Socio Technical Systems of a Company: The Dimensionality of Socio Technical Systems

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Abstract

Socio technical systems (STS) are to be designed as agile work systems that respond to environmental challenges and at the same time institutionalize organizational core functions that enable to create and sustain value in an organization. STS should spread its wings to institutionalize these functions/dimensions and provide cohesiveness among them to become adaptable to the demands of organization and environment simultaneously. The four dimensions of STS uncovered based on 'Human Goals Based Theory of the Firm (HGBTF)' are knowledge management, competitiveness, corporate entrepreneurship and HRM Practices. The exploratory research suggests that companies should develop and deploy STS to institutionalize these four dimensions for continuous learning, enhanced value proposition, consistent innovation, and employee development. Hence, all the successful companies consider STS as an organizational goal for holistic development, sustainability, and transformational change of organization. This article is a revised and expanded version of a paper entitled 'Socio Technical Systems of a Company: The Dimensionality of Socio Technical Systems', presentedatFifteenth Global Conference on Flexible Systems Management, Symbiosis Institute of Technology (SIT), Pune, India, Oct 23-25, 2015

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1. Introduction

The objective of the paper is to identify various organizational challenges and explore solutions to address them through socio technical systems (STS). The exploratory study through literature review has identified four important challenges- continuous learning, enhanced value proposition, consistent innovation, and employee development. Socio technical systems address these four challenges by focusing on four dimensions in the areas of knowledge management, competitiveness, corporate entrepreneurship and HRM practices. The four dimensions of STS are uncovered based on Human Goals Based Theory of the Firm (HGBTF) which is developed by authors in the light of Indian Ethos.

Megginson (1963) said, "According to Darwin's *Origin of Species*, It is not the most intellectual of the species that survives; it is not the strongest that survives; but the species that survives is the one that is able to best adapt and adjust to the changing environment in which it finds itself". Hamel (2007) has tried to understand organizations from adaptation perspective and says "For almost 20 years I've tried to help large companies innovate. And despite a lot of successes along the way, I've often felt as if I were trying to teach a dog to walk on his hind legs. Sure, if you get the right people in

the room, create the right incentives, and eliminate the distractions, you can spur a lot of innovation. But the moment you turn your back, the dog is on all fours again because it has quadrupled DNA, not biped DNA. So, over the years, it's become increasingly clear to me that organizations do not have innovative DNA. They don't have adaptability DNA. This realization inevitably led me back to a fundamental question; what problem was management invented to solve any way?" The fundamental question is how can we transform quadruped DNA and sustain biped DNA? A company should design a work system to sustain biped DNA in response to the needs of the organization that reinforces biped DNA in response to the environmental changes.

Many companies display burst of innovation over short stretches of time or in specific business or product lines, whereas winning companies institutionalize innovation which is reflected in their products, processes and business models on a consistent basis. The yearly survey of BCG on 'The Most Innovative Companies 2016' shows Apple as the No.1 innovative company among the list of 50 innovative companies in the world followed by Google, Tesla Motors, Microsoft, Samsung, Facebook, 3M, etc. in that order (Ringel et al., 2017). Apple has been No.1 since 2005 and has a history of repeated hit innovations, from the Mac, to the iPod and the iTunes, to the latest iPhone 'X' that reflect the Apple's legacy of *corporate entrepreneurship*. Google has been No.2 every year since 2006. At Google, there is a budgeted time for innovation where employees focus on thinking afresh at certain time intervals regularly every day. 3M, occupying 42nd position, has institutionalized corporate entrepreneurship by linking one-third sales from new products released in the past five years to reinforce innovation continuity. These innovations become institutionalized in organizations' internal mechanism. These systems exist in a state of quasi-

equilibrium that allows further innovation and thereby enhanced adaptability to dynamic changes in the environment.

Dinosaurs in spite of their large size could not survive because they haven't learnt how to adapt to the dynamics of environment. They are unable to make the necessary changes in their internal structure in tune with the changed demand conditions. Gues (1997) says, "Your ability to learn faster than your competition is your only sustainable competitive advantage". Sony is a world leader in electronics because it learns faster than others by making its employees ready for environmental changes. Sony's CEO Marasu Ibuka attributed the success much to training and said, 'We knew learning was a skill. The more employees learned the better learner they became. We knew continuous learning would make them more adaptive to new ways of manufacturing' (Bell, 2012). Sony has already *institutionalized learning* with continues training of employees in anticipation of environmental changes. Ackoff (2002) suggests developing 'learning-adaptation support systems' in organization for continuous learning.

One needs to change one's business model according to needs of the environment so as to offer a competitive value to customer. Narayana Health (NH), started by Devi Shetty to help children with heart problem has become a benchmark for 'cardiac surgery' in the healthcare industry. The hospital has developed *a system* to standardize the process of 'surgery' that facilitates more number of operations per day and at a cheaper price compared to hospitals in the west. Indian conditions are very peculiar and the customers are price sensitive hence a delivery model that is responsive to the local conditions survives better than imported models from rich countries. Many developing countries and even rich countries are transplanting NH model and work *systems* to enhance *value*

SMS
VARANASI

proposition and *competitiveness* of their companies. NH has institutionalized competitiveness by designing and deploying right systems.

The business environment is very uncertain and stakeholder relationships are dynamic, hence, everyone looks for an order in chaos, a predictable value return. Trump (Trump and Kiyosaki, 2006) says, "I have looked at so many businesses that are top-heavy, staffed by highly educated and highly paid people who are working hard and are accomplishing little. In most of the cases, these types of businesses focus primarily on people and not on developing great systems. A great team of highly paid people will fail without great systems". Trump says *build systems* to control and minimize losses (Trump and Kiyosaki, 2006). The desired human behavior can be institutionalized by designing appropriate systems.

Aravind Eye Care System (AECS), Madurai, India, follows a farsighted recruitment system where ophthalmologists are selected from inside the pool of fellows and residents. The management has a strong preference for employing doctors groomed within its walls because they have already absorbed not just the technical aspects of its system but also the cultural ethos of the organization. They have less to unlearn because their behavior is institutionalized (Mehta and Shenoy, 2011). The founders have developed refined systems for all the *HRM practices* to mould employee behavior in tune with the values of the organization for its sustainability.

The above examples emphasize the various dimensions of an organization but the common thread is the importance of 'Systems' and how systems play a vital role in sustaining organizational functions. Since '*Systems*' is the undercurrent of organizational functions as discussed above in terms of '*learning,*

competitiveness, corporate entrepreneurship and *HRM practices*' for their consistency, they need to be given the highest attention and focus. In the present globalization era, most of the systems are technologically sophisticated and sandwiched with human component. They are also executed by people hence the importance of the socio technical dimension. The socio technical systems are a basis for competitive advantage if they are firm-specific that competitors cannot generally copycat. Apple, Sony, NH, AECS are some of the examples of organizations that have developed systems which rivals can't match and hence have lasted longer in the market. Socio Technical Systems support all the functions of an organization to maintain consistency, predictability and optimization. Systems need to co-evolve with the dynamics of organization and environment.

Winby (2011, 2012) proposes an 'adaptive work system' that is demand-centric and self-designing work system to respond to turbulent business environment and organizational aspirations. The adaptive work system is configured to operate as a work system at multiple levels of global, enterprise, or unit levels of design. Performance characteristics such as agility, speed, flexibility and re-configurability are typically delivered by 'adaptive work systems'.

2. Socio Technical Systems (STS)

Socio technical refers to the interrelatedness of social and technical aspects of an organization. The cornerstone of the socio technical approach is the design process that leads to optimization of the two subsystems. The socio technical system is also open and must manage the boundary between the system and the environment; for example, adequate information flow must be available to understand the changing demands of environment within and outside the organization. Organizations that are adaptive to the demands of the

environment are able to thrive on chaos to meet its desired goals.

Socio technical theory has its origin in the work of the Tavistock Institute, London during the 1950s and 1960s (Trist & Bamforth 1951).
The main application of socio technical systems is the autonomous work group or self-managed teams. Trist (1981) finds that self-managed teams with flexible roles are more effective than teams with highly structured roles. Socio technical systems theory has strongly influenced the Quality of Work Life Movement in the 1970s. The importance of Socio technical systems has re-surfaced as a part of the fifth discipline (Senge, 1990).

Socio technical system is based on an Open Systems theory, which posits that an organization is a human system in dynamic relationship with its environment. Organizations can achieve much higher performance by gearing internal structures to control variances using principles of socio technical systems (Berezin, 200X). According to Sommerville (2003) the complex relationships between the components in a system mean that the system is more than the sum of its parts and has properties that are properties of the system as a whole. These emergent properties (Checkland, 1981) cannot be attributed to any specific part of the system. Rather, they only emerge once the system components have been integrated. Whitworth (2009) says 'A traditional information system's performance is its functionality, but a better definition is how successfully a system interacts with its environment. This allows usability and other "non-functional" requirements like security and reliability to be part of system performance. The eight system goals perform two distinct types of actions; one, success-creating goals (functionality, flexibility, extendibility and connectivity) the other, failure-avoiding goals (security, reliability, privacy and usability).

The study 'Great by Choice' (Collins and Hansen, 2011) has uncovered the Southwest Airline's 10-point framework as SMaC (Specific, Methodical and Consistent) recipe, a set of durable operating practices that create a replicable and consistent success that guide in 'what to do and what not to do' to provide predictable service. Amazon.com is successful because its systems are supported by technology and software programs. Southwest, American, United, Delta, and other major airlines cannot hope to provide world-class passenger service without a computerized reservation system, an accurate and expeditious baggage handling system, and a strong aircraft maintenance program (Thompson and Strickland, 2004). Systems help align actions and behavior with strategy throughout the organization, placing limits on independent action and channeling individual and group efforts along the intended path. Socio Technical Systems optimize techno-human interface and provide predictability, consistency, and agility to organizational core dimensions/functions so as to ensure organizational performance outcomes viz. profit, shareholder value, customer delight, stakeholder satisfaction and more, hence, should be pursued as an *organizational causal goal*.

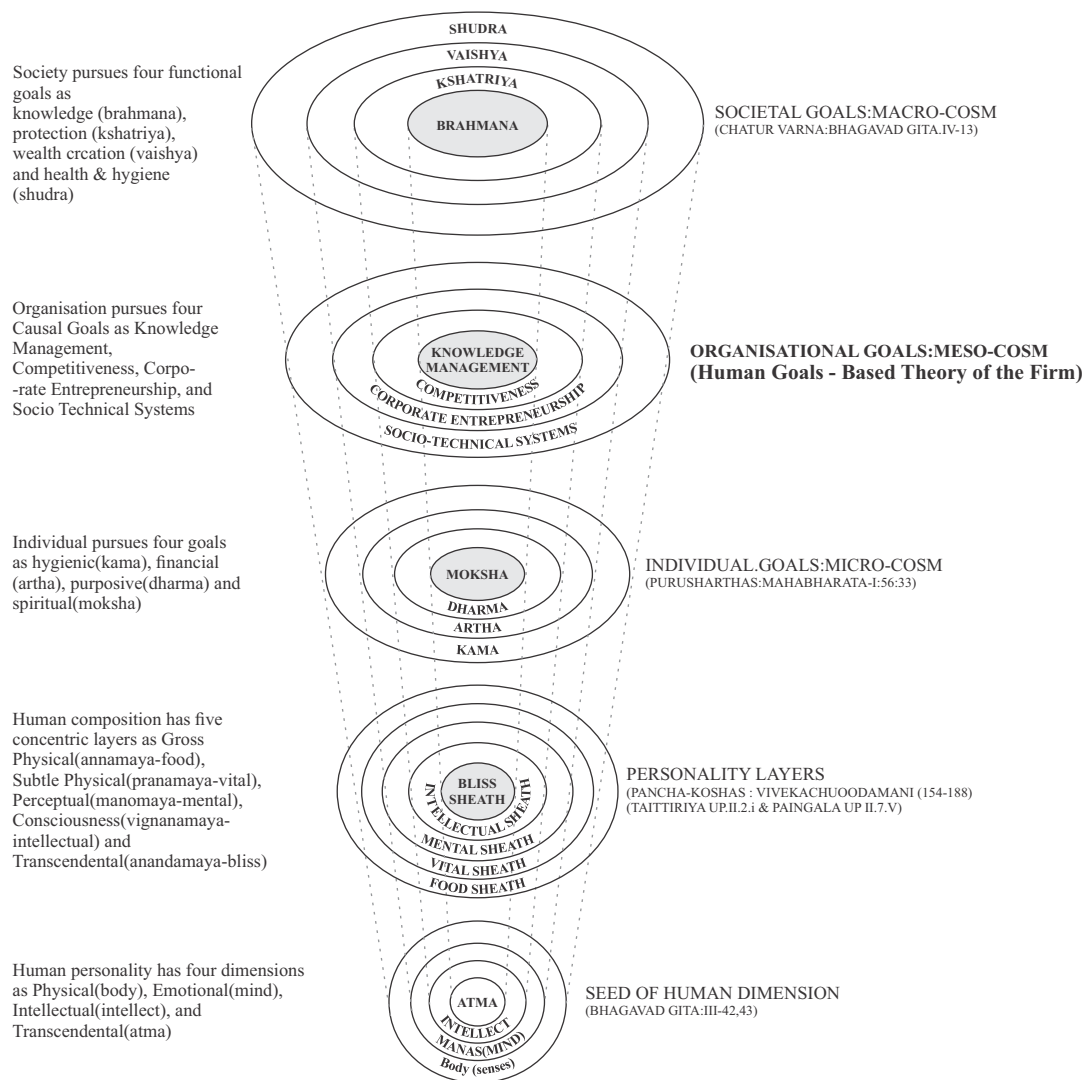## 3. Socio Technical Systems (STS) as an Organizational Goal

Socio technical systems should support organizational core dimensions individually and synergize collectively, hence a strategy should be to redesign governance mechanism to accommodate new models of work systems in response to the environment. Lowder (2006) of GE says, "Immelt's leadership is oriented toward execution that hinges upon a controlled, organic growth initiative driven by effective and efficient processes. GE's technological structures are being designed around the concepts of customer value, innovation, leadership in technology, commercial

excellence, globalization, and growth leadership".
As Winby and Taylor (2005) suggested, for STS to
grow and succeed as a viable concept, philosophy,
and contribution to the world of work, it must
undertake a discontinuous change by creating new
STS technologies that provide new-to-the-world
customer value and displacing existing ways of
delivering customer value. STS should be agile
enough to meet the demands of the environment

and at the same time align with strategy and core
dimensions of the organization.

The organizational core dimensions uncovered
based on Human Goals Based Theory of the Firm
(HGBTF) are four: Knowledge Management,
Competitiveness, Corporate Entrepreneurship and
Socio Technical Systems (Botla and Kondur, 2014)
as shown in the Figure 1.

Fig.1: Human Goals Based Theory of the Firm (HGBTF)

Society pursues four functional goals as knowledge (brahmana), protection (kshatriya), wealth creation (vaishya) and health & hygiene (shudra)

SHUDRA
VAISHYA
KSHATRIYA
BRAHMANA

SOCIETAL GOALS:MACRO-COSM
(CHATUR VARNA:BHAGAVAD GITA.IV-13)

Organisation pursues four Causal Goals as Knowledge Management, Competitiveness, Corpo--rate Entrepreneurship, and Socio Technical Systems

KNOWLEDGE MANAGEMENT
COMPETITIVENESS
CORPORATE ENTREPRENEURSHIP
SOCIO-TECHNICAL SYSTEMS

ORGANISATIONAL GOALS:MESO-COSM
(Human Goals - Based Theory of the Firm)

Individual pursues four goals as hygienic(kama), financial (artha), purposive(dharma) and spiritual(moksha)

MOKSHA
DHARMA
ARTHA
KAMA

INDIVIDUAL.GOALS:MICRO-COSM
(PURUSHARTHAS:MAHABHARATA-I:56:33)

Human composition has five concentric layers as Gross Physical(annamaya-food), Subtle Physical(pranamaya-vital), Perceptual(manomaya-mental), Consciousness(vignanamaya-intellectual) and Transcendental(anandamaya-bliss)

BLISS SHEATH
INTELLECTUAL SHEATH
MENTAL SHEATH
VITAL SHEATH
FOOD SHEATH

PERSONALITY LAYERS
(PANCHA-KOSHAS : VIVEKACHUOODAMANI (154-188)
(TAITTIRIYA UP.II.2.i & PAINGALA UP II.7.V)

Human personality has four dimensions as Physical(body), Emotional(mind), Intellectual(intellect), and Transcendental(atma)

ATMA
INTELLECT
MANAS(MIND)
Body (senses)

SEED OF HUMAN DIMENSION
(BHAGAVAD GITA:III-42,43)

Law of Correspondence (Mirroring)
As above, So below, As below, So above

The four organizational core dimensions are implemented by employees hence the importance of HRM practices. Organizations align employees with the four organizational core dimensions through HRM Practices for optimum value creation. Hence, HRM practices become an integrative function among the four organizational core dimensions. Socio Technical Systems in other words has to support four organizational dimensions in terms of the three organizational dimensions (knowledge management, competitiveness and corporate entrepreneurship) and the fourth HRM practices. These five organizational dimensions/functions are interwoven to enrich each other.

Unless Socio Technical Systems (STS), as an organizational goal, supports core functions of an organization, it is difficult to sustain the growth and development in the organization. STS should sustain the following four organizational core dimensions while aligning with 'strategy' to ensure *continuous learning, enhanced value proposition, consistent innovation,* and *employee development.* The four dimensions of STS are shown in the Figure 2.

Fig. 2: Four Dimensions of Socio Technical Systems
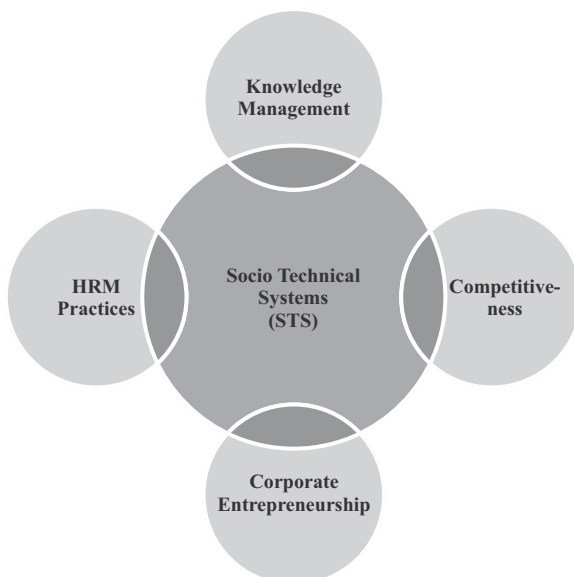
1. Socio Technical Systems and Knowledge Management

STS should support knowledge creation, sharing and application in a continuous mode. Knowledge is available in tacit and explicit forms inside and outside of the organization. How to integrate both tacit and explicit knowledge along with internal and external knowledge? Community of practices, employee experiences, and connectedness create the platform for tacit and explicit knowledge sharing within a company. Creation of formal & informal networks with customers, suppliers, competitors, and other stakeholders integrate internal and external knowledge.

The SECI model postulates that the conscious interplay of tacit and explicit knowledge is accomplished through organization's structures and systems to facilitate the interaction of four knowledge creating processes—socialization, externalization, combination, and internalization. The fast conversion between the tacit and the explicit knowledge creates knowledge base for being a learning organization. NASA (National Aeronautics and Space Administration) has successfully landed the rover 'Curiosity' on the planet Mars on August 6, 2012 with the support of its knowledge management systems. NASA's knowledge sharing initiatives bring together thought leaders in project management and systems engineering to promote excellence in project management. NASA facilitates dialogue through narratives and informal storytelling to give practitioners a sense of context so as to grasp the tacit nature of the knowledge. GE takes advantage of knowledge transfer from its healthcare imaging division and in applying it to its energy, rail, aviation, and oil and gas divisions to eliminate infrastructure weaknesses. Henderson and Cockburn (1994) indicate that those firms, where information flows across units having different knowledge backgrounds, are more likely to

outperform their competitors in their research output.

Microsoft is very successful in building systems for knowledge management like 'digital nervous system', which will work with the speed of thought. Bill Gates says, "A digital nervous system is the corporate, digital equivalent of the human nervous system, providing a well-integrated flow of information to the right part of the organization at the right time. A digital nervous system is distinguished by the accuracy, immediacy, and richness of the information it brings to knowledge workers and the insight and collaboration made possible by the information (Gates and Hemingway, 2000). The knowledge in Microsoft reaches all employees instantly for exploration and exploitation because the value of knowledge has a time dimension too.

Many companies have installed software systems on their company intranet to catalog best practices information. Such systems speed up organizational learning by providing efficient communication systems, organizational memory of best practice, and permitting people across the organization to exchange knowledge and updated solutions. The Knowledge Management Program (KMP) in Mittal Steel is designed to build a world-class Knowledge Management capability. Knowledge exchange helps Arthur Anderson employees to capture the lessons learnt in the company's daily work and make them available to all other personnel round the clock.

Customer Knowledge Management System leverages customer touch points where data mining techniques unearth the riches hidden in customer data. For example, Harrah's Entertainment, the world's largest casino operator, maintains a vast customer data base and uses its CRM system to manage day-to-day relationships with important customers at its 43 casinos around

the world. CRM is not a technology solution but one of a relationship (Kotler, 2008). Every e-Bay user has a feedback profile made up of comments from others e-Bay users to monitor the transaction experience (Friedman, 2005). One of the business strategies of IBM is development of a system that is on-demand. The employees at IBM anticipate and take feedback from the market, to create infrastructure and to meet the market demand. The systems are ready to build the skills of employees and to surpass the expectations of customers.

Institutionalized practices or organizational memory nurtures learning culture. Google has institutionalized learning through a series of 'Tech Talks' that are given by distinguished researchers from around the world. Google has institutionalized 'Googleness' among all the employees to imbibe Google culture into the system (Garvin et al. 2008). Tata's culture, GE culture, Toyota way etc. are culturally ingrained systems that drive or guide employee to leverage knowledge of their companies. GE has a culture of boundary-less organization where knowledge is seen as one unified whole i.e. knowledge doesn't have any boundary. LV Prasad Eye Institute(LVPEI)'s day begins at 7.00 am with knowledge sharing activity among consultants and fellows for one hour across all locations through video conference. This is the only Eye Institute in India that attracted three Shanti Swarup Bhatnagar Awards to its working scientists for the research done within the Institute. LVPEI, a Centre of Excellence in ophthalmology, has developed systems to foster a culture of knowledge creation, sharing and application on a continuous basis.

Knowledge Management Maturity Models guide institutionalization of knowledge management activities. TCS believes the states of knowledge maturity can be achieved by systematically addressing the three basic pillars of KM- People: people and culture, Process: process, policy and

strategy and Technology: technology and infrastructure. TCS follows the 5iKM3 Knowledge Maturity Model to institutionalize knowledge management practices (Mohanty and Chand, 2004).

2. Socio Technical Systems and Competitiveness

Competitiveness is the ability to create unique value proposition to market. Companies can build competitiveness by enhanced productivity to deliver superior customer value. Tata Steel occupies a better market share because it follows customer value management as a philosophy. STS enhances job satisfaction and productivity through a design process that focuses on the interdependencies among people, technology, and work environment (Emery & Trist, 1969). Ohno's efforts enabled Toyota to cut change over time that initially required two to three hours, to less than an hour, and then to fifteen minutes, and then down to merely three minutes (overall, an improvement of 60X), giving Toyota an enormous productivity advantage over its competitors (Ohno, 1988).

AECS doctors perform on average 2,000 surgeries a year, significantly exceeding the national average of about 400. AECS has developed 'assembly–line--production--model' to perform more surgeries in less time with more accuracy (Dias and Monteiro 2006). The systems in place aim to reduce the surgeon's wait time –whether for case details, a surgical instrument, or the next patient –to zero. AECS has invented a system that "If a team of one surgeon and two nurses is equipped with two sets of instruments instead of one, they can double the number of surgeries done per hour. With an additional nurse and four more instrument sets, they can quadruple their output. It has also invented that pre-grouping cases by degree of complexity, boosts surgical productivity (Mehta and Shenoy, 2011). Venkataswamy (Dr.V), the founder of the AECS, is the first Indian who could

see a medical solution in American food chain, the McDonald's. He has understood the importance of *systems* in providing a standard cataract surgery to millions of blind people in India (Rangan, 1993). McDonalds's policy manual, in an attempt to steer 'crew members' into stronger quality and service behavior patterns, spells out procedures in detail; for example, "Cooks must turn, never flip hamburgers. If they haven't been purchased, Big Macs must be discarded in 10 minutes after being cooked and French Fries in 7 minutes. Cashiers must make eye contact with and smile at every customer (Thompson and Strickland, 2004)". Though consumers can get better hamburgers in lots of other places, what they're buying at the fast-food chain is consistency. Franchise Model is 'systems-driven' to provide standardized high-quality solution on a consistent basis. ICICI, India, has developed technology-driven systems and considers technology as its core competence. K.V.Kamat, CEO of ICICI, says, "People didn't have all the time in the world to walk to a bank, stand in a line, get served, and come out again. They didn't mind learning to use a bit of technology" (Leo, 2007). Technology has facilitated ICICI to provide enhanced services to customers and serve more numbers of customers.

The systems of successful companies are firm-specific and hence difficult for others to imitate. Starbucks roasting curves are built into proprietary computer software that will not allow another competitor to duplicate Starbucks signature roasts (Kachara and Crossan, 1997). Mumbai Dabbawala is able to attract a Six Sigma rating of efficiency for distributing lunch boxes across Mumbai in India. Each Dabbawala organizes himself like self-organizing system coupled with simple marking mechanism (Rediff, 2005). Miles and Snow (1984) argue that "successful organizations achieve strategic fit with their market environments and support their strategies with appropriately designed structures and management processes,

while less successful organizations typically exhibit poor externally or internally, or both". Porter (1996) opined that the more a company's positioning rests on activity systems with second-and-third-order fit, the more sustainable its advantage will be. Such systems, by their very nature, are usually difficult to untangle from outside the company and therefore hard to imitate. LVPEI is the first major eye institute in India, accredited by NABH (National Accreditation Board for Hospitals and Healthcare) to assure healthcare standards and has reached a benchmarking status in the country. Tata Business Excellence Model (TBEM) has been developed by Tata Group to convey its standardized recipe as a benchmark to all companies of Tata Group to enhance their competitiveness (Botla and Kondur, 2011).

Nature has created everything out of simplified systems. All animals have similar digestive system, excretory system and breathing system even though they may look dissimilar. The more simplified the system is, the better the competitiveness and it can be expanded into any extent of heterogeneity without compromising competitiveness. Honda Motors has simplified the system of efficient engines. The system of 'engine' could be applied not just to motorcycles but also to autos, generators, outboard motors and other products. Honda is a leader in many domains because it is able to diversify and see a simplified common system. NH has begun with cardiac care and has successfully expanded into other areas like eye care, trauma and cancer care to optimize its existing systems (like infrastructure, trained staff, logistics, etc.) and transformed itself into 'health city' that assists to minimize costs and provide optimum value to its patients. Devi Shetty says about its expansion that "Cardiac surgery is like a moving train, we're just adding other cars" (Salter, 2012).

3. Socio Technical Systems and Corporate Entrepreneurship

Corporate entrepreneurship fuels an organization for its new products, new processes, new models, and new markets. Organizations often have innovation that is erratic and one can also notice the absence of innovation in organizations. How to sustain corporate Entrepreneurship in an organization? Morris (2006) says, "The nature of competition today has made innovation itself insufficient, because just having some ideas and bringing them to market does not assure a successful future. What you need instead is permanent innovation, the process of innovating regularly, constantly, & continuously, by developing organizational culture that embraces innovation as a core value, practices innovation as a core methodology, and produces innovation as a consistent output". Hence, institutionalizing corporate entrepreneurship for consistent innovation has become a necessity.

The BCG Innovation Survey (2007) shows that few companies have the ability to innovate, as witnessed by their steady and ongoing generation of bottom-line-enhancing products and services, customer experiences, processes, and business models. These companies appear to be able to 'go to the well' whenever they need to and consistently come up with winners. Successful companies create structures, processes, and metrics precisely for the purpose of risk mitigation. The survey says "Risk-averse corporate culture was identified by survey respondents as the single largest factor impeding company's ability to maximize return on innovation spending" (Andrew at al. 2007). Risk-tolerating systems are crucial for encouraging innovation. Larsen &Toubro Limited (L&T) is successful because employees have a freedom to experiment and they do not have any fear of reprimand. Innovation has been encouraged for timely completion and there are also instances of

faster completion than the competitors at construction sites (Sarin, 2010).

Bureaucratic managers often say no to people from outside their area just to demonstrate that they are in control. Intrapreneurs are persistent visionaries who act courageously to turn ideas into profitable realities. Senior managers of innovative companies even encourage innovators to bend rules and rigid procedures in order to keep promising ideas on track and also for converting ideas into products. Firms such as Samsung, Nike, Facebook, etc. have created highly decentralized, flat structures and enabling systems & practices to maintain an entrepreneurial environment. Entrepreneurial actions often begin from the informal interactions of likeminded individuals within organization and these people need to receive support from the organization formal structures, systems and roles (Kuratko and Hodgetts, 2007) to work on their innovative ideas. Entrepreneurial firms design organizational context conducive to autonomous generation of entrepreneurial initiatives and this entails the creation of structures that facilitate entrepreneurial behaviours. Sony is able to come out with more patents because employees are empowered to work on their individual ideas. Whirlpool motivates employees by keeping aside more than 20% of capital budget and their pay is linked with the revenue derived from new products and services. Few companies emphasize that 25% ideas should come from external sources to provide fresh breath to the organization.

Entrepreneurial companies allocate resources, attention and talent disproportionately. Burke and Hussels (2013) say "Venture capitalists can foster a similar dynamic by taking care not to over-fund a new business, since having too much cash on hand can make it difficult to build a low-cost culture. Even individuals receive additional reward and compensation for their ideas and efforts beyond the standard reward system. Entrepreneurial companies allocate consistent funding for R & D to keep them more vibrant in innovation. Intel R&D consistently develops new versions of microprocessors to keep itself ahead of competitors. Microsoft also focuses on consistent product innovation through its research centers. Nokia achieved market leadership because of its constant efforts towards developing a corporate culture to encourage innovation (Regani, 2006). Innovative organizations create cross-disciplinary project teams to foster innovation and are empowered to make decision on their own. When companies distribute ownership to employees they start behaving differently. TCS has 23 Mini CEOs who manage their own profit and loss accounts, each with complete ownership. Right mix of resources will enable entrepreneurs to become globally competitive and that will have a multiplier effect not only on the individual or the country, but also on firms of different sizes as well (Ramachandran et. al, 2006).

Software companies in Silicon Valley are successful because external environment is more entrepreneurial. Local Innovation System and its connectedness with National Innovation System provide enough support for innovation as well as entrepreneurship (Wikipedia, 2013). Silicon Valley accounts for one-third of all venture capital investment in the US and provides base for startups and largest technology companies due to the existence of supportive ecosystem. Clusters help create an environment that is productive, attracts people with right skills, and provides a good supplier base and research organizations. Porter (2001) advises the Netherlands to implement cluster thinking to allow the innovation agenda to move forward rather than relying on government subsidies. Cluster here acts as a system through which innovation takes place in a large scale for the Netherlands entrepreneurship. Many software innovations took place in the US because it has a

well-protected legal system. Shahani (2013), MD of Novartis India, says, "If investments have to flow into R&D, the ecosystem has to be right" including IPR. Managing Director of Mahindra and Mahindra, says, "I think we have to spend an equal amount of time and rigor on setting up systems and protocols that encourage free thinking and innovation" (Mahindra, 2013). Gadiesh (2013), the Chairman of Bain & Co, opines, "Innovation really needs some structure. It's not just sitting somewhere in a lab and thinking interesting thoughts".

4. Socio Technical Systems and HRM Practices

Socio Technical Systems must create optimum value from human effort and HRM practices. Human resources are precious assets, hence, should be managed with effective processes to get consistent results vis-a-vis with continuous employee development. Cox (2000) opined about Maslow that, "people achieve an optimal level of functioning when organizations develop practices that embrace the holistic nature of human beings. He believed that a humane, enlightened management policy focused on human potential would prove financially profitable as well". HRM practices should incorporate intelligent systems to uncover employee talents for effective functioning and optimization of inherent potential.

Socio Technical Systems act like a lever to operate complex activities with the least human effort. Domino's Pizza has computerized systems at each outlet to facilitate ordering, inventory, payroll, cash flow, and work control functions, thereby freeing managers to spend more time on supervision, customer service, and business development activities (Quinn, 1992). Systems are the way that a large business leverages the expertise of skilled workers without losing quality control. You leverage the expertise to define processes or standard procedures followed by less

skilled – less expensive-workers. OTIS, an elevator company, has defined elevators as a 'service' business and not an elevator-producing business. The fleet of service personnel would move on motor cycles with walky-talky type of phones to ensure minimum downtime. It has even trained security guards of residential building societies what to check first if a lift goes out of order, even before contacting the service personnel (Sarin, 2010).

Corporate culture is the organic system of company's values and business principles. The culture at Microsoft motivates everyone for longer hours of work to meet deadlines and complete programs on time. HR's purpose is to create a culture that results in sustained business out-performance while ensuring extreme care for core values (Dubey 2010). One of the stories at FedEx is about a deliveryman who unbolted the drop box when the right key was missing to deliver the packages on time (Thompson and Strickland, 2004).

Companies are using IT systems to recruit, screen, hire, train and promote employees. A scientifically designed Human Resources Information System (HRIS) facilitates management to readily identify employees with particular skills in order to meet the changing demands of the company. HRIS also helps in HR planning, training programs, succession planning, compensation management, rewards, etc. Many of the transactional types of services have been done through e-HR so that HR staff can concentrate on more strategic issues. Recruitment and selection should follow effective systems to get the right person for the right job. Infosys follows consistent high academic standards for employees for entry-level jobs. Right interview techniques and tests are necessary to pick right employees for an organization. Campus interviews are necessary for recruiting fresh blood into the organization.

Newly recruited employees and experienced employees both receive adequate training periodically to update their knowledge, skills and attitudes. Experienced employees get right training when moving to a new position or when new initiatives are introduced in the organization. Krishnamoorthy (2010), Senior Vice President (Corporate HR & Personnel), L&T says, "An engineer, if provided with general management skills, will be much better equipped to handle senior positions". L&T has an Assessment and Development Centre where the potential of well-performing employees is continuously assessed.

Organization basically gets what it rewards. The training system, the planning system, the communication system, the budgeting system, the information system, the compensation system—all have to be based on the principle of win/win (Covey, 1989). Systems act as a powerful lever for changing the corporate culture in ways that produce a strong fit with the strategy. Strategy supportive motivational approaches reinforce the desired behaviors among employees; hence, appropriate reward system is need of the hour to bring-in transformation.

Gerstner's (2002) prophetic words 'People do what you inspect, not what you expect' hence feedback systems to monitor performance of employees is necessary so that unwelcome surprises can be avoided. Performance appraisal is done through 360-degree feedback systems and others. People Capability Maturity Model (PCMM) prepares an organization to integrate HR practices with organizational goals through employee development. PCMM helps companies to gauge and develop the maturity of employees to evolve

their competencies and provides the road map for employee development. Wipro is the first company in the world to be assessed at PCMM Level 5 in 2001 and subsequently many other companies like TCS, Infosys, L&T Infotech, MindTree, Honeywell, etc. have reached PCMM Level 5 status where systems alignment with people has reached the optimizing level.

Employees have optimum satisfaction when they have positive career path. Corning Inc. uses HR software to set developmental goals of its employees once they've been hired and gauge how well they are meeting them. Employees can look online to see their own goals and mark their progress as well as see everyone else's goals in the command chain, from the CEO down to their immediate supervisors. This 'cascading' of goals has helped Corning's employees align their personal goals with the organizational overall objectives in order to reach higher levels (Snell and Bohlander, 2007). Systems should make people more capable and optimize potential to deliver unimagined value hence creation of virtuous systems are more important. "Good people in a bad system typically go bad. Bad people in a good system become good. That sounds simplistic, but it is true (Mehta and Shenoy, 2011)".

5. Conclusion

The four core dimensions of Socio Technical Systems viz. knowledge management, competitiveness, corporate entrepreneurship and HRM practices should be institutionalized individually and collectively so as to form into a socio technical virtuous system as show n in the Figure 3 to optimize the value creation.

Fig. 3: Socio Technical Virtuous Systems

The STS sustains the emergent virtuous system that enriches these four dimensions viz. continuous learning, enhanced value proposition, consistent innovation and employee development. The STS should incorporate these four dimensions while designing a virtuous work system to lock competitors and unleash company potential to respond to the dynamics of environment. The institutionalization of four dimensions not only sustains the organization in the long run for consistent value preservation and creation but also designs the desired environment. The holistic development and transformational change of an organization is possible only when all the dimensions are inclusively sustained with Socio Technical Systems as an organizational goal.

References

Ackoff, R. L. (2002). *A Systemic View of Transformational Leadership*. (online), http://www.acasa.upenn.edu/leadership.pdf, 12, (Accessed April 10, 2013).

Andrew, P. J., Sirkin, L. H., Haanaes, K., and Michael, C. D. (2007). Innovation 2007: A BCG Senior Management Survey. (online),

http://www.bcgindia.com/documents/file15063.pdf, (Accessed August 12, 2015)

BCG Innovation Survey (2007). (online), https://www.bcgperspectives.com/Images/BCG_Innovation _2007_Aug_07_tcm80-15063.pdf, 26-27, (Accessed September 15, 2010)

Bell, C.R,(2012). *Learning as a Competitive Advantage*. (online), http://www.astd.org/Publications/Blogs/Human-Capital-Blog/2012/08/Learning-as-a-Competitive-Strategy, (Accessed April 9, 2013)

Berezin, C. E. (200X), Practical Mechanisms for Achieving High Performance in Knowledge-Based Industries. a White paper from Management Strategies,(online), http://svn2.assembla.com/svn/sales/aspmimic/trunk/aspmi mic/docs/sts.pdf, 1, (Accessed June 15, 2008)

Botla, L., and Kondur, H. (2011). Competitiveness of a Company: Dimensionality of Competitiveness. *Research Journal of Social Science & Management*, 1(6), 51

Botla, L., and Kondur, H. (2014). Rethinking Organizational Goals in the Context of Indian Ethos. *International Journal of Indian Culture and Business Management*, 8(4), 442-458

Burke, A., and Hussels, S. (2013). How Competition Strengthens Startups, *Harvard Business Review*, 91(3), p.24

Checkland, P. (1981). Socio-technical Systems . *Software Engineering*, 7th Edition, 4

Collins, J., and Hansen, M. T. (2011). *Great by Choice*. London: Random House Business Books.

Covey, R.S. (1989). *The 7 Habits of Highly Effective People: Restoring the Character Ethic*. New York: A Fireside Book, 231

Cox, R. (2000). The Rich Harvest of Abraham Maslow. *Motivation and Personality*, India: Pearson Education Asia Pvt. Ltd., 257

Dias, A.J., and Monteiro, E.V. (2006). *Aravind Eye Care System*. Case Study of AESE Research Center, 5

Dubey, R. (2010). Unleash the Potential, *The Human Factor*, October 2010, 39

Emery, F., and Trist, E. (1965). The Causal Texture of Organizational Environments. *Human Relations*, 18(1), 21-32

Friedman, T. (2005). *The World is Flat: A Brief History of the Globalized World in the Twenty-first Century*. England: Allen Lane Penguin Books, 454

Gadiesh, O. (2013). The Time at Davos Debate: The Rewards of Mastering Risk, *Time*, (online), http://business.time.com/2013/01/25/the-time-at-davos-debate-the-rewards-of-mastering-risk/2/, (Accessed April 16, 2013)

Garvin, D.A., Edmondson, A.C., and Gino, F. (2008). Is Yours a Learning Organization? *Harvard Business Review*, 86(3),111

Gates, B., and Hemingway, C. (2000), *Business@the Speed of Thought: Succeeding in the Digital Economy*. New York: Warner Books, xvii-xxii

Gerstner Jr, L.V. (2002). *Who Says Elephants Can't Dance? Inside IBM's Historic Turnaround*. New York: Harper Business.

Gues, A. D. (1997). *The Living Company*, London: Nicholas Brealey.

Hamel, G.(2007). In Barsh, J.(2007). *Innovative Management: A Conversation with Gary Hamel and Lowell Bryan*. (online), https://www.mckinseyquarterly.com/Innovative_management_A_conversation_between_Gary_Hamel_and_Lowell_Bryan_2065, (Accessed January 10, 2010)

Henderson, R.M., and Cockburn, I. (1994). In Macchitella U. (2008). The effect of Human Resource Management Practices on Organizational Performance through Corporate Entrepreneurship, *Workshop paper,* (online), http://www.woa.sistemacongressi.com/web/woa2008/paper/track01/The%20effect%20of%20Human%20Resource_Macchitella.pdf, 12-13, (Accessed March 12, 2010)

Kachara, A., and Crossan, M. (1997). *Starbucks*. Case Study, Richard Ivey School of Business, 8

Kotler, P. (2008). *Principles of Marketing*. New Delhi: Pearson Education,106-107

Krishnamoorthy, M.S. (2010). Construct People Leadership.

Human Factor, October 2010, 41

Kuratko, F. D., and Hodgetts, M. R. (2007). *Entrepreneurship in the New Millennium*. New Delhi: Cengage Learning.

Leo, P. (2007). The CEO as CIO: An Interview with the Head of India's Top Private Bank, *McKinsey quarterly*, March 2007, (Accessed on 12 April, 2007).
Lowder, B. T. (2006). *Masters of Change: Transformational Growth Strategies at General Electric from 1982 to 2006*. (online), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=918546 ,19, (Accessed March 10, 2010).

Mahindra, A. (2013). The Time at Davos Debate: The Rewards of Mastering Risk. *Time*, (online), http://business.time.com/2013/01/25/the-time-at-davos-debate-the-rewards-of-mastering-risk/2/, (Accessed April 16, 20113)

Meggison,,L.C.(1963). Lessons from Europe for American Business. *Southwestern Social Science Quarterly*, 44(1), 4

Mehta, P.K., and Shenoy, S. (2011). *Infinite Vision: How Aravind Became the World's Greatest Business Case for Compassion*. San Francisco: Berrett-Koehler Publishers.

Miles, R., and Snow, C. (1984). In Stoner, J.A.F., Freeman, R.E., and Gilbert, D.N., *Management*. New Delhi: Pearson Education, 316

Mohanty, S.K., and Chand, M. (2004). *5iKM3 Knowledge Management Maturity Model: For assessing and harnessing the organizational ability to manage knowledge*, (online) http://www.careermosaicindia.com/tcs/km_whitepaper_tcs.pdf, (Accessed February 10, 2010)

Morris, L. (2006). *Permanent Innovation*, (online), www.permanentinnovation.com, 21, (Accessed March 20, 2013).

Ohno, T. (1988). In Morris, L. (2011). *Permanent Innovation*, (online), http://innovationlabs.com/Permanent_Innovation_Revised_Download_Version.pdf , 30, (Accessed April 11, 2013)

Porter, M. E. (2001). *Innovation Lecture*. (Online), http://www.isc.hbs.edu/InnovationLecture.pdf, (Accessed September 15, 2008)

SMS
VARANASI

Porter, M.E. (1996). What is Strategy? *Harvard Business Review*, 74(6), 74

Quinn, J.B. (1992). *Intelligent Enterprise*. New York: Free Press,181

Ramachandran, J., Mukherji, S., and Sud, M..(2006). Strategic Entrepreneurship in a Globalising Economy: Evidence from Emerging Economies, *IIMB Management Review*, 18(3), 282

Rangan, K. (1993). In Service for Sight, Harvard Business School Case Study, 1-2

Rediff. (2005). *Mumbai's Amazing Dabbawallas*. (online), http://www.rediff.com/money/2005/nov/11spec.htm, (Accessed December 15, 2008)

Regani, S.(2006). Nokia-Fostering Innovation, In George,S.S. (2006)(Ed.), *Management in Practice: Case Studies from the World of Business*, Hyderabad: ICFAI Center for Management Research, 55

Ringel,M., Taylor, A., and Zablit, H.(2017). *The Most Innovative Companies 2016*. (online), https://media-publications.bcg.com/MIC/BCG-The-Most-Innovative-Companies-2016-Jan-2017.pdf, (Accessed October 30, 2017)

Salter, C.(2012). *The World's 50 Most Innovative Companies 2012*. (online), http://www.fastcompany.com/most-innovative-companies/2012/narayana-hrudayalaya-hospitals, (Accessed January 5, 2013)

Sarin, S. (2010). *Strategic Brand Management for B2B Markets: A Road map for Organizational Transformation*, New Delhi: Response Books.

Senge, P.M. (1990). *The Fifth Discipline: The Art and Practice of Learning Organization*. New York: Double Day

Shahani, R. (2013). End of R&D. *The Hindu*, Hyderabad, April 2, 2013,10

Snell, S., and Bohlander, G. (2007). *Human Resource Management*. New Delhi: Cengage Learning,10-11

Sommerville, I. (2003). Socio-technical Systems, *Software Engineering*, 7th Edition, 4-5

Thompson Jr, A.A., and Strickland III, A.J.(2004a&b&c). *Strategic Management*. New Delhi: Tata McGraw-Hill.
Trist, E. (1981*). Socio-Technical Ideas at the End of the '70s'*, (online), http://www.moderntimesworkplace.com/archives/ericsess/sessvol2/20TRSOCI.pdf,

Trist, E.L., and Bamforth, K.W. (1951). Some Social and Psychological Consequences of the Long Wall Method of Coal Getting, *Human Relations*, 4(3), 6-24

Trump, D.J., and Kiyosaki, T. R. (2006). *Why We Want You To Be Rich: Two Men, One Message*, New York: Rich Publishing.

Whitworth, B. (2009). A Brief Introduction to Socio-technical Systems. *Encyclopedia of Information Science and Technology*, Second Edition, (online), http://brianwhitworth.com/2008-STSIntro.pdf, (Accessed March 13, 2010)

Wikipedia. (2013). *Innovation System, In OECD (1997)*. National Innovation Systems. (online), http://www.oecd.org/science/inno/2101733.pdf, (Accessed March 10, 2013).

Winby, S. (2011). *Creating Adaptive Organizations: Innovations in Horizons III*. (online), http://organizationdesignforum.org/wp-content/uploads/2012/03/aodf_stuwindby.pdf, (Accessed March 30, 2013)

Winby, S. (2012). *In Mohr, B. (2012). Integrative Governance for Adaptive Work Systems: A Strengths Based, Socio-Technical Design Approach*, (online), http://www.stsroundtable.com/wp-content/uploads/MohrIntegrativeGovernanceSTSRTCanterbury2012.pdf, (Accessed April 10, 2013)

Winby, S., and Taylor, J. (2005). STS Discovery Team, STS Roundtable, The Revolution Challenge. *Presented to the STS Round Table Annual Meeting*, Chicago.