Modeling and Managing the Preconditions for Effective Knowledge Sharing

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ABSTRACT

Knowledge sharing is a key component of knowledge management, yet very few empirical studies have investigated the conditions that significantly influence its effectiveness. The objective of this paper is to test an empirical model of knowledge sharing that we had derived previously from a public sector study. The model comprises of six latent factors: an innovative climate created by an open leadership style, a capacity to reflect and learn, information quality, satisfaction with change processes, a performance orientation, and a vision for change. By renewed application of the model in a private sector firm, we present results to support the latent structure, and we demonstrate the significant relationships of the constructs to a measure of knowledge sharing effectiveness. Finally, the paper discusses how this model may be used to improve the success of knowledge management by proactive management intervention.

INTRODUCTION

This paper is focused on identifying and developing the preconditions for effective knowledge sharing. Without understanding these underpinning preconditions, organizations will not be ready to accept, adopt and utilize the processes and practices embodied in knowledge management (Gold, Malhotra, & Segars, 2001; Walczak & Zwart, 2003); however, we have not been able to identify very much empirical research that addresses this issue.

The research objective is to test a model of knowledge sharing that we had previously derived from a public sector study. To this end, we present results from a renewed application of the model in a private sector firm. Model validation by replication and extension is an essential component of knowledge generation (Hunter, 2001), yet there is a lack of such model testing and development in the MIS literature. Consequently, many research findings remain isolated and fragile (Tsang & Kwan, 1999), wherein models derived from one dataset cannot dispel the possibility that they represent the peculiar or unique circumstances of the research setting. Such a lack of a cumulative tradition is undesirable, in that it does not lead to a coherent body of management knowledge, or provide advice to managers that is robust and widely applicable (Huber, 1991).

The paper delineates six key factors that are associated with successful knowledge sharing and suggest ways in which these can be used to proactively manage a culture that is conducive to Knowledge Management. We show that the derived model is equally applicable in the private sector context of the focal firm. The next section establishes the essential preconditions for effective knowledge sharing that have been identified through other research studies, and subsequently introduces our model. Following an outline of the research methodology, the remaining sections present results of the model validation and a discussion of how the model can be used as a management tool to proactively develop an organization's knowledge sharing performance. We conclude by suggesting some avenues for further research.

PRECONDITIONS FOR KNOWLEDGE SHARING

In a recent survey of Knowledge Management implementations, one of the most recurring weaknesses was that companies lacked the right cultural climate that would create and nurture openness and co-operation (Kluge, Stein, & Licht, 2001). Others concur that being able to create the organizational conditions that facilitate the generation, sharing and application of knowledge is key to KM success (Collison & Parcell, 2001). However, defining the set of appropriate organizational conditions is still a focus of research. The problem is exacerbated by the fact that implementation of knowledge management is context dependent, such that there is no universal recipe or methodology (Probst, Raub, & Romhardt, 2000; Zammuto, Gifford, & Goodman, 2000).

Current research has suggested that the development of a knowledge sharing culture is more complex than previously thought, and is certainly not simply about the provision of incentives and rewards to motivate individuals to share (Bock & Kim, 2002; Huber, 2001). The notion of developing a suitable organizational environment for knowledge sharing was expanded by Gold *et al* (2001:208) who postulated that without such, "knowledge sharing initiatives might be doomed before they begin". Nevertheless, there is still a substantial research gap in understanding the underpinning conditions and drivers of knowledge sharing effectiveness.

Nonaka and Takeuchi were among the first to discuss the importance of social relationships for the sharing of tacit knowledge, but their SECI model also highlighted the key role of information in knowledge sharing processes (Nonaka & Takeuchi, 1995). This critical interdependence of information and knowledge was further emphasized by Blumentritt and Johnston who discussed the interactions between information and knowledge, observing that information is both an antecedent to knowledge, and the medium by which it is transferred (Blumentritt & Johnston, 1999). Beyond organizational factors such as culture and information, a capacity to reflect and learn, especially from failures (Garvin, 1993), is also central to knowledge sharing effectiveness, since individuals need to have the capacity to internalize new information and knowledge (Szulanski, 1996).

Our earlier work tested these influences on knowledge sharing capability in a public sector setting (Taylor & Wright, 2004). From this research we developed a six-factor model of essential preconditions for knowledge sharing, Figure 1.

This model added to the extant literature through its focus on public sector knowledge sharing, and by empirically testing the connections of these latent constructs with a measure of knowledge sharing effectiveness. Moreover, while all six constructs are relatively well known and studied in the private sector literature, there is no evidence of them all being incorporated into one research design for investigating knowledge sharing.

In this current paper, we test the robustness of the model, by applying it in another research setting. More specifically, we postulate that all six factors might equally apply in the private sector. If this were true, it would represent a "quantum leap in credibility" for the model

Figure 1: Knowledge Sharing Model
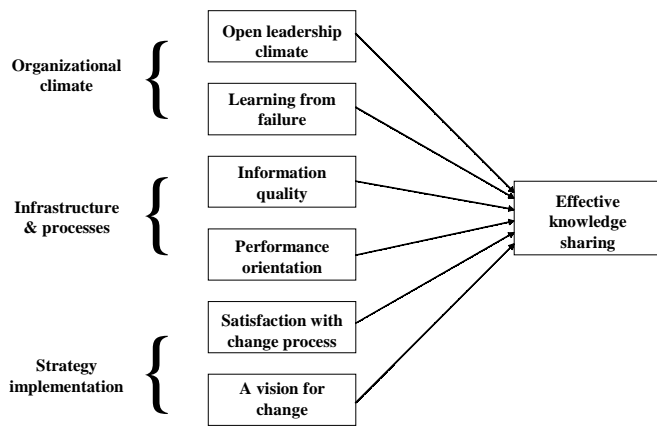
(Tsang et al., 1999) and thus form the basis of a practical management tool to diagnose and improve knowledge sharing. Thus, our research questions were:

- Is the public sector model transferable to a private sector context?
- How can the model be used to manage knowledge sharing performance?

RESEARCH METHOD
Research Setting and Sample Selection
The research was undertaken in one business unit of an international software development company, employing over 30,000 staff in more than 40 countries. The business unit had been engaged in a knowledge management initiative for four years. We confined the sample to knowledge workers, i.e. software developers and customer support staff who were directly connected to the core business process. The questionnaire was sent to 423 employees, with a supporting statement from the CKO to encourage a high response rate. Some 205 completed questionnaires were received, representing a response rate of 48.5%.

Survey Instrument and Measures
Full details of the selection of variables and identification of the constructs are contained in our earlier paper (Taylor et al., 2004). The survey instrument comprised the thirty items from our original study, plus two additional items to strengthen the assessment of information quality. These two additional items addressed information accuracy (Wang & Strong, 1996) and timeliness (Goodhue, 1995), and complemented the existing measures of information's completeness and usefulness. The dependent variable was a self-reported measure of the effectiveness of knowledge sharing within the firm. All variables were measured on a five-point Likert scale, anchored by 1 = strongly agree and 5 = strongly disagree. The survey instrument was pre-tested in collaboration with the company to confirm the meaning and relevance of the statements in this private sector environment.

Analysis Procedures
To validate the model we used a two-stage process. First, to test if the same items and constructs remained valid, we subjected the 32 independent variables to exploratory factor analysis using Principal Components Analysis as the extraction method and Varimax rotation with Kaiser normalization. The number of factors was determined by two criteria: the elbow of the scree plot and factors with eigenvalues greater than 1.0. Reverse scoring was applied to variables with negative valence. Items were deleted if their factor loadings were less than 0.5 or if there were cross-loadings greater than 0.35 on two or more factors (Churchill, 1979; Kim & Mueller, 1978). After three iterations, three

Table 1: Factor Analysis

Factors and items	Factor loadings					
	1	2	3	4	5	6
Open leadership climate (α = 0.96)						
OL1 Token consultation with staff [R]	.93					
OL2 Strategic inclusion	.91					
OL3 Motivating people to develop new ideas	.91					
OL4 Strong leadership	.86					
OL5 Recognizing the importance of people	.86					
OL6 Encouraging people to suggest new ideas	.85					
OL7 Accepting new ideas	.85					
OL8 Change seen as a positive challenge	.79					
OL9 Rigid and hierarchical structure [R]	.64					
Learning and reflection (α = 0.95)						
LR1 Learning from failure		.91				
LR2 A user focus for continuous improvement		.90				
LR3 Reflecting on success		.86				
LR4 Service quality performance reviewed		.84				
LR5 Systems to facilitate learning		.83				
LR6 Reflecting on what doesn't work		.82				
Information quality (α = 0.97)						
IQ1 Information accuracy			.96			
IQ2 User focused information			.96			
IQ3 Timeliness of information			.96			
IQ4 Appropriate information systems			.84			
Satisfaction with change processes (α = 0.73)						
SC1 Continuous changes of target outcomes [R]				.85		
SC2 Results of innovation and change not apparent [R]				.73		
SC3 Constantly high levels of stress [R]				.69		
SC4 Experiencing discomfort with change [R]				.65		
Performance orientation (α = 0.90)						
PO1 Imperative to be seen as successful despite the reality [R]					.80	
PO2 Defensiveness impedes improvement [R]					.77	
PO3 Ignoring performance statistics [R]					.70	
A vision for change (α = 0.80)						
VC1 Lack of urgency to change [R]						.83
VC2 Perceived need to improve user responsiveness						.81
VC3 Desiring the status quo [R]						.77
Eigenvalues	9.61	4.15	3.55	2.26	2.1	1.06
% of variance explained	33.2	14.3	12.2	7.8	7.2	3.7
Cumulative % of variance explained	33.2	47.5	59.7	67.5	74.7	78.4

Bartlett's test of sphericity χ^2=7748.082, df=406, p<0.0001
Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.840

Table 2: Multiple Regression Analysis.
Relative Importance of Constructs in Public and Private Organizations.

Construct	Private (n=205)		Public (n=132)	
	Rank	β	Rank	β
Open leadership climate	1	0.40**	1	0.52**
Customer-focused vision for change	2	0.29**	5	0.13**
Performance orientation	3	0.20**	6	0.10*
Learning and reflection	4	0.19**	4	0.20**
Information quality	5	0.18**	2	0.24**
Satisfaction with change processes	6	0.14*	3	0.22**
R		0.61		0.66
R^2		0.37		0.44
Adjusted R^2		0.35		0.41

** *significant at 0.01 level;* * *significant at 0.05 level*

items were deleted and the remaining 29 items loaded satisfactorily onto the six latent factors. Variable communality and multicollinearity were within acceptable levels, and the case-to-variable ratio was above the recommended minimum (Hair, Anderson, Tatham, & Black, 1998). Second, using multiple regression, we explored the relationships between the six composite factors and the dependent variable, effective knowledge sharing.

RESULTS

Table 1 shows the construct reliabilities for the six latent factors extracted from the 29 variables, and the loadings for the principal factor to which each variable contributes. Item statements with reversed valences are indicated "R".

Table 2 shows the multiple regression of the dependent variable, effectiveness of knowledge sharing, regressed onto all six latent factors.

Table 2 also contains the results from the public sector study for comparison. The predictive validity of the current knowledge-sharing model is acceptable, with a Multiple R coefficient of 0.61, which compares favorably with the previously published public sector results (R=0.66). In both regression models, five of the latent factors are significant predictors of knowledge sharing (at the 0.01 level), with the sixth being significant at the 5% level. In both cases, factor 1, *Open leadership climate* is the strongest predictive factor. The difference between the two models is that factor 3, *Performance orientation* was previously only significant at the 5% level, whereas in this analysis, it is factor 6, *Satisfaction with change processes* that is the least significant.

DISCUSSION

We firstly discuss the testing of our original public sector model of knowledge sharing in this private sector service environment, before considering the research contribution of the study and its implications for management practice. Overall, these data suggest that the elements and constructs in the model, derived from a public service context, are equally applicable to a private sector service firm. Moreover, this test of the model has shown it to be robust, with the six-factor structure being consistent with the public sector version, comprising the same item definitions and latent constructs. In fact this analysis has produced stronger factor loadings and an increase in the percentage of variance explained, from 71.9% to 78.4%. The minimum factor loading of 0.64 is well above the minimum of 0.40 recommended for a sample of 200 (Hair et al., 1998).

All six factors are significant predictors of the dependent variable. With a coefficient of determination >0.60, for the sample size and the number of independent variables, these results indicate that the six factors have a reasonably high degree of criterion validity. Notably, factor 1, *Open leadership climate,* is the most significant predictor of knowledge sharing performance. This is also consistent with our public sector sample. However, the relative importance of the remaining five factors varies between the public and private samples. This is not at all surprising, and confirms that the organizational context will affect knowledge sharing capability (Probst et al., 2000; Zammuto et al., 2000).

Implications for Research

Our model provides an approach to organizing and thinking about important variables, but it goes further by offering a diagnostic tool by which to measure and assess context-specific challenges. Therefore, our contribution to the literature is that we have developed a valid and reliable instrument to assess an organization's knowledge sharing readiness. The creation of this instrument and its associated model is based on robust and rigorous statistical methods, and remains one of the few empirically grounded studies of knowledge sharing to-date. While we do not yet make definitive claims for the generalizability of our model to either the public or private sector, we have at least demonstrated the model's transferability to another research setting.

Implications for Management Practice

This work has practical implications for managers. First, the survey instrument has merit in its own right as a tool for assessing the effectiveness of an organization's practices. Second, by repeated administration of the survey instrument in an organization, managers can track their employees' perceptions of all six constructs over time, to monitor whether or not improvement is being made to the innovativeness of the culture, the quality of information and so on.

Third, this also provides an opportunity for organizations to engage in benchmarking, either within a single firm to compare the knowledge-sharing capability of various business units, or geographically dispersed divisions, or against other firms implementing knowledge sharing initiatives, although this depends upon such data becoming available. Finally, we have also shown that there is a strong and positive relationship between the six factors and knowledge sharing effectiveness. Although the relative importance of the factors varied between the public and private studies, our approach nevertheless demonstrates how managers can establish which factors have most significance for their particular context, and therefore where to direct resources and managerial time to improve knowledge sharing.

CONCLUSIONS AND FUTURE RESEARCH

This study has established a knowledge sharing management tool by testing a previously derived model of knowledge sharing readiness that we developed in a public service context. We have shown that the model applies equally well in a private sector service company. In so doing we have validated the survey instrument and the six constructs in the model. This work suggests that a wider, law-like generalization may indeed be possible, and echoes the observation that such model testing can represent a quantum leap in credibility for a model. As a consequence of this work we believe that there are several avenues for future research.

Future research

While the model has been tested in two service contexts, much work remains to be done before more generic conclusions can be drawn. One avenue for research is to test the model in other public and private organizational settings, including manufacturing, in order to develop a larger empirical base. Consequently, we hope that this work will stimulate others to develop an experiential and data-oriented approach to the study of knowledge sharing and its antecedents. Desirably, this should also include data sets from some organizations reputed to be leading practitioners of knowledge sharing.

Knowledge sharing also depends upon an effective information infrastructure, to facilitate access to, and utilization of, knowledge and memory (Jennex, 2003) and inter-employee collaboration (Constant, Sproull, & Kiesler, 1996; Gold et al., 2001). Our model embodies organizational capabilities for knowledge sharing, but arguably needs to be expanded to encompass technical capabilities to provide an overall knowledge sharing architecture (Zack, 1999). Thus, we recognize the need for new dimensions to be added to the model, which may explain even more of the variance in the dependent variable.

We empathize with Adams et al (1992) that IS researchers should challenge the tendency to become complacent after conducting a very limited number of studies and that "we should begin to focus on replication, refinement and development of models and measures" (Adams, Nelson, & Todd, 1992) to avoid the general lack of cumulative work and a lack of synthesis of findings from different research groups. In the spirit of knowledge sharing, we hope to engage in academic debate with others who develop alternative instruments and empirical approaches, without which debate, the field of knowledge management will have difficulty moving forward effectively.

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