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A Knowledge Contribution Model to a Knowledge Management System

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ABSTRACT

An organization's capability to amalgamate and disseminate its intellectual capital to enhance organizational learning and decision-making – knowledge management (KM) - is linked to the long-term viability of many firms and is becoming increasingly dependent on the contributions of employees. In this paper, we explore the motivations for the continual non-perfunctory contribution of knowledge to knowledge management systems and propose a success model, with *Knowledge Contribution* as the major variable of interest and *Individual Belief Structure* and *Organizational Context* as key antecedents of success. While some components of the model have been empirically tested in prior research, the knowledge contribution construct remains unexplored. We therefore derive several propositions from this model to form the basis for future evaluation of this key KM success factor.

INTRODUCTION

In an era where organizational learning and knowledge management (KM) are of significant interest to organizations, knowledge is recognized as a critical asset, and the long-term viability of some organizations is linked to their ability to harness their accumulated intellectual capital - employees' knowledge - and disseminate it for effective decision-making. The success of the KM effort has become vital to organizations; as an example KPMG says that, as a result of its KM capability, when one of its professionals engage a client all 35000 employees walk in with him or her (Jessop & Valacich, 1999).

This knowledge-based view of a firm (Nonaka & Takeuchi, 1995), is an extension of the resource-based view, which regards knowledge as a critical resource to be leveraged to the firm's advantage. If knowledge is such a critical resource, then it too has to be managed like any other important organizational asset. Consequently, there is a generally accepted KM process, which includes knowledge creation, storage and retrieval, transfer, and application as its components (Alavi & Leidner, 2001).

However, it is believed that the extent to which employees can be motivated to voluntarily share individual knowledge and participate in extending the pool of organizational knowledge – knowledge contribution – is a significant determinant of derivable benefits and needs to be addressed in the KM process schema (Alavi & Leidner, 2001). The amalgam of organization knowledge can only be effective if the KM process maximizes the contribution of employees. We therefore posit that *Knowledge Contribution* is a critical success factor in KM and requires its own specific focus in this process, which should be slotted between the creation and storage components.

Several researchers have prescribed conceptual approaches to knowledge sharing (Goodman & Darr, 1998; Markus, 2001; Wasko & Faraj, 2000). Others have contributed empirical insights through experiments and surveys (Bock et al., 2005; Constant et al., 1994) in an attempt to understand, model and explain the behavior of contributing employees, with varying degrees of success. Exactly what drives this contribution of knowledge is still not well known.

This paper explores the motivations for the continual non-perfunctory contribution of knowledge to a knowledge management system (KMS) from the perspective of the *personal belief* of the contributor (intrinsic motivation), *organizational context* of the host firm (extrinsic motivation), and *information quality* (learning from system content by the contributor). The objective is to enhance the state of existing knowledge of this increasingly important and interesting topic by providing a theoretical model that explicitly examines the influence of knowledge contribution to a KMS in a modified KM process. This model is used to generate a set of propositions that provides some focus for future research we expect to conduct in this area and to stimulate the interest of other researchers.

KNOWLEDGE MANAGEMENT AND KNOWLEDGE CONTRIBUTION

The link between a firm's performance represented by business value and its knowledge is articulated by the knowledge based view theory of a firm (Grant, 1996), the business value here is the attainment of the goals, and the contribution of these goals to the overall corporate objectives. This knowledge that the firm possesses resides in employees who create, recognize, archive, access and apply knowledge in carrying out their task (Bock et al., 2005). The challenge here is to have this knowledge continually updated, and through this process facilitate an environment for the creation of new knowledge.

Knowledge can be classified dimensionally as tacit or explicit (Nonaka, 1994). The latter - the component of knowledge that cannot be easily expressed or codified - is of particular interest in this paper. Because individuals cannot be forced to share this knowledge, organizations must create an environment conducive to knowledge sharing, and motivate its employees to part with their knowledge. Knowledge sharing in this context is defined as making explicit, codifying, and recording the tacit knowledge in an electronic format. In order for the KM effort to be successful, organizations must understand what drives employees' motivations to contribute. Contributors need incentives to part with their knowledge; those who will use the knowledge must be willing to obtain it from the KMS (Ba, et al., 2001).

It is accepted that organizations neither know what factors drive the use of KMS (Markus, 2001) nor what incentives are effective in encouraging knowledge contribution and sharing (Alavi & Leidner, 2001); hence there is a need for a knowledge contribution success model. Similar to the IS success model (DeLone & McLean, 1992; DeLone & McLean, 2003), we are proposing a success model for a KMS with the quality of *Knowledge Contribution* as a primary focus, driven by behavioral and information quality antecedents. It is intended that this model would form part of a generic framework for evaluating the success of a KMS implementation.

TOWARD THE DEVELOPMENT OF THE MODEL

The interest in organizational learning and the management of what is being learnt, (i.e. the knowledge), has spawned an area of IS research called knowledge management. A KMS is comprised of the following knowledge processes: creation, storage and retrieval, transfer, application (Holzner & Marx, 1979; Pentland, 1995). The focus here is what happens between the creation and storage of knowledge, i.e. the contribution of knowledge. Although the technical system is important, it doesn't guarantee success in the KM effort (McDermott, 1999). The question of what incentives were effective in encouraging knowledge contribution and sharing in organizations has been raised by Alavi and Leidner, (2001).

Ko et al. (2005) explored the intrinsic and extrinsic stimuli that motivate employees to share and contribute knowledge to a KMS. They found that intrinsic motivation was the more significant of the two in facilitating knowledge transfer. Employees are intrinsically motivated, when their needs are directly satisfied (e.g., self-defined goals), or when their satisfaction lies in the content of the activity itself (Ko et al., 2005). Intrinsic motivation occurs when an activity "is valued for its own sake and appears to be self sustained" (Calder & Staw, 1975)[p. 599]. Intrinsic motivation is important to the transfer of best practices (O'Dell & Grayson, 1998), and intrinsic motivation should enable the transfer of tacit knowledge (Osterloh & Frey, 2000). The contributor has to be convinced that it is worthwhile to contribute to a KMS, otherwise it will be done perfunctorily.

Motivational forces are derived from two sources (Szulanski, 1996): (1) employees' personal belief structure, and (2) institutional structures values, norms and accepted practices that shape an individual's belief structure (DeLong & Fahey, 2000). Sharing knowledge takes time and effort (Gibbert & Krause, 2002), and doing so at work results in the public good dilemma (Barry & Hardin, 1982): others will have access to the accumulated knowledge of the organization whether or they not contributed to this knowledge pool (Dawes, 1980; Thorn & Connolly, 1987). By sharing knowledge an employee could perceive that he or she stands to loose their uniqueness to the organization, and this comes at the cost of time, effort, and uniqueness that the employee might not be willing to incur for 'good' reason.

The theories of resistance to management information systems (MIS) speak to the reluctance to use, misuse, or underutilize a system. MIS are resisted because of a person's own internal factors, poorly designed systems, and/or because of the interaction of specific system design features with aspects of the organizational context of system use (Markus, 1983). The first theory of resistance is related to intrinsic motivation, i.e. personal reasons for resisting system use. The issue of system design and its fit for the task, i.e. the second theory of resistance, is deferred and will be covered later as the information systems artifact. As articulated by Markus (1983), the third theory of resistance, interaction theory (Kling, 1980), indicates that it is system use in an organizational context that causes concern and resistance. Drawing on an insight from Bock et al. (2005), in an organization undergoing manpower restructuring, personnel could possibly perceive that having codified (shared) their knowledge they become more dispensable, thus generating resistance.

Regarding the second theory of resistance, it is recognized that information, system and service quality are critical parameters in IS success according to DeLone & McLean, (2003), who asserted that IS researchers need to choose the dependent variable according to the context of the problem they are trying to resolve; in this case *Knowledge Contribution* is made the variable of interest paralleling knowledge transfer from Ko et al., 2005. For the sake of parsimony of the model, the service quality issue will be discounted, i.e. service is assumed to be at its best. For system quality issues, the assumption here is that the application works very well, see system quality measures (DeLone & McLean, 1992). Applying the DeLone and McLean (2003) IS success model, if the variable of interest is *Knowledge Contribution*, then *Information Quality* is directly affected by the outcome, i.e. a closed loop. Information quality in a KMS is dependent on the quality of the *Knowledge Contribution*, so long as the contributor is not contributing perfunctorily. See information quality measures (DeLone & McLean, 1992).

Adapted from Alavi and Leidner (2001)

Table 1. Knowledge Management Processes

Knowledge Management Processes	Knowledge Creation	Knowledge Contribution	Knowledge Storage/Retrieval	Knowledge Transfer	Knowledge Application
Supporting Information Technologies	Data Mining Learning tools	Web pages Contributor rating system	Electronic bulletin boards Knowledge repositories Databases	Electronic bulletin boards Discussion forums Knowledge directories	Expert systems Workflow systems
IT Enables	Combining new sources of knowledge Just in time learning	A medium for peer recognition Promoting knowledge sharing	Support of individual and organizational memory Inter-group knowledge access	More extensive internal network More communication channels available Faster access to knowledge sources	Knowledge can be applied in many locations More rapid application of new knowledge through workflow automation
Platform Technologies	Groupware and communication technologies				
	INTRANETS				

The Modified Knowledge Management Process

Table 1 outlines the modified knowledge management process. In keeping with the tone of this article, we have included *Knowledge Contribution* as a step in the knowledge management process that requires deliberate attention in and of itself, instead of as a sub-element of *Knowledge Creation*.

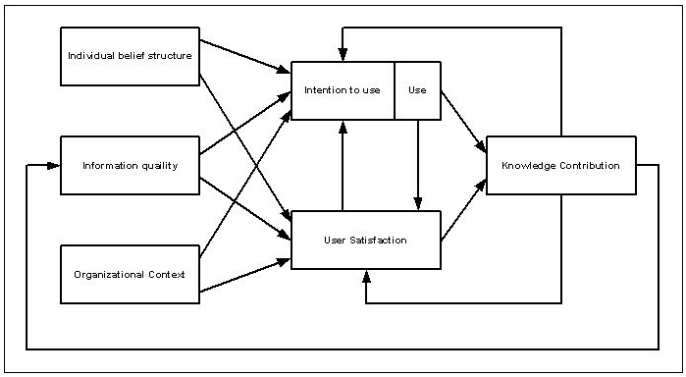
The *Knowledge Contribution* process can be managed; this process would involve influencing belief and behavior, a sphere that may lie outside of the IS artifact (probably explaining why it was omitted from a model developed by IS researchers). Behavior is a social issue, and social issues contribute to the success of a KM effort (Ruppel & Harrington, 2001). The issue of contribution is well recognized, and the need to better control the outcome between the creation and storage process (Ko, et al., 2005).

The Knowledge Contribution Model

Figure 1 depicts an adaptation of the DeLone and McLean (2003) IS success model for this particular problem, with *Knowledge Contribution* as the variable of interest: It relates the following variables:

- *Individual Belief Structure* is defined as the intrinsic motivation for an employee to contribute (Ko, *et al.*, 2005). The employee might be motivated by the organization's reward scheme (monetary incentives, educational assistance, peer recognition, etc.) or de-motivated by the risk of losing their value after contributing with knowledge. Motivation is also impacted by the perceived usefulness of the accumulated contributed knowledge or the overall impact that this contributed knowledge could have on the organization's performance.
- *Information Quality* is defined as the embodiment of the information quality measures (DeLone & McLean, 1992) in the content of the KMS.
- *Organizational Context* is defined as the state of the environment in which the system use occurs. This is inclusive of organizational culture, use of power, the role of politics, extrinsic motivation such as compensation, industry competitiveness, etc. (Bocket al., 2005; Ko et al., 2005; Markus, 1983; Powell & Dent-Micallef, 1997; Quaddus & Xu, 2005).
- *Use* is defined as the voluntary component of the interaction with the system to both contributing and consuming content (Ein-Dor & Segev, 1978; Hamilton & Chervany, 1981; Zmud, 1978); see the *Use* measures (DeLone & McLean, 1992). It is important to distinguish between the involuntary use of a system that the workflow process demands resulting in perfunctory contribution and consumption, and the voluntary use, which results in quality contribution to the KMS. *Use* is also defined here as the search for required information (whether it is found or not), suggesting that the user was willing to consume the content of the KMS.
- *User Satisfaction* is defined as the recipient's response to the consumption of the content of the system (Ein-Dor & Segev, 1978; Hamilton & Chervany, 1981), see the *User Satisfaction* measures (DeLone & McLean, 1992).

Figure 1. The knowledge contribution model



- *Intention to Use* is defined as an attitude towards use (DeLone & McLean, 2003) and is introduced to resolve some of the process versus causal concerns (Seddon, 1997).

This model is derived from a process understanding of what drives knowledge contribution: (1) firstly, individual motivation, information quality, and the organizational context, i.e. operational environment of the KB, leading to (2) secondly, intention to use, use, user satisfaction (i.e. KB usage).

The correlation between Information Quality and System Use, i.e. Intention to Use and Use, (Clemons et al., 1993), and Information Quality and User Satisfaction (Agarwal & Prasad, 1997) has been established. Similarly, the correlation between System Use, i.e. Intention to Use and Use, and User Satisfaction has been established (D'Ambra & Rice, 2001; Geldman, 1998).

Propositions for Future Research

The propositions identified below represent food for thought for the types of hypotheses that may be constructed form the proposed model to test casual relations in future research. They are organized according to the major factors identified in the model.

We recognize that there are some limitations of the proposed model such as the lack of defined measures for *Individual Belief Structure*, and *Organizational Context*, when compared to the establishment for *Information Quality*, *System Use* and *User Satisfaction* (DeLone and McLean, 1992). However, researchers have investigated these constructs and developed measures for them (Amabile, et al., 1994; Covington & Mueller, 1993), albeit some outside of IS research. The challenge here is to effectively adapt, develop and apply these measures.

Correlated Constructs & Variables	Proposition
Individual Belief Structure and System Use/*User Satisfaction*	P1: The more intrinsically motivated an employee, the greater the propensity to use the system.
	P2: The more intrinsically motivated an employee, the greater the satisfaction derived from system use.
Organizational Context and System Use/*User Satisfaction*.	P3: The more conducive the organizational environment is to sharing knowledge, the greater the propensity to use the system.
	P4: The more conducive the organizational environment is to sharing knowledge, the greater the satisfaction derived from system use.
System Use/*User Satisfaction* and *Knowledge Contribution*	P5: The greater the propensity to use the system, the greater the quality of knowledge contributed to the system.
	P6: The greater the satisfaction derived from system use, the greater the quality of knowledge contributed to the system.
Knowledge Contribution and System Use / *User Satisfaction* / *Information Quality*	P7: The greater the quality of knowledge contributed to the system, the greater the propensity to want to use the system.
	P8: The greater the quality of knowledge contributed to the system, the greater the satisfaction derived from system use.
	P9: The greater the quality of knowledge contributed to the system, the greater the quality of information in the system.
Individual Belief Structure / *Organizational Context* and *Knowledge Contribution*	P10: The more intrinsically motivated an employee, the greater the quality of knowledge contributed to the system.
	P11: The more conducive the organizational environment is to sharing knowledge, the greater the quality of knowledge contributed to the system.

The managerial implications for any program of influence that will affect *Organizational Context* and ultimately the *Individual Belief Structure* are clear. Organizations may choose to foster knowledge communities (Barrett et al., 2004), knowledge networks (Buchel & Raub, 2002), and make the support of top management demonstrable. The use of meta-knowledge directories (Nevo & Wand, 2005) in the first instance, instead of knowledge repositories could alleviate the perception that the organization only wants to extract that which is most valuable from the employee. Programs of incentives, not necessarily monetary (, e.g. educational assistance, public recognition, etc.), allocation of slack time in support of KM efforts are possible mechanisms for influencing the *Individual Belief Structure* in an *Organizational Context*.

CONCLUSION

In this paper we have addressed an important issue of KM - *Knowledge Contribution* - in an attempt to provide some insights into an aspect of this important subject, which is often ignored or subsumed under other process steps such as knowledge creation. Potentially, it is a pivotal ingredient of KM, which we believe deserves specific consideration. Accordingly, we have modified the KM process to reflect this.

We have also provided a knowledge contribution model, from which we derived propositions that may be later translated into testable hypotheses. The intention is to use the proposed model to conduct our own research in the future and to provide a starting point for others to engage in similar research in this very interesting and important segment of KM, and to make a useful contribution to the literature. In our future research we will test the model and associated propositions with guidance from similar methodologies for related works in testing models of IS success, knowledge sharing, and transfer (Bock et al., 2005; Ko et al., 2005). The answers to several research questions in this area are pending. For example, what are the precise factors that influence knowledge contribution, what are the strengths of their influences, and to what extent they interact. We have taken a step in providing some answers and hope we have encouraged others to participate.

REFERENCES

Agarwal, R. & Prasad, J. (1997). The role of innovation characteristics and perceived voluntariness in the acceptance of information technologies. *Decision Sciences*, 28(3), 557-580.

Alavi, M. & Leidner, D. E. (2001). Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations And Research Issues. *MIS Quarterly*, 25(1), 107-136.

Amabile, T., Hill, K., Hennessey, B. & Tighe, E. (1994). The Work Preference Inventory; Assessing Intrinsic and Extrinsic Motivational Orientations. *Journal of Personality and Social Psychology*, 66(5), 950-967.

Ba, S., Stallaert, J. & Whinston, A. B. (2001). Research Commentary: Introducing a Third Dimension in Information Systems Design - The Case for Incentive Alignment. *Information Systems Research*, 12(3), 225-239.

Barrett, M., Cappleman, S., Shoib, G. & Walsham, G. (2004). Learning in Knowledge Communities: Managing Technology and Context. *European Management Journal*, 22(1), 1-11.

Barry, B. & Hardin, R. (1982). Rational Man and Irrational Society? *Sage Publications, Newbury Park, CA*.

Bock, G., Zmud, R. W., Kim, Y. & Lee, J. (2005). Behavioral Intention Formation in Knowledge Sharing: Examining the Roles of Extrinsic Motivators, Social-Psychological Forces, and Organizational Climate. *MIS Quarterly*, 29(1), 87-111.

Buchel, B. & Raub, S. (2002). Building Knowledge-creating Value Networks. *European Management Journal*, 20(6), 587-596.

Calder, B. J. & Staw, B. M. (1975). The Self-Perception of Intrinsic and Extrinsic Motivation. *Journal of Personality and Social Psychology*, 31, 599-605.

Clemons, E. K., Reddi, S. P. & Row, M. C. (1993). The impact of information technology on he organization of economic activity: The "move to the middle" hypothesis. *Journal of Management Information Systems*, 10(2), 9-35.

Constant, D., Kiesler, S. & Sproull, L. (1994). What's Mine Is Ours or Is It? A Study of Attitudes about Information Sharing. *Information Systems Research*, 5(4), 400-421.

Covington, M. V. & Mueller, K. J. (1993). Intrinsic versus Extrinsic Motivation: An Approach/Avoidance Reformulation. *Educational Psychology Review* 13(2), 157-176.

D'Ambra, J. & Rice, R. E. (2001). Emerging factors in user evaluation of the World Wide Web. *Information & Management*, 38(6), 373-384.

Dawes, R. (1980). Social Dilemmas. *Annual Review of Psychology*, 31, 169-193.

DeLone, W. H. & McLean, E. R. (1992). Information Systems Success: The Quest for the Dependent Variable. *Information Systems Research*, 3(1), 60-95.

DeLone, W. H. & McLean, E. R. (2003). The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems*, 19(4), 9-30.

DeLong, D. W. & Fahey, L. (2000). Diagnosing Cultural Barriers to Knowledge Management. *Academy of Management Executive*, 14(4), 118-127.

Ein-Dor, P. & Segev, E. (1978). Organizational Context and the Success of Management Information Systems. *Management Science*, 24(10), 1064-1077.

Geldman, M. (1998). The relation between user satisfaction, usage of information systems, and performance. *Information & Management*, 34(1), 11-18.

Gibbert, M. & Krause, H. (2002). Practice Exchange in a Best Practice Marketplace. *Knowledge Management Case Book: Siemens Best Practices, T. H. Davenport and G. J. B. Probst (Eds), Publics Corporate Publishing, Eriangen. Germany*, 89-105.

Goodman, P. S. & Darr, E. D. (1998). Computer-Aided Systems and Communities: Mechanisms for Organizational Learning in Distributed Environments. *MIS Quarterly* 22(4), 417-440.

Grant, R. M. (1996). Toward a knowledge-Based Theory of the Firm. *Strategic Management Journal*, 17, 109-122.

Hamilton, S. & Chervany, N. L. (1981). Evaluating Information System Effectiveness. Part I Comparing Evaluation Approaches. *MIS Quarterly*, 5(3), 55-69.

Holzner, B. & Marx, J. (1979). The Knowledge Application: The Knowledge System in Society. *Allyn-Bacon, Boston*.

Jessop, L. M. & Valacich, J. S. (1999). *Information Systems Foundations*. Upper Saddle River, NJ, Prentice Hall.

Kling, R. (1980). Social analyses of computing: Theoretical perspectives in recent empirical research. *Comput. Surv.*, 12(1), 61-110.

Ko, D., Kirsch, L. J. & King, W. R. (2005). ANTECEDENTS OF KNOWLEDGE TRANSFER FROM CONSULTANTS TO CLIENTS IN ENTERPRISE SYSTEM IMPLEMENTATIONS. *MIS Quarterly*, 29(1), 59-85.

Markus, M. L. (1983). Power, Politics, and MIS Implementation. *Communications of the ACM*, 26(6), 430-444.

Markus, M. L. (2001). Towards a Theory of Knowledge Reuse: Types of Knowledge Reuse Situations and Factors in Reuse Success. *Journal of Management Information Systems*, 18(1), 57-94.

McDermott, R. (1999). Why Information Technology Inspired but Cannot Deliver Knowledge Management. *California Managemen Review*, 41(4), 103-117.

Nevo, D. & Wand, Y. (2005). Organizational memory information systems: a transactive memory approach. *Elsevier B.V.*, 39, 549-562.

Nonaka, I. (1994). A Dynamic Theory of Organizational Knowledge Creation. *Organizational Science*, 5(1), 14-37.

Nonaka, I. & Takeuchi, H. (1995). The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation. *Oxford University Press, New York.*

O'Dell, C. & Grayson, C. J. (1998). If Only We Knew What We Know: Identification and Transfer of Internal Best Practices. *California Management Review* A0(3), 154-174.

Osterloh, M. & Frey, B. (2000). Motivation, Knowledge Transfer, and Organizational Forms. *Organization Science*, 11(5), 538-550.

Pentland, B. T. (1995). Information Systems and Organizational Learning: The Social Epistemology of Organizational Knowledge Systems. *Accounting, Management and Information Technologies* 5(1), 1-21.

Powell, T. C. & Dent-Micallef, A. (1997). Information Technology as Competitive Advantage: The Role of Human, Business and Technology Resources. *Strategic Management Journal*, 18(5), 375-405.

Quaddus, M. & Xu, J. (2005). Adoption and diffusion of knowledge management systems: field studies of factors and variables. *Elsevier B.V.*, 1-9.

Ruppel, C. P. & Harrington, S. J. (2001). Spreading Knowledge through Intranets: An Analysis of Organizational Culture Leading to Intranet Adoption and Use. *IEEE Transactions on Professional Communications*, 44(1), 37-52.

Seddon, P. B. (1997). A respecification and extension of the DeLone and McLean model of IS success. *Information Systems Research*, 8(3), 240-253.

Szulanski, G. (1996). Exploring Internal Stickiness: Impediments to the Transfer of Best Practice within the Firm. *Strategic Management Journal*, 17, 27-44.

Thorn, B. K. & Connolly, T. (1987). Discretionary Data Bases: A Theory and Some Experimental Findings. *Communication Research*, 14(5), 512-528.

Wasko, M. M. & Faraj, S. (2000). 'It Is What One Does': Why People Participate and Help Others in Electronic Communities of Practice. *Journal of Strategic Information Systems*, 9(2/3), 155-173.

Zmud, R. W. (1978). An Empirical Investigation of the Dimensionality of the Concept of Information. *Decision Sciences*, 9(2), 187-195.