Developing an Organizational Attributes-Based Continuous-Learning KM Model for Knowledge-Intensive Small Firms

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Abstract: In this paper we draw on the knowledge market analogy and integrate the considerations of organizational culture and attributes, knowledge management (KM) guiding principles and continuous learning-based systems development into the design of a model for effective KM in knowledge-intensive small firms. This model can be applied to provide a blueprint for KM development in knowledge-intensive small firms. Our model is intended to promote not only awareness of KM among small firms, but also an appreciation for concepts that have intrinsic value and overall altering effects on organizational behavior and culture, regardless of the level or implementation undertaken.

Key-Words: Continuous Learning, Knowledge Intensive Firms, Knowledge Management, Knowledge Market, KM Guiding Principles, Organizational Culture

1 Introduction
In the knowledge-based economy, an organization’s ability to survive and succeed depends mainly upon its ability to manage organizational knowledge and embody it in new products and services. Though technological advancement has enabled many businesses to achieve huge performance improvements in the way they conduct business, technology solutions alone are simply not enough. More businesses have increasingly realized that their key asset and the only sustainable source of their competitive advantage is their ability to apply organizational knowledge productively [11][13][31]. This is especially true of knowledge-intensive organizations [43].

A knowledge-intensive organization is one whose major workforce comprises well-educated, qualified employees, and whose work is mainly of an intellectual nature [34][43]. Each organization has its own culture, employees, background, and other idiosyncratic attributes. One of the unique characteristics of knowledge-intensive organizations is that the effective application of organizational knowledge is strongly affected by the combination of these organizational-unique attributes [41]. Without this understanding, a knowledge-intensive organization cannot truly attain knowledge-based strategic advantages.

Effective application of organizational knowledge requires systematic guidelines. These guidelines provide a conceptual framework for the initiatives of knowledge application in organizations. Several roadmaps and models for knowledge application have been proposed based on systems development methodologies [44]; however, the consideration of organizational attributes is either lack in the model or only implied in the development stages. In addition, most of the current models are for large organizations, which rely on a set of prescribed methodologies in conducting business, with emphasis on technology [30][36]. This might prevent organizations from attaining the advantages and opportunities promised by effective knowledge flow. Actually, effective application of organizational knowledge is more of an organizational problem than a technological problem [41].

In this paper we draw on the knowledge market analogy and integrate the considerations of organizational culture and attributes, knowledge management (KM) guiding principles and continuous learning-based systems development into the design of a model for effective KM in knowledge-intensive small firms. This model can be applied to provide a blueprint for KM development in knowledge-intensive small firms. We intend to promote not only awareness of KM among small
2 Knowledge Management

In recent years, knowledge has been widely recognized as one of the most important productive forces and intangible resources organizations need to develop to compete in the environment [4]. Unlike data or information, knowledge is embedded in people, and knowledge creation occurs in the process of knowing via social interaction [42] and is the result of “purposeful coordination of action” [50]. Maturana & Varela [29] provide a competence-oriented notion of knowledge, and emphasize on the inseparability between action and experience in shaping knowledge which can only be demonstrated through action. In other words, true knowledge must be actionable. Knowledge by itself, if it is not accompanied by action, is of limited use. Knowledge and action work together, and knowledge can only be made complete by action.

Boisot [3] and Nonaka & Takeuchi [32] classify organizational knowledge into explicit and tacit knowledge. Tacit knowledge is personal mental model and insight toward the complexity of the environment, and is usually characterized by personal beliefs, intuition or judgment, values, and experiences. On the other hand, explicit knowledge can be articulated as patterns of rules for problem solving, and is usually susceptible of codification and replication. It is the nature of explicit knowledge that lends it naturally to the technological approach to KM. We focus on the tacit personal knowledge, which is the implicit knowledge that organizational members learned through years’ of experience in performing organizational tasks, and is distributed in the totality of the individual’s experience. According to Polanyi [35], all knowledge is rooted in tacit knowledge. This type of personal, tacit knowledge underlies organizational capabilities [47], and is vital to organizational learning, for organizations can only learn and innovate by leveraging on the tacit knowledge of their members [7].

Combining the above views, we regard, in this paper, organizational knowledge as the collective manifestation of the problem-solving, decision-making, and purposeful action coordination capabilities of organizational members.

2.1 Definition of Knowledge Management

Organizational knowledge management has been called the “fifth discipline” [38], and an organization’s IT investments are increasingly being measured against a KM metric. In essence, KM is the process of capturing, codifying, and transferring knowledge across the organization in order to create business value or achieve competitive advantages [1][14]. In a general sense, KM can be understood as a formalized and active approach to managing and optimizing knowledge resources in an organization [48].

Wiig [46] points out that the ultimate goal of KM is to create a people-centered “knowledge-vigilant” enterprise environment that promotes continual personal focus on knowledge-related tasks. This view is further supported by the survey findings of Knowledge Management magazine & International Data Corp. (KMM/IDC), indicating that the most common motivations for KM initiatives include retaining expertise of personnel and increasing customer satisfaction [12]. Thus, KM requires the ability to create and retain greater value from core business competencies for generating competitive advantages [23]. Such an ability of KM is usually accomplished via leveraging the organizational best practices in building a collection of reusable assets for sharing in the organization.

2.2 Current KM Methodologies

Most of current KM development approaches can be regarded as based on various degrees of combination of the two strategies proposed by Hansen, et al. [18]: codification and personalization. Codification is an engineering process of employing information technology to extract knowledge from domain experts and make it accessible and reusable in an organization. In contrast, personalization focuses on knowledge sharing via person-to-person contacts and dialogues.

Nonaka & Takeuchi [32] proposed a three-phase model for KM, including knowledge acquisition, knowledge sharing, and knowledge utilization. Though this model provides a very general framework for KM, it does not incorporate explicitly organizational and cultural aspects into model building. In addition, it does not adopt a methodological approach to KM system development.

Expanding Nonaka & Takeuchi’s model and incorporating systems development principles, Tiwana [44] proposed a five-phase model for KM. Though Tiwana’s model is more rigorous than Nonaka & Takeuchi’s model, it focuses on the knowledge cycle process, culture and reward structures are only mentioned briefly after the
deployment phase. In addition, Tiwana’s model pays little consideration to the issue of knowledge transfer.

By integrating the knowledge cycle process into strategic goals of the organization, Liebowitz [27] proposed a SMART (Strategize-Model-Act-Revise-Transfer) methodology for knowledge acquisition, storage, integration, and review for necessary update. This model applies knowledge mapping to identify knowledge sources and to determine organizational competences and weaknesses. This methodology is characterized by its integration of KM into strategic goals of the organization. However, implementation of the SMART methodology is also highly resource-demanding and expensive for small companies.

Holsapple & Joshi [19] conducted a Delphi study on KM factors, and proposed a KM general framework by synthesizing surveyed factors into three forces: managerial influences, resource influences, and environmental influences. This generic framework is mainly about the factors for KM projects, instead of KM development processes.

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3 A Conceptual Model for Building Knowledge Management Systems in Small Firms
We propose in Fig. 1 a knowledge market-based, sharing-driven continuous-learning model for KM initiatives in knowledge-intensive small firms. Small firms, with flatter organizational structure and less bureaucracy, are easier to maintain a sharing and trusting culture in the organization [2].

The rationale of our model is that the development of KM systems must start with the understanding of knowledge components. We incorporate the knowledge market concept into the iterative KM development processes for identifying participants (i.e., the “Who” component) involved in the KM initiative, understanding their motives (i.e., the “Why” component), analyzing what they need and what they can offer (i.e., the “What” component), and designing how to facilitate knowledge transactions among the participants (i.e., the “How” component).

Cultivating a knowledge-sharing culture could be the single-most effective ingredient to effective KM—and also one of the most challenging tasks, especially for knowledge-intensive firms [8]. According to the findings of the KMM/IDC survey, one of the major obstacles to KM initiatives is the absence of a sharing culture in the organization [12]. In a true sharing environment, knowledge should flow continuously in a cyclic direction between “knowledge sellers” and “knowledge buyers,” giving all participants the opportunity to benefit from the larger body of knowledge, and contribute the derived knowledge back to it. This continuous learning approach is the key to our model in developing common knowledge for sharing across boundaries within or outside an organization. This whole process of KMS development is guided by KM principles.

Due to the special setting (i.e., small firms) for which our model is proposed, we do not include tasks on planning knowledge strategies, investigating the economic feasibility of the KM initiative, or setting KM priorities. For a knowledge-intensive firm, the compounded knowledge, skills, capabilities and experience of the employees is perceived to be an integral part of its business process. In such a setting, KM is usually embraced as a strategic initiative and endorsed by the top management of the firm [36]. Thus, our model does not specifically emphasize the strategic planning for KM.
Our sharing-driven continuous-learning KM model is a process-oriented model, while its major components (including knowledge components, KM guiding principles, continuous-learning based KM development processes) form a three-tiered conceptual relationship, as shown in Fig. 2.

3.1 Understanding Components of Knowledge

The underlying premise of KM is that knowledge is a fundamental factor behind all of the enterprise’s activities [46]. Different from most of the ontological definitions for knowledge, Wiig [46] defines knowledge by identifying its components as: truths, beliefs, judgments, and know-how.

We adapt Wiig’s knowledge components and propose that understanding various components of knowledge forms the foundation for a KM project, shown as the fundamental tier in Fig. 2. Beliefs are subjective knowledge that may not always be proven, but either personally or generally accepted. In organizations, beliefs tend to have substantial influences on management in interpreting new experiences and information for decision making [28]. Ground truth is a military term referring to knowledge which is gained in the trenches of the battlefield, and is here applied to refer to a rich and complex understanding of an event or situation in the context of organizational operations. The practicality of ground truth sometimes outweighs logic as a component of knowledge. Knowledge that conveys ground truth is one of the most effective ways of communication, and is more likely to be absorbed by the knowledge recipient [9].

In essence, knowledge deals with the complexity of how people apply their minds to conduct work. Knowledge incorporates the complex outcomes of analysis and introduces the judgments of the decision maker into the final result. Values influence personal judgments and provide a basis for comparison standards, and experiences resulting from actions in contrast to those standards, either positive or negative, are incorporated into the formation of knowledge.

3.2 Guiding Principles for Knowledge Management

We propose a set of people-oriented guiding principles for KM initiatives in knowledge-intensive small firms, as shown as the middle tier in Fig. 2. This special emphasis is consistent with the survey results in Consultants News, which reveals that small firms (below $5 million in annual revenues) attribute less significance to technology for achieving competitive advantages than mid-sized firms ($5 to $25 million in annual revenues) and large firms (over $25 million in annual revenue) [36]. The guiding principles are:

- **Focusing on people.** People are the originator of knowledge. Knowing where people who know reside and what they know has enormous benefits. These are those who own the means of production—their knowledge—and will be the ultimate determinant in a company's success [45].

- **Cultivating trust.** Trust is the most important enabler for fostering a knowledge sharing environment [16], and binds people and their companies together in converting mere transactions into personal relationships [45]. To be effective, trust must be integrated into the culture of the organization. An environment of distrust can frustrate even the best-planned KM initiatives. Three key principles for helping establish trust effectively [9]: trust must be visible so that people can see credit given for knowledge shared; trust must be ubiquitously applied to all individuals and all levels of the organization; trust must start at the top. Above all, management by example will play an important role in establishing trust as a medium of knowledge exchange.

- **Balancing human resources and technological infrastructure.** Though organizational and technological infrastructures form the backbone of KM systems, defining technology resources necessary for knowledge storage, exchange or sharing must be balanced with the human resources [15]. The last several years have seen a trend that large technology expenditures were not accompanied by the human capital to make them effective [12][36]. Humans are the most integral role in an organization’s KM initiatives, and a truly effective KM system must be human-centered. Technology is only a tool, an enabler for the
collaboration process and learning in an organization [20][33]. Effectiveness KM requires strong collaboration among people and business processes that can take advantage of the IT infrastructure in supporting the achievement of an organization’s goals [37]. This new tripartite focus—on people, process, and technology—enables the planning and adoption of effective KM solutions to meet an organization’s business goals.

- **Providing meaningful encouragement & reward.** Meaningful and visible rewards and encouragement can be used as a function of performance and compensation evaluations for motivating the support of the KM project [26][36]. Through the development of an electronic community of practice, Brazelton & Gorry [5] found out that gaining increased prominence in the community was also an effective form of rewards for their project participants to continue to contribute to the community.

- **Requiring Management Commitment & Support.** As with any change-oriented project, KM projects require management’s commitment and support in order to be most successful. Top management support is a top priority issue in the survey by King, et al. [21] and Holsapple & Joshi [19]. Though Brazelton & Gorry [5] suggest that electronic communities for knowledge sharing can succeed even in settings where a strong organizational mandate is lacking, their conclusion actually hinges upon the willingness of project participants to share their knowledge.

- **Measuring Performance.** Finally, measurements on qualitative as well as quantitative factors are necessary for evaluating KM projects in knowledge-intensive firms [40]. Although it is an under-implemented area, measuring the effectiveness of a KM project becomes increasingly important [33], especially as electronic business and IT ventures are driven by leveraging valuable information. While Wiig [46] proposed mainly quantitative measurements, Wu & Wang [49] proposed using five qualitative variables, including systems quality, knowledge quality, perceived KM benefits, user satisfaction, and system use, for evaluating KM success in the organization.

### 3.3 The Sharing-Driven KMS Development Process

As shown in Fig. 2, the third tier is the iterative process for KM development which addresses the critical issues of participants identification ("who"), motivation identification ("why"), knowledge requirements or needs determination ("what"), and design ("how") for the development of KM systems.

- **Participants Identification—Who**

  The very first task for KM is the identification of participants (i.e., “who”) involved in the knowledge environment. Participants identification can be explained by using the concept of a knowledge market [9]. In a knowledge market there are buyers, sellers and brokers of knowledge. One individual might play all three roles in a single day or there may be several of each generating many transactions during the same period.

  Knowledge buyers are those who are seeking to resolve complex issues that have no easy answers. They look for insights, judgments, and understanding that will make them more successful in their work. Knowledge sellers are those who are reputed to have substantial knowledge about a particular process or subject. Knowledge brokers are the facilitators who make connections between the buyers and the sellers. The problem of finding the right person or group who knows has led to the development of knowledge networks [24], and knowledge brokers play a key role in this endeavor because of their ability to span geographic, organizational, and departmental boundaries.

- **Motivation Identification—Why**

  After identifying the participants, we need to address the issues why participants want to share knowledge in their organizations. According to Lee [25], knowledge sharing is one of the major predictors for organizational capability to learn or acquire the needed knowledge, and it is also important for building strong communities of practice [31]. Davenport and Prusak [9] identified four main reasons why participants share their knowledge: Reciprocity, Repute, Altruism, and Trust. Reciprocity is about the interchangeability of the roles of knowledge participants. Knowledge sellers will sell their knowledge, if they know that the buyers will be willing sellers when their roles are reversed. In addition to the expectation of being provided with equally valuable knowledge from buyers, a knowledge seller might expect reciprocity in the form as increased reputation as a willing knowledge sharer and thus increased knowledge credit in the organization.

  Repute refers to the perception others have for a particular individual based on his or her willingness to share knowledge. Repute can bear tangible as well as intangible benefits. Someone who has a reputation for bearing (and sharing) expert-level knowledge on a particular topic can bring to himself or herself substantial benefits in the form of job security or promotions. Company experts also bring repute to the organizations they work for. Knowledge-intensive firms define and solve their
clients’ problems through the direct application of expert knowledge, and repute is closely associated with value creation and is a key driver in knowledge-intensive firms [39]. Occasionally, knowledge is shared for purely altruistic reasons. This is certainly the case with someone who is passionate about his or her knowledge. Altruism can play an important role in an organization if encouraged and cultivated. Knowledge transactions are based on personal relationships, and therefore are dependent on the trustworthiness of the parties involved. Trust is actually more a catalyst or a lubricant than a motivator. Without trust, knowledge sharing simply cannot take place.

- **Knowledge Requirements/Needs Determination—What**

The next phase of KM development is determining what will be transferred in the knowledge environment. From a knowledge market point of view, both the sellers and buyers have their own knowledge. In order to facilitate the knowledge transaction, each side needs to know what is known, and what the other side wants to know. There might or might not exist some common knowledge between the two sets of knowledge. Knowledge sharing hinges on the premise that there is a unique set of knowledge on each side which the other side does not own. It is the unique set of knowledge that forms the basis of knowledge exchange. Each side wants to know what it does not know and the other side knows. Fig. 3 illustrates this situation. After the desire of each side has been clearly identified, the only question that remains is “how” to share the knowledge between them.

- **Design of Implementation Methods—How**

There have been several approaches to bridging the gap between what “we” know and what “they” know. One is to “patch” knowledge “holes” by sending knowledge back and forth via messengers, emails, letters, or meetings. This approach is like fire-fighting and does not offer systematic solutions to KM development.

KM requires a continuous system of interaction and iteration with the knowledge owners to validate and share existing knowledge. Edgington et al [13] applied knowledge lens in an ontological manner to help synthesize convergent, legitimate perspectives of the desired knowledge while suppressing the irrelevant. For ontology-based KM, both sides’ knowledge should be converged in a true sharing sense, and the knowledge should flow continuously in a cyclic direction, giving all participants the opportunity to benefit from the larger body of knowledge, and contribute the derived knowledge back to it. Fig. 4 illustrates our sharing-enabled continuous-learning approach. New knowledge will be synergistically assimilated into the base of common knowledge (as indicated by the dashed inner circle) through sharing processes, and continue to flow and proliferate in the organization (as indicated by the dashed arrows). As a result, the number of people who have the same knowledge will also increase. This approach is similar to the iterative model proposed by Carlile [6] for managing knowledge and developing common knowledge for sharing across boundaries within or outside an organization through a series of steps: syntactic transfer, semantic translation, and pragmatic transformation.

Effectiveness of our approach is strongly dependent on the sense of community formed among participants in the knowledge market. According to the survey of Consultants News, people working in small firms tend to develop a stronger sense of interdependence of their performance on the firm’s than do people in large firms [36]. This strong sense of interdependence as a community fosters a continuous learning environment, in which people have the strong desire
to share with other people “what we know” and to learn from other people “what they know.”

Several techniques can be employed to enable efficient knowledge capturing and sharing, and help assimilate knowledge into organizational core competence in increasing the competitiveness of the organization. Knowledge repositories or bases are most efficient for storing structured knowledge, which can be indexed by using categories and keywords for providing task-specific and -relevant information to users [10]. Though mainly for storing structured information, a knowledge repository might also include informal internal knowledge, usually in the form of FAQ/help, bulletin boards or pressroom. This type of information is less structured, but it may provide additional insight not evident in formal documentation. However, knowledge repositories fall short in knowledge-intensive consulting firms where “tacit” knowledge is most effective.

Another technique is using knowledge networks to identify existing knowledge as well as the people who hold it for facilitating actual knowledge sharing and transfer among individuals [24]. Knowledge networks function more like the Yellow Pages in helping knowledge buyers locate knowledge sellers. Another difference between knowledge networks and knowledge repositories is in their technical implementation. Repositories generally exist in the form of databases, whereas knowledge network techniques employ tools for communications in addition to databases.

Through the development of their ECOT project, Brazelton & Gorry [5] found out that one effective method for knowledge transfer was to provide face-to-face contact as much as possible. Whether they are formal or informal, face-to-face settings help to build trust and provide for the refining of knowledge contained in repositories through interaction. The Internet, groupware, global communications systems and other technologies can also create great efficiencies for knowledge communications, but they should never overshadow the need for personal contact. Still, King [22] suggests that the best approach is context dependent, and claims that for military-related organizations stringent supervisory control is a more effective means for implementing KM than knowledge sharing culture.

In many cases, a combination of techniques might be needed to achieve the desired results. A company might have a repository for its structured information, communications technology to facilitate face-to-face contact and knowledge access, collaboration technology, such as groupware, mandatory meetings, and company-wide events and efforts that are geared to promote awareness of KM issues. The types of implementation techniques chosen depend on the amount of resources available to the projects, the level of management support, and the ability of those in stewardship positions to communicate the benefits of participation to the rest of the organization.

4 Conclusion
In this paper, we drew on the knowledge market analogy and integrated organizational culture & attributes, KM guiding principles and continuous learning-based systems development methodology into a model for KM initiatives. This model is intended to provide a blueprint for defining the necessary requirements planning for KM projects in knowledge-intensive small firms. Our effort is also for building awareness and cultural receptivity to knowledge in improving the KM process. Effective application of our model requires the involvement of the entire organization, including both internal and external knowledge agents. Norms and values are sometimes developed or changed in an effort to establish a knowledge-sharing environment. This type of effort takes much coordination and a concerted employment of resources. It is more effective in organizations that are less resistant to change in their corporate cultures, but the resulting benefits of a knowledge-sharing environment may provide long-lasting results to any organization.

Our current model does not include mechanisms to measure the contributions of KM initiatives, due to most knowledge-intensive firms treat KM as a strategic initiative instead of an economic investment. However, KM development consumes organizational resources, and thus incurs opportunity costs to an organization. KM development should be treated as an economic investment. We plan to investigate metrics for the economic value of KM. We also plan to expand our current research from the perspective of core competencies of a firm. Methods need to be established for defining the core competencies and for investigating the use of KM systems for leveraging the core competencies in building new ones. This ability of an organization to modify its behavior to reflect new knowledge and insights is a key element of a learning organization [17]. In the practical application of KM, a learning organization provides an environment necessary to effectively leverage and disseminate knowledge and expertise.

Another issue to be addressed is about finding a balance between technology and organizational culture in constructing information architecture for KM. Indeed, organizational culture affects how a
firm thinks about and applies technology within the organization, and this will determine the strategic position of the firm in the market place.

Still, the emergent behavior arising from the interactions among the participants in the knowledge market is another interesting topic for future research, and some useful insights might be learned from the current development in multi-agent systems of artificial intelligence.

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