Research Journal of Management Sciences _____ *Res. J. Management Sci.*
Vol. **1(1),** 28-36, August **(2012)**

Systems Approach to Determine the Significance of the Critical Success Factors of a Knowledge Management System

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Available online at: www.isca.in
Received 7th July 2012, revised 21st July 2012, accepted 30th July 2012

Abstract

Today's organizations have realized the necessity to focus on their knowledge assets for ensuring sustainability in a globally challenging environment. This paper identifies the critical success factors (CSFs) of knowledge management (KM) in a typical IT industry and studies the influence of organizational culture, top management commitment and support, KM organization and process, KM tools and technology and KM metrics and incentives on knowledge management System (KMS) performance. The interdependence between CSFs are considered while developing a system dynamics (SD) model and the influence of the variables belonging to each factor are analysed separately in an attempt to identify the criticality of the factors for the survival of a knowledge management System (KMS), also in conjunction with the other success factors. The simulation results underscore the importance of all the factors under consideration. However, top management commitment and support and KM measurement and incentives turns out to be the most critical among the factors considered.

Keywords: Knowledge management, knowledge management system, critical success factors, system dynamics, top management commitment and support, organization culture.

Introduction

Knowledge management (KM) deals with managing of knowledge assets which are capable of enabling the organization to improve their performance, in today's knowledge economy. Management of knowledge is essential for improving organizational performance, problem solving and decision making. Understanding the need of implementing a knowledge management system (KMS) is profoundly important for new organizations as well as existing organizations. Over the last decade or so, KM has found its space as a major discipline in an organization's formal functional structure.

Knowledge management caters to the critical issues of organisational adaptation, survival and competence in the face of increasingly discontinuous environmental change and it is the only tool that helps an organization to gain insight and understanding from its own experience[1]. Some of the most successful and influential companies compete primarily on the knowledge-based strategy whereby knowledge and knowledge-based products drive their global strategy. In fact, the core competency of these companies is to commercialize knowledge faster and more efficiently than their competitors. They achieve their strategic goals through organizational structure, processes and culture that are integrated to support knowledge workers and knowledge driven strategy[2]. The IT sector was one of the early adopters of the KM initiatives, because they seemed to have realised much earlier the potential of a KMS in a dynamic and changing business environment like IT. This movement helped such organizations to come out of a people-centric approach to more of a knowledge-centric one, which gave them the much needed freedom and flexibility to innovate and compete in the global economy. IT organizations, with their in-house technology capabilities, were also in a much better position, compared to other sectors, to begin their own KM initiative.

There are various factors which have been identified crucial to the success of a KMS, often referred to as the critical success factors (CSFs) of KM. Like the various KM definitions in place, there aren't any fixed set of CSFs which can be directly attributed to KM success. This can be due to the various levels of representation of different CSFs by researchers and also, depends upon the nature of business. For a close observer, ultimately the CSFs of KM distils down to the five primary factors which are top management commitment and support, organization culture, KM organization and process, KM tools and technology and KM metric and incentives. These are the five CSFs which are focused in this paper while developing the system dynamics (SD) model which determines the performance of a KMS. The focus of this paper will be to system dynamically analyse the criticality of the five identified factors, and rank them according to their effect of influence on the performance of a KMS, in an IT sector. However, the study of influence of these factors cannot be done in isolation as the systems perspective must be taken into account in order to examine the actual behaviour of the system when different variables interact with each other. If we tend to focus only on a small part of the system, ignoring the larger picture, we are subject to the learning disability "I am my position" [3] which results in overlooking the otherwise important patterns of the

system. Hence, an in-depth and accurate study of the individual factors can be done only by considering the influence of the various players of the system and their interactions on a larger frame.

Literature Review: Identifying the critical success factors (CSFs), for any discipline for that matter, is crucial to its success. Rockart defined CSFs as "the limited number of areas in which results, if satisfactory, will ensure successful competitive performance for the organization[4]. Many researchers have proposed the CSFs pertaining to KM implementations as well. Most of these CSFs were proposed based on qualitative as well as quantitative studies which were conducted on organizations which were successful in KM implementation. Brief overviews of the factors which are considered in this research are given in this section. Apparently, these factors are closely in lines with the four pillars of KM which are leadership, organization, technology and learning [5].

Top Management Commitment and Support: Very few initiatives in an organization can be successful without the support of the top management. It plays an inevitable role in the case of KM implementation also, largely due to the relative novelty of the concept. When the leadership is committed and supportive, it instils that confidence in the employees to go out and practise something which is completely new to them. Holsapple and Joshi[6]; Jennex and Olfman [7]; Yu, et al[8]; and Wong [9] have noted top management commitment and support (TMCS) as a key factor in the success of KM. It is the role of the leadership to promote learning and knowledge diffusion amongst the organization members to achieve corporate transformation[10]. In brief, top management is the initiator, sponsor and promoter of KM and it is responsible for providing enough financial resources and time for the KMS[11].

Organization Culture: Another equally important CSF for KM success is to have a favourable organization culture [7, 8] which nourishes the development of KM practise. No matter even if you have the best technology and other resources which support KM implementation, if the employees are not willing to share their knowledge that puts the whole KM programme in jeopardy. So, probably the first step to have a successful KM programme is to create a culture of mutual trust [12], which enables knowledge sharing and which results in organizational learning. People, their talents, their skills and knowledge are the ultimate foundations of organizational performance [13]. The learning organization principles of personal mastery, mental models, shared vision, team learning and systems thinking [3] forms the much needed foundation for a strong culture which enables the success of the KMS.

KM Organization and Process: Well defined KM Organization and Processes[7,9,11,14] has been identified as another key factor contributing to the success of KMS. There should be distinctive roles and responsibilities, like any other management discipline, for the smooth functioning of KM as a discipline. Their role will be to promote the concept of KM and as well as to give the much required guidance, direction and support which will ensure the sustainability of the programme. The different KM Processes, viz., knowledge creation, discovery, gathering, calibration, modelling, integration, dissemination, reuse, sharing and synthesis [15] needs to be effectively supported by the KM organization and structure.

KM Tools and Technology*:* Technology [7, 8, 14] can be considered as the backbone of the KMS in an organization. Technology in KM usually refers to the information technology (IT) which is needed to support the KMS. A solid IT infrastructure enables the smooth functioning of various KM processes. KM tools like data mining help to analyse large quantities of data in an organizations' database and discover hidden knowledge patterns[16, 17]. KM Technology, when given the right source feeds, can deliver relevant and timely knowledge[18]. On the flipside, too much of focus on technology ignoring the other success factors reap little benefits out of any KM programme.

KM Metric and Incentives: According to Redman, that which does not get measured does not get managed [19]. Measurement of the KMS[7,8,14] is extremely important for improving the process. The growth of the organization's knowledge assets needs to be evaluated and the individual contribution of the employees needs to be measured consistently. Employees, at the same time being the users, can be creators and contributors to the KMS: The voluntary sharing of knowledge by individuals is a key element in the implementation and success of any knowledge-management endeavour; KM community has theorized, examined, and implemented various incentive structures to promote knowledge sharing and systemic approach in organizations[20].

Research Methodology

The system dynamics (SD) methodology helps to analyse a problem situation in a systems perspective. It has a variety of applications and the SD approach has proven to be a very beneficial technique in areas such as planning, inventory control, goal seeking behaviour, oscillations and instability, and forecasts[21]. The SD methodology proposed by Sterman is followed for this research, which consists of the stages: problem articulation, dynamic hypothesis, formulation, testing and policy formulation and evaluation[22]. The first step, problem articulation, aims at defining the problem and the objective of the model. The problem definition for this study is to identify and analyse the factors which are critical to KMS success. The focus here is to develop a system dynamics model which captures all the CSFs which have been identified after the literature review and to identify their interactions with each other. The objective of the simulation is to identify how these factors affect KMS performance individually, but in conjunction with the other factors of the system, in a dynamic KM environment.

The dynamic hypothesis phase deals with system conceptualisation, where a causal loop diagram is developed based on the system dynamic theories proposed by Forrestor and also using the concepts of learning organization which was proposed by Senge[3] based on Forrestor's SD theories. The different CSFs and their associated variables will be considered for the development of the causal loop diagram. Causal loop diagrams (CLDs) are an important tool for representing the feedback structure of systems. It consists of variables which are connected by causal links shown by arrows, denoting the causal influences among the variables. Each causal link is assigned a polarity, either positive (+) or negative (-) to indicate how the dependent variable changes when the independent variable changes. The important loops are highlighted by a loop identifier which shows whether the loop is a positive (reinforcing) or negative (balancing) feedback[22].

The next step model formulation, involves the conversion of the causal loop diagram into a stock and flow diagram by defining the mathematical equations between the variables. This defines the behaviour of the model and makes the SD model ready for simulation runs. Stocks are accumulating variables which characterise the state of a system at a point in time and generates the information on which decisions and actions rest. Flows correspond to the change per period of time that increases or decreases the levels in the system. This step also includes the development of decision rules (i.e. mathematical equations), the quantification of the variables, and the model calibration using parameters to define initial conditions[22.]

Before doing the actual simulation for policy analysis, the developed SD model needs to be tested by performing a series of validation steps. Validation is the process of establishing confidence in the usefulness of a model[23]. The process of validation can determine whether the model on which simulation is based, is an acceptably accurate representation of reality [24]. The final stage of a simulation research is the policy formulation and evaluation, were various policies are varied dynamically and the model is simulated, to study their influence on the dependent variable. The results of the simulation are interpreted and a change in policy is recommended by case by case analysis. Thus, the simulation model aims at testing and comparing different scenarios of "fictive" actions, to predict the future behaviours of the system under consideration: a simulation model ultimately works as a decision-support system[22].

System Dynamics Model: The software used for simulation is VenSim®. The causal loop diagram which was developed based on the objective of this research shows the inter-relationships of the different variables under consideration. It was identified that there are three reinforcing loops and two balancing loops in the causal loop diagram (figure-1). The first reinforcing loop is between level of acceptance and organization culture favourable to KM. As the level of acceptance is increased, it increases the organization culture, which in turn increases the level of acceptance. The second reinforcing loop is between the organization culture and the erosion of culture congenial to KM.
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When the erosion of culture increases, the organization culture decreases, which in turn decreases the erosion of culture. The third reinforcing loop is formed by the level of acceptance, erosion of culture and organization culture. An increase in level of acceptance can reduce the erosion of culture, which increases the organization culture and that in turn results in improving the level of acceptance. There is also a delay between the level of acceptance and organization culture and also between the erosion of culture and organization culture. The two balancing loops in the model are between adoption of technology, and KM tools and technology (KTT) and between obsolescence of technology and KTT. In the first loop, when technology adoption ratio is increased it increases the level of KTT, which in turn can reduce the technology adoption ratio for acquiring more technology. In the second balancing loop, when the obsolescence rate increases, the KTT reduces and the obsolescence rate also reduces as a result.

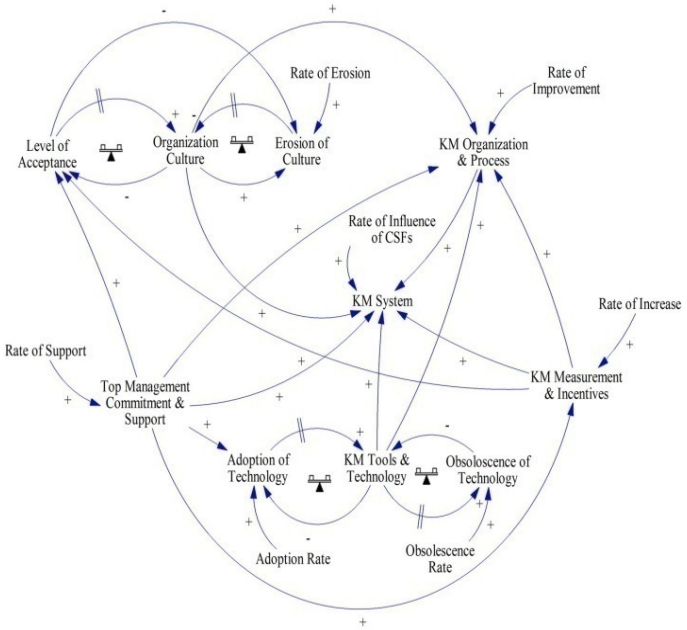

Figure – 1
Causal Loop Diagram showing Inter-relationships of CSFs and KMS

The causal loop diagram forms the basis for the development of the stock and flow diagram (figure-2), in which, the KMS performance is studied against the variations of the following variable groups which are considered collectively, each one representing a critical success factor.

Organization culture: i. *Delay in cultural transformation:* It denotes the delay in months, taken by the employees of the organization to acquire the new culture congenial for KM, ii.

Rate of erosion of culture congenial to KM: It is the rate at which the acquired culture favourable to KM is eroded.

Top management commitment and support: *Top management commitment and support (TCMS) index:* It denotes the level of commitment and support of the top management, given for the KM initiative.

KM tools and technology: i. *Technology adoption ratio*: It denotes the ratio at which the required technology is adopted to support the KM activities, ii. *Rate of obsolescence of technology:* It is the rate at which the acquired technology becomes obsolete over a period of time, iii. *Delay in technology usage:* It denotes the delay in months, taken for the acquired technology to be functional, and be used by the knowledge workers.

KM organization and process: i. *Rate of KM process improvement*: It denotes the rate at which the knowledge processes are improved in order to boost the KM activities, and it also captures if the knowledge processes are effectively supported by a solid organizational structure devoid of knowledge boundaries.

KM measurement and incentives: i. *Rate of increase of KM effectiveness:* In this study, it refers to the rate at which a KM metric is identified and applied, so as to find out whether the KMS strategy is aligned with the business strategy, and also to find if the right things are done, rather than doing the things right. Ultimately, this leads to recognition of efforts of knowledge workers, and appropriate distribution of incentives.

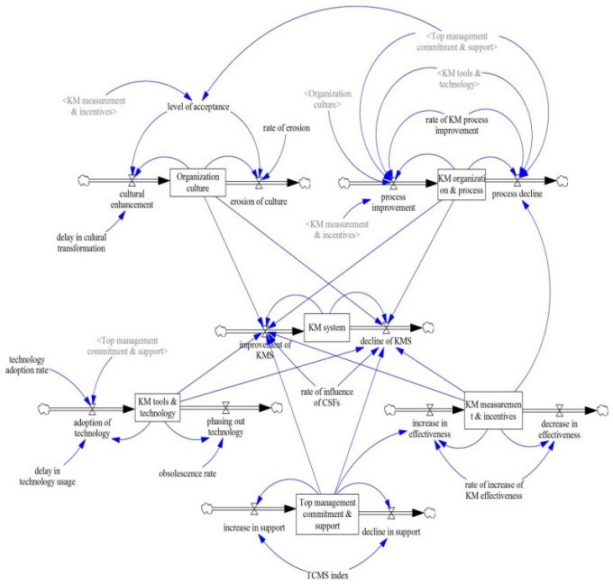

Figure – 2
The Stock and Flow diagram of Knowledge Management Success

After the model was completely developed, it was tested using the set of validations procedures laid out by Rodrigues et al for testing a SD model[25]. The different validation steps- validation of the model structure, validation of the model behaviour and the validation of policy implications were performed on the SD model, which exhibited positive results, proving the validity of the model.

Results and Discussion

The variables, constants, and their units used in the model are given in the table-1 scenario wise. An influence rate of CSFs is set as 0.9 (factors contributing to 90% of KM success) in all cases to give room for any extraneous factors which may be influential in the performance of the KMS, but not considered in the current model. The obsolescence rate of technology is assumed to be zero for the first year, considering the fact that the latest technology is initially acquired, but it gradually starts becoming obsolete starting from the second year.

Five scenarios are considered in this paper in which each CSF is analysed separately. In each scenario, the variables of the CSF under consideration are set values which denote weak performance of that particular factor, whereas, all other factors are given values which describes their best performance. Under these conditions, the KMS performance is analysed individually and finally compared across the scenarios to identify the criticality of the factors. The variables and constants used for the simulation runs are depicted in table-1, scenario-wise. The results, inferences and implications of the various scenarios are described below:

Scenario 1 – KMS performance with weak organization culture

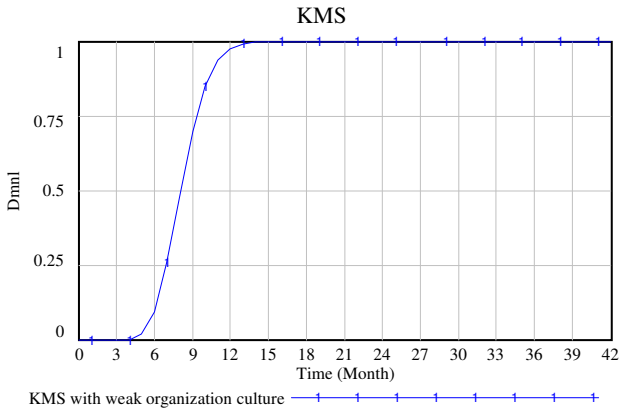

Figure – 3
KMS performance when organization culture weak

Results: The variables pertaining to the organization culture- delay in cultural transformation and erosion of culture are given values which indicate an organization culture which is not congenial for a KM initiative (table-1). The results (figure-3)

shows that with other factors set performing at their best, the KMS will reach peak performance around 15 months.

Inferences: Although, the organization culture is weak to start off initially, owing to the other influential factors such as top management commitment and support and KM measurement and incentives (figure 1and2), the level of acceptance of the employees for the KM initiatives increases over a period of time. This improves the organizational culture congenial to KM, which in turn helps the KMS reaching its peak performance, but takes sizeable amount of time in reaching there.

Implications: The delay in the cultural transformation and erosion of culture can prolong the KMS success even when all other factors are given due consideration. Here, these two variables can be looked at, as the systems archetype "limits to growth[3]. They act together as a limiting factor, which is responsible for the weak culture and hence the growth and success of the KMS is delayed. The management, in such circumstances, instead of trying too hard to push the reinforcing loop of growth, should try to minimise the effect of the limiting factor, which would improve the KMS performance. The management needs to identify the causes contributing to the delay of cultural transformation and try to start addressing them at the shortest possible time. Also, the increase in the rate of erosion can be due to various factors such as influence of the employees who resist change, the employees who may leave the culture due to lack of motivation and incentives or due to high level of attrition of employees [26]. Whatever the reason may be, it must be identified at the earliest stage and the rate of erosion should be controlled.

On the other side, having a weak culture to start with should not be a reason for organizations to not to go for a KM programme. Undoubtedly, congenial culture is crucial to KM success, but it is also something which can always be developed over a period of time, given that there is strong top management commitment and support and an effective KM metric and incentives in place.

Scenario 2 – KMS performance with weak top management commitment and support

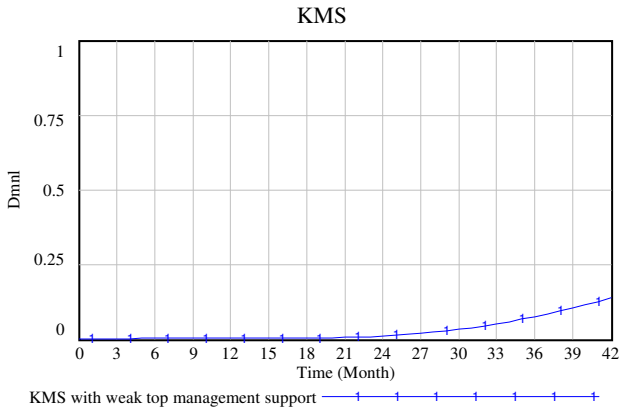

Figure – 4
KMS performance when TMCS low

Results: In this scenario the TMCS index is given a value of 0.2 to denote a weak top management support and the rest of the factors are given their best case values (table-1). The simulation run shows that the KMS performance does not take off in the initial 24 months and slight improvements are observed after that.

Inferences: When the TMCS is weak, the KMS hardly improves its initial position. The other factors performing at their best are also not enough to pull the KMS from the plateau.

Implications: Small changes can produce big results – but the areas of highest leverage are often least obvious. The most obvious solutions may not always give great results. System thinking shows that, small, well-focused actions can sometimes produce significant, enduring improvements, if they are in the right place, which is often referred to as "leverage"[3]. The TMCS turns out to be such a leverage point which is crucial to KMS success. An organization looking to achieve KMS success in minimum possible time cannot afford a low level of TMCS. It is important that all the members of the top management should be clear about the benefits of implementing a KMS and act in unison to improve the levels of commitment and support. The support should be extended to the project managers who handle individual IT projects by providing them with adequate funds for managing the KM processes. Top management can also consider developing various kinds of training programs, depending on the needs of different projects [27].

Scenario 3 – KMS performance with weak tools and technology

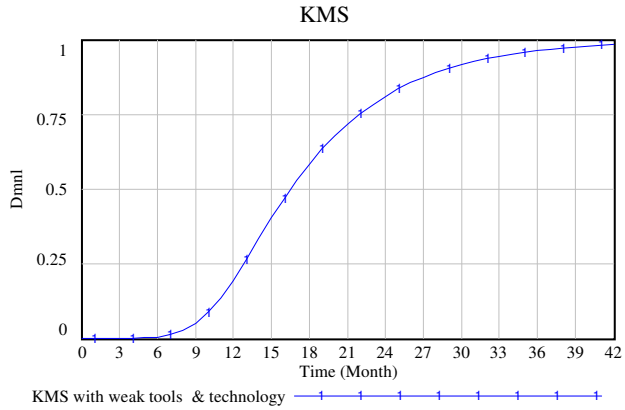

Figure – 5
KMS performance with inadequate technology

Results: To study the effect of KM tools and technology (KTT), the variables technology adoption ratio, delay in cultural transformation and obsolescence rate of technology are kept at their worst case scenario while the other factors are kept at their best case scenario (table-1). The simulation results show, that under these circumstances, the KMS peak performance is not achieved in a time-frame of 42 months (figure-5).

Inferences: Not having adequate technology does not allow a KMS to reach its peak performance in favourable time periods.

Implications: KTT is the backbone of any KM initiative. For the KMS to be effective and successful, it should be backed by adequate technology. In this scenario, although the technology adoption is weak initially, the KMS is improving gradually owing to fact that the TMCS is at its best (table-1), which is crucial for the allocation sufficient budgets for acquiring or developing of new technology. Whenever the management plans to acquire a new technology, it is always recommended to evaluate the life cycle of the technology in question, to find out whether it is in its growth, maturity or decline stage. It is always better to adopt the technology which is in the growth stage of its life cycle because it helps the obsolescence of the technology to be delayed as far as possible. Reducing the delay in technology usage definitely improves the KMS performance. The management should plan the adoption of technology in such a way that the installation of the technology is done with reduced timelines, and also, it is advisable to start parallel training sessions for the users on how to use the technology so that by the time the technology is ready for use, the users doesn't waste time in getting used to the system rather be productive from the first day itself.

Scenario 4 – KMS performance with weak organization and process

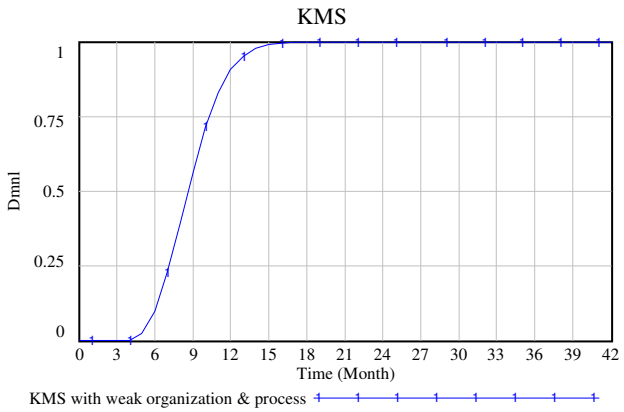

Figure – 6
KMS performance with weak KM organization and processes

Results: The significance of the influence of the CSF KM organization and process, on KMS performance is studied by giving a value of 0.2 for the variable rate of process improvement while other variables kept at their best case scenario (Table - 1). After the initial slump in the first 4 months, the KMS gradually improves and reaches its peak performance at around 18 months.

Inferences: The low level of rate of process improvement is delaying the KMS success. But, the other factors in the system are strong enough to improve the KM organization and process and in turn the KM system, although it takes its time.

Implications: "The harder you push, the harder the system pushes you back" [3] is a concept that is applicable in this situation. It is not always about how hard you try, but it is all about adopting the right processes at the right time, which can bring about large improvements in the KMS performance. Laying out the KM organization and processes is crucial to the KMS success, and has to be looked into in the very infant stages of KMS implementation. The KM processes need to be followed and practised by the employees as they are the enablers.

The KM processes needs to be efficiently supported by a robust technological infrastructure which is up to date and best suited to achieve the organizational goals. A strong organization culture favourable for KM also plays an important role to make sure that employees do follow the KM processes without any compulsion or fear. All these factors need to be backed up with a formal organizational structure for KM. Last, but not the least, the motivation of the employees also needs to be taken care by providing timely incentives. With a weak process to start with, the KMS is still holding up due to the strong factors like KTT, TMCS, organization culture and KM metric and incentives. If the processes are also adopted at the right time, KMS performance can be improved significantly.

Scenario 5 – KMS performance with weak measurement and incentives

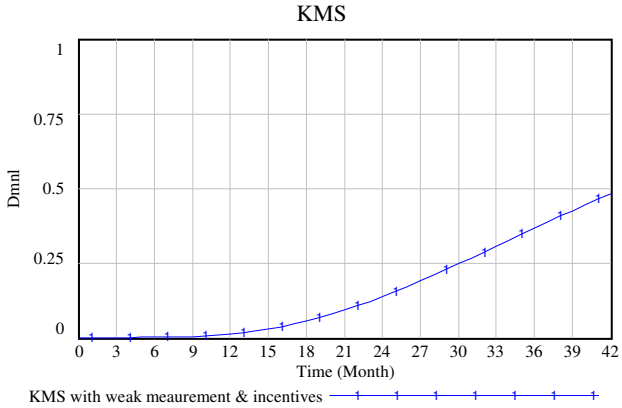

Figure – 7
KMS performance with poor KM measurement and incentives

Results: The effect of the CSF KM measurement and incentives on KMS success is analysed in this scenario (figure-7). The variable pertaining to this factor is given a value to 0.2 to denote a low performance of this factor, while other factors are set values of best performance (table-1). It was observed that the KMS curve does not even reach the 50% f the desired level of success in a reasonable time period of 42 months.

Inferences: Having low levels of incentives may mar the success of KMS. From the simulation run, it is clear that very

low rates of incentives may result in the KMS system not reaching its peak performance even at an extended period of time, although other factors perform at their best.

Implications: Similar to TMCS, the KM incentives turn out to be such a key factor with great leverage which improves the KMS success to a greater extent. The focus on this factor is extremely important and critical for the success of KMS. This factor, almost certainly, contributes hugely to the motivation factor of the employees to endorse the KM programme. When the benefits in the form of incentives seem to be visible, the employees go for it, which results in KMS success. The success stories of several leading organization further strengthens this point where incentives in the forms of Employee stock options (ESOP), Knowledge currency units (KCUs), etc. are very effective in promoting higher level of KMS performance. Hence having effective KM metric and incentives in place is essential if an organization looks to step-up its KMS to another level along with the other CSFs playing their part.

Comparison and Ranking of CSFs

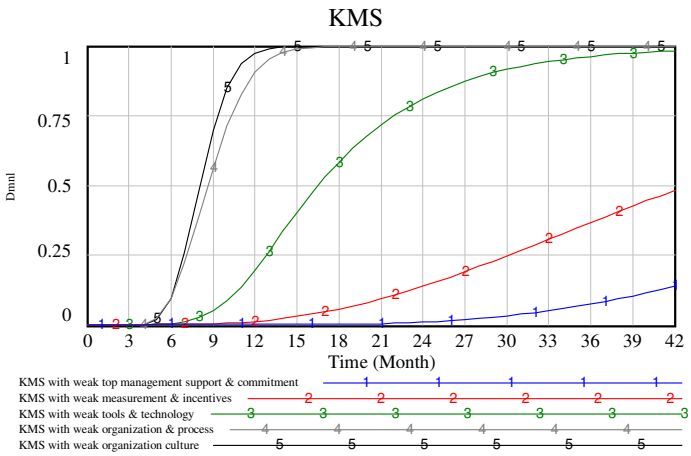

Figure – 8
Comparison of the influence of CSFs

This section tries to compare all the five scenarios which have been discussed so far and draw conclusions on the criticality of the CSFs. The differences in KMS performances are quite evident when the individual scenarios are superimposed on a single graph (figure-8). Having a low level of TMCS is detrimental to a KM initiative as this factor pulls down the KMS the most compared to the other factors (run 1). The second most influential factor as per the simulation is the KM measurement and incentives (run 2) because when this factor performs below par, the KMS performance is negatively affected. The technological infrastructure holds the KMS together, hence inadequate technology (run 3) delays the KMS success considerably. Undoubtedly, the low performance of the factors-KM organization and process (run 4) and organization culture (Run 5) impedes the growth of KMS, but, relatively the damage done is found to be less harmful compared to the other factors. The reason for this being that the culture and process can be improved upon when you have a strong TMCS, KTT and KM incentive in place.

Based on the simulation results, the significance of the influence of CSFs on the KMS can be ranked as follows: i. Top management commitment and support, ii. KM measurement and incentives, iii. KM tools and technology, iv. KM organization and process, v. Organization culture

However, this ranking does not take away the importance of any factor, as all the factors are inter-related and inter-dependent. For a KMS to be successful needs the adequate considerations of all these factors. The ranking just indicates the directions in which an organization should move in order to achieve the ultimate goal of a successful KMS which generates value and results in improved organization performance.

Conclusion

Understanding the CSFs of KM helps organizations to perform better by applying leverage. The factors which are identified for this research were organization culture, top management commitment and support, KM tools and technology, KM organization and process and KM measurement and incentives.

Even though one have the best technology and other resources which support KM implementation, if the employees are not willing to share their knowledge the KMS can never be successful. So, it is important to create a culture of knowledge management that support knowledge sharing and value creation and encourage its use. The top management support, for any initiative in an organization, is crucial to its success. This is no different in the case of KM, may be even more important, because of the very nature of the KM programme which needs co-operation from all parties. Especially in a business environment like IT, it is important that the management gives their employees enough time and resources to take part in the knowledge activities.

The various knowledge processes described in the literature such as knowledge creation, discovery, gathering, calibration, modelling, integration, dissemination, reuse, sharing and synthesis facilitates the KMS programme. The KM organization mechanisms such as knowledge centers, knowledge-centered roles and functions, knowledge linkages and communities of practise can enable the smooth functioning of the knowledge processes in a dynamic IT environment[28]. Most importantly, KM metric and incentives for knowledge workers based on knowledge work, creation, sharing and KM adoption forms a strong base for the overall performance of the process dimension of the KMS [29]. The backbone of a KM initiative is its technological infrastructure or the information technology. The various knowledge processes needs to be supported by suitable technology. Some of the key technologies which need to be adopted are document management systems, data warehouses,

enterprise information portal, information retrieval systems, groupware, workflow systems, help-desk technology, knowledge mapping and training systems [30].

In this research, the CSFs were analysed using a system dynamics model which is developed considering the relationships between the factors and the KMS. The causal loop diagram depicts the interactions of all the CSFs, which act in synchronization, for the success of the KMS. Using the stock and flow diagram, which was developed based on the causal loop diagram, the variables related to each factor were analysed separately. The factor under consideration was given low performance values and the rest of the factors were given their best performance values during each simulation run. This revealed the criticality of the factors and the effect each of them had on KMS performance. Top management commitment and support and KM measurement and incentives turned out to be the leverage points of the system. The KM tools and technology was found to be an essential factor in determining the course of the KMS progress. Although among the 5 CSFs, organization culture and KM organization and process were portrayed as least critical, the survival of a KMS was found to be closely knitted to those factors.

The current model has considered the most important factors which have been discussed in the KM literature as the CSFs of KM. The possibility to extend the current model by adding new factors or even expanding a single factor in this model to study its underlying structure is always open for future research. For example, it would be interesting to dive deep into the process factors, KM organization and processes and KM metric and incentives, to study the variables influencing their performance, individually. Another possibility of improving the model is to consider the variables at micro level and identify the interactions between them and analyse their behaviour. This model can act as a starting point for researchers and SD modelling enthusiasts to analyse the various factors in detail which contribute to the success of KMS, and provide insights into the hidden patterns of the system

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Table – 1
Variables and Constants used for simulation

Variables and Constants	Range (Min-Max)	Unit	Scenarios				
			1	2	3	4	5
Delay in cultural transformation	–	Months	8	2	2	2	2
Rate of erosion of culture	0 – 1	Per Month	0.2	0.05	0.05	0.05	0.05
TMCS index	0 – 1	Per Month	1	0.2	1	1	1
Technology adoption ratio	0 – 1	Per Month	1	1	0.2	1	1
Delay in technology usage	–	Months	2	2	6	2	2
Rate of increase in KM effectiveness	0 – 1	Per Month	1	1	1	1	0.2
Rate of KM process improvement	0 – 1	Per Month	1	1	1	0.2	1
Rate of influence of CSFs	0 – 1	Per Month	0.9	0.9	0.9	0.9	0.9
Obsolescence rate of technology*	0 – 1	Per Month	0.02	0.02	0.2	0.02	0.02
Starts from 2nd year							