

Applying Group Research Framework to Knowledge Management

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ABSTRACT

This paper describes the similarities shared between group research and knowledge management research, and proposes a framework derived from group research which consists of five contextual variables: individual, group (team), task, environment and knowledge type. Moreover, it examines the relationships among these five variables, behavior setting (i.e. patterned relations among group, task, and knowledge types), and knowledge interaction processes (e.g. knowledge creation, transfer, application and others), then sums up several existing KM studies within this framework. Lastly, this paper shows that the existing KM frameworks could fit in with this new framework.

INTRODUCTION

Information systems researchers acknowledge that standardization of terms and instruments has always been an issue for any research at its early stage of development (Jarvenpaa et al., 1985; Teng & Galletta, 1990; Szajna, 1994). Like any other research in its early stage of development, the research in the field of knowledge management (KM) also has the need of standardization. For instance, in a study which summarizes ten different frameworks, KM researchers not only conclude the necessities to have a common or standard way of describing KM processes, but also recognize the needs to have a "standard way of characterizing influences on the conduct of KM" (Holsapple & Joshi, 1999).

Additionally, as there are many frameworks proposed by different KM researchers (e.g. Nonaka, 1994; Pentland, 1995; Gray & Chan, 2000; Gupta & Govindarajan, 2000; Alavi & Leidner, 2001; Becerra-Fernandez & Sabherwal, 2001; Gold et al., 2001; Grover & Davenport, 2001; Massey et al., 2002; Argote et al., 2003), researchers and practitioners may have difficulties in deciding which frameworks they should apply or they may apply one of the frameworks they like the most and overlook the benefits offered by other frameworks.

Instead of reinventing the wheel, this paper proposes a framework derived from group research (McGrath, 1984). Firstly, this is because group research is a well-established field, and most of the terms have been standardized. Further, researchers have validated the model vigorously. Thirdly, in a complex field such as KM or group research, researchers may not be able to study everything at the same time (McGrath, 1984) and learning from previous research (i.e. group research) may be able to examine KM research more systematically. Therefore, adopting a framework from group research may enable us to examine every possible issue that encompasses KM research.

Moreover, all KM processes require at least two persons (i.e. knowledge contributor, and knowledge adopter) to interact with each other (Constant et al., 1994; Constant et al., 1996; Kankanhalli, 2002). In some studies, researchers analyze a team or a group (e.g. virtual team) which consists of more than two persons (Massey et al., 2002; Miranda & Saunders, 2003), and still some look at the community of practice (i.e. a group of people sharing the common interests) (e.g. Brown & Duguid, 1991; Wasko & Faraj, 2000). All these studies share the same pattern, that is, research in KM views knowledge as the result of interaction between individuals with a group or within an organization (Dixon, 2000; Brown & Duguid, 1991).

In the next section, a framework adopted from group research consisting of five contextual variables (i.e. individual, group, task, environment and knowledge type characteristics), behavior setting and knowledge interaction processes is described. This is followed by the summary of eight existing frameworks, and how the summarized frameworks could fit into the proposed framework. The last section provides the implication and conclusion of the proposed framework.

APPLYING GROUP RESEARCH FRAMEWORK TO KM

Figure 1 shows a framework for the study of KM (adopted from McGrath, 1984). In figure 1, all contextual categories are identical to McGrath (1984), except the addition of knowledge type which is required in KM research, and does not exist in the group study. As knowledge type is included in the framework, the original group interaction processes (GIP), which is defined as "the patterned behavior of members of group in behavior setting, in relation to task/situation and environment" (McGrath, 1984), is renamed to knowledge interaction processes (KIP). KIP is further defined as "the patterned behavior of members of group in behavior setting, in relation to task/situation, *knowledge type* and environment." As recommended by McGrath (1984), this is only a model of the problem, and is not a theory or model of KM research. This framework guides research in KM to look at five different issues together with behavioral setting and knowledge interaction processes described below.

Individual

Individual characteristics are the biological, social and psychological properties of individual group members. For instance, biological properties refer to individuals who may be strong, old, and many other properties. Social properties include but are not limited to their roles in KM such as knowledge contributors and knowledge adopters. Psychological properties refer to the traits, habits, and many others. All these properties may affect knowledge interaction processes.

Group

Group characteristics are the patterned relations among group members. For instance, individuals may establish a group in the form of community of practice, in the form of task force, virtual team and others. A group may have a leader who is skeptical to KM or who is supportive of KM. All these properties may also affect knowledge interaction processes.

Environment

Environmental characteristics are the physical, socio-cultural, and technological properties of the environment. For instance, certain knowledge interaction processes (KIP) can be carried out informally in the canteen, formally in the classroom or as a form of discussion within KM systems. These environmental characteristics can influence how a person behaves, at the same time they can also influence KIP.

Task

KIP can be about someone (individual or group) doing something (task) in somewhere (environment). Task characteristics can be as simple as

planning dinner or as complex as building an airplane. These tasks could also influence how certain KIP are being performed.

Task characteristics are the patterned relations among environmental inputs, that is, environment could form how certain tasks are carried out. For instance, playing football (doing a task) in a very high temperature such as 38-degree Celsius (environment) is very different from a very moderate temperature 25-degree (e.g. in a very high temperature environment the players may not wear t-shirt).

Environmental opportunities, constraints, or demands can influence the tasks, and consequently can influence KIP. For instance, In an organization (environment) which supports more focused, process oriented task will have higher degree of KM satisfaction for doing certain KIP (i.e. internalization) (Becerra-Fernandez & Sabherwal, 2001)

Knowledge Types

Knowledge type characteristics are also the patterned relations among environmental inputs. Knowledge types include but are not limited to tacit and explicit types (see Appendix B for details about knowledge types). Environmental opportunities, constraints or demands can also influence knowledge types. For instance, when individuals interact face-to-face (environmental setting), knowledge may be tacit, however, when individuals interact using text based KM technology in a distance place (environmental setting), knowledge may be explicit.

The interrelationship among those five contextual categories starts with individual and environment characteristics. When individuals interact they develop relationship, this relationship is the group structure (letter a in figure 1). Next, environmental characteristics interact and develop a particular task or situation; environmental

characteristics influences how the task is carried out (letter f). Environmental characteristics could also affect knowledge types (letter g) such as tacit or explicit.

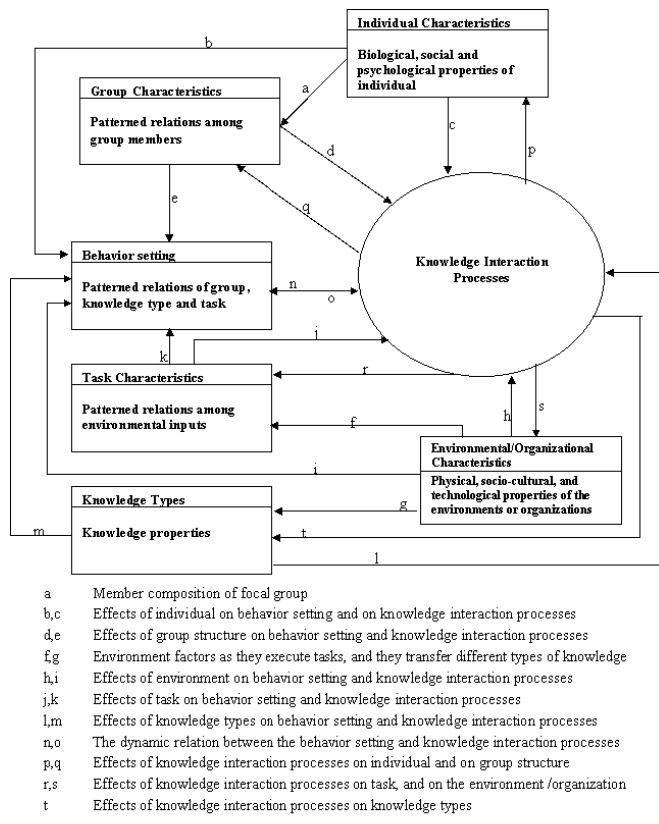
All five contextual categories are the inputs and outputs to/from knowledge interaction processes (explain in section 2.7), and behavior setting (explain in section 2.6). **Table 1** summarizes KM empirical studies into these five contextual categories.

Behavior Setting

Behavior setting is a term McGrath borrowed from Backer (1965). In Backer's definition, behavior setting is "individuals behaving in environments, or individual behaving in task/situations", and McGrath adds the group structure concept, and considers the juxtaposition of the group and task as behavior setting. In this study, similarly we add the concept of knowledge type, and consider that group, task and knowledge type are inputs for behavior setting. In the model, though individual and environmental characteristics affect behavioral settings directly, behavior setting describes the fit between the group (as the structured entity of individual characteristics), the task (as the structured set of environmental requirement/opportunities/constraints) and knowledge type (also as the structured set of environmental requirement/ opportunities/ constraints).

The fit is described by McGrath (1984) analogously as "a particular concert (behavior setting and knowledge interaction process) in which it is viewed as *mainly* a juxtaposition of a particular orchestra (group) with a particular set of musical compositions (task/situation/knowledge type), and yet properties of the orchestra members (individual) and of the concert hall, the city and perhaps the time of year (environment) may still have effects on the results" (p. 16).

Figure 1.A Conceptual Framework for the Study of KM



Knowledge Interaction Processes (KIP)

A process is a set of interrelated activities. A process could be explained as workflows in which all activities have relationships with one another (Kock, 1999). KIP (also known as KM processes) are the processes that

Table 1. Selected KM Studies within KM Framework Adopted from McGrath (1984)

Contextual category	Contextual variable	Study
Individual characteristics	Sharing Motivation	Constant et al. (1996)
	Mental models (cognition)	Orlikowski (1992)
	Action Control	Kuo et al. (2003)
	Motivation, Absorptive and Retention capacities	Szulanski (1996)
Group characteristics	Weak ties	Constant et al. (1996)
	In-group / Out-group (Insider) / (Outsider)	Hansen, M. H. (1999)
	Barren context; Arduous relationship	Menon, and Pfeffer (2003)
	Structure	Szulanski (1996)
	Managerial Influence	Majchrzak et al. (2000b)
	Task interdependence	Masse et al. (2002)
Task characteristics	Task Orientation, Task Domain	Kankanhalli et al. (2001)
	Task Orientation, Task Domain	Jarvenpaa, and Staples (2000)
	Task Orientation, Task Domain	Becerra-Fernandez, and Sabherwal (2001)
	Task Orientation, Task Domain	
Knowledge Types	Knowledge as public good, and private good	Wasko, and Faraj (2000)
	Knowledge tacitness	Kankanhalli et al. (2001)
	Breadth of Information; Depth of Information	Miranda and Saunders (2003)
	Tacit and Explicit	Jacob and Ebrahimpur (2001)
	Causal ambiguity and Unproven	Szulanski (1996)
	Codified and Dependent	Hansen, M. H. (1999)
Environment / Organizational characteristics	Culture	Orlikowski (1992)
	Information influence	Sussman, and Siegal (2003)
	Organizational structure	Orlikowski (1992)
	Time and Space	Schulze, and Boland (2000)
	Infrastructure capability	Gold et al. (2001)
	Tech structure & Org environment	Majchrzak et al. (2000b)
	Resource and Environmental Influence	Masse et al. (2002)
	Technology, Culture	Khalifa et al. (2001)
		Goodman and Darr (1998)

happened when individuals in a group interact in behavior setting which carry various tasks, knowledge types, and environment effects, and KIP can be influenced by or can influence those effects.

Researchers have proposed many different types of KIP. (With so many processes proposed, this paper does not provide full description of each study instead see Appendix C for the summary of fifteen studies which offer different types of KIP). This paper followed the most widely-quoted definition of KIP proposed by Alavi and Leidner (2001). KIP include four types of processes, such as knowledge creation, storage/retrieval, transfer, and application (see the details in section 3.2 and 3.4).

EXISTING KM FRAMEWORKS

Extensive review of KM literature shows that the following eight frameworks are the most influential KM frameworks, and this section summarizes them. At the end of this section, table 2 shows that the eight reviewed frameworks could fit into a framework adopted from group research described above (McGrath, 1984).

The existing KM frameworks in the following sub-sections are listed based on the year of publication, and then alphabetical order.

Nonaka (1994)

This paper proposes a framework to analyze organizational knowledge creation. This framework concerns about conversion and interaction of different knowledge types. Drawing from Polanyi's (1966), two knowledge types are presented, they are tacit and explicit. Tacit knowledge is individual knowledge that is not easy to express, and it is profoundly embedded inside someone's behavior and experience. On the other hand, explicit knowledge is easily expressed, and can be easily communicated with others in the form of words, numbers, and picture. Since knowledge creation is a continuous process of interactions between explicit and tacit knowledge, only through these interactions knowledge could be created efficiently (see Appendix A, figure A.1).

Pentland (1995)

This framework analyzes organizational knowledge and learning by proposing the following five knowledge processes. 1) Knowledge construction: this process is in which knowledge creation takes place. 2) Knowledge organization: after knowledge construction phase, new knowledge needs to be organized according to its category for future reuse. 3) Knowledge storage: after knowledge is organized, knowledge should be stored for future reuse. 4) Knowledge distribution: it refers to how knowledge could be delivered to places in which it is needed. 5) Knowledge application: it refers to how knowledge could be applied by the target recipients.

Gupta, and Govindarajan (2000)

Based on a theory from communication research, Gupta, and Govindarajan (2000) offer a conceptual framework for analyzing knowledge transfer. The framework includes the following five factors which influence knowledge transfer in the organization: 1) Value of the source unit's knowledge stock (i.e. the content/value of the message). 2) Motivational disposition of the source (i.e., what drive contributors to share). 3) Existence and richness of transmission channels. 4) Motivational disposition of the receiving unit. 5) The absorptive capacity of the receiving unit.

Alavi and Leidner (2001)

Drawing from Pentland's (1995) organizational knowledge and learning process framework, this paper proposes four types of knowledge processes (i.e. knowledge creation, storage/retrieval, transfer and application). Knowledge creation is a similar to knowledge construction (Pentland, 1995) and knowledge creation (Nonaka, 1994, see section 3.1), knowledge transfer is similar to knowledge distribution, and knowledge application retains its original term and meaning found in

Pentland (1995). On the other hand, knowledge storage/retrieval is the combination of knowledge organization, and storage. For details, please see section 3.2 for framework proposed by Pentland (1995).

Becerra-Fernandez and Sabherwal (2001)

They develop a contingency framework which consists of nature of tasks performed by individuals or groups. Two dimensions of tasks are identified: task orientation and task domain. Task orientation includes process oriented (how to perform the process) and content oriented (how to achieve specific goals) and task domain comprise focused (low task variability, yet greater specialization) and broad tasks (high task variability, yet low specialization). They hypothesize that these tasks moderate the effects between KM processes (such as socialization, externalization, combination, and internalization) and KM satisfaction. The result shows support to most of hypotheses (see Appendix A).

Gold et al. (2001)

They develop a KM framework from the perspective of organizational capabilities. The framework describes the identification of the preconditions that are essential for successful KM initiatives. These preconditions are resources or capabilities which incorporate infrastructures and processes. The infrastructures capabilities consist of technical, structural, and cultural dimensions, and the processes capabilities comprise acquisition, conversion, application, and protection. They propose that these capabilities affect organizational effectiveness. The result shows support to all hypotheses, that is, knowledge infrastructure capability, and knowledge process capability have effects on organizational effectiveness (see Appendix A).

Grover and Davenport (2001)

This paper offers a pragmatic framework for the study of KM which includes knowledge processes, and the context embedded in the process. There are two processes (i.e. emergent and deliberate) which includes four sub-processes. Emergent process refers to the process bounded to organizational procedures. Deliberate process is the process initiated by management in the organization due to the need of such a process. Knowledge generation, codification, transfer, and realization are the sub-processes within these two processes. The elements of the context embedded in these processes are individuals, groups, and organizations. These elements could influence the processes, and also be influenced by them. This framework also includes key domains for KM research. These key domains are strategy, structure, people/culture and technology. KM research could examine the interactions of these domains, processes and context. For instance, knowledge transfer processes could be observed within or between organizations which have competitive or corporative culture, and which apply certain technologies (see Appendix A).

Argote et al. (2003)

This paper proposes an interactive framework for KM in organizations. The framework includes two dimensions (KM outcome and properties of the context which KM takes place). KM outcome includes knowledge creation, retention, and transfer. The three properties are properties of unit, properties of relationships between unit, and properties of knowledge. Units could be an individual, or an organization involve in knowledge creation, retention and transfer. Properties include but not are limited to the status of individual such as expert status, or an organization's social status (such as high-status vs. low-status). Properties of relationships between units describe the relationships among units such as the dyadic relationships among the team which include but not limited to how intensive the relationship is, how frequent they get in touch with one another. Properties of relationships between units may also describe the relationships between organizations. Properties of knowledge refer to different types of knowledge such as tacit, explicit, implicit, codified, uncoded, public, private, and other knowledge. These knowledge types influence on how knowledge is created, how knowledge is stored, and how knowledge is diffused (see Appendix A).

Table 2. Different Frameworks Under KM Framework Adopted from McGrath (1984)

Papers	A framework for the study of knowledge management (adapted from McGrath, 1984)					
	Contextual Categories					Knowledge Interaction Process
	Individual	Group	Task	Environment	Knowledge Type	
Paper 1	✓	✓			✓	Conversion between different knowledge types (tacit and explicit) at group, and organizational levels.
Paper 2		✓	✓	✓		"Knowledge is always embedded in some embedded, culturally, cultural assumptions, practices, and power, and one cannot collect it" (Pentland, 1995).
Paper 3	✓			✓	✓	Knowledge transfer is a function of the 5 factors: (1) value of knowledge stock, (2) motivational disposition of the source, (3) richness of channels, (4) motivational disposition of the recipient, (5) capability of the recipient (Gupta, 2000).
Paper 4	✓	✓		✓	✓	"A systematic framework knowledge creation, transfer, and that will be used to further analyze and discuss the potential technologies in organizational knowledge management. In individuals or groups, and conversion of tacit and explicit knowledge" (Leidner, 2001).
Paper 5	✓	✓	✓	✓	✓	A contingency framework which consists of nature, efficacy, and impact of the infrastructure variables at a given time (S&C).
Paper 6	✓	✓	✓	✓	✓	A framework for effective KM from the perspective of organizational infrastructure such as technology, structure, culture and process.
Paper 7	✓	✓	✓	✓	✓	A pragmatic framework for the study of knowledge management knowledge processes, and the context embedded in the process.
Paper 8	✓	✓		✓	✓	Pragmatic framework for knowledge creation, transfer, and process of knowledge creation, transfer, or transfer.

Paper 1=Nonaka, 1994

Paper 4=Alavi and Leidner, 2000

Paper 7=Grover and Davenport, 2001

Paper 2=Pentland, 1995

Paper 5=Becerra-Fernandez & Sabherwal, 2001

Paper 8=Argote et al., 2003

Paper 3=Gupta & Govindarajan, 2000

Paper 6=Gold et al., 2001

Different KM Frameworks Under a Framework Adopted from McGrath (1984)

Previous sections summarize various KM frameworks offered by different studies. These frameworks are developed for understanding complex KM phenomena, and they all provide valuable directions for KM research. Each framework in these studies recommends a different framework for a different KM perspective. For instance, a framework from the perspective of organizational capabilities mainly emphasizes on the infrastructure and process capabilities, on the other hand, a framework for knowledge creation mainly examines the conversion of knowledge types among individuals and groups, but do not emphasize on infrastructure capabilities, and task. In summary, table 2 shows that the eight reviewed frameworks could fit into a broader framework adopted from McGrath (1984).

CONCLUSION

The eight frameworks summarized earlier provide some insightful observations about phenomena that happened in KM research from different perspectives. Through the comparison made on these frameworks, and through the framework proposed, this paper contributes to KM research and practice in several ways. First, researchers and practitioners are no longer confronted with the difficulties of choosing which frameworks to apply. Second, it summarizes the existing frameworks and shows that some frameworks offer examination at the low-level of abstraction, others offer higher-level of abstraction. For instance, knowledge transfer processes proposed by Pentland (1995) describe how knowledge should be delivered (transferred), but Gupta, and Govindarajan (2000) offer lower level of abstraction by providing the detail about what is the message, who are the participants (sender and recipient), what motivate them to contribute, or to adopt knowledge and under what environment (channel), but none of the frameworks subsumes others.

Third, it addresses the differences among frameworks. For instance, there are more than fifteen studies which each of them proposes different knowledge interaction processes (see Appendix C). Fourth, it shows some similarities between group research and KM research. Additionally, it also demonstrates that contextual variables offered from existing frameworks could fit into a broader framework offered in this study without losing any important details (see table 2). Further, the proposed framework could also be used to analyze existing empirical studies (see Table 1), and lastly but not least, the interactions and the relationships among five contextual variables together with behavior setting and knowledge interaction processes in the framework provide

a systematical ways of conducting research in KM. That is, the proposed framework separates the entire issues found in KM apart, and allows researchers and practitioners to analyze the issue in a manageable size, and then put each component back together as putting pieces of a jigsaw puzzle to see its full picture.

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APPENDIX A

Figure A.1. A Framework for Knowledge Creation (Nonaka 1994)

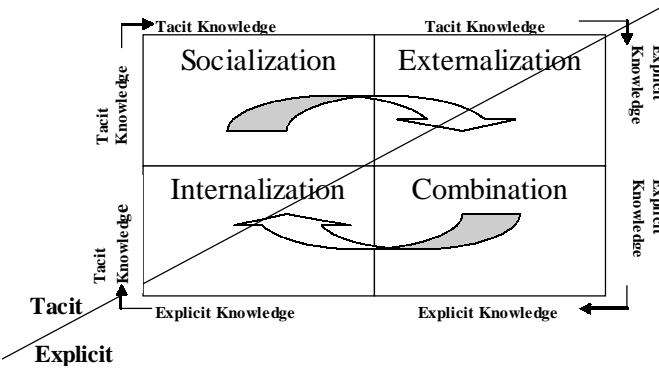


Figure A.2. A Framework of Organizational KM from a Contingency Perspective (Becerra-Fernandez and Rajiv Sabherwal, 2001)

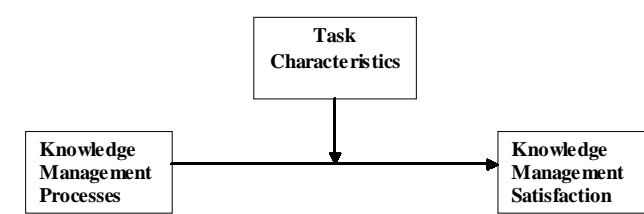


Figure A.3. A Framework of KM from an Organizational Capabilities Perspective (Gold et al. 2001)

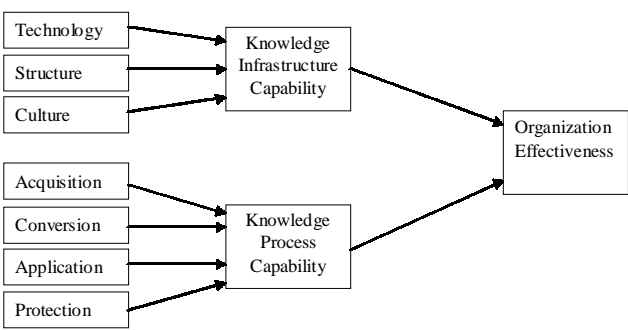
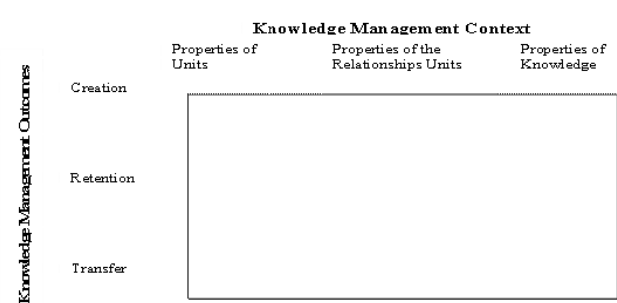


Figure A.4. A Pragmatic Framework for KM Research (Grover and Davenport 2001)

Organizations				
Groups				
Individuals				
Deliberate	Generation →	Codification →	Transfer →	Retention
Emergent	Generation →	Codification →	Transfer →	Retention
Strategy				
Structure				
People/Culture				
Technology				

Figure A.5. A Theoretical Framework for Organizing Research on Organizational Learning and Knowledge Management (Argote et al. 2003)



Due to space limitation, Appendix B and C are not included but are available upon request from the lead author.

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