management are knowledge intensive tasks that inevitably draw upon the experience of a wide range of people with diverse knowledge capabilities. Knowledge Management (KM) has been identified as a critical success factor in ES projects. Despite the recognized importance of managing knowledge for ES benefits realization, systematic attempts to conceptualize KM-structures have been few. Where the adequacy of KM-structures is assessed, the process and measures are typically idiosyncratic and lack credibility. Using the 'KM-process', itself based in sociology of knowledge, this paper conceptualizes four main constructs to measure the adequacy of KM-structures. The SEM model is tested using 310 responses gathered from 27 ES installations that had implemented SAP R/3. The findings reveal six constructs for KM-structure. Furthermore, the paper demonstrates the application of KM-structures in the context of ES using the Adaptive Structuration Theory. The results demonstrate that having adequate KM-structures in place, while necessary, is not sufficient. These rules and resources must be appropriated to have greater positive influence on the Enterprise System. Furthermore, the study provides empirical support for knowledge-based theory by illustrating the importance of knowledge use/re-use (vs. knowledge creation) as the most important driver in the process of KM.

Keywords: Knowledge Management, Enterprise Systems, Knowledge Management Structures, Adaptive Structuration Theory

Introduction

Managing an ES[1] is a knowledge intensive task that necessarily draws upon the experience of a wide range of people with diverse knowledge capabilities. Managing ES knowledge has been identified as a critical success factor (Bingi et al. 1999; Davenport 1996; Davenport 1998a; Davenport 1998b; Gable et al. 1998; Sumner 1999). Reasons for not achieving the anticipated benefits of ES include: lack of in-house expertise (Smith 1998), poor employee retention (McFarlan et al. 1995), difficulty keeping up with changing technological advancements ((Lacity et al. 1998), and more broadly, ineffective ES lifecycle-wide knowledge management (Gable, Scott, Davenport, 1998). (Stedman 1999) highlighted the implications of insufficient knowledge management procedures in his case study of the renowned Hershey Foods ES implementation. Conversely, there have been reports of organizations achieving greater success with ES through effective knowledge management procedures (Al-Mashari et al. 2000; McNurlin 2001). Davenport (1998) emphasised the

[1] In this paper, the terms ERP, Enterprise Resource Planning and the more contemporary, Enterprise Systems (ES), are used interchangeably. See Klaus, H., Rosemann, M., and Gable, G. "What Is ERP?," *Information Systems Frontiers* (2:2) 2000, pp 141-162.and Shanks, G., Seddon, P.B., and Willcocks, L. (eds.) *Second-Wave Enterprise Resource Planning Systems: Implementing For Effectiveness*. Cambridge University Press, Cambridge, UK, 2003.

importance of a comprehensive knowledge management process for Enterprise Systems, stating "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". Employing the knowledge classification of (Swanson 1994), (Sadagopan 2003) categorizes ES projects as the most demanding innovation domain. (Soh et al. 2000) argue that users and external consultants play an important role in an ES project. Researchers conceptualize KM-structures are the rules and resources actors use to generate and support the management of knowledge. KM-structures applicable to ES context include, among other things, resources, technology, culture, norms, and the knowledge held by participants (Gopal et al. 1992; Khalifa et al. 2001). Despite the recognized importance of managing knowledge for ES benefits realization, systematic attempts to measure the adequacy of Knowledge Management Structures (KM-structures) have been few. Where *KM-Structure Adequacy* is assessed, the process and measures are typically idiosyncratic and lack credibility. Furthermore, the inconsistency and complexity associated with conceptualising the KM-structures; hinder the progress of research findings. Neither have the KM-structures constructs been carefully operationalised and empirically validated, nor has causality been grounded in any firm theory-base.

Study Objectives

The main objective of this paper is to conceptualize and validate the constructs to measure KM-structure adequacy in ES projects. The four a-priori constructs of KM-structures: (1) knowledge creation, (2) knowledge transfer, (3) knowledge retention, and (4) knowledge re-use, are based in (Alavi et al. 2001) 'knowledge management process', itself based in (Berger et al. 1967) sociology of knowledge (see also (Gurvitch 1971; Holzner et al. 1979). The paper derives and validates the constructs of KM-structures and demonstrates the relative importance of each construct using a path diagram. Finally, using the Adaptive Structuration Theory (Poole et al. 1990), the paper demonstrates the application of the KM-structure adequacy in the context of Enterprise System.

The paper begins with a literature review aimed at developing an understanding of the constructs of the a-priori research model. The review of literature provides a succinct discussion on defining Knowledge and Knowledge Management. However, this research does not engage in an epistemological debate on the definition of 'knowledge'[2]. Next, the study context is described, followed by the research methodology. Consequently, the paper reports the results of the data analysis, using the 310 respondents received from 27 SAP R/3 installations. The Exploratory Factor Analysis was conducted first to derive the constructs of KM-structures, followed a Structural Equation Modeling analysis to depict the significance of the aforementioned constructs. The paper concludes with a theoretical discussion on the application of study findings in the ES context.

The Literature Review

Literature on Knowledge[3] Management and Enterprise Systems are mainly classified into two broad streams: (1) Enterprise Systems for knowledge management, whereby the implemented

[2] The multi-disciplinary nature of knowledge management means that it is doubtful that any unanimity on the definition of 'knowledge' and Knowledge Management (KM) will emerge.

[3] Davenport (1998) defines knowledge as a fluid mix of framed experience, value, contextual information and expert insights that provides a framework for evaluating and incorporating new experiences and information. Drawing on the work of Polanyi (1962, 1967), Nonaka (1994) explicated two dimensions of knowledge in organizations: tacit and explicit. Tacit knowledge which comprised of both cognitive and technical elements

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 longevity. This study focuses on the latter stream of research.

In the past years, there has been a growing interest in treating knowledge as a significant organizational resource. The knowledge-based perspective, which emerged in the strategic management literature (Nonaka et al. 1995; Spender 1996), postulates that the services rendered by tangible resources depend on how they are combined and applied, which is in turn a function of the firm's knowledge (Grant 1996; Nelson et al. 1982; Spender 1996). This knowledge (i.e. know-how) is embedded in and carried through multiple entities. Horwitch and Armacost (2002) suggests that managing Knowledge can be viewed as the process of creating, capturing, transferring, and accessing the right knowledge and information when needed to make better decisions, take actions, and deliver results in support of the underlying business strategy. (Walker 1998) suggests that KM is a process of taking better advantage of a organizational data to determine such things as best practices, to retain tacit knowledge of individuals, to identify field experts, and to enable corporations to react more quickly and more decisively to problems and their competitors.

(Hibbard 1997) defines KM as the process of capturing a collective expertise of the organization from different sources (i.e. databases, paper, people), and distributing it to areas to produce the biggest payoff. From a different viewpoint, (O'Dell et al. 1998) define KM as a systematic approach to finding, understanding, and using knowledge to create value. Similarly, Davenport and Prusak (1998) suggests KM as a process consisting of generation, codification, transfer, and application of knowledge. Adopting a control perspective, van der Speek and Spijkervet (1997) defined KM as the explicit control and management of knowledge within an organization aimed at achieving the objectives of the firm. On a similar note, Wiig (1997b) asserts that KM is the systematic, explicit, deliberate building, renewal, and application of knowledge to maximize knowledge-related effectiveness and returns from all knowledge assets of the organization. Taking a technological incline, Raisinghani (2000) describes KM as a process that creates structures which combines the most advanced elements of technological resources and the indispensable input of human response and decision-making. Though technology could certainly facilitate KM, Ponelis and Fairer-Wessels (1998), point out that placing a higher emphasis on technology may lead to failures in KM initiatives.

Alavi and Leidner (2001) interpret KM as a four-staged process of related activities, including: knowledge creation, storage, transfer and application. (O'Dell et al. 1998) argue that many organizations commence KM efforts by focusing on identifying, collecting, and organizing their best practices and internal knowledge. The following observations can be made using the summary results of the literature review depicted in Table 1. It is intended to present the frameworks without imposing any meta-structure. This is done with the objective of showing the diverse and sometimes conflicting thoughts on KM activities. First, though the level of detail described in each of the above studies differ substantially – with some

(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.

studies encompassing the entire gamut of KM activities – the others provide a high level overview. Secondly, while there is some agreement with how the KM process begins of, there is lack of consent on what activities mark the end of the cycle. With the granularity of the frameworks varies and the number of phases ranging from seven (e.g. Allee 1997) to three (e.g. Walsh et al. 1991), four key phases are derived that are common to all literature:
(1) acquisition / creation / generation,
(2) retention / storage / capture,
(3) share / transfer / disseminate and
(4) application / utilization / use.
Alavi and Leidner (2001) argue that four phases (creation, retention, transfer and use) form the KM-process. This research study aims to capture the [organizational] structures in place to increase positive outcomes of the KM-process outlined above.

Source	Knowledge Management Activities						
Alavi and Leidner (2001)	Creation	Storage	Transfer	Application			
Alle (1997)	Collect	Identify	Create	Share	Apply	Organize	Adapt
Argote (1999)	Share	Generate	Evaluate	Combine			
Bartezzaghi et al. (1997)	Abstraction and Generalization	Embodiment	Dissemination	Application			
Davenport and Prusak (1998)	Determine Requirements	Capture	Distribute	Use			
Despres and Chauvel (1999)	Mapping	Acquire Capture Create	Package	Store	Apply Share Transfer	Reuse Innovate Evolve Transform	
Dixon (1992)	Acquire	Distribute	Interpret	Making Meaning	Organizati-onal Memory	Retrieve	
Huber (1991)	Acquisition	Distribution	Interpretation	Organizational Memory			
Nevis et al. (1995)	Acquisition	Sharing	Utilization				
Stein and Zwass (1995)	Acquisition Learning	Retention	Maintenance	Retrieval			
Szulanski (1996)	Initiation	Implementation	Ramp-up	Integration			
Walsh and Ungson (1991)	Acquisition	Storage	Retrieval				
Wiig (1997a)	Creation	Capture	Transformation	Use			

Table 1: Yielding a definition for KM processes

Deriving the a-priori Model

Deriving from the literature review, the a-priori research model includes the four constructs: 1) Knowledge creation, 2) Knowledge transformation, 3) Knowledge retention and 4)

Knowledge Use / Re-use (See figure 1). The four constructs of KM-structure adequacy is operationalised using the 'KM-process' of Alavi and Leidner's (2001), and were adapted from the framework of sociology of knowledge[4] (Berger and Lickman 1967; Gurvith 1971, Holzner and Marx 1979).

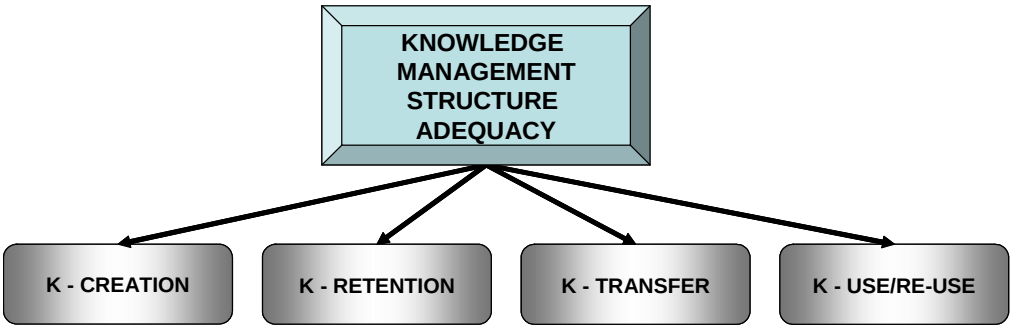

Figure 1: The a-priori model

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 - consultant, vendor and client (Gable et al. 1997). It involves developing new content and replacing existing content within the organization's tacit and explicit knowledge base (Alavi and Leidner, 2001). The external players bring new knowledge on the software and business processes (Davenport, 1998) to the client organization, and the client organization shares organizational knowledge (including business process knowledge) with the external parties. (Sedera et al. 2003) combine (2) and (3) and suggest 6 main ES knowledge sources, illustrating a 3x2 matrix cross-referencing the 3 key players with 2 knowledge types. (Gupta et al. 2000) conceptualized *knowledge transfer* in terms of five elements and emphasized the importance and the richness of the channels of knowledge transfer[5]. Knowledge transfer channels can be informal or formal (Holtham et al. 1998). Unscheduled meetings, informal gatherings, and coffee break conversations are examples of the informal transfer of ES related knowledge. Although informal transfer promotes socialization and could be effective in small organizations, it precludes wide dissemination (Alavi and Leidner 2001; Holtham and Courtney 1998). Formal transfers, such as training programs, may ensure wider distribution of knowledge and suits highly context specific knowledge. *Knowledge retention* comprises organizational and personal knowledge retention. The individual's knowledge retention is developed based on one's observations, experiences and actions (Sanderlands et al. 1987). (Markus 2001) suggests that the source of competitive advantage resides not in the knowledge itself, but in the application of the knowledge (its *use/re-use*). In terms of the level of ES-success, knowledge re-use plays a vital role in every phase of the ES lifecycle, particularly in maintenance and upgrades. However, the effective reuse of knowledge is arguably a more frequent organizational concern and one that is clearly related to ES-success (Dixon, 2000).

[4] Based on the framework of sociology of knowledge (Berger and Luckman 1967).

[5] 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 Context

The study was conducted across 27 Queensland state Government agencies running live SAP systems. State of Queensland is the first Australian state to implement common financial management software state-wide namely; The Queensland Government Financial Management System (QGFMS). In 1995 the state Government of Queensland commenced implementation of SAP Financials across all state Government agencies (later followed by Controlling, Materials Management and in some agencies Human Resources). It is also one of the largest SAP installations in Australia. All SAP implementations were assisted by one or more external parties, representing either the vendor or a consulting company. The Queensland Government approach was very much focused on using the Enterprise System as a common reporting and financial management tool (Queensland Treasury 2000). The objectives of the new QGFMS were to provide a financial management system to Queensland Government agencies that would: (1) support the 'Managing for Outcomes' (MFO) framework and financial management improvement activities, (2) encourage best practice resource management across Queensland Government, (3) facilitate the consolidation of Queensland Government financial information, (4) meet the business needs of agencies and (5) achieve economies of scale in main operations(Queensland Treasury 2000). Having past several years since implementation, these organizations are considered to be in the 'mature' stage of the ES-lifecycle. As emphasized by Markus (2001) and Dixon (2000), the maturity of the sampled organizations facilitated improved observations on the effectiveness of existing KM-structures.

Operationalizing the Research Model

Given the lack of research on operationalizing the constructs of KM-structures, all survey items were carefully derived by the researchers. A single criterion item was used to assess the overall effectiveness of KM-structures. All thirteen items were scored on a seven-point LIKERT scale with the end values (1) strongly disagree and (7) strong agree with the middle value (4) neutral. The instrument was pilot tested with a selected sample of a large Government agency. Feedback from the pilot survey resulted minor cosmetic modifications to the survey structure. The survey was disseminated to staff at all levels of Queensland Government who use the SAP system. The survey was disseminated predominately through a (1) web survey facility and in some cases using (2) a MS Word instrument attached email.

Study Results

All twenty-seven (27) organizations responded to the survey resulting three-hundred and nineteen (319) responses. Nine responses were removed due to missing values or perceived frivolity, yielding 310 valid responses. Respondents were next classified into the four employment cohorts (i.e. Strategic, Management, Operational and Technical) based on their employment title and demographic information provided pertaining to their involvement with the SAP system. The classification of respondents into multiple employment cohorts established the representativeness of the sample. In order to minimize individual errors of judgment, three academics and two senior business analysts from surveyed organizations, participated in the classification of respondents into cohorts. Participants individually mapped a sample of respondents into the four employment cohorts and compared results. Guidelines were designed to increase the systemisation, repeatability and the validity of the process[6].

6 Classification guidelines and samples are available upon request

Comparison of the individual classifications revealed an average inter-coder agreement of 80%[7], agreeing with the recommendations of (Krippendorff 1980).

Employment Cohorts		
	#	%
Strategic	35	11%
Management	122	39%
Operational	108	35%
Technical	45	15%
	310	100%

Table 2: Respondents Classification

The classification exercise revealed (See table 2) 11% of respondents were from the Strategic level, 39% from Management level, 35% were from the Operational levels and 15% represented Technical staff. All indications suggest that this distribution is representative of users of the SAP system in Queensland Government.

Model Validation

This section demonstrates the results of model validation. The analysis reported herein first attempts to establish the underlying latent factors for construct validity by conducting Exploratory Factor Analysis (EFA). Once the factors are identified, the criterion validity results are reported next. Using Structural Equation Modeling[8], a path diagram is then derived to test the significance of each construct.

Construct Validity

Construct validity seeks evidence that the selected constructs are true depicters that describe the event, not merely artefacts (Campbell et al. 1959; Cronbach 1971). 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)[9]. In order to establish the construct validity of the independent variable, the KM-structure adequacy items were included in an exploratory factor analysis using varimax (orthogonal) rotation (Bagozzi et al. 1982). The scree plot suggested a six factor solution. To obtain a parsimonious factor solution, an item was removed, it having loaded relatively evenly across several of the factors. This resulted in a clean and logical six factor solution (table 3) with all items loading as anticipated[10], explaining 89.2% of the model variance, with all factors having Cronbach Alphas >0.9[11]. Furthermore, the variables display a strong discriminate validity by showing strong correlations between them.

7 Krippendorf (1980) recommends inter-coder reliability of at least 70% and suggests that any significant discrepancies should be discussed until consensus on the mappings is reached.

8 LISREL 8.53 versions were used in the analysis.

9 Concurrent and predictive validity are generally considered to be subsumed in the construct validity and thus will not be discussed in this paper.

10 Highly similar results were produced in separate factor analyses for each of the sample cohorts, further evidencing the existence of the four employment cohorts and the generalizability of the items across the cohorts.

11 It is theoretically stipulated that the phases in knowledge management process are highly correlated (Alavi and Leidner, 2001).

	Reuse	Transfer	External Soaftware K	External Process K	Internal Software & Process K	Retention
	1	2	3	4	5	6
Overall, SAP knowledge possessed by the *vendor (SAP Australia)* has been appropriate.	0.154	0.171	0.712	0.405	-0.093	0.314
Overall, SAP knowledge possessed by the *consultants* has been appropriate.	0.108	0.132	0.913	0.059	0.230	0.061
Overall, the agency's knowledge of itself (e.g. Business processes, information requirements, internal policies, etc.) has been appropriate	0.273	0.154	0.158	0.158	0.860	0.203
Overall, SAP knowledge possessed by the *agency* has been appropriate.	0.374	0.282	0.294	0.149	0.571	0.404
Overall, SAP knowledge has been re-used effectively and efficiently by the *agency*.	0.667	0.293	0.206	0.196	0.375	0.337
Overall, knowledge of the agency, possessed by the *vendor (SAP Australia)* has been appropriate.	0.180	0.093	0.163	0.929	0.121	0.136
Overall, knowledge of the agency, possessed by the *consultants* has been appropriate.	0.294	0.156	0.532	0.566	0.369	-0.160
Training in SAP has been appropriate.	0.265	0.877	0.118	0.050	0.107	0.153
Users have sufficient SAP knowledge.	0.169	0.893	0.153	0.128	0.115	0.145
The agency has retained the knowledge necessary to adapt the SAP system when required	0.334	0.282	0.143	0.095	0.222	0.781
Overall, SAP staff and knowledge retention strategies have been effective.	0.148	0.261	0.102	0.204	0.137	0.880

Table 3: Final Exploratory Factor Solution

The six constructs of KM-structure adequacy confirmed from the above analysis are: 1) adequacy of the knowledge retention structures of the client organization, 2) software-specific knowledge brought-to-bear by the external parties (consultants and vendors), 3) organizational knowledge brought-to-bear by the external parties, 3) software-specific knowledge and organisation-specific knowledge brought-to-bear by the client organization, 5) adequacy of the knowledge transfer structures of the client organization and 6) re-use of knowledge within the organization. Note that (2), (3) and (4) all pertain to the 'knowledge creation' construct in Figure 1.

Criterion Validity

Besides items referenced thus far, the survey instrument elicited a criterion measure of overall KM-structure adequacy. Table 4 shows results of correlating the 6 constructs with the criterion measure. The extent, to which each construct correlates with the criterion measure, is evidence of their criterion validity[12]. All correlations are significant at $p<.001$.

External software K	External Process K	Internal Software & Process K	K Retention	K Transfer	Re-Use
0.369	**0.406**	**0.615**	**0.688**	**0.562**	**0.629**

Table 4: Criterion Validity of the six constructs

The Relationship Between Knowledge Management Constructs

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* construct, which

[12] This method of validation assumes the criterion measure is valid (Kerlinger 1988).

confirms the knowledge-based theory. An important aspect of the knowledge-based theory of the firm is that the source of competitive advantage resides in the application of the knowledge, rather than in the knowledge (similar to knowledge creation in this research) it self.

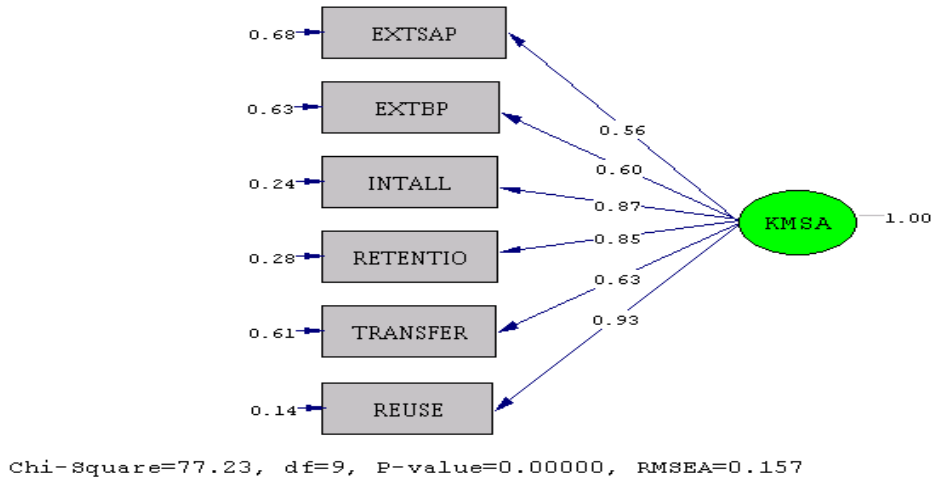

Figure 2: Model Analysis

(EXTSAP = External Software Knowledge, EXTBP = External Business Process Knowledge, INTALL = Internal Software and Business Process Knowledge, RETENTIO = Knowledge Retention, TRANSFER = Knowledge Transfer, REUSE = Knowledge Transfer)

To demonstrate the additivity of the constructs, we next posited that each of the six constructs explains a unique portion of the variance in overall success (as represented by the criterion item). To test this proposition, we regressed each of the six constructs on the variance remaining after having partialled out of overall success all variance explained by the other five constructs. It is noted that in each case, the incremental r^2 was significant (p=0.001), thereby supporting our proposition.

Assessing the Model Fit

Many researchers have been attracted to Structural Equation Modelling (SEM) due to its offering global fit indicators, which in practice often serve as omnibus tests of the model. Joreskog and Sorbom (2001) suggest that such assessments should be made (global fit indicators) before analysing the individual parameters. A variety of fit indicators are currently available to assess the model 'fit' with data. (Tanaka 1993) suggests three types of model fit indicators: (1) absolute model fit, (2) comparative model fit and (3) parsimonious model fit (Kelloway 1998)[13] to be used in triangulating the best model fit with the data. The fit indictors are summarised in table 5 and discussed thereafter. From table 5, it is evident that the Root Mean Square (**RMR**) shows good fit with data. Standardized RMR (SRMR), which eliminates this problem of RMR, recommends values less than 0.05 as indicating of good fit to the data. In relation to the reported value for **SRMR**, the model demonstrates reasonable fit with the data. It is cautioned that both RMR and SRMR are sensitive to the scale of measurement and therefore it is difficult to establish what a 'low' value is. Root Mean Squared Error of Approximation (**RMSEA**) developed by (Steiger 1990) provides similar information to **RMR**. Steiger (1990) suggests that values below 0.10 indicate good fit with the data, values below 0.05 indicating very good fit, and values below 0.01 indicating

[13] See Kelloway 1998 for a summary of fit indicators

outstanding fit to the data (he further notes that 'very good' and 'outstanding' fit are rarely achieved).

			Reported Values
	Abbreviation	**Best Range**	
Absolute Fit Measures			
Root Mean Square	RMR	Close to 0	0.065
Standerdized Root Mean Square	SRMR	< 0.05	0.064
Root Mean Squared error of approximation	RMSEA	<0.1	0.16
Goodness of Fit Index	GFI	>0.9	0.92
Adjusted Goodness of Fit Index	AGFI	>0.9	0.82
Chi Sqr / DF	X2/df	<5	8.9
Comparative Fit Measures			
Normed Fit Index	NFI	>0.9	0.95
NonNormed Fit Index	NNFI	>0.9	0.92
Incremental Fit Index	IFI	0 to 1	0.95
Parsimonious Fit Measures			
Parsimonious Normed Fit Index	PNFI	0 to 1	0.57
Parsimonious Goodness of Fit Index	PGFI	0 to 1	0.4

Table 5: LISREL model fit indicators

The model shows good fit for the indication of RMSEA. Although values over 0.9 are generally considered indicative of good fit for Goodness of Fit (**GFI**), the GFI should be treated with caution as it is sensitive to sample size (Kelloway, 1998). The Adjusted Goodness of Fit Index (**AGFI**) theoretically ranges from 0 to 1, with values over 0.9 considered as good fit with data. However, similar to the GFI, values over 0.9 are rarely achieved. Despite the strict principles associated with these indicators, the model depicts a good GFI (0.92) and reasonable AGFI (0.82) indicating a good fit. (Medsker et al. 1994) introduced the notion of **chi-square and degree of freedom** as an index, treating ratios between 2 to 5 as indicating good fit. The model does not corroborate this notion, demonstrating a Chi-square/df of 8.9. Next looking at the comparative fit measures, the Normed Fit Index (**NFI**), the Non Normed Fit Index (**NNFI**) and the Incremental Fit Index (**IFI**) are considered. It is observed that the model depicts good fit for comparative goodness of fit with all indicators greater than or equal to 0.90. Finally, the Parsimonious Goodness of Fit Index (**PGFI**) is examined. The PGFI ranges from 0 to 1, with higher values indicating good fit. However, neither PNFI nor PGFI are likely to reach the .90 target level used for other of the indicators. Instead, these indicators are best used for comparing alternative models. Since there was no alternate model, these measures are less informative for the purpose of analysing this data. Analysing the results thus far, it is clear that of the research model and its constructs, demonstrate adequate fit to the data. Confirming the results reported earlier in this paper, the LISREL Structural Equation Modeling analysis demonstrated strong and significant paths between all the six constructs of KM-structures.

Common Method Variance

Common Method Variance (CMV) can cause researchers to find a significant effect in self reported data, when in fact the true effect is due to the method employed. (Woszczynski et al. 2003) recommend several techniques to reduce Common Method Variance, two of which were explored in this study: (1) multiple respondent types, and (2) (Harman 1976) one-factor test. The responses in the survey were gathered from four distinct employment cohorts yielding highly similar results in separate factor analyses for each of the sample cohorts (Sedera et al. 2004). Furthermore, the nature of the item loadings on the first factor (in all factor analyses) suggested that not all items loaded above the cut-off level of (0.4) on a single factor. These findings suggest that Common Method Variance (CMV) is not likely to be present.

Discussion

This study conceptualized the constructs to gauge adequacy for KM-structures in the context of ES. Deriving from the Knowledge Management Process (Alavi and Leidner 2001) based in (Berger et al. 1967) sociology of knowledge (see also (Gurvitch 1971; Holzner et al. 1979). The study identified six interrelated variables that sufficiently measure KM-structure adequacy, which include: (1) creation of software knowledge by external parties, (2) creation of business process knowledge by external parties, (3) creation of software knowledge and business process knowledge by internal parties, (4) knowledge transfer, (5) knowledge retention and (6) knowledge re-use. The study provides empirical support for knowledge-based theory by illustrating the importance of knowledge use/re-use (vs knowledge creation) as the most important driver in the process of KM. The aforementioned findings can be applied to the Enterprise Systems context, using the theoretical underpinnings of the Adaptive Structuration Theory (AST). Using the AST, we argue that having adequate KM-structures in place, while necessary, *is not sufficient*. ES-Success, rather than resulting directly from effective management of ES-related knowledge, reflects the manner in which employees 'appropriate' the KM-structures, and the context of KM-structures use (DeSanctis et al. 1994). Appropriation is the manner through which technology and social structures are adapted by an organisation for its own use through a process called Structuration (Gopal et al. 1992). In the context of this study, appropriation refers to the manner in which KM-structures are adapted for the ES, wherein the KM-structures are continuously produced and reproduced or confirmed, through interaction with the ES. The theoretical background of AST provides sufficient groundings to demonstrate the recursive causal relationship between KM and ES-success (see figure 3). In this proposal, it is hypothesized that adequate KM structures lead to higher ES-success.

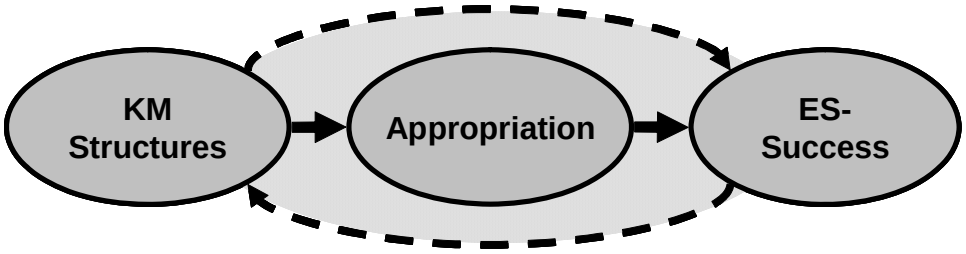

Figure 3: Appropriation of KM structures

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