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Knowledge Management Frameworks:
A Review of Conceptual Foundations and a KMF for IT-based Organizations.

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In the new economic era, knowledge has become the primary source of wealth and consequently, the term knowledge economy or knowledge age. Rapid technological advancements and innovations have narrowed the gap between competing organizations such that the collective knowledge of employees is regarded as the key factor in producing innovative and competitive products or services. Organizations, since the early 1990s, have been forced to rethink the way they manage their intangible assets, which are in form of knowledge resources and therefore the need for knowledge management. Many organisations use knowledge management frameworks as a model that initiates and strengthens knowledge management activities in the context of achieving organisational excellence. However, different knowledge management frameworks do not fully address knowledge management activities across the organisation, such that each of them addresses certain knowledge management elements, while leaving others unattended to. The paper examined 21 knowledge management frameworks guided by three themes as knowledge management activities, knowledge management resources and knowledge management enablers (or influences) on knowledge management. A matrix was developed to capture the individual components advanced by each author with respect to knowledge management activities, resources and influences. Based on the matrices for activities, resources and influences, the individual components were harmonised and integrated in terms of relationships in the context of knowledge management.

The findings are that knowledge management activities are socially enacted activities that support individual and collective knowledge. The activities vary depending on which of the knowledge resources the organization aims at improving. Since each organization has a different focus, knowledge management activities take place in different contexts. These activities have been summarized as knowledge acquisition, creation, repository, sharing, use and evaluation. The organization should consciously choose which of these activities they intend to support in order to identify appropriate organizational variables and technology to enable them have effect. Based on findings, a new knowledge management framework has been proposed to guide practitioners and researchers when conducting knowledge management.

1. Introduction

The world is experiencing a new economic era in which knowledge has become the primary source of wealth [Savage, 1996] and this era has been termed the “knowledge age” or the “knowledge economy” [Sunassee and Sewry, 2002]. With the rapid technological advancements and innovations, the gap between competing organizations has been narrowed such that the trend now is to regard the collective knowledge of
the employees as the key factor in producing innovative and competitive products or services [Sunassee and Sewry, 2002]. Based on this development, Zack [1999] argues that organizations view knowledge as their most valuable and strategic resource, while Nonaka [1998] agrees by pointing out that in an economy, where the only certainty is uncertainty, the only sure source of lasting competitive advantage is knowledge. This change of focus since the early 1990s has forced organization to re-think the way they manage their affairs given that the emphasis is no longer on tangible assets but on intangible assets as well in form of knowledge resources and hence the need for knowledge management [Sunassee and Sewry, 2002].

Knowledge Management (KM) derives its importance from the support it provides to organizations to gain competitive advantage and effective working through sharing and re-using knowledge [Abdullah et al., 2005]. In the global market, knowledge management initiatives are used to systematically control information and expertise to improve organizational responsiveness, innovation, competency and efficiency. The collaborative functions of groupware, for example, Lotus Notes encouraged real-time collaboration and information sharing through the concept of “places” as virtual rooms similar to internet chat-rooms where team members can work on a document or share tools [FT, 2001]. According to Abdullah et al. [2005], there are many reasons why knowledge should be managed properly especially using collaborative technology. The reasons for knowledge management include information overload, technology advancement, increased professional specialization, competition, workforce mobility and turnover, and capitalization of organizational knowledge. In this paper, knowledge management is taken to mean the processes by which knowledge is acquired, created, communicated, shared, applied and effectively utilised and managed, in order to achieve an IT-based organisation’s existing and emerging needs including identification and exploitation of existing and acquired knowledge assets [Alavi and Leidner, 2001; Bhatt, 2001; Holm, 2001; Gupta et al., 2000; Davenport and Prusak, 1998; Quintas et al., 1997; Allee, 1997]. In this case, IT-based organizations have been taken to mean private or public organizations that apply IT systems to support and enhance their core operations including the processing of knowledge creation, storage/retrieval, transfer, and application [Alavi and Leidner, 2001].

Previous research on Knowledge Management Frameworks (KMFs) has enabled many organisations to conduct and implement knowledge management. These KMFs have served as foundations for planning and developing knowledge management systems (KMS) in IT-based organisations to achieve operational excellence. A KMS refers to a class of computer-based information system applied to managing organisational knowledge to support and improve the processes of knowledge creation, storage/retrieval, transfer and application. Most of KMFs discussed in this paper describe or prescribe how organizations manage their knowledge [Lai and Chu, 2000] but still show differences in many aspects including being incomprehensive in some ways [Holsapple and Joshi, 1999; Hsiangchu and Tsai-hsin, 2000]. Different frameworks do not fully address KM comprehensively to take care of organisational requirements [Calaberese, 2000], but each of them addresses specific aspects of KM elements with the implication
that other elements are left unattended to. However, with the advancement in technology and the specificity of many of the existing frameworks, there is need to review these frameworks in details and integrate them into a comprehensive model to facilitate future research and innovation in IT-based organisations conducting knowledge management.

This paper reviews and compares the existing KMFs proposed by various authors in the literature. A synthesis of the KMFs is undertaken to identify the commonalities and shortcomings. By combining these factors, the paper then proposes a new framework, which is believed to be more suitable for IT-based organizations. The paper is organized in the following manner. First, KM background is provided in the introduction followed by a discussion of the conceptual foundations of KM and its relation to information technology. Then a comparative analysis of the existing frameworks is presented, which leads to the development of the comprehensive KMF model. This is then followed by the presentation of the key distinguishing features of the new KMF and the conclusion.

2. Conceptual Foundations of Knowledge and Knowledge Management

2.1 Data, information and Knowledge

Data are at the lowest level of known facts, with little value on their own and have to be organized, analyzed, and interpreted in order to be of value. After the clean up of such data, it then becomes information. Accordingly, information can be described as assembled data into a message that is meaningful [Duffy, 1999]. Therefore, information is data or facts organised to describe a situation or condition [Wiig, 1993]. Information then becomes knowledge after it has been validated. It is the information with context, which provides the understanding and rationale associated with knowledge and cognitive experiences; its insight, judgment, and innovation. In general, knowledge can be experience, concepts, values, or beliefs that increase an individual's capability to take effective action [Alavi & Leidner, 1999; Allee, 1997]. This, therefore, implies that knowledge is a pre-requisite for decision making for many individuals and organizations.

2.2 Types of Knowledge

Previous research suggests the existence of different types of knowledge. According to Polanyi [1967], knowledge can be either tacit or explicit. Tacit Knowledge refers to the knowledge that has a personal quality that makes it hard to articulate or communicate. It can be said to be the knowing or the deeply rooted know-how that emerges from action in a particular context. The tacit dimension is based on experience, thinking, and feelings in a specific context, and is comprised of both cognitive and technical components. The cognitive component refers to an individual’s mental models, maps, beliefs, paradigms, and viewpoints. The technical component refers to concrete know-how and skills that apply to a specific context [Popadiuk and Choo, 2006].

Explicit Knowledge refers to the codifiable component that can be disembodied and transmitted [Alavi and Leidner, 1999]. It is the know-what which can be extracted from the knowledge holder and shared with other individuals [Nonaka & Takeushi, 1995]. It
can be expressed in form of books, reports, data files, newsreels, audio cassettes, DVDs, 
CDs and other physical forms. The explicit dimension may also be classified as object 
based or rule-based. Knowledge is object-based when it is codified in words, numbers, 
formulas, or made tangible as equipment, documents, or models. It is rule-based when 
the knowledge is encoded as rules, routines, or standard operating procedures [Choo, 
1998].

The rule-based knowledge is further broken down into four types of procedures 
[Cyert and March, 1992] as (a) task performance rules for accomplishing organizational 
tasks and facilitating the transfer of learning; (b) record-keeping rules on what records 
and how such records should be maintained by the organization; (c) information-
handling rules that define the organization’s communication system and (d) planning 
rules that guide the planning process and the allocation of resources among the activities 
of the organization.

Besides the tacit and explicit types of knowledge by Polanyi [1967], Choo [1998] 
introduced a third kind of knowledge - the cultural knowledge. This refers to the 
“assumptions and beliefs that are used to describe, and explain reality, as well as the 
conventions and expectations that are used to assign value and significance to new 
information” (p.112). Cultural knowledge is not codified but is diffused over the ties 
and relationships that connect a group. Although Nonaka and Takeushi [1995] did 
not mention cultural knowledge, they attempted to distinguish between knowledge of 
the individual and the collective. Individual knowledge is created by and exists in the 
individual according to his/her beliefs, attitudes, opinions, and the factors that influence 
the personality formation. Social knowledge is created by and resides in the collective 
actions of a group, which forms their cultural knowledge heritage. It involves the 
norms that guide intra-group communication and coordination.

Based on the foregoing and previous researches, Figure 1 below shows the different 
classification of knowledge. Further classification was provided by Alavi and Leidner 
[2001] basing it on its usefulness (value chain) and Zack [1998] who proposed procedural, 
causal, conditional and relational attributes.
2.3 Knowledge Management

According to Bukowitz [1999], knowledge management is the process by which the organization generates wealth from its knowledge or intellectual capital. In a simplified way, knowledge management is the process through which organizations generate value from their intellectual and knowledge-based assets. Most often, generating value from such assets involves sharing them among employees, departments and even with other companies in an effort to devise best practices. Hayek (1945) pointed out that knowledge sharing was an old concept in organizations in which the most important asset is considered to be its ability to process information. Knowledge management has been defined by Kinney (1998) as “the process by which an organization creates, captures, acquires, and uses knowledge to support and improve the performance of the organization”. This definition complements that provided by Anthony (1965) who defined information handling as “…the process of collecting, manipulating and transmitting information, whatever its use is to be…”

2.4 Knowledge Management Paradigms

Two main or meta-level paradigms to explicate knowledge management have been identified in the literature, namely, the scientific view and the social view [Hazlett and McAdam, 2005]. The scientific view of knowledge takes knowledge as “truth” [Alvesson & Willmott, 1996] and that knowledge is essentially a canonical body of facts and rational laws [Swann & Scarborough, 2001]. Gergen [1991] describes such indisputability as “scientists adding sanctity to ideology”. Researchers go through bodies of scientific facts, propose hypotheses, evaluate outcomes of deductions, and then build repositories of knowledge for organizational use.

Considering the limitations of solely relying on the scientific paradigm to interpret knowledge management, a different view or paradigm has been used [Demerest, 1997].
Such a paradigm is what is loosely referred to as the social paradigm of knowledge construction where Burgoyne, Pedlar, and Boydell [1994] state that the “philosophy of science has largely been replaced on the intellectual agenda by the history and sociology of knowledge which emphasizes cultural and historical processes rather than rationally superior knowledge.” This therefore implies that knowledge can be socially constructed rather than being seen as universal scientific truth, which Burgoyne et al. [1994] term “constructionist consciousness.” This concept agrees with Habermas’s view that knowledge constitutes human interest rather than being restricted to a functionalist science. The outcome of this debate is that knowledge management research can be undertaken using either the positivist approach or the interpretivist approach or both in combination but not any more on positivism alone. The implications of science and social paradigms for knowledge management research in relation to their sub paradigms, underlying epistemological assumptions and the applicable methods are shown in the Figure 2 below.

Figure 2: Reflexibility in Knowledge Theory and Praxis (adapted from Hazlett and McAdam (2005))

3. Knowledge Management Frameworks

In the 1990s, there was a strong inclination to research on Knowledge Management Frameworks (KMFs) to better understand knowledge management phenomenon. Many such frameworks have been developed and classified into two categories namely the descriptive and prescriptive frameworks [Holsapple and Joshi, 1999]. The descriptive frameworks attempt to explain the characteristics of the KM phenomenon while the prescriptive frameworks are geared to describing the methodologies to be followed when
conducting KM. In this paper, the attention will be on developing a broad framework that is both descriptive and prescriptive in nature with emphasis on content covering knowledge resources, knowledge manipulation activities, and influences dimensions on the conduct of knowledge management.

From the content angle, the knowledge resources dimension concerns itself with the characterization of an organization’s resources, the dimension of knowledge manipulation activity identifies operations on these knowledge resources that can be executed in the organization’s conduct of KM and the knowledge manipulation activities operate on the knowledge resources under the influence of various factors. The knowledge management influences dimension identifies the influencing or enabling factors that operate on the knowledge management activities and resources. Therefore, based on this analysis, Holsapple and Joshi (1999) contend that the understanding of KM phenomenon depends on:

i. identifying the organizational knowledge resources that need management attention;

ii. categorizing the activities that operate on the resources in the conduct of knowledge management, and;

iii. outlining the factors which affect the conduct of knowledge management.

3.1 Review of Previous Knowledge Management Frameworks (KMFs)

Knowledge management (KM) frameworks provide the organizations with the central areas for consideration in KM efforts [Earl, 2001]. The frameworks can help such organizations to approach KM methodically and consciously [Okunoye, 2004]. Furthermore, they can help to identify a specific approach to KM, to define goals and strategies, to understand the various KM initiatives, and then to choose the best ones in the particular circumstances [Maier and Remus, 2001; Earl, 2001].

Several reviews have been done on existing frameworks but the authors of this paper have focused on framework reviews by Holsapple and Joshi [1999], Lai and Chu [2000] and Rubestein-Montano et al. [2001] which have been used to discuss the main features and assumptions in the existing frameworks. According to Okunoye [2004], most reviewers have generated a consensus on the need for a more generalized framework and further agree that the key components of the framework should be KM intellectual capital, KM processes and KM enablers. The authors of this paper share the same view.

3.2 Key Features of Previous Knowledge Management Frameworks (KMFs)

3.2.1 Knowledge Management Intellectual Capital

A debate has been raging on regarding the rapid changing nature of organisations’ environment within which they operate especially in the developed economies. The debate goes on to discuss what constitutes a competitive advantage to an organization [Eggu, 2002]. Knowledge has been identified as being a source of competitive advantage for organizations and that it is fast overtaking capital and labour as the key economic resource in form of an intangible asset in advanced economies [Eggu, 2000; Edvinsson,
Hence, management of knowledge in organizations has to be done in an effective and efficient manner. The critical advantage of knowledge management is vested in the intellectual capital as a resource [Lai and Chu, 2000]. Different knowledge management frameworks have developed several resources dimensions which have been summarized into three types of intellectual capital namely human capital, structure capital, and customer capital [Holsapple & Joshi, 1999; Hahn and Subramani, 2000; and Okunoye, 2004].

The benefit and strategic importance of knowledge management provides leverage to an organization to correctly identify which type of intellectual capital they can improve and apply to gain sustainable competitive advantage [Okunoye, 2004]. Bukowitz and Williams [1999] describe knowledge management as the process by which the organization derives wealth from its knowledge or intellectual capital. The components of intellectual capital form the knowledge management resources [Stewart, 1997], which are the organization’s assets that can be used to achieve organizational goals.

The first knowledge resource is human capital, which refers to the employee capability to solve a problem and is the source of creativity. This is similar to the terms “employee knowledge, “employee competencies” and “professional intellect” proposed by Leonard-Barton [1995], Sveiby [1997] and Quinn, et al. [1996] separately. The framework by Leonard-Barton [1995] identified two types of knowledge resources - employee knowledge (human capital) and physical systems (structure capital) such as machinery and databases. In line with this thinking, the Petrash [1996] framework came up with four more types of intellectual capital: customers (referred to as customer capital), organizational processes, organizational structures, and organizational culture but the latter three relate to as organizational capital. Sveiby’s framework is similar to Petrash but further incorporates customer capital within the external intellectual capital but excluding customers (e.g., suppliers).

The second intellectual capital is structural capital that relates to the organizing capability of an organization in order to meet the customers’ needs. The organizing capability refers to organizational structure, processes, systems, patents, culture, documented experience and knowledge, and the capability to utilise knowledge through sharing and transferring [Stewart, 1997; Holsapple & Joshi, 1999; Mayo, 1998]. According to Lai and Chu [2000], this was considered to be similar to the terms “internal structures,” “organizational capital” proposed by Sveiby [1997] and Petrash [1996] separately.

The third kind of intellectual capital is customer capital. It concerns the relationship between an organization and its stakeholders, such as a supplier or customer relationship, brands, and reputation [Stewart, 1997; Holsapple & Joshi, 1999]. This was called “external structure.” by Sveiby [1997].

### 3.2.2 Knowledge Management Processes

Knowledge management processes are the sequential steps of conducting knowledge management in an organization. A number of KMFs have been proposed and some have been modified by various authors in as far as knowledge management processes (activities) are concerned. In addition, several reviews have been made that have
summarized or integrated the knowledge management processes [Holsapple & Joshi, 1999; Lai and Chu, 2000]. One such comprehensive review was by Lai and Chu [2000] who indicated in their review that all of the knowledge processes included in the previous frameworks were integrated based on the “content” of the processes rather than the “name” of the process and concluded that these processes can be classified into seven processes as initiation, generation, modeling, repository, distribution and transfer, use, and retrospect.

Knowledge management processes are socially enacted activities that support individual and collective knowledge and interaction [Alavi and Leidner, 2001]. These processes vary depending on which type of knowledge intellectual capital the organization aims at improving. Since each organization has a different focus, KM processes take place also in a different context.

3.3.3 Knowledge Management Enablers

Knowledge management enablers (also called factors) have an impact (positive or negative) on the way knowledge management processes are manipulated. The outcome of knowledge management processes is affected by the enablers. Holsapple and Joshi [1999] identified five researchers who contributed to the discussion on knowledge enablers as Leornard-Barton [1995], Van der Spek Spijkervet [1997], Szulanski [1996], Wiig (1993), and Arthur Andersen and APQC (1996. These enablers have been summarized as leadership, culture, measurement, technology, education, reward and incentive systems, and value and norms [Holsapple and Joshi, 1999; Lai and Chu, 2000]. These enablers have been further classified into three groups a) internal organisational variables, b) external organisational variables and c) facilitating variables that cut across the previous two i.e. both internal and external such as information technology.

Organisational Variables

Okunoye [2004] used the conceptual framework on organizational issues developed by Galbraith [1977] to explain the need to identify and classify the internal enablers to the organization as organizational variables [Hurley and Green, 2005]. The original conceptual framework was modified by Okunoye [2004] to include the component of culture (internal culture) that related to the organization and this is presented in Figure 3. This chart therefore is a good representative of the organizational ‘internal’ variables that were modified by various researchers as enablers.
Facilitating Variables have specifically been tagged to Information technology (IT), which has already made its mark in supporting the processes for knowledge creation, sharing, storage and use [Alavi and Leidner, 2001]. In this era of the internet, World Wide Web and ubiquitous computing, modern organizations no longer view IT as being only to support various organizational processes but also as a source of competitive advantage and organizational core capability [Holsapple and Joshi, 1999; Alavi and Leidner, 1999; Okunoye 2004]. IT has the ability to make the information and decision making processes easier. It also supports changes in the organizational structure and influences communication within and between organizations. Most of the contemporary organizations have been affected by IT in every aspect including the thinking of people and conduct of businesses at the workplace, if the organization is IT enabled [Lau et al., 2001]).

External organizational Variables also known as environmental variables have been identified as enablers [Holsapple and Joshi, 2000; Lai & Chu, 2000; Okunoye 2004]. These are the factors outside the control of the organization and do arise from within the surrounding environment for the organization. Environmental variables have been taken to include governmental, economic, political, social, and educational factors [Holsapple and Joshi, 2000].

In summary, the knowledge management enablers (variables) can not be ignored when conducting knowledge management. Organisational change and transformation in the nature of work done by organization including knowledge management is better understood by looking at both the technological and the institutional (specifically environmental) changes that are reshaping economic and organizational activities [Orlikowski and Barley 2001]. This therefore provides a manifestation of the
interrelationship of the environment, organizational and technology variables including information technology.

4 Proposed Kmf for IT-based Organisations

Many organisations in conducting KM use Knowledge Management Frameworks (KMFs) as a basis for planning and developing knowledge management systems. All frameworks identified in this research describe how organizations manage their knowledge [Lai and Chu, 2000] but are different in several areas and are still lacking in some ways [Holsapple and Joshi, 1999; Hsiangchu and Tsai-hsin, 2000]. Different frameworks do not fully address KM across the full spectrum of organisational needs [Calaberese, 2000] especially IT-based organisations, but each of them addresses certain KM elements while leaving others unattended to. However, with the growing need to accelerate research in knowledge management, the authors have reviewed these frameworks in details and integrated them into a comprehensive KMF model to guide future research in IT-based organisations.

4.1 KMF Model Design

A review of literature on knowledge, knowledge management and knowledge management frameworks was undertaken; the purpose specifically was to identify commonalities and shortcomings in knowledge management frameworks so as to develop a generic knowledge management framework appropriate for IT-based organizations. A total of 21 knowledge management frameworks were reviewed from 1993 to 2004.

The review was guided by three themes as knowledge management activities, resources, enablers (or influences) adopted from Lai and Chu [2001] and other researchers. A matrix was developed to capture the respective components of each author with respect to knowledge management influences, resources and then activities. Based on these matrices for influences, resources and activities, the individual components were then harmonised in terms of relationships in the context of knowledge management. Therefore, some components were combined, where possible, in the sense that they refer to the same thing and consequently, a new list of components was derived for each matrix.

4.2 Structure of the Proposed KMF

Based on the literature survey and analysis, the authors have constructed a new comprehensive framework for IT-based Organisations, which addresses the shortcomings of the existing models. The proposed framework consists of two main distinguishing aspects or elements as 1) integrated Knowledge Management Influences Aspects encompassing environmental, information technology and organizational factors and 2) Knowledge Development Aspects that consist of knowledge management planning, resources and activities as shown in Figure 4. These two aspects interact with each other and within each aspect. The environmental factors relate to national infrastructure and culture in the surrounding environment while organizational factors concern corporate variables and information technology factors (over rapping with the environment) support the process of knowledge creation and its sustainability. These factors shape the other key knowledge development aspects of the framework that include knowledge planning, knowledge resources and knowledge activities (processes).
Based on the model, it is then possible to clearly identify the key components of the proposed KMF model as being:

i) Knowledge Influences Aspects
   a) Environmental Influences
   b) Information Technology Influences
   c) Organizational Influences

ii) Knowledge Development Aspects
   a) Knowledge planning,
   b) Knowledge resources
   c) Knowledge activities

4.3 Key Components of the KMF Model

4.3.1 Knowledge Influences Aspects

Whereas previous analyses on influences (called enablers or factors in previous KMFs) were based on five frameworks at the time [Lai & Chu, 2000], the authors’ analysis has been based on 16 other frameworks that have made a contribution to influences including those after 2000. Although these influences had been further categorised into three groups as a) *environmental influences* b) information technology influences and c) *organisational influences*, the individual influences already identified had not been integrated into these category group, which the authors have done. Based on this approach, the authors have re-classified the influences as shown in Table 1 as identified by Holsapple and Joshi [1999], Lai & Chu [2000] and other researchers.
a) **Environment Influences** - The Environmental Influences are in the outer circle of the KMF model to represent governmental, economic, political, social, and educational factors. But these are further categorized into two ie the national culture and the national infrastructure. The **national culture aspects include** norms, values and beliefs while the national **infrastructure aspects cover** education, banking and cooperatives, transport and communication systems and other industry players [Holsapple and Joshi, 2000; Okunoye, 2004].

### Table 1: Knowledge management influences

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<td>Leonard - Barton, 1995</td>
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<td>Saudamiki, 1996</td>
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<td>Holmapple &amp; Jishi, 1999</td>
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b) **Information Technology (IT) Influences** - Information Technology has been also instrumental in enhancing communication and the interaction of individual, group, organizational, and inter-organisational knowledge [Nonaka and Takeuchi, 1995; Hedlund, 1994]. Although some elements of IT are part and partial of the internal organization like the local area network (LAN), computers and software that form the organisation's information system, there is the other part of the IT that is external and hence organizations do not have direct control over those elements of IT such as the other networks, the internet and the communication system outside the LAN. So, it is crucial that IT, because of its strategic importance to all organizations and more especially those that are IT-based (intensive), should stand...
out alone as a separate influence to knowledge management. Hence, information technology facilitates rapid search, access and retrieval of information, and enables collaboration and communication between organizational members. In essence, it plays a variety of roles to support an organization’s KM processes [Alavi and Leidner, 2001; Lee and Hong, 2002; Wong, 2005].

c) Organisational Influences - Based on the summary provided in table 1, many of the influences relate to factors within the organization [Galbraith, 1977] and these include corporate culture, leadership, corporate infrastructure, knowledge structure, vision, continuous learning, knowledge worker, measurement, reward and incentives, among others. In view of their interrelationships as depicted in Figure 3, each of these influences has implications for KM efforts in organizations. It has been observed that particular attention be paid to organisational influences without which the success of KM becomes doubtful.

4.3.2 Knowledge Development Aspects

i) Knowledge Management Planning
Planning is one of the key principles of management that deals with setting objectives to achieve organizational goals [Vasquez et al., 2000]. Although previous research on knowledge management frameworks has hinted on planning, it has not been emphasized as an important factor to start on before conducting a knowledge management activity. The authors argue that it should be the first step in the conduct of knowledge management and incorporated in the IT-based KMF. Holsapple and Joshi [1999] brought out the issue of planning in the focus dimension. The focus dimension identifies the primary intent of a framework, which in our view is in reference to planning. In the same vain, Arthur Anderson and APQC [1996], for example, identify the need to provide a basis for benchmarking the conduct of knowledge management within and between organizations and most likely at the beginning of a knowledge management project. Similarly, other researchers whose contribution was in reference to planning included Van der Spek Spijkervet [1997] by advocating for a conceptualize-reflect-act-retrospect cycle. In addition, Szulanski [1996] proposed the need to identify and examine the barriers that prevent transfer of best practices within an organization when conducting knowledge management. However, none of these previous frameworks placed knowledge management planning at the centre stage of their KMFs.

The authors contend and agree with previous researchers that knowledge management frameworks can help to identify a specific approach to knowledge management, to define goals and strategies, to understand the various KM initiatives, and then to choose the best ones in the particular circumstances [Maier and Remus, 2001; Earl, 2001] but this can only be achieved through a proper planning process. Knowledge management process therefore should begin with planning. This is more so given that knowledge management in its generality is a conceptual framework that encompasses all activities and perspectives required to plan for and gain an overview of the organizational knowledge assets and their conditions [Wigs, 1993]. This approach makes a knowledge management framework pinpoint and prioritize those knowledge areas that require
Knowledge Management Frameworks

management attention; further it identifies the salient alternatives by suggesting methods for managing them, and conducts activities required to achieve desired results. Wigs therefore identified that planning was important in the management of knowledge [Vasquez et al., 2000]. Maier and Remus, [2001] and Earl [2001] also recognized the importance of planning, which is reflected in their argument that knowledge management frameworks can help to identify a specific approach to knowledge management. It is against this background that a recommendation is being made that the starting point to conduct knowledge management should be the knowledge management planning function.

ii) Knowledge Management Resources

Previous authors have focused on knowledge management resources (also called intellectual capital in previous KMFs) as being composed of three components—human, structure and customer resource (capital). However, this categorization does not take into account the asset value brought about by IT. IT has generated many possibilities of advancing KM not only in terms of using it as a tool but also as a KM resource. Therefore, the authors propose a fourth knowledge management resource termed Collaborative Technological Capital (CTC) to cover concepts that do not properly fit in the earlier categorization.

Collaborative technology has been described as a tool that supports team members or other tools that share information and contribute to any knowledge management system [Hayden, 2003]. These technologies provide a platform that allows team members to collaborate on problems or projects, efficiently capture data and information, and transform it into knowledge. It is against this view that this new knowledge generated from collaborative technology becomes a knowledge resource or capital and hence the use of the term collaborative technological capital. Abdullah et al. [2005] supports the view that knowledge would be more useful if it could be shared and used among the organisation’s staff that work together using collaborative technology at anytime, anyplace and anywhere. Hahn & Subramani [2000], on the other hand, argued that many organizations currently deploy corporate intranets so that important documents can be posted and accessed by other users browsing or searching through the site. The emphasis was that such documents do not follow a predefined structure but search and retrieval is achieved via search engines that locate documents using full-text search. The use of collaborative filtering technology that recommends documents is an alternative approach to locating documents relevant to a user’s question or problem without structuring contents a priori. The collaborative filtering system records the browse and search behaviors of users and recommends documents based on the past behaviors of other users when they performed similar searches. This is an aspect of collaborative technological capital as a resource in knowledge management. The authors note that all the three researchers mentioned identified CTC but in the context of building knowledge management systems and not in the sense of being a component of the KMF as a resource.
Collaborative technological capital as a fourth resource in KM provides new grounds for reclassifying the contributions made by earlier authors. Leonard-Barton [1995] for example considered databases under structure but these can be also in collaborative technological capital. Sveiby [1997] looked at concepts, and computer and administrative system under structure capital but this too can be placed under collaborative technological capital. On the other hand, Hahn & Subramani [2000] and Abdullah et al. [2005] identified collaborative technological capital as a legitimate knowledge asset. It is against this view that collaborative technological capital as fourth knowledge resource is justified.

Table 2: Classification of Knowledge Management Resources

<table>
<thead>
<tr>
<th>Author</th>
<th>Knowledge Resources</th>
<th>Human Capital</th>
<th>Structure Capital</th>
<th>Customer Capital</th>
<th>Collaborative Technological Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leornard-Barton, 1995</td>
<td></td>
<td>Employee Knowledge</td>
<td>Physical systems (Machines)</td>
<td></td>
<td>Physical systems (Databases)</td>
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<tr>
<td>Petrash, 1996</td>
<td></td>
<td>Human Capital</td>
<td>Organizational capital/structures</td>
<td>Customer capital</td>
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<tr>
<td>Sveiby, 1997</td>
<td></td>
<td>Employee competence</td>
<td>Internal structures (patents, concepts, models, &amp; culture.)</td>
<td>External structures (customer &amp; supplier relationships, brands)</td>
<td>Concepts, computer and administrative systems</td>
</tr>
<tr>
<td>Steward, 1997</td>
<td></td>
<td>Human Capability</td>
<td>Organizing Capability (structure, culture, processes, patents, experience)</td>
<td>Stakeholder Relationships (supplier, customer, brands, reputation)</td>
<td>Organizing Capability (systems, documented experience)</td>
</tr>
<tr>
<td>Klobas, 1997</td>
<td></td>
<td>Individuals</td>
<td>Recorded knowledge</td>
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<td></td>
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<tr>
<td>Hahn &amp; Subramani, 2000</td>
<td></td>
<td>Individuals</td>
<td>Organizational knowledge - repositories, Datawarehouses</td>
<td></td>
<td>Collaborative filtering (Intranets, Search Engine)</td>
</tr>
<tr>
<td>Abdullah et al., 2005</td>
<td></td>
<td>Knowledge workers</td>
<td>Organizational capital (documents, repositories, processes, practices, norms)</td>
<td></td>
<td>collaborative technology capability any time/place/anywhere-email, engines</td>
</tr>
</tbody>
</table>

Knowledge management resources can have structured and unstructured segments for purposes of knowledge management support [Hahn and Subramani, 2000]. In this regard, the Figure 5 below represents the four components of knowledge management resources and the examples of such knowledge under each resource for IT-based organisations [Abdullah et al., 2005]. The human capital resource, for example, has yellow pages of experts, expert profiles, and experts’ database under structured knowledge and electronic forum under unstructured knowledge. The other resources also have examples that have relevance to IT-based organisations. The structure capital,
for instance, has repositories, data warehouses, systems, processes etc as structured knowledge while culture and norms fall under unstructured knowledge. The customer capital, on the other hand, has repositories, data warehouses, systems, processes under structured knowledge whereas relationships with stakeholders belong to unstructured knowledge. Finally, collaborative technological capital has intranets and search engines [Abdullah et al., 2005; Hahn & Subramani, 2000] as unstructured knowledge. The re-classified knowledge resources can then be fitted into the proposed comprehensive knowledge management framework as a major pillar.

Figure 5: Knowledge Management Resources for IT-based organizations.

iii) Knowledge management activities

For the purpose of this paper but basing on previous frameworks, a new and simplified matrix has been developed as shown in Table 3 to serve as an analytical framework for the review and presentation of the activities more applicable to IT-based organizations. The knowledge activities were re-classified and summarized into six activities basing on content of each activity as analysed from previous frameworks. The new structure of activities is knowledge acquisition, creation, repository, sharing, use and evaluation. The authors took and considered these as the key management activities for the development of the generic comprehensive knowledge framework appropriate for IT-based organizations. From the 21 knowledge management frameworks reviewed, only 16 of them were focused on knowledge management activities. The organization should consciously choose which of these activities they intend to support in order to identify appropriate organizational variables and technology to enable them have effect.
Table 3: Knowledge Management Activities

<table>
<thead>
<tr>
<th>Authors</th>
<th>Acquisition</th>
<th>Creation</th>
<th>Repository</th>
<th>Sharing</th>
<th>Use</th>
<th>Evaluation</th>
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<tbody>
<tr>
<td>1. Wiig, 1993</td>
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<td>2. Nonaka, 1994</td>
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<td>3. Leonard-Barton, 1995</td>
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<td>5. Choo, 1996</td>
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<td>7. Van der spek and Spijkervet, 1997</td>
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<td>8. Alavi, 1997</td>
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<td>10. M’Rad, 2000</td>
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<td>11. Alavi and Leidner, 2001</td>
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A brief outline of each knowledge management activity identified in Table 3 is provided below:

**Knowledge acquisition** - Knowledge acquisition is the process of acquiring knowledge from both internal and external sources of the organisation. It is acquired through various ways for instance, internally through induction programme for new employees and externally through educational institutions and previous employers. The knowledge for example, customer service experience, which the new recruits bring to the organization, can be converted for the benefit of the organization [Koh *et al*., 2005]. The source of knowledge acquisition has no limits; it could be from superiors, customers, advertisements, magazines, newspapers and television. [Koh *et al*, 2005]. Information made available through ICT, manuals, memos and e-mails provides the supporting environment to enhance knowledge acquisition process.

**Knowledge creation** - Knowledge creation is the transformation of tacit knowledge to explicit knowledge and vice versa. The conversion of one kind of knowledge to another has been explained using the Spiral of Organizational Knowledge Creation Model proposed by Nonaka and Takeuchi [1995] as explained below:

*Socialization:* This is the creation of tacit knowledge from other tacit knowledge, through experiences shared by many members of the organisation. It rests on the transmission of tacit knowledge from one person to another without using formal communication but through observation, conversation, imitation and practice e.g. using teleconferencing technology.
Combination: This is the creation of explicit knowledge from an explicit knowledge source, for example through filtering, categorization or “re contextualising” of explicit knowledge, brainstorming for instance falls in this category. An example of combination is by using groupware technology.

Externalization: This emphasizes converting tacit knowledge to explicit knowledge through codification e.g. by using e-mail and broadcasting technology.

Internalization: This involves converting explicit knowledge into tacit knowledge e.g. using visualization technology. The process of knowledge creation draws extensively from the existing knowledge base, for instance, transformation of explicit, tacit and cultural knowledge to new knowledge. When management tries to resolve an issue by finding a solution, it results in knowledge creation. Once a solution has been found and implemented successfully, the new knowledge can be made available organizationally by the management. [Koh et al, 2005].

Knowledge repository - Knowledge storage/repository is the ability of providing a centralised repository for knowledge storage, for example a public library and a database of related information about a particular subject. In the context of information technology, a knowledge repository is a machine-readable resource for the dissemination of information, either online or offline. A well-organized knowledge repository can save the organization money by decreasing the amount of employee time spent trying to find information for instance on company policies and procedures.

Knowledge sharing - Knowledge sharing is the means by which organization obtains access to its own and other organizations’ knowledge. Experience and research suggest that successful knowledge sharing involves extended learning processes rather than simple communication processes, as ideas related to development and innovation need to be made locally applicable with the adaptation being done by the ‘incumbent organisations’ for the ideas to be successfully implemented [Cummings, 2003]. When knowledge is shared in the organization to achieve an organizational goal, the knowledge is distributed. Sharing of knowledge takes place in two ways for example formal and informal. Formal sharing takes place through official channels like meetings, discussions, e-mail, web-postings and memos, while informal sharing takes place inside or outside the office, for instance, during breaks and time out. Deliberate management attempts can improve the knowledge sharing functions in the organisation. These measures could include community of practice, quality circles and buddy training [Koh et al, 2005].

Knowledge use - Knowledge use is the process of getting knowledge utilised for a particular purpose; this occurs, when knowledge is put into action for decision making or policy making. Knowledge utilization results in knowledge increase, by gaining expertise and insights. Employees learn through experience on how to deal with a particular type of enquiry efficiently. For instance, frequent use of the information helps employees to locate the information faster and become aware of the location in which the information resides. Knowledge is useless if it is not utilized. People do not just passively receive
knowledge; rather they actively interpret it to fit with their own situation and perspective [Nonaka, 1998]. Utilization of knowledge increases the expertise in a domain of action, and the user becomes an expert through repetitive practice.

**Knowledge Evaluation** - This is the process of appraising the knowledge available to the organisation say in its repository to assess whether it meets the organisation’s objectives. It is also a process of determining whether new knowledge was created [Lai and Chu, 2000].

5. **Differentiating Features of the Comprehensive KMF**

The discussion of previous frameworks above provided the foundation for designing a comprehensive framework for IT-based organizations. This framework differs from the other previous KMFs in several ways:

1) It introduces and emphasizes the need to start the conduct of knowledge management with planning and continue interactively with the other components of the framework like knowledge resources, activities etc.

2) It acknowledges the impact of IT on KM as a knowledge management resource enabled through collaborative technologies. This therefore increases the knowledge resources from the three previously advanced to the current four namely human, customer, organization structure and collaborative technological capital, which now form part of the comprehensive KMF.

3) It harmonizes the knowledge management activities into six activities (acquisition, creation, repository, sharing, use and evaluation) that are considered as core to KM in IT-based organizations. These six activities summarize and integrate all the previous researchers’ KM activities that have been advanced as the processes required and necessary in the conduct of KM in an organisation;

4) It harmonises all the individual influences previously advanced and classifies them into three groups ie environmental influences, information technology influences and organizational influences.

6. **Conclusion**

The framework provides a methodology for the conduct of knowledge management. It is intended to provide a basis for organizations to undertake the design of better policies, modification of actions and delivery of desired results. Accordingly, the framework presented can be used by any person intending to develop or evaluate knowledge management in any organization. The integration of previous frameworks into this comprehensive framework can aid the acceleration of research in knowledge management.

Previous research has shown that knowledge management provides a major competitive advantage and as such is a critical activity. This is so given that KM is the process of managing knowledge through a systematically and organizationally specified process for acquiring, organizing, sustaining, sharing, and renewing both tacit and
explicit knowledge of employees to enhance organizational performance and create value [Allee, 1997; Davenport and Prusak, 1998; Alavi and Leidner, 2001].

Knowledge management, as a managerial activity which develops, transfers, transmits, stores and applies knowledge for decision making in order to attain the organization’s goals, requires careful planning before implementation. Furthermore, the activation of individual components within the framework should take cognisance of the fact that these components are inter-related, which is in line with Leavitt [1965] model of organisational change recommendations that makes a case for the interdependence of productive variables.

The framework, however, has not been evaluated to test its consistency and validity. It is suggested that further research should look into the evaluation of this framework.

References


