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Research Article

Toward Designing A Flexibility-Based Knowledge Management Model

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Abstract:

The terms 'Flexibility' and 'Knowledge Management (KM)' might exhibit similarity in the characteristics, however, the difference lies in their application to the organizational assets. While knowledge is extracted from intellectual assets; flexibility is meant to be applied to control the behaviour of these assets. This way KM can be perceived as the application of extraction while flexibility is the application of control. Their integration can be visualized as a *process* and a *system* wherein KM as process, is related to the managing, creating and sharing of organization knowledge and; flexibility as system, keeps a check on the tendencies that may cause organization to drift from its KM process. This postulate holds the basis of this research. The orientation of this paper is therefore towards understanding how to design a flexibility based KM model.

Keywords: Competitive Advantage, Control, Flexibility, Knowledge Management (KM), Strategy, Systems Theory

Introduction

There is a similarity in the characteristics that the terms 'flexibility' and 'knowledge management' (KM) display. Both have been recognized as 'strategic approach' to achieve competitive advantage. They deploy the same set of elements- 'strategy', 'technology' and 'organization structure' to sustain the 'culture' of improvement in productivity using 'leadership' capabilities. Both share the same aim- to make 'economic' use of assets. As concept also, both are relatively 'new phenomena' with 'ambiguity in definition' and 'multi-dimensional nature'. They both seem to have originated from the 'aftermaths of hyper competitiveness' caused prominently by technological developments. They are still evolving, as evident from the'taxonomies' and the 'generations' they are classified into.Despite growing emphasis, in the last two decades, both have still largely remained 'unstructured as a discipline' and 'inconsistent as a model'. Taken up by scholars and practitioners in multiple ways both suffer the limitation of being seen in parts rather than the 'sum of parts'. The fact is, in reality, both are practiced more than preached, without organizations noticing that they are applying them. The most vital characteristic that both have is the ability to breed- *knowledge breeds more knowledge and flexibility breeds more flexibility* – leading to altogether a new way of looking at the existing body of knowledge or creating a whole new set. In terms of competitiveness, survival of business world like firms always depends upon their flexibility (Chan et al., 2016).

Additionally, according to knowledge-based theory (KBT), when knowledge management procedures are properly and efficiently managed, they generate special qualities that support improved organisational performance through innovation (Kane, 2017). Organizational performance is therefore more likely to be achieved by those with stronger knowledge management techniques (Lopes et al., 2017; Shujahat et al., 2019). According to Akhavan et al. (2016), knowledge management methods including sharing, acquiring, and using knowledge foster creativity, which enhances organisational performance.

Beneath the above discussed similarities there remains often unnoticed difference that lies in their application to the organizational assets. While knowledge is extracted from organization's

intellectual assets; flexibility can be applied to control the behaviour of these assets. This way KM can be perceived as the 'application of extraction' while flexibility can be the 'application of control'.

Let us see how the premise (of extraction and control) we have developed above can help us in decoding the relationship between flexibility and KM. To do this, we will use the dual control perspective of (Leeuw and Volberda, 1996) which the authors have derived from the systems theory of control. This approach will enable us to analyze flexibility as the function of control– embedded into the KM model to control its functionality; to meet KM user's dynamic demands and optimal KM use.

Flexibility: A Brief Review

Flexibility, viewed initially as manufacturing and design tool, is now largely being looked upon as a source of competitiveness. The scope this way has broadened. Evolving from operational capabilities to invoking managerial-systems thinking; flexibility addresses volatility. Organizations have started to gauge its contribution to productivity, quality and market competitive position (Grewal and Tansuhaj, 2001). Unlike earlier theories that postulate that organization has to tradeoff between efficiency and flexibility, it has been proved now that efficiency, stability and flexibility are independent variables that could be improved in parallel (Adler, Goldoftas and Levine, 1999). In present times, flexibility more appropriately is being seen as a strategic activity that can be applied to all levels of organization for competitiveness. As a competitive tool, it perceives the situation under which what all activities will be preferable over the others are determined to respond to the environment (Sushil, 2001a). It is essentially a mechanism to balance incompatible tendencies arising out of any change, tendencies causing rigidity in maintenance and alteration of these tendencies to command the environment. The premise of the concept is that all organizations demand some sort of control mechanism to respond to tendencies (Cook, 1979).

Flexibility thus isthe ability of a system to respond to a situation. It is about doing something different than planned, an aptitude to change and react to environment dynamism with an objective of gaining competitive position and obtaining sustainable advantage (Ionescu, Cornescu and Druica, 2012). So it is rather organic than mechanistic in nature. But it suffers from adjectives of (too many and so confused) taxonomies and a lot of overlapping in defining its types and gaps in need for studying relationship between them (Parker & Wirth, 1998).

Growing uncertainties cause instability in business, and flexibility captures this uncertainty and treats instability. It does that by incorporating ability to react to change (Upton, 1994), creating and making choices to adapt to the required change (Merkhofer, 1977).However the choices made must also show integration on one hand and a differentiation on the other between the alternatives. Integration is how well-suited this choice is in capturing uncertainty and how good it fits in treating instability. The applied choice must be good enough in opposing change and yet function in coherent and cohesive manner with other alternatives (Pascale, 1990). It is required because these alternatives are found to have spread on a continuum of a scale – between two extreme ends – flexibility and rigidity, and applying the choice located on either of the extreme-sides can be disastrous for business (Sushil, 1997)

The flexibility definition that this paper uses is largely derived from Volberda's (1996) work which has defined flexibility as an interactive process between elements of 'organizational system' and 'business environment', and whose determinants are 'managerial capabilities' and 'controllability of design' for responding and adapting to change.This has been described further in the sections below. The knowledge of available choices in the organizational system and managerial capability to pick up or re-generate a more appropriate choice (within the means available) for the particular environment followed by its acceptance (by the system) can be termed as 'flexibility' (Sushil, 2013).

Concept of Flexibility as Dual Control

All organisations need some sort of flexibility to respond to its environmental tendencies or insulate it from the unwanted change (Cook, 1979) more importantly where investments can't be reversed (Das and Elango, 1995). The premise is for every change there is a corresponding 'user capability' and 'system ability' to control it (Volberda, 1996). In fact flexibility is the outcome of interaction between these two properties of control in balance (Leeuw and Volberda, 1996). It is a competitive tool that helps determine what all activities will be preferable over the others to respond best to its environment (Sushil, 2001a). It is the knowledge of available choices in the organisational system and managerial capability to pick up or re-generate a more appropriate choice (within the means available) for the particular environment followed by its acceptance by the system (Sushil 2013). It isthe ability of a system to respond to a situation mostly not planned but with tendency to change and ability to react to environment dynamism orany business instability (Ionescu et al., 2012).

Dual control perspective suggests flexibility has two control types- user-controlled and system controlled. User controlled flexibility is based on user's capabilities to react to a particular situation or environment. System controlled flexibility is designed to self-adjust or auto-regulate to suit the environment requirements. These flexibility controls are configured in such a way that it adapts to the variations in its business model within the acceptable limits that are caused by internal (organisational) or external (business environment) changes.

Consider an example to understand this. The billing process of a firm facing a regulatory change say due to new service tax laws. The whole accounting process has to adapt this new taxation regime. Now, this external change not only impacts the internal changes for 'payments received' from its customers but also for the 'payments made' to its partner stakeholders. The billing structure has to be revamped to meet regulatory obligation. Now, the firm has two choices: either buy the readymade software that meets the compliance requirements or make changes in its existing billing software to meet the obligation. Unless the existing ecosystem provides that flexibility, the firm will have absolutely no choice then to buy new software. Thus, flexibility can help avoid this situation. This is one thing. Another is what if the firm could configure this change in its existing billing system to adjust to this new taxation regime without any or much manual intervention. This is autonomous flexibility. When system needs intervention to adapt to change it is called user controlled flexibility. Dual control notion thus allow us to view flexibility as two types of controls. These controls can vary between fully-controlled (limited flexibility) to fully-autonomous (total flexibility) continuum depending upon the need of the process. In other words, some processes can be fully automated while others may need intervention from time to time. The dual control thus deploys the mix of both in varying degrees to offer flexibility.

If we also refer back to our earlier example of flexible CRM (or in that sense even to a KM model), we see flexibility acts as a strategic agent that controls (or expands) the behaviour of the system for a pre-defined outcome. For same Sales Manager, if he directs or guides the system to extract some particular MIS, it's user-controlled flexibility. If the system self-produces and throws MIS option to this Sales Manager to choose from, it's system-controlled flexibility. Of course, in the latter case, CRM system will need to be trained to sense the Sales Manager's data requirements based on certain logic like his past activities, choice of report and data availability. Most of the times, this would require help from the information world in the form of tools like artificial intelligence, machine learning, data analytics method to reduce, if not eliminate, the human intervention. Wouldn't it be useful to Sales Manager if someone (read system) could tell him the optimal product-mix to sell or the most preferred customer segment to sell products to, what revenue to expect, how best to respond to the customer needs and provide provision for any unforeseen deviation from planned etc. This will help him to break free from vicious cycle of rigidity and, proactively overcome his psychological and organisational biases born because of his experience of a situation (Shimizu and Hitt, 2004). This can be deemed as the manifestation of flexibility.

Managerial Capability Vs. Design Controllability

Flexibility is a control function where management constantly develops capabilities to attempt to influence its environment conditions. However to what extent organisation can control its environment and what factors would help it do that requires systems theory of control to explain. Systems theory of control is the both-ways interaction between a network of controlling organs and target systems designed cognitively. This is presented in Figure 1 and 2. Let us understand the theory further.

A system has open and close types. Open interacts with environment affecting it overall while close monitors the communication within itself. Thus, a system interacts with environment in part and full. This is how organisation can define its relation with its environment, continually (re-)configuring itself to respond to environment disruption or the volatility. This reconfiguring requires defining an interaction pattern that the system (and its elements) recognizes. In simpler words, organisations need to anticipate future environment changes (like regulatory change in Sales Tax example) to provision for the effect these may cause. This is done by identifying how '*target systems*' interacts with '*controlling organs*'. It takes input from the firm's business environment to transform into output since it is exposed to fluctuations in the environment that constrains the behaviour of the system. Controlling organs are autonomous elements (nodes) that constantly interact among each other to control their own maintenance in a circular pattern. Change in one entity automatically introduces change into the other causing change in the functioning of the loop to meet the environmental expectations. Flexibility is the facilitator of this change which is defined as their 'property of control'. It therefore makes sense for organisation to review itself as close system (self-controlled system) and as open or autonomous system (user-adjusted system) to respond to its environment. Flexibility thus can be reviewed in terms of quality of management control the organisation has (i.e. close system) and the self-ability of the organisation to adapt to its environment(open system) stemming from its adoption of technology, culture and design to control. Cook (1979), who laid down the foundation of this concept, defined it as 'specializing for maintaining stability' and 'specializing for allowing flexibility' in the system.

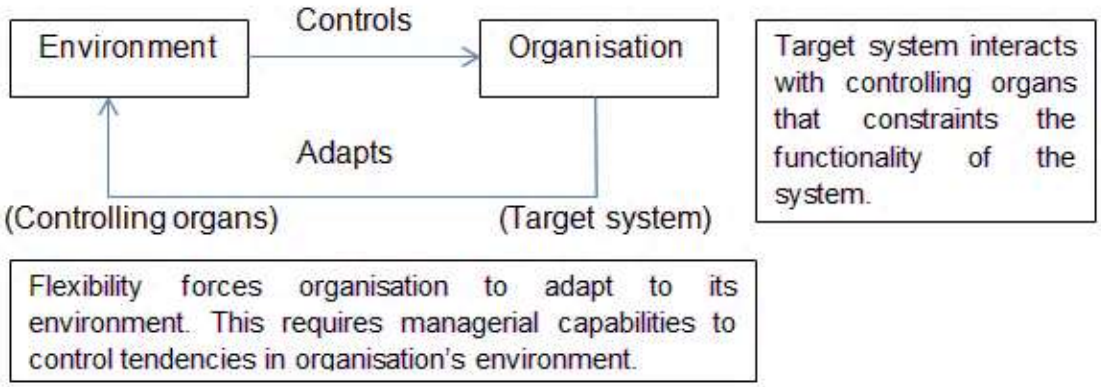

Figure 1: Flexibility as Managerial Capability to Control

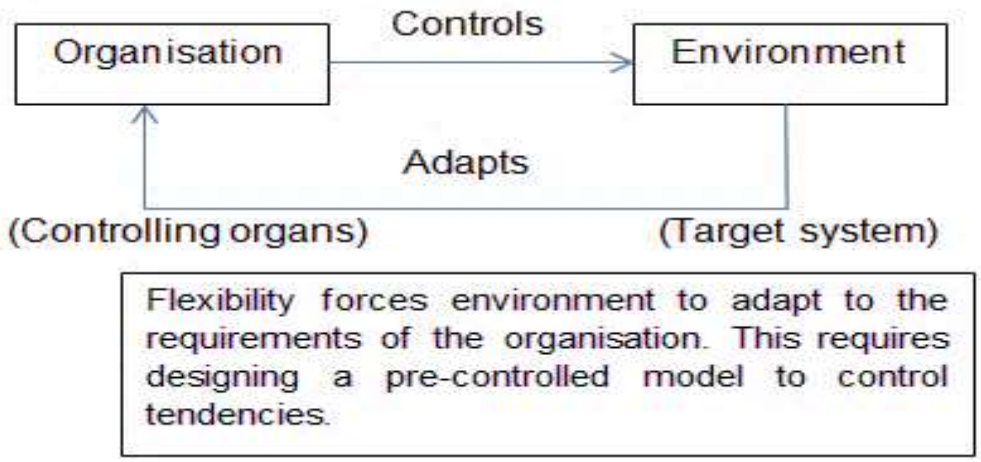

Figure 2: Flexibility as Controllability of Design

Figure 1 & 2 illustrates the relationship between organisation and its environment as controlling organs and target system, interchangeably. In first figure, controlling organs (a set of nodes communicating within themselves in a closed set-up to control changes effected by the organisation's internal changes) is the manifestation of organisation's environment while target system (system that communicates with controlling organs) is the manifestation of the organisation itself. In simpler words, if organisation is the target system and its business environment is the controlling organs, the target system (organisation) will interact with controlling organs (business environment) to prepare itself to adapt to the anticipated environment changes by bringing changes in the controlling organs. Any change introduced into controlling organs by this communication (signal) from the target system will automatically cause controlling organs to adapt to business environment. Similarly figure 2 represents the reversed situation where target system is manifested as firm's environment and controlling organs as organisation itself.

Environment as 'controlling organs' that controls the target system 'organisation'. It imposes challenges for organisation, forcing it in a certain direction contrary to its pre-defined purpose. The organisation adapts to the environment forces without much changes in its system, defying the hold of the environment. The hypothesis is environment does not influence the organisation due it its high flexibility towards adapting to environmental changes. This is called 'quality of management control'. When the situation is reversed replacing the meaning of controlling organs with organisation and target system with environment; the organisation challenges the environment forcing it to adapt according to the functioning of organisation. It is called 'ability of organisation to control'. We can thus define flexibility based on these two dimensions as: '*managerial capabilities to control*' and '*controllability of design to control*'. Managerial capabilities to control results in control for variety, procedures and rapidity while controllability of design to control results from technology, structure and culture (Leeuw and Volberda, 1996).Low flexibility will mean submission to administrative and bureaucratic procedures (Wyk, 2013). Too high flexibility will also make its adoption invariably inconsistent. There are four combinations that can emerge out of their interaction as proposed in figure 3.

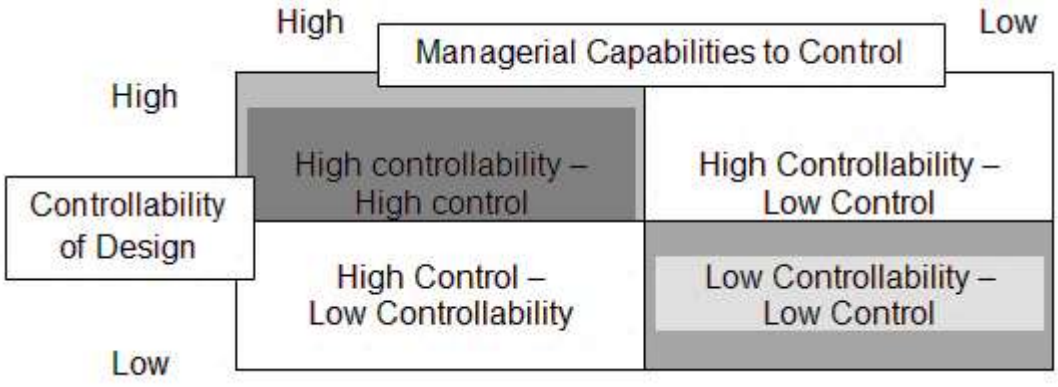

Figure 3: Flexibility Combinations: High-Low Controllability Design Versus High-Low Managerial Capabilities to Control

To summarise, the concept of flexibility originated initially as two-dimensional strategic approach, whose pillars are managerial control capabilities and organisational design control resulted in various forms (rigid, planned, flexible and chaotic flexibility forms) and types (volume, product, operational, mix flexibility types) to ward off business environment surprises caused due to hyper-competition. It is the strategic option that requires high responsiveness of the organisation and sufficient managerial capabilities to apply.

After defining control perspective of flexibility, we can move forward to discuss our core agenda- its linkage with KM. How can it help us design the KM model on the basis of its ability to control and adapt (or respond) to the user's dynamic demand?

Knowledge Management as Systems Theory

Like flexibility, KM too is being seen to be based on notion of competitive economics(McCampbell, Clare and Gitters, 1999)that is a prerequisite for organizational success. It provides for problem-solving(Cross, Parker, Prusak&Borgatti, 2001)that promotes systems thinking logic through mental models(Wiig, 1999) to connect the elements belonging to the system, thus defining both – environment and the elements interacting in the environment – to make the system work.It is complex phenomenon that deals with human understanding and mental models and how these are used to derive the economic value. The knowledge comes from the cognitive structure of people in organization system who re-organizes information to derive meaning to meet business goals (Sussman and Seigal, 2003).The degree of knowledge required by any organization is evident in what it does and how (Zack, 2003). That is why knowledge system is more intrinsically linked to the social and learning processes within the organization (McAdam & Reid, 2000) referred to as *social ecology* – a system in which people operate whose elements are culture, structure, technology, processes, people and leadership. These knowledge determinants interact to construct knowledge (Gupta &Govindrajan, 2000).Given the information -based economy's rapid development, knowledge is seen as a key factor in fostering success and prosperity (Abubakar, 2019). It is based on the premise that value is extracted from the stocks of knowledge. Knowledge stocks depreciate when remain unused but produces value when maintained (Curado, 2008). These stocks are largely made up of information on what organizations know about their customers, products, processes, mistakes and successes; that get accumulated over a period of time. It servesas reference for organizationsto decide its stance when confronted with a past situation. The knowledge thus is built on certain assumptions, different levels of analysis, varying levels of experience and different objectives at individual, group or organization-level. The knowledge thus produced is debated and challenged by different people before its adoption as an integral part of organization's strategy (De Long & Seemann, 2000).

Knowledge life cycle (Birkinshaw and Sheehan, 2002) of creating, preserving and sharing knowledge is perfect manifestation of a system (Argote, McEvily, and Reagans, 2003). First phase is *knowledge creation* which is when organization solves a unique problem or a big problem in

parts. Second phase is *knowledge preservation*that records the problem and its solution generated in the first phase as a new knowledge. Third phase is *knowledge dissemination* that becomes the input for solving problems further(Bij, Song, and Weggeman, 2003). Each phase thus is the input for another phase in a cyclical manner to build knowledge upon itself (Salisbury, 2003). This is identical to what has been defined in Systems theory as closed system, whose elements interact among themselves in a cyclic pattern and change in one element is bound to cause an effect into another. The knowledge is constructed through remember, understand, apply, analyze, evaluate and create process in the same order as defined. '*Create'* stage has the highest level of cognition elements which an individual puts together to form a '*new logic'*. It is this logicthat is applied to solve a problem or innovate (Hanisch, Lindner, Mueller and Wald, 2009).Any change – strategic, technological or structural will cause change in each element thus impacting the contribution of each element in constructing knowledge (Dutt, Qamar and Jha, 2011a). The important elements thus, could be segregated from others in some order. For example knowledge elements that produce superior competitive advantage versus the knowledge elements that require more flexibility for improvising performance either by removingor reducing them or by shaping them continuously to meet the performance benchmark (Dutt, Qamar, and Jha, 2011b). This KM model is tested by Dutt, Qamar and Jha (2012) in their research on commercial banks in India. It analyzed the contribution of 74 knowledge elements to embody the KM model.

Decoding Flexibility-KM Relation

The integration between and KM and flexibility as an application of extraction and application of control respectively, can be visualized as per the systems theory of control. To understand this better, let's assume KM is a process and flexibility is a system of control. 'KM as process' can be viewed asmanaging, creating and sharing of organisationknowledgeand 'flexibility as control system' can be looked upon as a check on the tendencies that may cause organisation to drift from its KM process. This equation can also be viewed, interchangeably. For example, KM (shown in Figure-4) as system can be perceived as interaction between its enablers: technology, strategy, organisation structure, driven through strong KM culture directed by its top leadership. Flexibility as process can be seen as an order of anticipating tendencies, formulating strategies, accumulating resources and implementing capabilities needed to control the anticipated tendencies. As per the need, both can be transformed from process to a system and vice-versa[1].

Figure :4 Visualization of a KM Model

[1] Analogy is proposed in Figure 5 and Figure 6.

So if KM is defined as a process, then flexibility can be defined as a system that interacts with the elements of KM process to constrain their behaviour as per the requirements of the environment (read: organisation). The challenge is it requires defining an interaction pattern developed logically that the system (and its elements) recognizes. As defined in systems theory (Cook, 1979), this interaction pattern should be such that KM model reconfigures itself continuously based on its interaction with (the changes in the) environment. We will, hence, have to think through the possible configurations between the KM process and its operating environment (i.e.organisation). This requires us to define the KM model first.

A KM model can be seen as comprised of a 'process' and its 'enablers/elements'. As process, it is a loop of managing, creating and sharing knowledge for enterprise-wide use. As enabler, it is a function of technology, strategy, structure, leadership and culture required for leveraging knowledge intellectually. Environment forces will impact the KM process requiring some agent to 'control' changes in the KM model caused by environmental forces. Similarly, environment forces will impact the KM enablers requiring them to 'pre-control' the environment forces for controlling impact on the KM process. In other words, the KM model should be able to automatically adapt to its operating environment. This 'control' agent is flexibility. It may be noted that KM and flexibility can have the same set of enablers. Figure 5-6 present the relationship between KM and flexibility broadly.

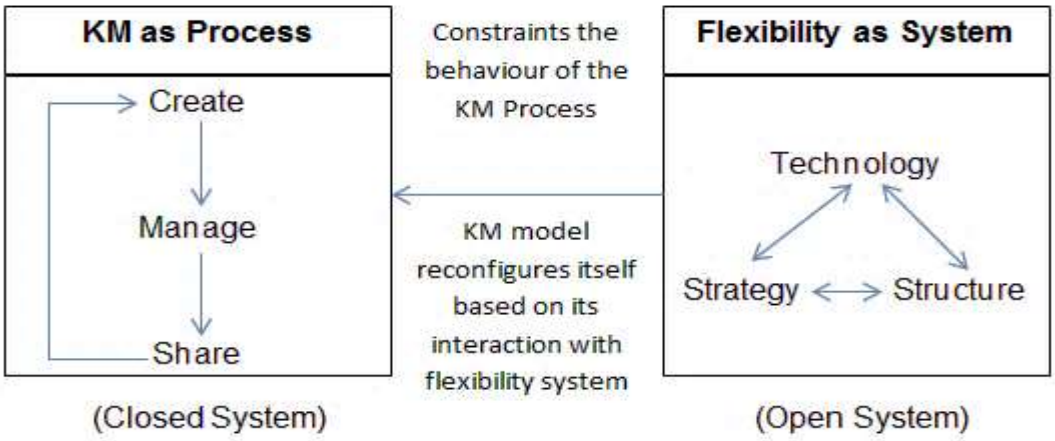

Figure 5: KM as Process and Flexibility as System

According to this approach, flexibility can be defined as 'managerial capabilities that control the changes in the KM model' caused due to its interaction with the environment and 'controllability of the KM design' that negates the impact of environment changes on it (Volberda, 1996). This hypothesis holds the basis of this research. The orientation of this paper is therefore towards understanding how to design a flexibility-based KM model.

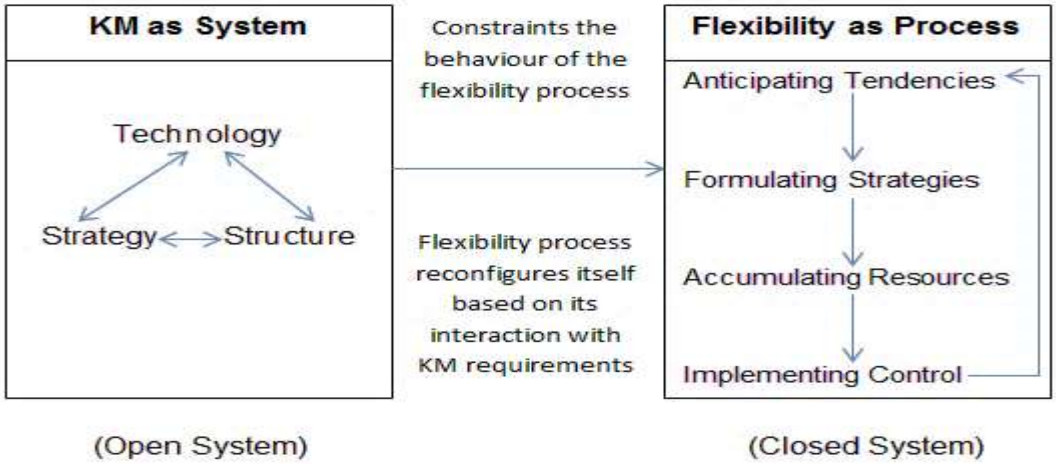

Figure 6: KM as System & Flexibility as Process

After reviewing KM as system composed of elements/enablers of KM and KM as process, we now start integrating flexibility to KM model for designing a more competitive KM model that is more responsive to changes in its system and have better controllability of managerial capabilities and system design to negate tendencies.

Determinants of Flexible KM System

Designing a flexibility-based KM requires translating hard systems into soft. It demands majorly three things: human motivation (for sharing organisational knowledge), and focus on idea generation from everyone in the organisation, relationship among system elements and their collective relation with system's environment. It presents a structure that stems from a complex, composite-mix of interaction between technology (data, information, rules, procedures, best practices) and human traits (such as attention, motivation, commitment, creativity, and, innovation) which cannot be predicted or ascertained. This way, the flexibility-based KM design differs from other KM model that is more of static, non-anticipatory and rigid in approach being highly routinized and pre-programmed, pre-determined for output in terms of specification of tasks and rules. Even the level of flexibility required will be different for these two, with latter requiring more pragmatic approach to adjust to future possibilities on more real-time basis on various flexibility forms and types. This design gives more weightage to human dimensions (managerial flexibility) rather technological (flexibility) because of the fact that knowledge resides in the user. But limitation of human approach, unlike technology, is that it depends upon subjective interpretation of the user. The design also requires identifying and using human dimensions as moderating variables and interventions to regulate the system for control and output. So what should be considered in designing such model is specifying fewer rules, using specific information which is more focused, and freedom for system to control its functioning using managerial competencies that conceptualize problem-solutions order.

In the end it would be justified to say that organisations can create sustainable KM system only by attending to the fundamentals of flexibility. Different 'kinds of flexibility'[2] will be needed in designing KM model depending upon the purpose of the organisation, knowledge gaps assessed, resources available and collective capabilities (for example high versus low degree of specialization, high versus low homogeneity, high versus low functional diversity, high versus low technical infrastructure, cost versus benefits per option, high versus low flexibility of options and, present versus future state of system adaptability) deployed by the users in its development. The right fit will be assessed based on different measurements like KM system's capability to change, cost of change, duration of change and performance of the system post the changes(Eckart et al., 2011). In fact it is the tradeoff between the level of flexibility available in the system, and the associated complexity and cost. Right flexibility level will automatically control the operational cost. This has been defined by Sethi and Sethi (1990) as 'flexibility profiles' to design the model. Profiling will explore the tradeoffs between various flexibilities types with reference to degree of control over variables like productivity, quality, variety of knowledge assets. Increased control of one dimension may cause increased flexibility in other dimensions for anticipating and adjusting to the future needs.SAP-LAP framework (Sushil, 2001b) can be more resourceful further to understand building flexibility better where *Situation-Actor-Process* leads to *Learning-Action-Performance* to bring out issues concerning SAP. Such issues result in problem-solving and analyzing solutions from multi-perspective, and doing critical inquiry into relationship between elements of the framework for the right flexibility (Palanisamy, 2012).

[2]Flexibility is complex, multidimensional and hard-to-capture concept. At least 50 different terms for various types of flexibility can be found mostly referring to the same type of flexibility, but not in agreement with each other. See Sethi and Sethi (1990) pg. 289.

Some possible definitions of flexibility-based KM system that summarises its essence characteristics and purpose can be defined below as:

1. Ability of KM system to respond to unanticipated but relevant fluctuations in the environment without much change in time, effort and cost.
2. Capability to leverage knowledge-based resources and perform knowledge-based activities that should result in increased people intellectualness to cope up with rising environmental complexity.
3. Process of analyzing various knowledge configurations and governing functionality of knowledge entities in the organisation system to address relevant knowledge gaps, identify knowledge requirements, address knowledge volatility, break knowledge rigidity, overcome knowledge biases, respond to knowledge demand and imperfections, and creating sustainable knowledge advantage.
4. Significant degrees of change in (organisational) knowledge requirements in response to environmental pressure to change; to defy the hold of environment based on anticipating change before it happens or deflecting change to avoid unexpected.
5. A composite mix of soft (people) and hard systems (technology) to optimize knowledge management process of creating, managing and sharing (organisational) knowledge for its synthesis with action.

Integrating Flexibility into KM Design

Review of systems theory of control with respect to KM and flexibility assert two ways to look at their integration: one, where KM constrains the flexibility process and two, where flexibility constrains the KM enablers. When KM constrains flexibility we call it 'controllability of KM design' to respond to the changes in organisational knowledge needs triggered by changes in its operating environment. When flexibility constrains KM system, we call it 'managerial capability to control' to manage organisation's knowledge resources and activities proactively to respond to its environment that is threatened bymarket competitiveness. So there are two ways in which a flexibility-based KM model design can be conceived. However it may be noted that both will be required in designing this model. Without one, the other will be like a cart with one wheel that of course would not move. Controllability of design and managerial capabilities to control are two continuums of a scale. This paradigm is bimodal in design which carries two opposite things together – flexibility and rigidity (Sushil, 2012a). *Let us understand how these two properties of control have been derived from systems theory of control.*

From systems theory perspective, design of KM model can be seen as an 'organisation' operating in an 'environment'. Theoretically, KM system is assumed as 'network of controlling organs' and its environment as 'target system'. As network of controlling organs, the elements/enablers of KM system which are – technology, culture, structure, strategy and leadership – interacts among themselves. In parallel, this system also interacts with its environment or the target system. The communication thus takes place at two levels: first, among autonomous elements of the KM system connected in a circular loop; and two, when these KM elements interact with its operating environment together as one. The first way looks at it as '*system in parts*' where each part is interacting with the other and any change in one part will bring change into the other. The second way looks at it as '*system as whole*' where 'system in parts' (i.e. KM elements) interacts with the environment. When together as one the controlling organs interact with target system, to adjust its organs (KM elements) based on the recurring changes of the environment, the flexibility will come from 'capabilities to control'. But when controlling organs and target system is interchanged that is KM becomes the target system and the environment forces (socio-cultural, political, and economic) the controlling organs; flexibility will come from the controllability of the KM design. Control capabilities rest with managerial eagerness to anticipate changes in the target system while controllability of design points at designing flexible structures adaptive to the change requirements of the controlling organs. This is presented in Figure-7.*Let us now analyse how the relationship between these two properties of control work with the help of an example.*

Management science applies rigor to solve the problem of optimal allocation of resources from the selection of means available. It is assumed that resources are a mix of physical and knowledge assets that will require managerial capabilities to control them for their optimal resource utilization. In this framework, these resources form the elements of the system (controlling organs) interacting with the environment (target system) that constrains resource optimization.

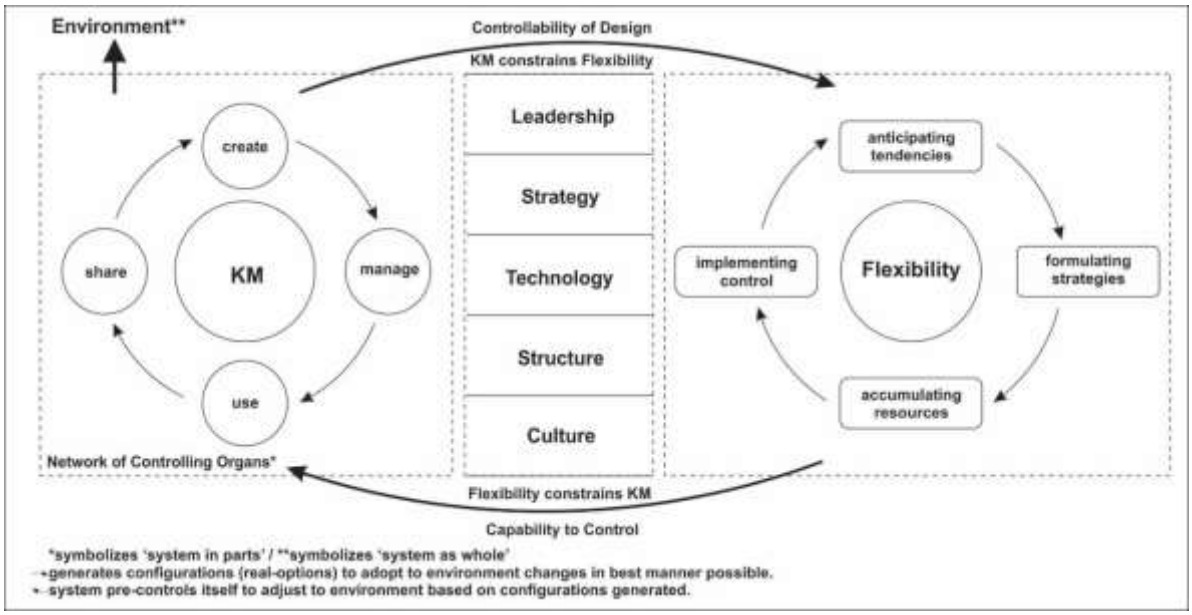

Figure -7:Systems Theory of Control from Flexibility-KM Perspective

Resources required to facilitate KM-flexibility process for knowledge generation, thus will become 'controlling organs' constrained by a 'target system' environment whoinfluences its enablers' configurations (relations between culture, structure, leadership capabilities, strategic alignment with its vision and technology its uses). The 'managerial control' challenge for this system is how to align with management's meaning of optimization and standards for improvement. Say, this includes critically thinking of long term environmental and development implications that suffer from uncertainties. The managerial scale will require gathering knowledge on matching technologies to designs and people to policies to a set of combinations of output (configurations) that will optimize the resource utilization as per management requirements. This matching will require managerial capabilities to answer: what should be the optimal resource utilization benchmark considering its long term implication in future on both – the organisation as well as the environment. The managerial capabilities to decision-making will produce a set of choice-based combinations and selecting the prominent one given the situation. For example, which combination will offer more flexibility than the other based on different scenarios and solutions developed using simulation (Wadhwa et al., 2007) with respect to 'optimization'? This will highlight the constraints in the environment. For instance, a technology constraint that restrains the way for modern design development; a structure constraint that refrains organisation from producing variety; a culture constraint that does not facilitate job rotation for conducive productivity; a strategy constraint that is misconfigured with manufacturing limiting its optimization and; a leadership constraint that miserably recognize the integration of all the four elements viz. technology, strategy, culture and organisation structure. It is therefore managerial capabilities (cognitive/intellectualness) are needed to generate configurations and select the most optimum. It takes into account the whole system's implications of an action from different viewpoints towards optimizing solutions (Ulrich, 1994).

On the other side is 'controllability of design' which is seen as the help in reducing dependence on managerial capabilities to control,by creating a self-regulated system even when the situation remains unanticipated. As a tool it helps in dealing with the problem of selection since system is conditioned to pre-select the best optimized solution from a series of alternatives pre-worked by managerial capabilities. Like for example, a certain manufacturing unit is pre-set to manufacture a

desired quantity, design and standard. In this way, control capabilities as conceived in the example above deals with 'principle of selectivity' whose foundation is based on managerial 'cognitive' capabilities towards resource-mix selection for configurations whereas capabilities to control is associated with 'principle of design' which is based on self-regulated processes that applies configuration best achievesthe optimization purpose. It is in this way system examines the relationship of controlling organs with the target system. The most important challenge however here is to identify what elements are contained inside the system (controlling organs) and what elements are considered the environment (target system) of the system (Rubenstein-Montano, 2001). Optimal resource utilization thus will take place when system elements reflect on what relationship each resource had with the other and in what proportion (depends upon managerial capabilities) and, what action collectively these resources will introduce into the system (depends upon controllability of design) to optimize the mix. This defines the relationship between these two properties of control. Now consider the same case again where organisation is looking for optimal resource utilization in production. It will need knowledge to define 'controlling organs' and 'operating environment' to conceive a system. This knowledge will come from organisational memory or knowledge repository that stores codified organisational knowledge for use at different point of time by different stakeholders. To deal with resource optimization, a system is created whose controlling organs let's say will be organisational knowledge about production processes and resources required for production; and environment let's say will be defined by demand for variety which is constrained by 'less or no change' in the plant capacity.

Systems flexibility provides for this optimization say by introspecting relationship between the product design and the production line design using the organisational knowledge available. Thus, KM is a vital element of the system. It provides the system, capability to respond to its business environment in more refined (knowledgeable) way. Mixed with different flexibility types and levels, system generates configurations/options to adjust itself to the changing environment. Flexibility in knowledge will be more prominent than knowledge alone that without flexibility will appear 'rigid' and 'static'. Flexibility will help in optimization of knowledge to respond to organisational knowledge requirements which in turn will be gainfully employed for optimizing resources. Flexibility exhibits this optimization by quickly adapting to future manufacturing design, which sometimes remains unanticipated even during the design of the product. Sanchez and Mahoney (1996) defined this approach as '*modular product architecture*' that uses flexible KM, wherein KM codifies the architectural interaction of the system components and flexibility expands this interaction towards solving problem, like in our case, to meet optimization challenge through interconnected, self-regulating, processes. It is like re-configurable components loosely designed to connect to each other, and capable of use in set of combinations for optimizing the product varieties and saving the organisation from redesign efforts, time and costs. Keese et al. (2009) described the similar notion as '*change modes and effects analysis'* and Chowdary and Muthineni (2012) called it '*knowledge based flexible machining centre selection*' that focuses on creation of knowledgebase through which selection of machines (to a design type) can be matched in most appropriate way. The system institutionalizes the process over the time, accustomed to adapt to the purpose of the system using a combination of hard (mechanical approach like computers, simulation) and soft systems (perceptual aspects like human motivation, viewpoints and interactions) approaches (Habermas, 1984). These approaches result in organisational learning (institutionalizing of process to optimize resource) using KM system (Senge, 1990) whose objective is to translate hard systems into soft for greater flexibility in adoption of hard systems by users which otherwise will be difficult to adopt. The synthesis of one (KM system) with another (flexibility) will work towards achieving the purpose (like optimization of resource).

Concluding Remarks

There are certain concerns in designing a successful KM model as discussed in the literature. Each of these concerns requires a logical analogy to integrate flexibility with these for achieving the KM purpose. Extracting value from knowledge assets is the heart of a KM program. How this value can

be optimized using flexibility is the idea of this paper. Why flexibility, because it controls the behaviour of these assets through its properties of control. Its application multiplies the problem-solving abilities in people by enhancing their intellectualness that improves the value of decision-making compared to traditional means like subjective judgement based on past experiences (Fujiwara, 2013). On the other hand, it paves the way for developing systems that once designed can regulate themselves on their own. It places adequate emphasis on transforming hard systems into soft for their wider diffusion and greater acceptance by people of the organisation for higher collective efforts to achieve the purpose. Process and structural flexibility, however not limited, are two main types that hold great relevance for a successful KM system. These types duly include human factors (that include culture, people and leadership), 2) organization factors (structures and processes), 3) information technology, and 4) strategy and control. These have been fairly discussed in the paper above.

But there are certainly some challenges in integrating KM and flexibility. It is because as concept both are abstract, dynamic and subjective in their interpretation. Some of these stems from ambiguity and unstructured-ness in their conceptual framework. In the absence of a uniform model,theytend to show greater disparity. For example, flexibility as a concept has been categorized into (different) types and (maturity) levels (Sushil, 2012a). But its application is not a 'ready-to-apply' thing. Each type may produce unique results with each of them having similar possibility to be applied a purpose with different costs, efforts and time equations. Same case is with KM. Variety of KM elements contribute to its success. But which element will contribute more compared to others, towards the success of the KM model, largely remains subjective. It is therefore their model development and integration with each other largely depends upon the purpose of their deployment. Designing a flexible KM therefore will require addressing the core purpose of pursuing a KM program first, reviewing the strength of resources, and perceiving a systems control model where balanced interaction between target system and controlling networks should take place, to match the purpose with result. Scope of this research can further be extended towards knowing the contribution of flexibility by 'quantifying'each KM element separately, for its contribution towards the business performance. A general compare is given in table 3 that compares and contrasts between the two, to enable conceptualization of their integration with each other in addressing organisation knowledge requirements more flexibly.

Table-1: A General Compare and Contrast between KM & Flexibility

Compare		**Contrast**	
Purpose	Based on the notion of competitive economics or economic value to the business.	**Application**	Knowledge is extracted from intellectual assets; flexibility is applied to control the behaviour of these assets.
Aim	Provides for problem solving that promotes systems thinking logic to connect the elementsofthe system defining environment impact on these elements.	**Approach**	KM is choices stored in the databank; flexibility is capability to select and apply that choice to respond to a certain situation.
Concept	Multidimensional (built on certain assumptions, different levels of analysis, varying levels of experience and different objectives at individual, group or organization-level) therefore inconsistent as a model.	**Function**	KM applies past experiences; flexibility discovers real-time options.
Discipline	Multidisciplinary therefore unstructured as a subject.	**Static Vs Dynamic**	KM is static approach to gaps finding whereas flexibility is clearly a dynamic approach that strategize for gap-filling
Determinants	Chiefly 5: Strategy, structure, technology, organisationalculture, leadership – referred as social ecology.	**Redundant thinking Vs Thinking redundantly**	KM presses for eliminating redundancy; flexibility stresses thinking-through the new business situations redundantly

Classification	Classified under Taxonomies and generations depending upon the type / context.	**Past Vs. Future (Solution)**	KM asserts past-like solution can be applied to the present situation; whereas flexibility typically anticipates a situation from multiple perspectives and create choices.

Future Scope of Research:

Scope of this research can further be extended towards knowing the contribution of flexibility by 'quantifying'each KM element separately, for its contribution towards the business performance. A general compare is given in Table-1 that compares and contrasts between the two, to enable conceptualization of their integration with each other in addressing organisation knowledge requirements more flexibly.

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