

A Novel Approach To Design Quality Model For Knowledge Management Systems

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Abstract: The Knowledge Management System (KMS) becomes cynosure of overall business strategies to ameliorate the organization's economy, it has various dimensions to understand strongly before develop or deploy for organizational benefits. The KMS is becoming more complex and diverse as a result of advancement in Information and Communication Technology (ICT), Even though there is no option to manage and get the benefit of its intellectual assets .However many of the initiatives of KMS fail since it is unable to achieve the expected quality in significant dimensions. An investigation of significant dimensions must be ensured to avoid failure. Moreover KMS Development Life Cycle(KMSLC) is fundamentally different from any other software system life cycle since the conventional system life cycles are primarily dependent on its functionality, were as KMS associated with knowledge and its related functionality. This paper investigates some of the recent and widely accepted KMS Development Life Cycles and proposes the quality dimensions and factors requirements in each stage of the life cycle to ensure the quality of KMS.

Index Terms: Devenport and Prusak Life cycle Model, Dixon Life Cycle Model, Elias M.Awad and Hassan Ghaziri Life cycle Model, Garvin's Life cycle Model ,KMS Quality, Knowledge management System, Liebowitz and Wilcox's Life Cycle Model, Tiwana Life Cycle Model.

1. INTRODUCTION

Knowledge Management System (KMS) is a collective process for organizational knowledge from identification to dissemination, which can improve the values of an organization by providing a homogenous structure for organizational knowledge extracted from heterogeneous sources. As more and more organizations undertaking KMS initiatives and incorporating KM strategies becomes cynosure of overall business strategy to ameliorate the organization's economy. Consequently, as organizations expected evidence of knowledge management's contribution to organizational performance in terms of financial indicators, this contribution is being progressively examined and an organization becomes heed of the power of knowledge as the most valuable strategic resource in the knowledge economy. The knowledge management becomes widely recognized as essential for the success or failure of organization [19]. According to one estimate, 81% of the leading organization in Europe and the U.S are utilizing some form of KM [11]. But knowledge management system has various dimensions to understand strongly before develop or deploy it for organizational benefits. The KMS are becoming more complex and diverse as a result of advancement in Information and Communication Technology (ICT). Even though there is no option to manage and get the benefit of its intellectual assets. However, many of the initiatives of KMS fail since it is unable to achieve the expected quality of significant dimensions. So the quality of KMS depends on dimensions associated with it, an investigation of significant dimensions must be ensured to avoid failure. But KMS associated with various aspects such as Process, technologies, knowledge, people, organization and culture, etc. Moreover, the procurement of suitable ingredient of KMS such as e-services, method, and tools for the knowledge process (creating, storing/retrieving, enrichment, etc) are also playing a prime role in the quality of KMS.

An understanding and applying the suitable technology, tools, and method on the organizational process for effectiveness is an iterative process since the business process needs continuous improvement to reduce the defects of the ongoing process. So organizational Knowledge is a key to the success of any organization, and maintains the knowledge of business techniques and gathering experience from experts are vital assets of any organization. The Knowledge management system is important to ameliorate the economy, reduction of product development time, effective utilization of resources in an organization. The Knowledge and its management are critical for enhancing sustainable competitive advantage and improving performance of organization [20]. The knowledge management (KM) and knowledge management systems (KMS) have gained tremendous momentum within the last decade. An understanding nature, related success factors, and suitable model are much important to avoid the negative impact of KMS on the economy of business since many KM implementation was unsuccessful and to date, many organizations are yet to reap benefits to the fullest extent[2]. Almost all industries using some form of knowledge to achieve competitive advantages in their field, such as intellectual properties, customer data, financial records, strategies and trade secrets, Moreover Knowledge Management systems(KMS) becomes inevitable to every industry due to rapid change in technologies, customer expectation, loss of key personals and non-volatile in market strategies. Almost all the research works related to quality models for KMS are limited in views. This research includes the investigation of significant dimensions and quality factors to effectively asses the quality of KMS in various stages of its life cycle.

2 WHAT IS NOT KMS?

KMS is to add the values to the organizational product, process, and people. This is possible with KMS, provided it is content quality should be beyond the regular practice, service, and standard. To investigate quality dimensions there should be a strong fundamental are required about KMS since it is multidisciplinary fields and has roots from many fields such as systems, Information Management, People, Psychology, technology, process business management. So it is necessary to cover all these fields under significant aspects, to investigate its quality dimension and factors. This research has considered five aspects to include all these associations

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as Technology, functional, people, organization and values. Moreover, research focus not only what is required for KMS's effectiveness rather it also focus on what is not required, So It is equally important to understand fields with which KMS not associated, the perceptions with which KMS do not having association are :

i) KMS is not concern about restructuring or reengineering of organizational process, instead, it concerns about another way of improving organization values in terms of quality, productivity and benefits through the intellectual base.

ii) KMS is not merely a digitalization of organizational knowledge; it provides an effective approach in every processes concern with KMS such as identification, creation, formatting, and disseminating, etc.

iii). KMS dependence on knowledge (As Know-how) not on information (As for what) or data (raw facts).since KMS gives us knowledge with quality reasoning.

iv) KMS is not only a source for organizational knowledge since knowledge cannot be captured by a single source or system completely.

v) KMS is not an intellectual capital of organization such as trade secrets, patents, etc. Its gives knowledge about the best methods, tools, and procedure to solve the organizational issues effectively.

KMS QUALITY

The KMS quality is concern with the quality of its associated roots such as software, process, KMS life cycle, and content.

KMS Quality Model provides the basis through which it is possible to control and improve processes. So KMS quality model is the road-map to achieve the expected level of quality in the product. Every product has its own perceptions, the analysis the attitudes of the product are very important before stretching the framework. Knowledge Workers can consider the following perceptions for the quality framework.

- Nature of the developing product
- Purpose of the product
- Operating Environment
- System User.

An organization can collect requirements of quality from quality experts, users, market people and organization leaders then knowledge workers can select the appropriate model from the repository based on collected information, and then eliminate the unwanted factors from the selected model can lead the organization to save cost and time. The knowledge workers can use these perceptions to eliminate the quality factors in various stages of KMSDLC.

Nature of Developing Product

The understanding of nature of developing product can help an organization to eliminate some factors in the model and can determine its appropriate dimension in quality model. For example, while developing the intelligent-based KMS development team need not have more attention on portability instead of future-proofed and portability can be considered in knowledge user's expected dimension instead of KMS developer dimensions. There are three types of KM system:

1. Enterprise-Wide KMS: This types of knowledge users can use KMS for all types of the organizational problems.
2. Knowledge Work System: The KMS of this can provides knowledge to organizational people to any particular problem

of organization. eg. Production, manufacturing .that means it won't cover all organizational problems.

3. Intelligent Techniques: The KMS of this type can be used by experts of an organization for the betterment of organization service such as new products, and improve customer satisfaction.

The knowledge deals with information with semantic meaning that means information can become as knowledge when information has the context, inferences. In general, there are some feature of IS are also applicable to KMS as below

- Supporting many business processes
- Individual support
- Workgroup support
- Organizational and Inter-organizational support [21]

But, in specific there are some features are unique to KMS alone such as values, content standard, and inference. Apart from all these differences, the perceived values are concerned with KMS since information systems can deliver information and benefits conceived by delivered information need not be measured. But KMS outcomes must be evaluated to ensure its applicability towards problems. Similarly, there is some feature specific features KMS are [21]:

- Knowledge related process (creation, identification, sharing, and formalization.
- Knowledge
- Tacit
- Explicit knowledge
- Experience
- Values
- Skill
- Expert insight
- Grounded intuition

Purpose of Product

The purpose of product usage can also help the organization to correct the factor's rank and degree of expected quality factors. For example the knowledge-work KMS product need of more attention on accuracy and interface, and no need of more importance to re-usability.

Operating Environment

The third perception is the environment on which the system going to work. Analysis on this perception will lead the organization to decide the degree of maintainability, usability required for the proposed system.

System User

The ultimate aim of KMS is to solve organizational problems effectively. So the analysis of its Users of the system makes the organization stretch the level of understandability, flexibility, interface, and relevance of knowledge. From the above investigation of QA in product and process aspects, it concluded that KMS related process and development stages need to be investigated for the betterment of KMS quality. The investigation of the KMS life cycle can helps to understand KMS's Nature, purpose, operating environment and user. So the rest of the chapter presents the review on KMS Quality and Life cycle. further review on recent and widely used software process quality and product quality model for KMS suitability will be discussed. There are different reasons have been raised for the necessity of measurement for KMS quality as listed below[13][6]:

- To Measure impact of knowledge on business results and

benefits.

- To provide roadmap to monitor performance levels.
- To define what to pay attention to and improve.
- To give an indication of quality deviation and the resource utilization.
- To give a standard for quality.
- To increase enthusiasm and support for KM by measurable success.

Understand the key performance factors are much important to avoid the negative impact of KMS since many KM implementations are a failure and yet to reap benefits to the fullest extent. The reasons behind failures are misconception of multidisciplinary fields' nature. The KM quality dependent on roots of other fields such as software, information, people, business, technology, contents psychology, social networks, cognitive science, etc, all these fields must be grouped under some common features so that investigation can be done on those aspects. This research grouped all the related fields of KMS into four aspects: Technical, functional, organization and people. there is several definitions to describe KMS as a product to perform knowledge-specific process for organizational effectiveness through values. So Effectiveness of KMS incorporates qualities of four aspects. But in general Quality have various definitions in different aspects and this research has considered the following definitions to proceed further.

ISO 8402 defined quality as "the totality of features and characteristics of a product or service that bears on its ability to satisfy stated or implied needs". This definition indicates two important issues that is:

1) Satisfies customer's needs, this means any quality system foremost goal is to meet the expectation of its users. Unfortunately, customers can not express whole his/her needs at once and expectations since it can be changed depending on time, business strategies, service, market, and technology. The requirement of users cannot stop at any point in time during system utilization. so a developed system should have an ability to meet upcoming requirements.

2) Quality is a set of characteristics that can be measured. This leads to the fact that defining the dimensions of each "entity" consider being important in achieving quality [2].

But quality is also defined in application aspects such as: 'fitness for use[1] and 'Conformance to requirements[12].

These definitions are focuses in usages (effectiveness) and requirement of users (values), that is quality product should meet customer needs and fitness through characteristics, which can provide those customers expectations (usage and fitness). So a quality model must incorporate quality characteristic in terms of technical and functional for fitness also characteristic in terms of people and organization for effectiveness .the quality model can act as road map for KM during its various stages of life cycle such as Strong, Collecting, structuring, controlling, creating, disseminating, coding, using, exploring, and auditing, at the same time product quality models of software and information systems, won't be appropriate due to multidisciplinary nature of KMS.

As stated by [4], KMS is multidisciplinary field, its quality dependents on various dimensions such as software, information/knowledge, people, business, technology, contents psychology, social networks, cognitive science, etc. So Software and Information systems quality models alone do not match with the KMS Effective model. However, software quality models are one of the cynosures to develop KMS

specific quality, since functionalities need to be implemented using software. The KMS aims to implement three functionalities:

- The coding and sharing of best practices
- The creation of corporate knowledge directories
- The creation of knowledge networks.

Every KMS has its perceptions whether it is domain-specific or organization-specific. It is necessary to identify the perceptions of developing products .because quality can be affected by the nature, purpose and working environment of the product, performance of user on product. The consideration of all these perceptions required for the organization before activating its quality model. Quality has various faces, identifying these faces is very important to the organization, Particularly KMS is a software product to perform the social process to improve their performance through an intellectual base. so It is mandatory to understand Software Quality Assurance(SQA) standards to the organization before the battle with KMS quality.

3 KNOWLEDGE MANAGEMENT SYSTEM DEVELOPMENT LIFE CYCLE

Knowledge Management System Development Life Cycle (KMSDLC) is fundamentally different from any other software system life cycle due its multidisciplinary features. However The conventional system life cycles are primarily dependent on its functionality alone. But KMS associated with knowledge and its related functionality. So the life cycle of KMS should reflect both knowledge specific processes and its standardization of functionalities. Some of the recent and widely accepted KMSDLC are discussed in the rest of this section to understand quality dimensions and factors requirements in each stage of the life cycle.

3.1 Liebowitz and Wilcox's Life Cycle

This Life cycle was proposed in 1997 with four stages as shown in figure 1 such as Build knowledge, Organize and hold, Distribute and pool, and Apply knowledge to work objects. The life cycle majorly developed with consideration of knowledge as the primary component of the system. Apart from knowledge related phases, there are other phases also required to develop the systems such as requirement and specification stage, which is to identify the user need, goal of system implementation, risk analysis, elicitation of requirements and requirement validation.

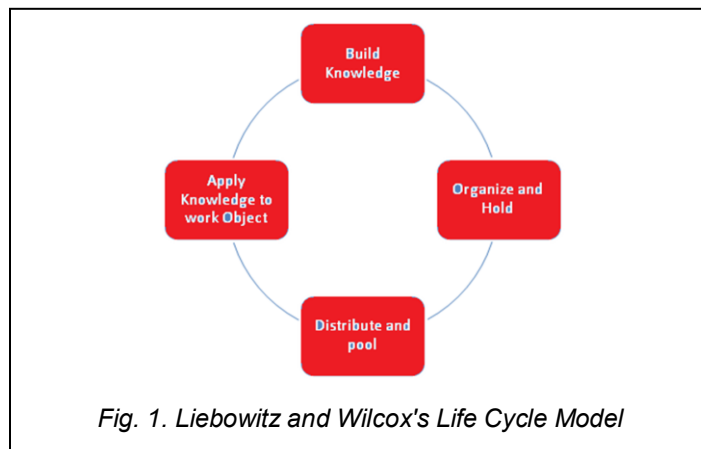
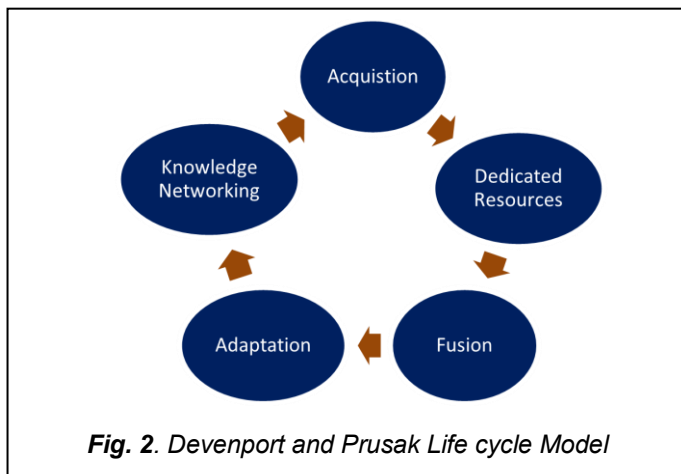


Fig. 1. Liebowitz and Wilcox's Life Cycle Model

However As far as this life cycle concern, there needs to be a quality dimension and factors associated with knowledge as primary quality dimension, moreover building of the knowledge is also concern with system, so system dimensions and its factors are required to measure. Next stage in this life cycle is an organize and hold this phase concern with ontology representation and capacity of knowledge repository. The distribute and pool phase is to deal with the standardization of effective approach to distribute the appropriate knowledge to knowledge users, so KMS-specific process quality required as dimension. Finally, the apply knowledge to work object represent the ability of KMS impact on organizational problems. So there needs to quality dimensions and factors to measure perceived benefits of KMS.

3.2 Devenport and Prusak Life cycle

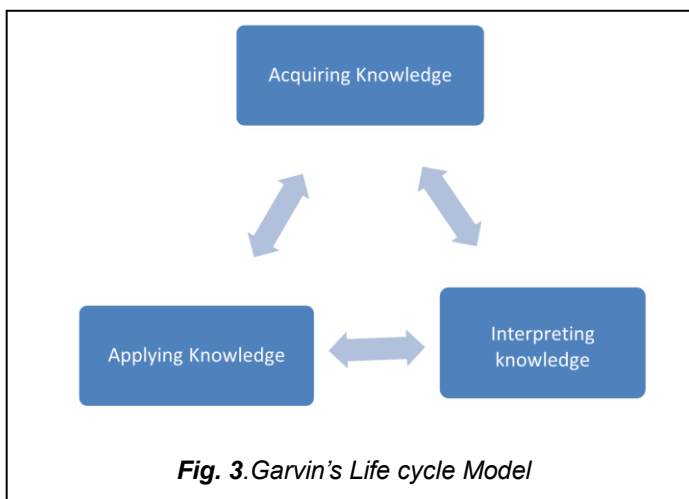
The Devenport and Prusak life cycle for KMS was introduced in 2000 with five different phases namely Acquisition, Dedicated resources, Fusion, Adaptation, and Knowledge networking. In Acquisition stage the knowledge workers can identify the required knowledge to KMS design since knowledge either available as tacit or explicit in out of an organization. The next phased of this life cycle deals with dedicated resources, it concerns with procurement of appropriate information and communication technology (ICT), database, ontology and reasoning tool. The block diagram of the life cycle is shown below in the figure 2.



As far as this life cycle concern, the first phase deals with knowledge specific processes like identification and acquisition that is similar to Liebowitz and wilcox's life cycle. But the procurement of ICT and related resources are considered in the second phase of the life cycle. so there needs to a consideration of quality factors of procurement. An assembling of components considered as the third stage of life cycle. There needs to be characteristics to conformance of integration. The fourth stage of the life cycle is dealt with adaptation of system and its content for organizational issues. The final phase associated with network support of knowledge such as knowledge map and personalization process. The Quality dimensions to this model, includes process quality (phase-1), system quality (phase 1 and 2),user satisfaction(phase-3) respectively. The knowledge network phase includes personalization and knowledge mapping so this stage of KMSDLC can be measured with process quality.

3.3 Garvin's Life cycle

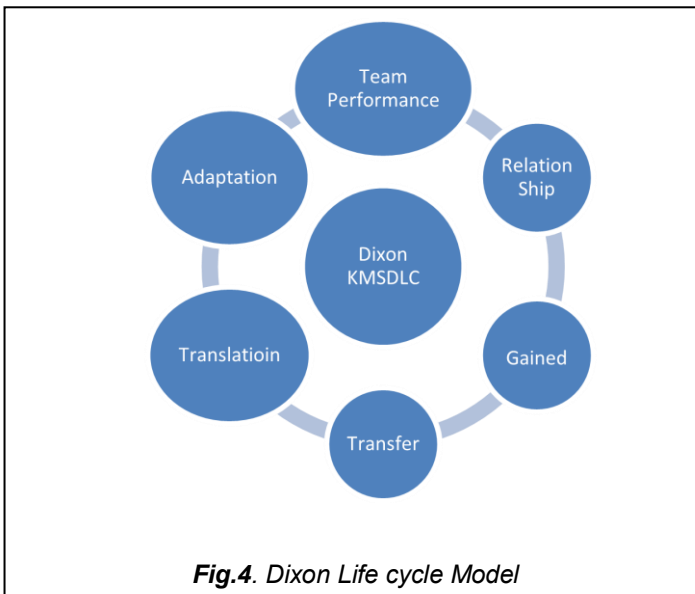
This life cycle abstractly stated KMS phases in three stages and all these phases are primarily includes knowledge quality and impact. This life cycle invented in early 2000 with Acquiring, interpreting and applying knowledge. The knowledge acquiring can be assessed with process quality, were as the interpreting phase can be assessed with inference and reasoning quality. The final stage of this life cycle is applying knowledge its impact cannot measured directly so this passed of KMS need conceived benefits of KMS. The below figure 3, illustrates the associated stages of this life cycle.



3.3 Dixon Life Cycle

The life cycle elaborated whole tasks of KMS development into six phases from knowledge workers analysis to adaptability of KMS content to organizational problems as shown in figure 4.. This life cycled borrowed some of the phases from traditional software system development life cycle, the phases include in this KMSDLC are:

1. Team Performance a task
2. The team explores the relationship between action and outcome
3. Common knowledge gained
4. Knowledge Transfer
5. Knowledge translated into a form usable by others
6. Adaptation for use.

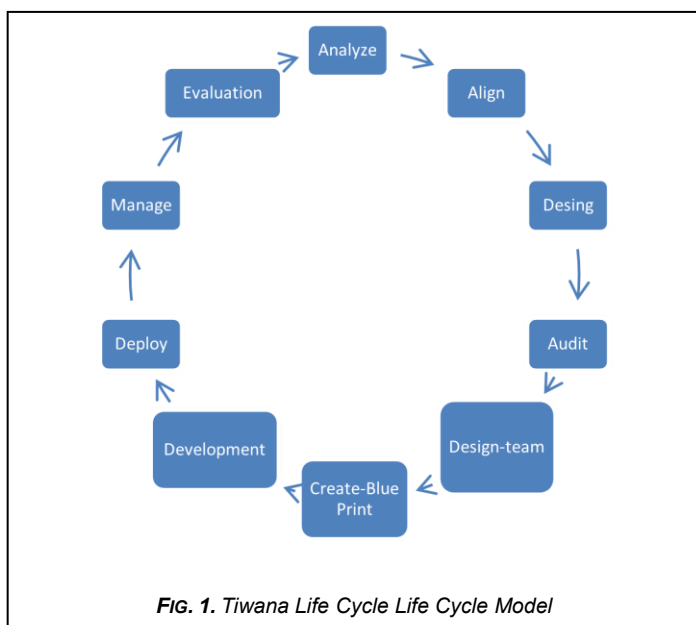


There are different characteristics are required to audit the quality of tasks associated in every phase. First phase of this life cycle need to have measures to conform effectiveness of team works, the second stage is deals with various actions such as risk analysis, acquisition, identification, creation of KMS specific process and its outcomes, so the quality model needs to have metrics to measure activity and its outcomes. The commonly driven knowledge validation is considered in the third phase of KMSDLC. The procurement of System to transfer knowledge considered as the fourth phase, So the quality model should have measure to system's content during transfer the knowledge. the six-stage of life cycle concern with the personalization of knowledge. but the quality of knowledge to the problem can be measured only through values. so quality model also need to have the mechanism to realize knowledge usage.

3.4 Tiwana Life Cycle

The life cycle of a KMS based on four primary aspects such as the intention of System, Development strategies, working environment and process used to build a system. But this life cycle elaborated those basic four phases as 10 stages namely:

1. Analyze existing infrastructures
2. Align KM and business Strategy
3. Design the knowledge infrastructure
4. Audit existing knowledge asset and systems
5. Design the KM team
6. Create the KM blueprint
7. Develop the KM system
8. Deployment
9. Management of strategies
10. Evaluation



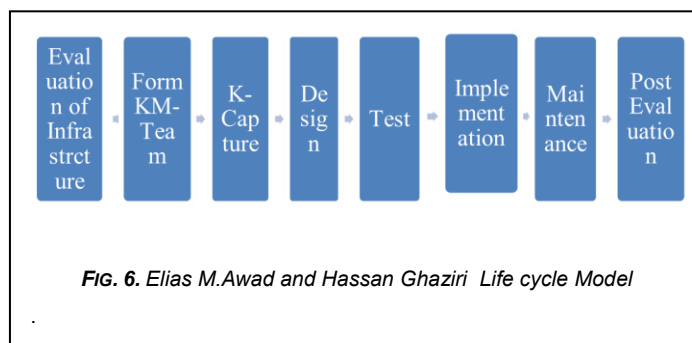
As shown in figure 5, this life cycle clearly states the significant-quality dimensions and factors integrated with KMS such as infrastructures, business strategies, knowledge structure, audit, knowledge workers, system, deployment, Manage and value-based evaluation. Even though the lifecycle is well established, there should be a standard to measure expected quality and deviation .so quality model is

required in system development since deviation and error identification is not as simple as in any other in the software system. However the life cycle included as many possible phases of KMS, it is more elaborated some phases such as analysis phase divided into Infrastructures and business, similarly design phase divided into knowledge infrastructure and team. The prescribed quality dimensions and factors are listed in table 1.

3.5 Elias M.Awad and Hassan Ghaziri Life cycle

This life cycle was introduced in 2006, with significant phases of KMS development. The stages concerned with this life cycle can directly associate with dimensions in quality model, and this KMSDLC also includes activities involved in each phase. moreover, the difference between knowledge workers and users are clearly stated, which helps to uniquely identify the role of each in KMS. The phases involved in this KMSDLC are:

1. Evaluation of Existing infrastructure
2. Form KM team
3. Knowledge capture
4. Design KM's Plan
5. Test KMS
6. Implementation
7. Maintenance of Structures
8. Post-system evaluation



As stated earlier, The life cycle defines the uniqueness of user and knowledge wokers characteristics with respect to the dependence of system, cooperation, tolerance, knowledge of organizational problems, contributions, system usage, availability of KMS. The block diagram of life cycle in figure 6. This investigation on various KMS's life cycle shows that, the quality model of KMS needs to have dimensions such as process, and product to assess the basic components of KMS. The significant dimensions in each phase of above discussed life cycle are listed in table 1.

4. CONCLUSION

The purpose of KMS is to add values to an organization's people, product and process. Apart from those factors, there are other factors which influence KMS in organizations, such as gaining competitive advantages, improve customer retention/satisfactions, retain key talent/expertise, develop new services, improved image, avoid loss of key personnel. At the same time, improper management of organizational knowledge can lead to serious losses. The knowledge can become useless if not managed through a quality life cycle and fully organized for corporate use. The identification of Key Quality Dimensions (KQDs) helps to determine the quality of KMS since the quality of KMS is an integration of the acquired quality of

significant dimensions. This research work includes an investigation of KQDs and its KQI with respect to technical, functional, organizational image and people quality aspects. The reason to consider these four aspects is, because of its roots with KMS. So the quality of KMS is associated with those fields. There are very limited researches works are available towards KMS quality model, however, those quality models also limited with less number of aspects. so there is no unified quality model to support KMS and this work includes significant-quality dimensions prior to its related works. The investigation of reasons for KMS-specific quality model rather than software and information quality model, the comparative study and analysis of knowledge gap in existing KMS's quality models are considered as future of this work.

KMSDLC Phase	E.M.A and H.G	Tiwana	Dixon	Gravin	L and W	P and P	Proposed Quality Dimensions or factors
Analysis Existing Infrastructures	X	X					System Quality
Align KM and Business Strategy		X	X			X	Process Quality KM Strategy
Design Knowledge Structure		X	X		X		Ontology quality Uniformity
Audit Knowledge		X	X				Values User Satisfaction Knowledge Quality
Design Team	X	X			X		Management Support expert availability of experts and management
Design Blue print	X	X					System Quality
Develop KM	X		X		X		User Satisfaction
Acquiring Knowledge	X		X		X		Knowledge Quality
Fusion				X			Knowledge Mapping
Interpreting Knowledge			X		X		Inference Quality
Knowledge Deployment		X	X				Concurrency
Apply Knowledge		X	X		X		User satisfaction
Management	X	X					Values Management Support
Post Evaluation	X	X					Training culture Reward/award system
Testing	X						Enrichment ROI
							User Satisfaction

TABLE 1. THE MAPPING OF VARIOUS KMS DEVELOPMENT LIFE CYCLES PHASE WITH PROPOSED QUALITY DIMENSIONS.

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