

# Conceptual Model of Knowledge Transfer Mechanism-Processes and Factors (Enablers and Barriers) Theoretical Model

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## Abstract

In the healthcare, treatment, policy and planning decisions should be based on evidence (explicit knowledge) and experience (tacit knowledge) wherever possible, but research knowledge still under research. Initially, knowledge transfer (KT) aims to facilitate producing, accessibility and application of tacit and explicit knowledge and may provide solutions to this challenge. However, based on longitudinal and systematic reviews, robust research into the KT mechanism is limited (Pentland et al., 2011).

This paper proposes a conceptual framework of a multilevel process-based of enablers and barriers of KT mechanism. On the basis of extensive literature from many fields and mainly sociotechnical model of Levite (1964), we moderate the KT mechanism into five main elements related to characteristics of knowledge, source, recipient, relationships between them, tools (technologies) and context of the actual transfer.

We discussed that the enablers and barriers can influence KT mechanism at three different levels; individual, team/ divisions, and organisation. Giving the longitudinal nature of KT processes and drawing on Szulansky's (1996), Lane *et al.*, (2006) and Minbaeva, D. B. (2007) models, we propose a balanced process model of enablers and barriers during stages of KT (dissemination and assimilation).

This model is conducted to help notify the design and implementation of KT systems and mechanisms for a large organisation including healthcare.

**Keywords:** Knowledge transfer mechanism, KT elements, Factors (enablers and barriers), KT processes and levels, Sociotechnical thinking, and Healthcare.

## Introduction

The importance of decision making and policy direction in healthcare services regarding the use of evidence (explicit knowledge) is an established concept (LoBiondo-Wood, and Haber, 2013). However, studies of the healthcare in this area are problematic. Thus, Knowledge management (KM) in general, or Knowledge transfer (KT) in

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<sup>1</sup>This is a developed conceptual paper of Knowledge Transfer mechanism as part of PhD project which is about the Knowledge Management in the healthcare.

specificemerges as a potential solution to encourage learning and distributing the knowledge which it can encounter the barriers and challenges of healthcare system. To date, the complete KT model as it pertains to healthcare has not been conceptualized in a single study. One reason is the challenges in defining KT mechanism and definitions across different focus of studies and fields. Moreover, there is a need to conduct a broader review of the literature relevant to KT and healthcare with the aim of identifying a multilevel process-based conceptual model of KT.

Therefore, the review examines literature concerning KT mechanism in different fields with more emphasis on healthcare setting. Specifically, in order to build a comprehensive model, literatures relating to four main priorities were identified as the following:

- 1- The main elements of the KT (sender, receiver, knowledge, tools, context and the relation between the sender and receiver).
- 2- The levels of transferring the knowledge (individual, group, and organisational)
- 3- The processes of the KT mechanism.
- 4- The factors (enablers and barriers) that affect the whole mechanism (see tables 3 and 4).

### **Research Methodology and Design**

The authors have developed an integrative review design to be broad enough to include primary sources, existing review studies, and utilizing different methodologies whilst being structured enough to remain focused on the KT topics.

The review design was created by reviewing a recent guidance on investigating literature which is intended to avoid the risk of bias and inaccuracy and to maintain rigor that can be integrated with the literature of this nature (Whittemore&Knafl 2005).

**Table (1): Inclusion and exclusion criteria in exploring the literature**

1- Peer-reviewed journal articles
2- English language only
3- Published form 2000 to 2014
4- The literature review is designed to help identify the most effective models, theories and processes of KT mechanism from different fields including healthcare.
5- The included articles which exhibited the following features <ul style="list-style-type: none"> <li>- Literature reviews relating to the overall models, processes or individual elements of KT mechanism.</li> <li>- Evaluations of integration between knowledge receivers and knowledge senders to promote the sharing of tacit and explicit knowledge.</li> <li>- Evaluations of integration between knowledge senders and knowledge receivers to identify the main elements, processes, levels and factors of KT mechanism.</li> </ul>
6- The excluded articles that <ul style="list-style-type: none"> <li>- Dealt with the technology transfer.</li> <li>- Focused on the education of health staff and medical research.</li> <li>- Dealt with transfer of programme that not includes new research knowledge.</li> </ul>

## **Search Method**

Reviewing literature from diverse fields was recognized as central to achieve a comprehension of the phenomena of facilitating KT mechanism in different sectors including healthcare. It was critical to be more specific to develop a holistic and practical framework by developing practical search parameters.

Exploring the existing literature enabled the reviewers to identify the subjects to enable focusing to be retained on examining the relevant literature. For instance the literature relating to developing medical knowledge was avoided. This paper shows the full details of parameters in the following table.

## **Building the Conceptual Model**

In the literature review KT has been studied by many based views. In proposing to build our conceptual model, we categorized studies of the KT mechanism under four components: (1) the elements of KT mechanism; (2) the processes of KT mechanism; (3) the levels of KT mechanism; and (4) the key factors (enablers and barriers) of KT mechanism as the following which are summarized in tables 3 and 4.

### **The Elements of KT Mechanism by Using Sociotechnical System Thinking**

The promise of sociotechnical thinking is that the system should be designed by taking into account both human and technical factors which influence the function and usage of such system. In general, system designs often meet their technical “requirements” but are considered to be a failure, because they do not take the real work structure and actors in the organisation into account. The main problem of techno-centric approaches to system design is the ignorance of the complex relationship between the organisational structures, people, functions and technologies (Norman, 1993; Goguen, 1999). In order to illustrate this idea clearly, Leavitt’s (1964) framework will be discussed. His framework had been developed through understanding the organisational change and focusing on the relationships between tasks, technologies, structures, and actors. He argued that any function of the organisation should be analysed through its main components. Moreover, Davis, M.C., et al (2013) extended Leavitt’s framework that was by adding goal and culture and using six interrelated elements which are embedded within an external environment. The main idea is that any complex organisational function or system can be represented in the form of a quadrilateral or a hexagon. We tried to apply this framework to analysis the KT mechanism to its main elements.

### **Literature review of Knowledge Transfer Models**

Most researchers used to deal with KT as a black box that they linked KT to bigger approaches; Knowledge Management (e.g. Nonaka and Takeuchi, 1996) and Organisational learning (e.g. Argote, & Ingram, 2000) had proposed a model for learning by achieving mainly three stages; creation, retention and transfer). Talking about KT levels; this study adopts three main levels of the function which they are individual, group and organisational levels. Also, we used source and recipient as general terms to identify the basic two elements of this mechanism.

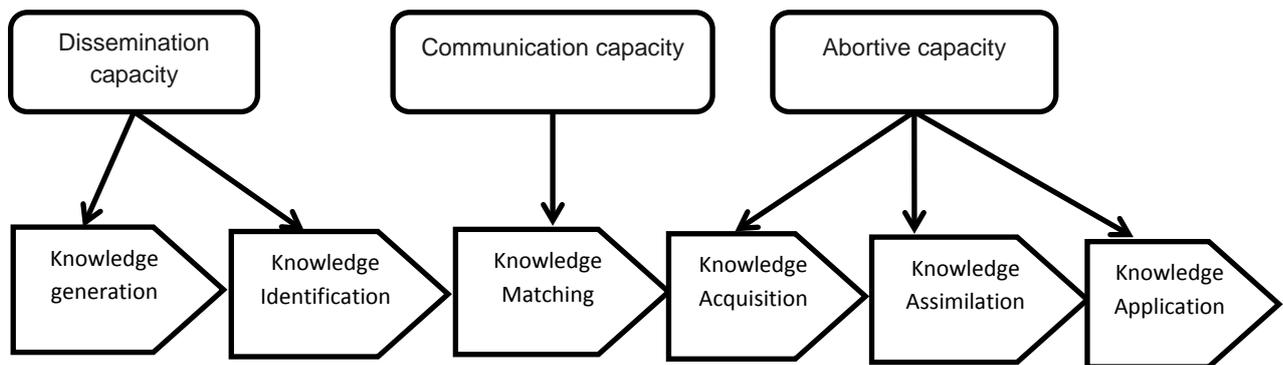
Talking about KT processes is like dealing with a black box. Opening the black box will provide insights on the nature of the inner workings of KT which it emphasizes the sequence of events. However, few researchers had classified and describe models for the processes of the KT.

Table 2 illustrates a summary of knowledge transfer process and mechanism's models. Table 3 and 4 illustrate a summary of the literature of enablers and barriers of KT mechanism.

Our model differs from the others in the following ways;

1. KT as a term has been discussed by the disciplines of organisational theories. Therefore, our model basically matches many different theories of organisation; absorptive capacity, organisational learning, knowledge based view and resource based view.
2. Our model reclassifies the process in a way to make it linked three main areas; processes related to sources by themselves, processes related to recipients by themselves and processes in between sources and recipients (see figure 1).
3. The first part of the processes related to dissemination capacity, the second part related to matching and communication capacity and the third related to the absorptive capacity (see the figure below).
4. In our model we combined between the enablers (see table: 3), the barriers (see table: 4), the level and the processes of the KT mechanism (see figure: 2).

**Figure (1): processes model of knowledge transfer.**



**Table (2): Comparison among KT models and studies (adapted from Frank & Ribeiro 2014).**

Main theories or approaches	Engineering approach							
	Organizational Capabilities focused on receptivity	Dynamic capabilities	Information-processing		Knowledge communication and translation	Information - processing focused on organization memory	Learning in continuous improvement	
Authors	Trott <i>et al.</i> (1995)	Marsh & Stock (2003)	Major & Cordey-Hayes (2000)	Markus (2001)	Liyanage <i>et al.</i> (2009)	Alavi & Leidner (2001)	Bartezzaghi <i>et al.</i> (1997)	Boer <i>et al.</i> (2001)
Nomenclature used for KT	Technology Transfer	Intertemporal Integration	Knowledge Transfer	Knowledge Reuse	Knowledge Transfer	Organizational Knowledge Process	Inter-project Learning	Knowledge Transfer
Phase 1 Knowledge generation in the source				Knowledge Production		Individual's Knowledge Creation	Intra-project learning	Intra-project learning
Phase 2 Knowledge identification	Awareness Association	Acquisition	Awareness	Capturing	Awareness	Storage	Abstraction	Acquiring
Phase 3 Knowledge matching			Collection	and documenting	Acquisition		Embodiment	
Phase 4 Knowledge acquisition			Summarization / Association Translation / Interpretation	Packaging knowledge	Transformation Association	Organization and Retrieval		
Phase 5 Knowledge assimilation	Communication	Distribution		Distributing knowledge		Transfer	Dissemination	Transferring
Phase 6 knowledge application	Assimilation	Interpretation	Assimilation	Reusing knowledge	Application	Absorption	Application	Consolidating
		Retention	Application / Commitment			Application		Applying
		Application						

Main theories or approaches	Emergent approach					
	Organizational Knowledge Creation	Organizational Behavior	Organizational Learning		Organizational Evolution	Organizational Culture
Authors	Nonaka (1994)	Szulanski (2000)	Gilbert and Cordey-Hayes (1996)	Carlile & Rebentisch (2003)	Zollo & Winter (2002)	Abou-Zeid (2005)
Nomenclature used for KT	Organizational Knowledge Creation	Knowledge Transfer	Knowledge Transfer	Knowledge transformation cycle	Knowledge Evolution Cycle	Knowledge Transfer
Phase 1: Knowledge generation in the source	Enlargement of an Individual's Knowledge Sharing Tacit Knowledge			Storage		
Phase 2: Knowledge identification		Initiation (Formation of the transfer seed)	Acquisition	Retrieval	Generative Variation (Ideas to be used)	Initialization
Phase 3: Knowledge matching	Conceptualization	Implementation (Decision to transfer)		Transformation	Internal Selection (Evaluation and Legitimization)	Interrelation
Phase 4: Knowledge acquisition			Communication		Replication	
Phase 5: Knowledge assimilation	Crystallization and Justification	Ramp-up (begin using)	Application			Implementation
Phase 6: Knowledge application	Networking Knowledge	Integration	Acceptance		Retention	Internalization
			Assimilation			

**Table (3) The enablers of Knowledge Transfer**

Category	Factor (s)	Definition	Study
Characteristics of knowledge	Availability (simplicity and explicitness)	The extent of opportunities to make knowledge available and easily accessible for use	Zander and Kogut, (1995); Bou-Llusar and Segarra, (2006); Apold <i>et al.</i> , (2006); Ambos and Ambos, (2009); Marella, 2007; and Sammer <i>et al.</i> , (2010).
Characteristics of source, dissemination capacity.	Ability	Abilities to find, manage and share the knowledge	Szulanski, (1996); Gupta and Simonin, (1999); Govindarajan, (2000); Minbaeva, (2007); Mu <i>et al.</i> , (2010).
	Motivation	Willingness and belief in the value of sharing	Grant, (1997); Zahra and George, (2002); Riege, (2007); Easterby Smith <i>et al.</i> , (2008);

Characteristics of recipient absorptive capacity	Ability	Having necessary skills, shared language and related prior-experience regarding the job	Ko et al., (2005); Walshe et al., (2010); Mu et al., (2010).
	Motivation	Willingness to contribute to organisational performance	Szulanski, (1996); Zahra and George, (2002); Minbaeva, (2007).
Characteristics of the relationship	Closeness of the relationships	The degree of involvement of source and recipient in communication channels and integrative mechanisms within a firm.	Szulanski, (1996); Minbaeva, (2007); Bonache and Zarraga, (2008); Li-AnHo et al., (2012).
Characteristics of the context	Supporting culture	The existence of values and behaviours that increase interaction between individuals and promote KT	Sun and Scott, (2005); Collins et al., (2006); Li-An Ho., (2012); Seba et al., (2012).
Characteristics of the tools	Technology acceptance	Design the tools, technology that is a human-centere	Davis et al., (1989); Alavi and Leidner, (1999); Venkatesh et al., (2003); Seba et al., (2012).

**Table (4): The barriers of Knowledge Transfer**

Category	Factor (s)	Definition	Study
Characteristics of knowledge	Ambiguity,	Degree of lack understanding between elements and consequences of actions	Szulansky, (1996); Szulansky et al., (2004).
	tacitness,	Degree to which knowledge is not modifiable	Szulansky, (1996); Simonin (1999), Lin et al., (2008).
	Complexity.	The amount of related practices, individual, skills etc attached to a knowledge set	Bou-Llugar and Segarra, (2006); Lin et al., (2008); Easterby Smith et al., (2008).
Characteristics of source	Lack of motivation.	Lack of personal tendency to participate in organisational practices	Szulansky, (1996); Perez-Nordtvedt et al., (2008); Wang and Noe, (2010); Mu et al., (2010).
	Lack of disseminative capacity.	Insufficient capability of a source to be reliable and reputable	Joshi et al., (2007); Mu et al., (2010).
Characteristics of recipient	Lack of absorptive capacity.	Inability to assess assimilate and apply acquired knowledge	Szulansky, (1996); Easterby Smith et al., (2008).
	Lack of motivation.	Lack of personal tendency to absorb in organisational practices	Szulansky, (1996); Smith et al., (2008); Yeoh, (2009).
Characteristics of the relationship	Lack of trust.	Lack of eagerness to be vulnerable based on reliance on other parties' knowledge	Inkpen and Tsang, (2005); Lin et al., (2008).
	Lack of communication competence.	Lack of skills to perform appropriate communicative behaviours	Ko et al., (2005); Xu and Ma, (2008).
	Lack of credibility.	When the recipient perceive the source of knowledge as unconvincing	Sarker, (2005); Elwyn et al., (2007).

Characteristics of the context	Lack of supporting culture.	Lack of supporting norms and values regarding KT in the organisation	Cline and Ryan, (2006); Liebwitz et al., (2007); Jones, Ajmal and Koskinen, (2008).
	Rigid Structure (Bureaucracy).	Inflexible organisational culture	Grant, (1997); Ivory et al., (2006); Lopez and Esteves, (2009).
	lack of supporting leadership.	When the manger has no tendency to	Disterer, (2001); Volpel, von Pierer and Streb, (2006); Xu and Ma, (2008).
Characteristics of the tools	unacceptance	When the participants feel that the technology is not conforming to standard usage	Detmer and Shortliffe; (1997); Riege, (2005); Drummond-Hay and Sidel (2004); Seba et al., (2012).
	lack of integration of infrastructure	Internet, intranet, security and maintenance service.	Brandon and Hollingshead, (2004); Seba et al., (2012).
	cognitive gap and lack of familiarity	The gap between the user's model and designer's model	Norman, (1990); Lin et al., (2012).
	Lack of trust in system (security); Lack of training regarding new IT systems.		Lin et al., (2012).

Having reviewed the literature of many fields in KT, it can be noted that there is significant attention to factors (enablers and barriers) which can effectively influence it. Moreover, the efficiency and effectiveness of KT in organisations have to take into consideration the following; behaviour of sources and recipients besides their disseminative and absorptive capacities, KT tools, channels, rules and network structures. Despite the importance of studying KT mechanism in the healthcare, little attention has been given toward it in the literature (Lin *et al.*, 2008; Nicolini *et al.*, 2008). Since the literature of KT enablers and barriers has been reviewed and the current research is concerned with healthcare, the following part will discuss the integration of the proposed model.

### **Integration of Models for KT Factors & Processes**

This section presents a suggested model of KT in the healthcare situations that summarizes and integrates the ideas of the processes discussed previously. This is due to (1) the pragmatic way to deal with the KT which is mostly concerned with developing solutions; (2) predominant focus on the complexity of healthcare situation; (3) a higher level of arrangement for KT phases. The proposed model is presented in the following table. The model is divided into phases. The table below is presents the references that were used for explanation and supporting of each stage. For best performance in Phase 1; knowledge generation which is split into two stages (1) knowledge creation and knowledge articulation. At this phase, it is crucial to develop the capacity for knowledge generation and creation in at all levels. Usually, the expected outcome of this phase develops new solutions to be part of new routines.

Phase2 is knowledge identification which consists of two stages: (1) knowing which types of knowledge can be reused (2) its matching abstraction and conceptualization. The main factor which can help at this phase is to develop the capacity to articulate the tacit knowledge to be useable in other context. Usually, the main outcome of this phase is explicit knowledge which can be applied in new projects.

**Table (5): The proposed model of KT mechanism (adapted from Frank & Ribeiro 2014)**

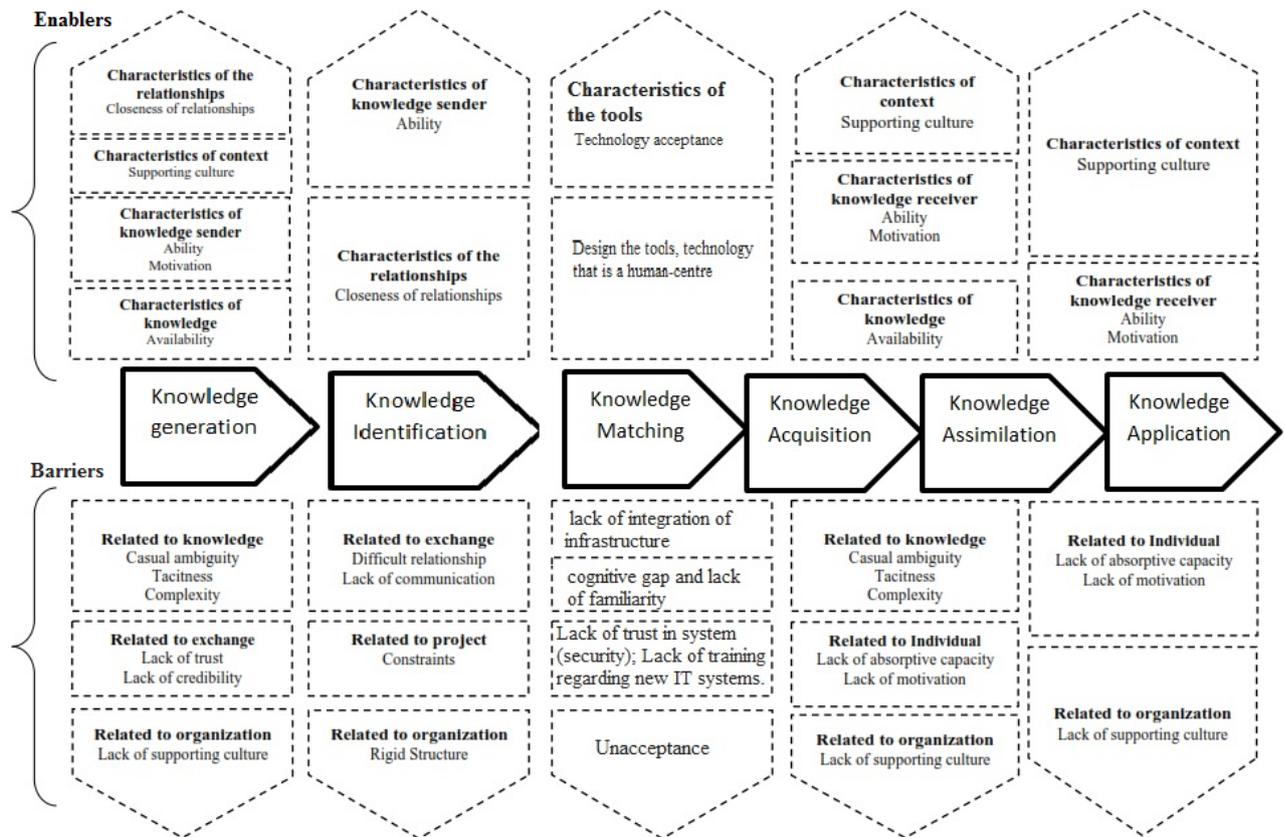
<i>Phase</i>	<i>Stage</i>	<i>Scope</i>	<i>Reference</i>
Phase 1: Knowledge generation in the source	Creation and enlargement (in individuals)	Knowledge is created in the minds of people during the project work.	Nonaka (1994); Alavi & Leidner (2001)
	Using and learning within the team project	Team members share their knowledge and learn together within a project.	Bartezzaghi <i>et al</i> (1997); Boer <i>et al</i> (2001)
Phase 2: Knowledge identification	Awareness	An opportunity to apply the knowledge to other projects is recognized. The identification may be from the source or from the recipient.	Trott <i>et al</i> (1995); Major & Cordey-Hayes (2000); Liyanage <i>et al</i> (2009)
	Abstraction and conceptualization	Knowledge is abstracted to a generic concept, applicable to other contexts.	Nonaka (1994); Bartezzaghi <i>et al</i> (1997)
Phase 3: <b>knowledge matching</b>	Explication and embodiment	Abstracted knowledge is embodied in a primary version of a formal register.	Bartezzaghi <i>et al</i> (1997); Major & Cordey-Hayes (2000); Markus (2001)
	Preparation	Registered knowledge is prepared and formatted, to become clear and comprehensive for other people.	Major & Cordey-Hayes (2000); Markus (2001); Liyanage <i>et al</i> (2009)
	Consolidation	Prepared knowledge is consolidated by comparison and increasing combination and association with other knowledge sources.	Major & Cordey-Hayes (2000); Markus (2001); Liyanage <i>et al</i> (2009)
Phase 4: <b>knowledge acquisition</b>	Distribution/ dissemination	Consolidated knowledge is distributed or disseminated to other teams that may use it.	Bartezzaghi <i>et al</i> (1997); Markus (2001); Marsh & Stock (2006)
Phase 5 <b>knowledge assimilation</b>	Absorption and assimilation	Other project teams study and learn about how to apply the shared knowledge in their context.	Major & Cordey-Hayes (2000); Alavi & Leidner (2001)
Phase 6 : Knowledge application by the recipient	Application	Knowledge is applied in the new project.	Bartezzaghi <i>et al</i> (1997); Major & Cordey-Hayes (2000); Alavi & Leidner (2001); Boer <i>et al</i> (2001); Liyanage <i>et al</i> (2009)
	Integration and retention	Knowledge is integrated in the routines and is retained permanently by the new team.	Szulanski (2000); Zollo & Winter (2002)

Phase 3 is knowledge matching which attempts to push the outcome of the second phase dynamically through the different tools and mechanisms. There are three new terms will be proposed at this phase to summarize the ideas of this phase: (1) knowledge embodiment and explanation in formal documents; (2) aiming to formulate the knowledge more clearly, preparation of the explicit knowledge is the second; (3) consolidation of the explicit knowledge. The main factor to be developed at this stage is capacity of resource to formulate and to present the explicit knowledge in a clear format. The main outcome of this phase is organisational memories which will be obtained.

Phase 4 is knowledge acquisition which is conserved completed when the recipient starts to recognize and understand new external knowledge or what we can call the exploratory learning to adjust the existed knowledge in addition to the new knowledge. The main factor of this phase is to motivate the recipient to know the knowledge gap and to look for how to reduce this gap.

Phase 5 is knowledge assimilation which is the process by which valuable external knowledge is assimilated by the recipients at many levels within the firm, involving several processes. The main factor of this phase is the recipient capacity to understand the knowledge and to combine it with the old one.

**Figure (2): The conceptual model of KT processes, elements and factors (enablers and barriers).**



Phase 6 is the application knowledge by the recipient which can be defined as the final phase of KT when the recipient can react regarding the last two phases. This phase can be divided into two stages: (1) direct application of the new knowledge in the context; (2) integration and retention of new knowledge in the organisation routines. At the last three phases, the main element can be developed is the absorptive capacity of the recipients (Lane *et al.*, 2006). The integrated conceptual model has been summarized in the figure 2.

### Discussion and Conclusion

Strong model of KT can effectively support the day to day activities at knowledge based organisations with a complex environment such healthcare situation. Also, the model can be strongly helpful for communication system developers to achieve smooth flow and exchange of knowledge in such situation. KT can be identified as the dynamic interaction between resource and recipient by using a suitable tool to generate, acquire and apply the knowledge by either different recipient in the same or different context. However, this model is a reflection of the needs to understand overview of KT mechanism completely which in turn leads to better organisational performance. To develop the model, this study integrates and analyse key disciplines of KT mechanism to know the directions of studies and to illustrate a big picture of this mechanism or function by looking at KT elements, processes, levels and factors.

I must acknowledge that the study has certain limitations. This paper has been built based on theoretical foundations, so proposed model is purely conceptual. Therefore, it would be important to conduct empirical studies to verify and enhance this model. A qualitative

study accordingly would be particularly appropriate. It could be a good chance to conduct studies, including multilevel interaction of the paradigms (international and global) during the transfer processes.

In spite of the paper limitations, there are many potential practical and theoretical contributions. To the best of knowledge, there are limited studies that try to make a comprehensive view of KT mechanisms included elements, processes, multilevel and factors. Most of studies focused on one of two fundamental dispensaries and tried to articulate KT mechanism around them. Building on the existing literature and depending on different disciplines (e.g. Knowledge based view and organisational learning), the processes were extended to be six phases which have been discussed in relation with key factors and levels of effects. Another key contribution of this paper is analysing the elements of the KT mechanism by using the sociotechnical thinking.

For practitioners, this paper identifies such a rich model which can help reduce the difficulties and increase the fast of KT in an organisational context. This model suggests that managers and system developers should pay close attention to the levels, factors, elements and process of such function. Finally, it is important to ensure that the tendency and willingness of basic elements of KT (resource and recipients) are crucial in the successful transfer and integration of knowledge within organisations.

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