A Quantifiable Transcultural Knowledge Management Model to Improve Quality of Healthcare: A Case study of the Kingdom of Bahrain

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ABSTRACT

Healthcare in the Kingdom of Bahrain (KoB) is an expensive investment, facing the challenge to attain and maintain the highest inter-national quality standards in patient care and client satisfaction. Concepts like Quality Management System that qua, Knowledge Translation and Knowledge friendly organizational culture are integrated with the knowledge management culture factors to develop an integrated and quantifiable transcultural healthcare Knowledge Management Model (culminated from a holistic system thinking approach) that plays a critical role to improving the quality of patient care and achieving patient satisfaction in a transcultural society.

This paper develops a pragmatic, integrative, and strategically viable model of an implement able Culture based Healthcare Quality Improvement Knowledge Management Model (HKM) for the healthcare initiatives in the KoB.

Since the knowledge management initiative is currently launched in the KoB's healthcare industry, this research can be a credible framework for a pragmatic HKM model for successful implementation of HKM in the Ministry of Healthcare of the KoB. This paper develops a new implement able integrated transcultural HKM model for healthcare subsequent to pilot testing, within the IT infrastructure and cultural aspect of HKM (considering the holistic approach to systems thinking and cultural sensitivities), appealing to

both practitioners and researchers. The final transcultural HKM model is an integration of models that include: (1) Clinical Healthcare Knowledge Management Model, (2) Quality Management Systems Model, (3) transcultural organizational cultural model and (4) knowledge translation model.

Keywords –Culture-based Healthcare Knowledge Management, Clinical Knowledge Management, Patient Satisfaction, Performance Assessment, Organizational Culture

THE IMPORTANCE OF QUALITY IMPROVEMNET IN HEALTH CARE

Quality in healthcare is stakeholder dependent as pointed out by Duke University Medical Center (2005). From a provider's perspective healthcare quality is the accuracy of diagnosis or health results and correctness of therapy from a technical sense. From a payer's point of view; cost effectiveness of healthcare assesses healthcare quality. From an employers viewpoint healthcare quality depends upon how their costs stay low and if they are able to bring back their employees to work quickly to achieve healthcare quality assurance. A patient however assesses healthcare quality from how clear their communication and compassion is with a healthcare provider. Quality improvement "*is a formal approach to the analysis of performance and systematic efforts to improve it."* Various quality improvement models exist with a common objective to improve industrial, administrative and medical practice performance like: (1) FADE, (2) PDSA, (3) Six Sigma (DMAIC), (4) CQI: continuous quality improvement and (5) TQM: Total quality management.

As Benjamin, Mandil & Saeman (1998) reports; kingdom of Bahrain (KoB) as an island along the Persian Gulf, providing free healthcare services resulting in large irresistible

numbers of patients to handle. Healthcare official are motivated to self-improve using a process called "continues quality improvement (CQI)" quipped with many established principles. As Singh (2008) notes, KoB's Bahrain medical society, upon assessment, urged Bahrain's healthcare systems to a re-examine and repair, if necessary, to improve healthcare services. Information technology (IT) was considered as an element of interest to bring back efficient healthcare systems as per international standards. In another report Singh (2008) also warns that patients lives are at risk (especially in the cases of emergency patients) for private hospitals refer patients to SMC without properly prepared patient records. In addition; in another report Singh (2008) also warns patients lives getting risked for SMC's healthcare administration's procedures are slow to process newly recruited doctor's paperwork. Since paperwork takes so long new doctors find other job opportunities and hence decline SMC's job offers. Hence SMC is left with lack of experienced doctors. SMC's accident and emergency department is designed to treat 400 patients every 24 hours. However is overwhelmed with 900 patients every 24 hours. Junior doctors are hence utilized but this does not solve the problem of overwhelmed number of patients to treat. The request to improve SMC's administrative procedures was also alerted by Singh (2008) when one patient also lost his life since he was sent back home due to lack of beds and experienced doctors.

As a resolution this paper points out foot steps of Mexico where Posadas (2007) shows this country as an example for setting up a policy where all of its public and private hospitals are asked to meet MMX-CC standard. These standards are similar to ISO 9000. As defined by Avocent Corporation (2009) "I*SO 9000 is a set of quality management standards, recognized worldwide, developed and controlled by the International Organization for Standardization (ISO) in Geneva, Switzerland".* As described by Posadas (2007) ISO 9000 are voluntary

quality management standards and a market requirement and for that reason applicable in the case of quality management systems (QMSs) in Mexico.

QUALITY MANAGEMENT SYSTEM (QMS) MODEL

As defined by Posadas (2007), QMS is a process based management strategy dependable upon the participation of its members to improve healthcare service quality. By developing a process based QMS model (illustrated in figure 1) Mexico can meet the new healthcare services quality-achieving standards. Arrows (dashed arrows) direct information flow and point out the main elements for executing a process (bold plain line arrow). Information flows feedback of client requirements and expectations inputted to a service realization process. This holds account for all services and their procedures and processes.

As ISO (2009) also mentions that QMS focuses on customer satisfaction through processes and procedures by measuring and monitoring the operations of QMS and strives for continual improvement. As Smith (2008) points out that this model intends to fulfill customer's requirements when evaluating a business (in this case healthcare) as a process with inputs and outputs. This model is made up of interfaces that include: (1) service realization, (2) resource management, (3) management responsibilities and measurement and (4) analysis and improvement. Each interface is composed of its own processes, inputs and outputs inter-relating with each other.

As Relex Software Corporation (2009) explains QMS's management responsibilities interface is for executive management to: (1) establish and enforce QMS while establishing

quality policies and objectives and (2) provide resources needed to endorse the standards placed forth. The resource management interface distinguishes resources like people, suppliers, information, work environment or even personal training that would be needed at the highest level of quality and customer satisfaction. Product or service realization utilizes feed back from customers to ensure that product or service meets customer expectations. The recognized services are re-engineered for any improvements taking under consideration the feedbacks. The measurement, analysis and improvement interface seeks continual improvement of QMS and is driven by quality policies and objectives. Past performance data and customer feedback are analyzed to determine areas (services in healthcare) for improvement.

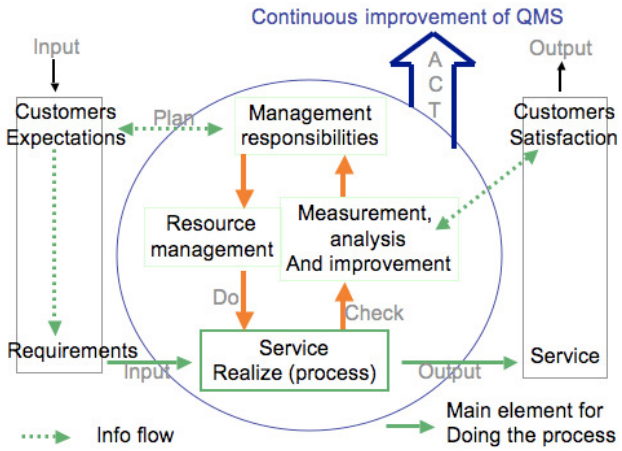

Figure 1. Process based QMS model.

Adapted from: ISO (2009); Posadas (2007); Smith (2008)

As requested by the ministry of health in a report by Hamza (2003) of the KoB a realization is mandatory towards implementation of of policies (actionable plans) in the nation health plan to promote quality and steadiness of practice. At this stage QMS can be a proposal as a suggestive tool to achieve this initiative.

SYSTEM THINKING

A system is though out before it is designed. Chowdhury (2007) states that technology's ability to capture, store and retrieve information is advantageous towards healthcare quality improvement (patient care, clinical audit, performance management and knowledge management). Any knowledge management project should hold both human and technical aspects that are balanced and interactive acting as one rather than two separate dimensions. Figure 2 illustrates the system-thinking model, which functions to integrate other models described in this paper.

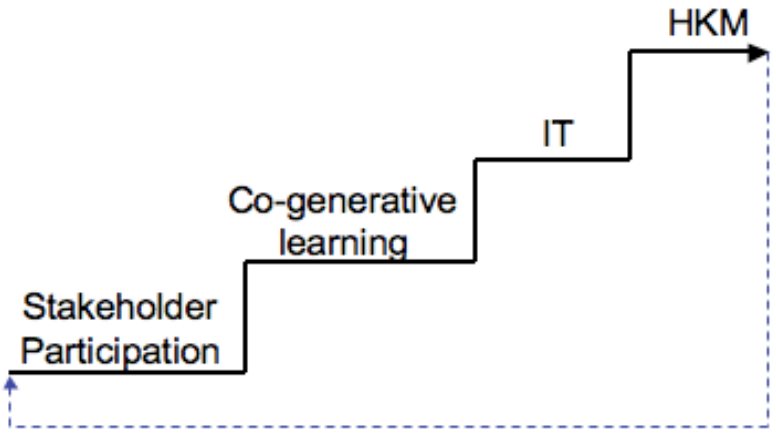

Figure 2. System thinking model.

Source: Chowdhury (2007)

Davenport (2005) points out that firms seeking effective knowledge management; need to consider humans and machines (computers – hardware and software) factor. Human are good in certain aspects while machines are good at others. Chowdhury (2007) promotes system thinking as a holistic approach since the whole is more than the sum of parts. Wikipedia the

free encyclopedia (2009) explains holism, as a whole system determined not by its parts but by the combined behavior of all of its parts. Chowdhury (2007) expresses system thinking as boundaries, so in the case of a healthcare organization, IT, HR, performance management, etc is examples with such division marked by people. Providing an effective IT infrastructure for HKM is only one element contribution to an effective system to improve healthcare quality. It is vital to consider not only hardware and software contribution (IT) but also the stakeholders' contribution (participation and co-generative learning experiences) that can take part in devising a plan on how healthcare service providers can use information.

A stakeholder, as defined by BusinessDictionary.com (2009), are people or a group having direct/indirect stake in an organization. Stakeholders in a healthcare organization are providers, payers, patients and employees as stated by Duke University Medical Center (2005). Sharma, Wickramasingha & Gupta (2005) also gives more examples as providers, payers, physicians, pharmaceutical industry and professors. Stakeholder participation according to United Nations (2003) is to make stakeholders responsible for the decision-making process & IDS Disclaimer (2009) stresses that community involvement (stakeholder participation) is seen as an ingredient towards health improvement.

Generative learning as defined by Furey (1996) is the process of linking new from old knowledge and the ability of integrating a new concept based upon the foundation of human's pre-learned mind embedded concept. As Senge (nd) quotes generative learning "*enhances our capability to create*" once this learning is personalized once this information is engaged.

So as Chowdhury (2007) concludes KM can be utilized to access information through IT but also succeeds in showing its ability to harness the power of creative action. Failure to

consider both human and technical aspects and the failure to recognize that any system has to work within a social framework keeping in mind social, political and cultural dimensions will lead to a failure in an IT system. ‘

IT INFRASTRUCTURE OF THE MINISTRY OF HEALTH AT THE KoB

As Lee (2008) defines an IT infrastructure is the use of hardware to interconnect device (like computers and transmission media), software and users to facilitate flow of information within an organization.

According to KoB Health Information Directorate (2009), the ministry of health’s Internet setup is a stepping stone towards initiating e-government with the ministry of health web site as a portal to allow public participation hence to improve healthcare service quality. The aim is to improve healthcare services through (1) improving overall health in Bahrain, (2) ensure conditions for evidence based care through the utilization of local resources and (3) improve decision making in areas such as clinical healthcare, human resources, financial management, ICT – information and communication technology, etc. Ministry of health provides primary, secondary, tertiary, public and customer healthcare services in addition to e-services. Primary healthcare services are provided through 22 health centers where patients get first point of contacts and then are further referred. Secondary healthcare service is mainly provided through Salmaniya Medical Complex (SMC), which is a public hospital for emergency, secondary and tertiary healthcare.

As BDO JawadHabib Consulting WLL (2007) sheds light on the “HealthIT” project that equips and connects SMC with other health centers and headquarter buildings, using an

Internet connection provided by Batelco (Internet service provider of the KoB) with 10 mbps multi-protocol label switching (MPLS). SMC connects using: (1) 20 mbps MPLS with (2) 2 mbps frame relay, (3) 100 mbps backup INFRA-RED and (4) 10 mbps microwave for connections to the C.I.O. offices. Any other external hospitals and health centers are connected to SMC using either 56 kbps dialup or 128 kbps frame relay.

According to Nawakda, Fathi, Ribiere & Mohammed (2008) healthcares services offered in KoB are: (1) general clinical services, (2) dental services, (3) diabetic services, (4) Bahrain International Airport services and (5) Immunization services. Healthcare Information Directorate located in SMC (hospital of 1000 beds) is responsible for IT deployment to serve 8,000 employees in the ministry of health. These initiatives have been active since the 1980s. The recent vision is to introduce: (1) open source and proprietary MDIS solutions development, (2) up to date effective networks to connect health centers and other ministries, (3) mechanisms to meet user demands relative to decision support systems (where the process based QMS is suggestive) and information access, (4) install healthcare related systems and (5) setup frameworks to anchor new strategies for technologies like KM, RFID or data warehousing.

DATA, INFORMATION, KNOWLEDGE AND KNOWLEDGE MANAGEMENT (KM)

As Thomas & Laurence (1998) define; data as facts organized in a record format such as clinical data (patient records) or administrative data (human resource data or health support data). As described by the London hospital (2001) a patient record detailing the patient, name of physicians or surgen, location for treatment, treatment details and results. In the case of a

report by the house of commons (2007), all National Health Service hospitals use IT to conducted patient administration where IT systems are used for admitting, discharging, recording and scheduling all aspects of clinical care.

All this related data forms an electronic patient record pertaining to each patient to be shared by local organizations. As defined by Lusingnan, Pritchard & Chan (2002) data is numbers or objects that get meaning only when accompanied with a context, which is information (flow of messages). Another example of data is recorded by Nawakda, Fathi, Ribiere & Mohammed (2008) where the ministry of health in the KoB accesses (1) clinical data – e.g.: medical records, (2) administrative data – e.g.: financial or human resources, (3) health support data – e.g.: drug control or laundry and (4) other services – e.g.: networking offices through area network.

The difference between information and knowledge is that knowledge stands upon the condition of an existence of commitment and belief that something is right or true. Hence, Information is parallel to data justification. An example of information, ss stated by Holmboe, Lipner & Grenier (2008), where a physician makes a clinical judgment by the patient's diagnosis, which is stated by his, or her medical condition based upon two key elements being collected information - e.g.: complete medical history and focused physical examination.

As clearly explaned by Bose (2002), knowledge is well managed, structured and catagerized information accessable by the right people at the right time. Knowledge according to Tandukar (2009) is an inclusion of data and information in addition to opinions and experiences of experts' knowledge to support decision making. As Silver & Shakshuki

(2002) defines knowledge "*is uniquely linked to action and has been described as "the capacity-to-act", an intangible asset that all organizations strive to create.*" Knowledge, according to Ammon, D., Hoffmann, D., Jakob, T. & Finkeissen (2008) is warehoused in knowledge bases. In healthcare this holds various purposes. This could be for encyclopedic source of information for clinicians such as attaining current treatment method. Frappaolo (2008) states that the basic systemic code to KM is in two forms: (1) explicit knowledge and (2) tacit knowledge. There also exists a middle ground being implicit knowledge.

Killen, Hunt & Keinschmid (2008) report knowledge exists in multiple experiences and perspectives classifiable as tacit and explicit knowledge. Explicit knowledge or tangible knowledge is expressible information among individuals and publishable in documents. An example of explicit knowledge; shown by Lusignan & Robinson (2007) is evidence-based-medicine (EBM). EBM by Duke University Medical Center Library and Health Sciences Library, UNC-Chapel Hil.. (2004) "*is the integration of clinical expertise, patient values, and the best evidence into the decision making process for patient care.*" Also, Killen, Hunt & Keinschmid (2008) define tacit knowledge or intangible factors embedded within an individual's experiences, beliefs, perspectives, values and instincts, are mostly inexpressible. Frappaolo (2008) points out that tacit knowledge intuitive is well communicated by face-to-face encounters. The middle ground (implicit knowledge) is "*some knowledge believed to be tacit can be transformed into explicit knowledge. This body of knowledge is the organization's implicit knowledge."*

Explicit knowledge as pointed out by Earoler & Czerwinski (2007) is three types of knowledge: (1) research knwoledge – e.g.: referable and upadated reviews from knowledge bases, (2) experiental knwledge - e.g.: derivable from service improvement gudelines and

good practice logs and (3) empirical intelligence of pratice and treatement effectiveness – e.g.: providable by public health observatory.

An example as shown by Web Center for Social Research Methods (nd) of applicable social reserch is (1) knowedge base – e.g.: "*online hypertext textbook*", (2) selective statistics – e.g.: "*online statistical advisor*", (3) simulation book – e.g.: exervices for eduational purposes to learn conducting of simple simulations and (4) concept mapping – repository for conceptual concept mapping. An example of experiential knwoledge as protrayed by Caron-Flinterman, Broerse, & Bunders (2004) is contribution of patients's experiences relayed through interviews by biomedical scientists towards the quality of biometric research. An example of empirical intelligence of pratice and treatement effectiveness is the APHO (2007) whose URL is http://www.apho.org.uk/.

Frappaolo (1997) defines KM as; "*a leveraging of collective wisdom to increase responsiveness and innovation*." This emerging business model as described by Sharma, Wickramasingha & Gupta (2005) deals within the context of a firm to create, codify and share knowledge assets. The processes; manage knowledge to promote improvement and learning within an organization. These processes are supported by dimensions around them being (1) knowledge storage media – e.g.: human mind, organization, computers and documents, (2) knowledge accessibility – e.g.: knowledge assets like tacit knowledge, implicit knowledge and explicit knowledge, (3) knowledge topologies – e.g.: "*knowledge type-conversation*" and elementary properties and (4) knowledge hierarchy – e.g.: data, information and knowledge.

Desouza (2005) describes a KM process starts from (1) creating and elicitation to (2) capture and store to (3) transfer and disseminate to (5) application and exploitation. In Knowledge creation and elicitation; Data is processed, using transaction-processing systems, to information. Information is analyzed through data mining and knowledge discovery (from databases). This is utilizable by marketing or financial analysts by using patterns and algorithm to create knowledge from raw data. Experts hold tacit (experiential) knowledge that needs to be transferred to explicit knowledge (using figurative and symbolic languages) by sharing knowledge. This is also another form of creating knowledge. For Knowledge capture and storage; knowledge is captured from peoples' minds and codified. Codification is an expensive process of transforming knowledge into readable form (e.g.: reports and electronic records) so that this knowledge is now independent of the person's mind and searchable from centralized repositories with search capabilities by other people without seeking knowledge sharing from the actual person himself/herself. In Knowledge transfer and dissemination; knowledge transfer needs to close the barrier between knowledge holders and knowledge seekers by organizations setting up two initiatives as knowledge users networks and internal knowledge mapping. Repositories like MS Exchange or IBM Lotus Notes are examples of repositories that assist group knowledge sharing and transfer, Using this electronic mediums, transfer of explicit knowledge is easy. The transfer of tacit knowledge is through means of socialization and externalization. Socialization (e.g.: on the job training) keeps knowledge tacit during transfer while externalization (e,g,: metaphors trigger dialogue) changes tacit to explicit knowledge. In Knowledge exploitation and application; an optimum system is the users' repository to exploit knowledge to learn from and therefore apply to get smarter while maintaining organizational performance.

SIGNIFIGANCE OF KM IN HEALTHCARE QUALITY IMPROVEMENT

As Sharma, Wickramasingha & Gupta (2005) point out with 20,000 journals, huge number of medicines, their prices and the number of their ingredients is overwhelming knowledge. Physicians are unable to keep updated with so much knowledge considering the amount of time they spend in treatments per week. In addition with the amount of knowledge these people are bombarded with through e-mails, voice mails, faxes, reports and memos it is necessary that a KM system becomes critical asset in every healthcare organization.

As Mukherjee, Lapre, & Wassemhove (1998) points out that knowledge is an important asset for an organizational to gain its competitive advantage. Health Canada (2006) also supports this view by pointing out that healthcare organization must build, drive and maintain an instrument that functions to create a learning culture capable of growing and teaching in order to gather and apply its findings. Here the KM theme is to support the influencing and the re-using of resources (best practices) rather than professionals re-inventing the wheel. This is by three objectives as illustrated in figure 3 to accomplish the KM theme.

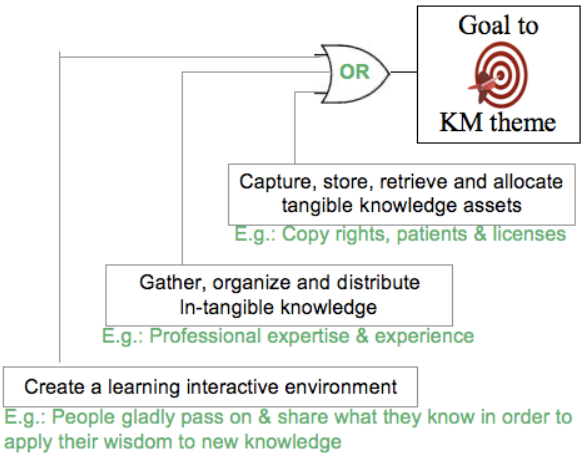

Figure 3. Alternative routes to a common goal (KM theme).

In addition Mukherjee, Lapre, & Wassemhove (1998) explain that organizations have to manage organizational learning to build knowledge for future use. Web labs Itd (2008) introduces a concept of a web self service system that utilizes one of its components being KM database to assist customers with 24/7 world wide knowledge for querying frequently asked questions, technical manuals, relevant literatures, life episodes, web pages and links to all services. Other components used were chat, web forms, management reports, SMS text messaging, resource booking systems etc. McLaughlin & Kaluzny (2005) points out that medical knowledge is in multiple formats (tacit and explicit) and is useful to assist healthcare managers and clinicians to make good decision in favor of patients. KM is a rapidly evolving field including electronic publishing, organizational behavior and system thinking. Its focus is on processes and people to create, share and leverage knowledge in organizations in order to support strategies that improve performance. KM is present through IT to assist in improving quality and raise customer satisfaction via Internet based free healthcare information access (e.g.: national library of medicine) to provide online resources for evidence based clinical guidelines (e.g.: American College of Physicians) and search engines (e.g.: MEDLINE) holding electronic publications. ACON (2008) lists best practices such as human resources, financial management, community and professional capacity building, collaboration and strategy building, etc in three areas of work being: (1) building a quality organization, (2) providing quality services and programs and (3) sustaining a quality external relationship. One of the best practices pointed out in the area of building a quality organization is knowledge management.

Health Canada (2006) states that healthcare KM engages an orderly process "*to acquire, conserve, organize, retrieve, display and distribute what is known.*" A process for this

delivery system is relative to the process based QMS since it is able to (1) collect information from customers to assess organization operations, (2) evaluate the collected customer feedback and customer requirements to identify what works and does not work and (3) apply this information to modify its process. This delivery system can attain effective patient care by exercising consistent managerial decision-making. In addition CrossTalk (2005) quotes; "*Process improvement (PI) is action taken to change processes to meet business needs and achieve business goals more effectively. As KM was developing as a way to improve corporate efficiency and to increase value added, PI was also becoming important in the corporate world.*"

According to Dwinedi, Bali and Nagub (2007), KM process includes: (1) knowledge creation, (2) knowledge identification, (3) knowledge collection, (4) knowledge storage and (5) knowledge accessing. QMS works with customers and managers to identify requirements and processes therefore participation of stakeholders is necessary. Through the (1) management of resources, (2) realization, measuring and analyzing of processes; improvement is a generative learning experience. Since stakeholder participation and co-generative learning harness KM processes; these processes (when integrated with an IT infrastructure) bring forth a pre-requisite for healthcare knowledge management (HKM).

These KM technologies facilitate KM processes as described by Dwinedi, Bali & Nagub (2007). Desouza (2005) suggests that knowledge creation can either be a function of a department working in parallel with other healthcare departments or it can be a responsibility of every healthcare individual. In addition; KM technology facilitate KM through data mining to discover knowledge. Codification (codify – electronic medical records, store and re-use knowledge) and personalization (community of practice networks to share tacit know-

how) strategy is utizable to capture and store gathered knowledge. The purpose of knowledge transfer and discrimination is to make captured knowledge securely available for its authorized utilizers by using expert systems. Knowledge application (routines to define knowledge like calculating patient blood pressure) and knowledge exploitation (using knowledge resources for decision making) is utilizes knowledge for decision-making. Once again expert systems combined with Internet framework and intelligent agents assist in accelerating the time taken to execute healthcare are promising in improving healthcare quality and patient satisfaction.

Sharma, Wickramasingha, & Gupta, (2005) suggests that capturing storing and sharing of knowledge is approachable through four initiatives (related to IT) being: (1) building infrastructure – using technology, (2) building conceptual infrastructure – re-thinking the intangible organizational infrastructure, (3) creating repositories – a warehouse storing skills and experiences for re-use rather than re-invent and (4) attaining quality standards and usability – setting stone for a foundation to build a knowledge based organization. These initiatives are well establish-able in healthcare at the ministry of health in the KoB.

KM TECHNOLOGUES AND TOOLS

The idea here is to portray an IT infrastructure as a pre-requisite for the healthcare knowledge management (HKM) model. According to Riley (2003) to understand the relation between technology and knowledge one should consider the cost relative to knowledge being (1) availability of knowledge, (2) accessibility of knowledge and (3) applicability of knowledge. Availability of knowledge associates with the IT infrastructure required in order to get the knowledge to the users. Accessibility of knowledge work around technology needed for a

user to be able to view the knowledge. Applicability of knowledge refers to the IT infrastructure for applying knowledge to perform the user's task. From the perspective of tacit knowledge an organization seeks ways to harness IT in order to capture existing knowledge from experienced heads by the use of system analyst, knowledge engineer and an interviewer. Then a process needs to be initiated to operate to codify captured knowledge (using technology like office suite application software) to explicit knowledge because codified tacit knowledge becomes explicit knowledge. IT us utilized to categorize explicit knowledge into knowledge bases. Knowledge bases are developed using storage media technology. Knowledge is categorized using technology like XML or RDF. Explicit knowledge gets hardened with time by a new approach referred as "evidence based" and in the government sector this is utilizable for making policies. In healthcare this points to medicine.

New employees need to learn this stored explicit knowledge giving rise to the need for better e-learning technologies. E-learning technologies assist in distributing knowledge using networking technologies. Knowledge is searchable using technologies like search engines (e.g.: Google). Technologies like artificial intelligence summarize knowledge suggestive decision supporting. Knowledge is used in technologies like groupware within workflow situations for groups to corporate and collaborate. Wickramasingha and Gupta (2005) give examples of new healthcare IT like: (1) electronic patient record that are easier to update and faster to access and (2) Internet technologies resting upon networks interlinked for faster discrimination of information, communication and higher productivity.

As Skyrme (2009) points out several years ago Lotus Notes was the most praised knowledge sharing technology. Apart from minds of knowledge holder what changes the most is technology. Examples of current technologies are: (1) artificial intelligence, (2) Bayes and

Boole, (3) content management, (4) Document management, (5) email, (6) groupware, (7) humans, (8) intelligence agents, (9) JIT knowledge, (10) learning objects, (11) mobile KM and (12) knowledge robot. Sharma (2005) concludes that KM technologies facilitate in strategizing electronic information delivery with information sources identified to build decision support systems tools and data mining templates. These technologies assist in establishing business rules and implement processes to improve techniques. Bose (2002) points out various technologies utilized in the four processes of knowledge management. These are: (1) Trellix or FolioViews for knowledge capture, Grapewine or Intraspect for knowledge organization or storage, (3) SmartFinder or Fulcrum for knowledge retrieval, (4) Ms Exchange, NetMeeting, InSight and/or knowledgeX for knowledge transfer and discrimination.

KM tools facilitate KM technologies. Examples of KM tools stated by Sharma (2005) are (1) knowledge mapping, (2) intelligent agents, (3) web browsers, (4) KM applications and (5) workflow applications. Tandukar (2009) describes knowledge mapping is a tool to discover value of knowledge, its location and who owns it. At home one has the knowledge of what is where and who knows of his/her surroundings so it is easy to locate something misplaced. This is a map set in ones mind of how k flows within that surrounding. However it is impossible to set up a map of knowledge of an organization. With the assistance of this tool the impossible becomes possible since this tool helps discover the location, ownership, use and value of knowledge within an organization. This is a every day practice composed of surveying. Auditing to display transparency and provide insights to quality.. Using this tool knowledge can be categorized into people, process, content and technology to harness existing expertise within an organization. The value of knowledge mapping comes handy when it expresses the importance of lost intellectual capital when an experiences employee

leaves and organization. In addition this illustration form of practice to construct a road map to locate information necessary to take advantage of resources assists in matching technology to k needs and procedures.

According to John Wiley & Sons, Inc. (1997) definition an intelligent agent is a software i.e. expert system or knowledge based systems implanted in information systems. As Jennings and Woolridge (nd) mentions there are new revolutionary model for developing software applications. An example of agents is email filters or air traffic controls where these systems work as responsive, proactive and social agents independent of humans having full control over their actions. As Kayne (nd) defines it, a web browser is a software application that understands a coded language (e.g. HTML) of a web page to translate it into a graphical format for end users to be able to view such a page. The page is viewed within this application called a web browser. An example of a web browser can be Safari on Apple computers.

HEALTHCARE KNOWEDGE MANAGEMENT (HKM) MODEL

Jennex (2006) defines information systems as a human or a machine capable of performing six types of operations (capturing, transmitting, storing, retrieving, manipulating and displaying) to process information in order to accomplish goals. This is an incomplete definition for a KMS. KMS can be described as an IT enabler to KM to enhance organizational processes to create, retrieve, transfer and apply knowledge KMS is an ICT (information and communication technologies) system to create, construct, identify, capture, acquisition, select, validate, organize, link, structure, formulate, visualize, distribute, maintain, refine, evaluate, access, search and apply knowledge. KMS techniques are IT/ICT

tools utilized in any phase of the knowledge life cycle being: (1) knowledge creation, (2) knowledge storage or retrieval, (3) knowledge transfer and (4) knowledge application.

As Kakabadse, Kakabadse, & Kouzmin (2003). describe KM as an attainence of right knowledge at the right time, in the right palce while applying actional information to imrpove organizational performace. A number of KM models exist in lietrature. However ample attention goes to a KM model that is unified by an integration of (1) a cognative KM model, (2) network model, (3) community of practice model and (4) philosophical model. The phylosophical model aims towards deeper thinking towards deep inter-organizational knowledge questions. (E.g.. "*What do we know that we do not know about our competator?*") Its focus is to find ways of knowing and its critical lever is questioning, reflecting and debating. According to Lusignan & Robinson (2007) an example of this model is evidence based medicine (EBM) applicable towards the healthcare's clinical environment.

Kakabadse, Kakabadse, & Kouzmin (2003) describes the cognative KM model capable of creating, locating, capturing and sharing of knowledge (experience) to solve problems. An example of a prominent cognetive KM model is the SECI (socialization, externalicatoin, combinatoin and internalization) model. The focus of this model is knwoledge capturing and storing with technology as a critical lever with standardication, routinazion and knwoeldge recycling. According to Lusignan & Robinson (2007) the best exam for this model is contribute clinical audit which can also be transformed to healthcare audit in the healthcare KM model.

Kakabadse, Kakabadse, & Kouzmin (2003) shows network model as a base for organizational knwoledge (intellictual capital) models and meta-knowledge models within a

network of relations. Its focus is on acquisitoining, sharing and transfering of knowledge. In this network of realtions stakeholders are given social and economiuc insentative to find a patterns of links between individuals and social groups to enable sharing and transfering of knowledge. The critical leverage to this model is boundry spanning. Mentorship is an example as contributed by Lusignan & Robinson (2007)'s healthcare CKM model. This example can be re-emphasized towards the healthcare KM model.

In the community model stated by Kakabadse, Kakabadse, & Kouzmin (2003) knowledge is a group's common property therefore the community of practice plays an important role to solve different organizational problems. Members often share tacit knowledge and knowledge is managed based upon trust during informal discussion groups with a goal that one cannot separate knowledge from practice. Lusignan & Robinson (2007) gives community of practice as an example towards this model applicable towards the CKM model and hence HKM model (figure 4 below).

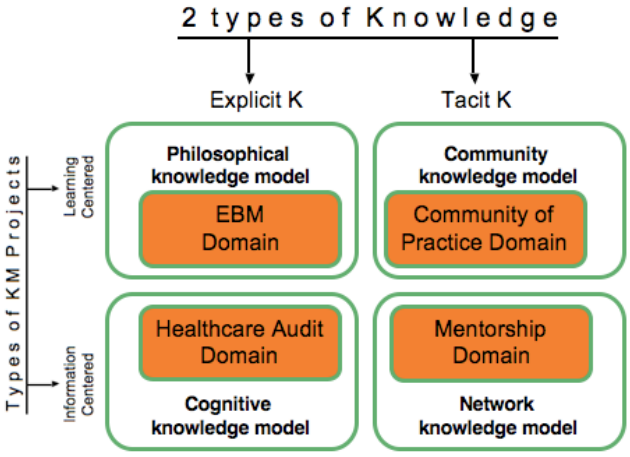

Figure 4. HKM model.

Adapted from: Kakabadse, Kakabadse, & Kouzmin (2003); Lusignan & Robinson (2007)

The above-illustrated HKM model is a promising model that can enhance the current health information and knowledge management systems built-in the KoB's ministry of health as illustrated in figure 5 below.

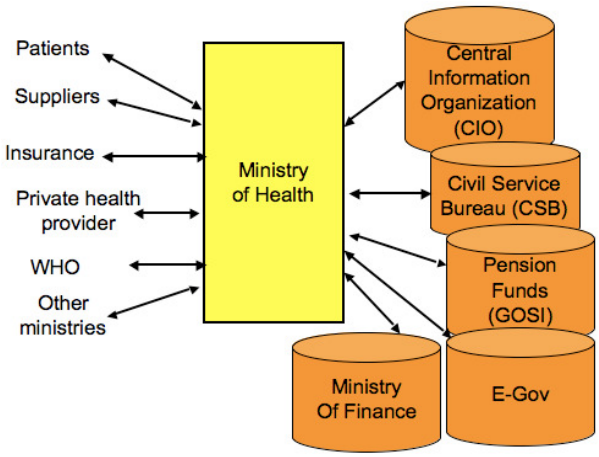

Figure 5. E-KoB's Health Information and KM system.

Adapted from: Nawakda, Fathi, Ribiere & Mohammed (2008)

The KoB's ministry of health includes: (1) health information system, (2) medical departments. (3) System development department, (4) project and project management department and (5) support department – administration, engineering, maintenance and inventory. The internal tacit knowledge managed between support department and project management department is medical tacit knowledge while application and system tacit knowledge is managed by the system development. The HID department manages internal health information explicit knowledge. External tacit knowledge is managed between the ministry of health and (1) patients – symptoms information, (2) suppliers – technology information, (3) insurance - insurance information, (4) private health provider – practice information, (5) WHO – health statistics and (6) other ministries - consultancy. . External explicit knowledge is managed between the ministry of health and (1) CIO – demographic

information, (2) CSB – staff information, (3) e-government – service information, (4) GOSI – pension information and (5) ministry of finance – budget information.

KNOWLEDGE TRANSLATION (KT)

The Canada Newswire (2009) reports that the Canadian Institute of Health Research (CIHR) formed the "*PubMed Central Canada*", which is a peer-review health and life science literature repository. CIHR's mission is to create new scientific knowledge and translate it to improve healthcare effectively. According to the Canadian Institute of Health Research (20009) KT is a process of complex relations between researchers and knowledge users towards synthesizing, exchanging and supporting the application of knowledge in an ethical manner. When Sudsawad (2007) defines KT, one thing that gets strictly stated is that it is a process pinning creators of knowledge (researchers) and appliers of knowledge (users) by incorporating evidence-based-information. However this concept requires that its processes, systems, measurements and its factors of influencing at individual and context-based level be fully and thoroughly understood.

The Canada Newswire (2009) also state that knowledge users are able to use knowledge generated through research) to make health policies or procedures decisions. **Synthesis** is contextualizing and integrating research findings by using qualitative and quantities methodologies within a topic of research and a large body of knowledge. **Discrimination** is tailoring the message and medium to identified audience. For example: summarized (message) for briefing stakeholders (audience) or education sessions for patients. **Exchange** is knowledge exchange between researcher and knowledge users when to solve a problem and therefore learn mutually. **Ethical application of knowledge** means an interactive

processing of putting knowledge to action within context of norms and social values in mind. According to Graham and Tetroe (2007) unless created knowledge is not put into action its benefits will be un-realized. This knowledge needs to be translated to improve healthcare, services and systems. KT fills the gaps between know and do. Also as defined by Business Wire (2009) KT (scientific study of methods) is gaining significance in a search for solution to the challenge of improving the quality of healthcare.

As stated by the Canadian Institute of Health Research (20009) KT is important towards healthcare as realized by the Canadian Institute of Health Research in the areas of creating knowledge and translating knowledge. Creating knowledge is not enough for it to impact healthcare. KT assists in making users aware of the knowledge they have gained during their project by applying advance methods of discrimination towards a large set of targeted audience. The other is integrated KT where researchers and research users collaborate to develop research questions, research methodologies, data collection, interpret finding and discriminate research results. This type of KT brings life to interactive or action-oriented research.

As Sudsawad (2007) explains; a KT process framework (figure 6 below) is useful to patients, practitioners and policy makers. In this figure; 'k' stands for knowledge. This framework is made up of knowledge creation component and knowledge action component where each is made up of phases. As Molfenter, Ammoury, Yeates & Steele (2009) describe knowledge creation as the inner funnel while the outer circling phases are the knowledge action. Both of these components have a dynamic influential relationship with each other. Knowledge creation is where ideas are thought out and techniques are created using knowledge inquiry knowledge synthesis and knowledge tools and products. Knowledge flows through inquiry

and synthesis so to transform into tools or products. Knowledge action is a cycle made up of phases that circle around the inner knowledge creation funnel and this is knowledge implementation and knowledge application.

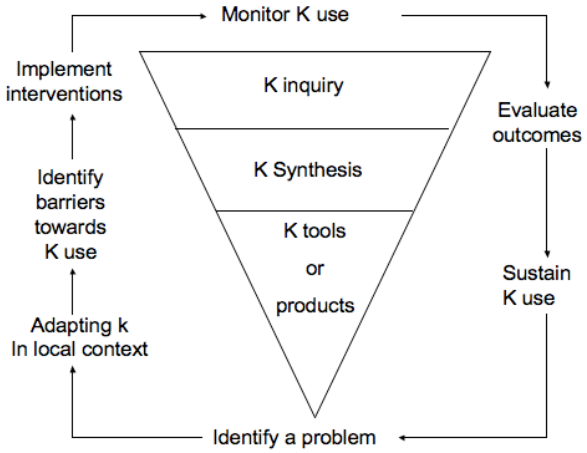

Figure 6. KT model.

Source: Sudsawad (2009)

ORGANIZATIONAL CULTURE TOWARDS KM CULTURE

A suitable organization culture facilitating a KM culture as a foundation needs to exist for a holistic system thinking approach to work successfully. Hence the HKM model can be implemented successfully too. Why? Hurley and Green (2005) conceptualize organizational culture as one of the most important condition for implementing a KM program in a KM initiative. KM implementation includes codification (codify and store knowledge in knowledge base) and personalization (communicating knowledge between people or by using computers as a medium) strategy. The other factors less important are training, top-management support, technology infrastructure, knowledge sharing, etc. Culture is group discovered pattern from their values, beliefs of basic assumptions in view to the correct way

to perceive, think and feel in manner that influences the way how organizational strategies are implemented.

As Hurley and Green (2005) suggest that organizational culture needs to influence recognition, encouragement and a rewarding procedure for encouraging KM activities. To make KM processes possible it is necessary to understand the importance of the change in culture (towards behaviors that motivate knowledge sharing, knowledge transfer and knowledge application based upon trust and integrity) through out an organization. "*Leavitt's 1965 model*" is proposed for an organizational change for affecting KM culture. The effectiveness of any change takes place through coordination and balance of four subsystems (technology, structure, task and people) within organization. This inter-relation is illustrated within the KM culture - "*Leavitt's 1965 model*" in figure 7 as illustrated below.

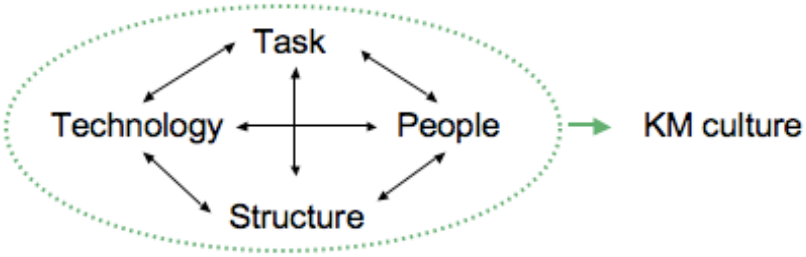

Figure 7. KM culture.

Source: Leavitt's (1965)

Structure or organization structure is the manner in which labour is divided to perform tasks. This could be centralized hierarchy (not favorable for knowledge sharing) or de-centralized hierarchy (favorable for knowledge sharing). Another part of organization structure is the rewarding system set up for those who share knowledge. **Tasks** are activities to produce goods or services in order to determine job satisfaction. In addition these jobs are

characterized in a manner to encourage knowledge creation and knowledge transfer so workers can create tacit knowledge through "*learning-by-doing*". so to transform tacit to explicit knowledge. **People** are actors that perform work in an organization. Here strategies are applied to change human behavior so people can be made to do what they are wanted to do. **Technology** exists to support KM activities and the strategy here is the use of technology acceptance model so people within an organization are encouraged to used computers and their programs to further facilitate KM sharing and transferring.

Leidner, Emory and Baylor (2006) point out that an organization holds a constructive culture if values are related to encouragement and achievement. A constructive more encouraging and supportive culture leads to a greater KM success. As Ribiere (2001) notes organizational culture is the main reason for failures of knowledge management initiatives. Therefore a need for a "*knowledge-friendly*" organizational culture is mandatory for success. Organization culture is assessable through 2 factors being (1) trust and (2) solidarity. To reduces the risk of failure of a KM initiative; the basic elements for knowledge flow are not enough to in support. Knowledge flow elements are (1) knowledge creation, (2) knowledge retention, (3) knowledge transfer and (4) knowledge utilization. In addition we need KM learning (utilization of lessons learnt in process to build process or systems to improve efficiency and effectiveness in an enterprise wide knowledge), KM leadership (establishing and implementing a strategy for success of KM with the support of the right culture), KM technology (an enabler to support decision making, data warehousing and process modeling, management tools and communication systems) and KM organizational structure (composed of business processes and performance management systems to deal with turbulence and strong enough to adopt change). These four pillars form the KM framework. Therefore KM culture's model is a supportive pillar for KM organizational structure as illustrated in figure 8.

In addition top level conceptual KM framework model defined by Murray, Allison and Hekimian (2000) as illustrated in figure 8.

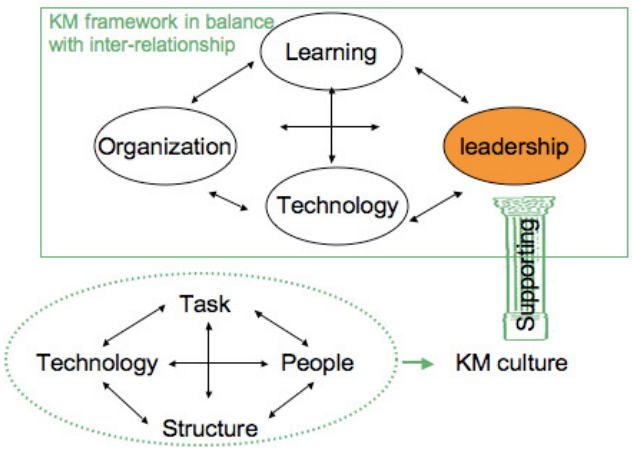

Figure 8. Knowledge Friendly Organizational culture model.

Adapted from: Murray, Allison and Hekimian (2000)

TRANSCULTURA HEALTHCARE KNOWLEDGE MANAGEMENT MODEL

A transcultural healthcare knowledge management model (Figure 9) below integrates all the pre-requisite models discussed above.

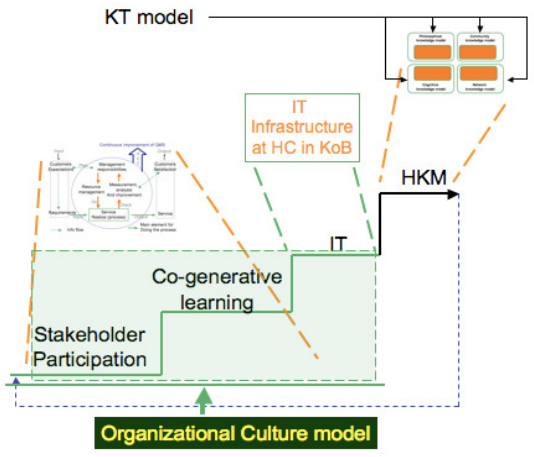

Figure 9. Transcultural Healthcare Quality improvement KM model.

A system is design from a holistic approach where stakeholder participation element and co-generative learning element is satisfied by the process based QMS model (figure 1 above). The healthcare of the KoB currently holds an IT infrastructure framework (figure 5 above), which fulfills the IT element of the system design model. These three elements require a base for an organizational culture (figure 8 above) as a pre-requisite to implement the healthcare knowledge management model described above (figure 4). The philosophical knowledge model and the community model for the HKM model are implemental after implementation of their pre-requisite being the knowledge translation model (figure 6).

CONCLUSION

The ministry of health of the KoB provides free healthcare with 22 healthcare centers spread through out the island. With overwhelming number of patients the ministry seeks to initiate a plan to foster the healthcare service quality improvement. This paper provides an integrated transcultural quality improvement healthcare knowledge management model formulated using five models being: (1) Process based QMS model - figure 1, (2) System thinking model – figure 2, (3) HKM model – figure 4, (4) KT model– figure 6, (5) Knowledge Friendly Organizational culture model – figure 8.

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