CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

The rapid growth of data on technologies triggers the transformation of data to useful information, known as knowledge. Nowadays, people are aware of the importance of knowledge and ways to acquire, recognize, capture, retrieve, use or measure, manage and collaborate it so that the knowledge can be shared without losing it (Maizatul and Chua, 2004). As a result, the term 'KNOWLEDGE MANAGEMENT' (KM) is created for this purpose. Knowledge management has been widely accepted and implemented in organizations and knowledge is recognized as the most important resource of organizations (Alvesson and Karreman, 2001; Minu, 2003; Nahapiet and Ghoshal, 1998; Spender and Grant, 1996 in Christian and Andrian, 2008). Manipulating knowledge creation, knowledge storing, knowledge sharing, and knowledge application helps organizations gain competitive advantage (Nonaka *et al*., 1994, 1995, 2000; Argote and Paul2000).

KM is a new field especially in higher institutions of learning. Recently, researchers have expanded studies of knowledge management into the domain of higher education. Using knowledge management techniques and technologies in higher education is as vital as it is in the corporate sector. If done effectively, it can lead to better decision-making capabilities, reduced product development cycle time (for example curriculum development and research), improved academic and administrative services, and reduced costs (Jillinda *et al*, 2000).

Higher education in today's environment is subject to the same pressures as the marketplace. The high demand for knowledge and increased competition has pushed higher education institutions to think like business. The educational markets are becoming global as higher education institutions are attempting to internationalise their curricula and offer high-quality programmes to students regardless of location (Anand, 2003).

They are also facing higher competition for a share of student market both local and international, though this is not the case in Nigeria where students rather compete for entry into higher institutions as observed by Victor (2007), "The demand for entry into

Nigerian universities is usually very high and competitive. With a population of about one hundred and forty million, there has been an increase in the demand for university education. At present, the total number of Nigerian universities both private and public is 91 with 1,096,312 students". Afemikhe (2008) noted "One major problem facing university system in Nigeria (and in fact all other higher institutions of learning) is that associated with selection and placement of students. Unfortunately, the number of applicants outweighs the number of available spaces".

According to Salim (1997), the general untidiness of this uncoordinated system of admissions, and the attendant problems had assumed new proportions with the establishment of new universities, polytechnics and colleges of education.

Moreover, higher institutions have to adjust themselves and develop strategies to respond rapidly to the changes in technologies and increasing demands of stakeholders. In this new Millennium, knowledge is power and more knowledge is within individuals more than in records (Anand, 2003).

An institution wide approach to knowledge management can lead to exponential improvements in sharing knowledge (Jillinda, *et al*, 2000).

In the context of educational institutions, sharing knowledge is paramount to the existence of an educational institution (Liao, 2004). Knowledge transfer is the primary key to effective teaching and learning in higher education. It contributes to guiding and improving students' professional development (Teresa *et al*, 2008).

Feng *et al*, (2009) made the first attempt to introduce and acknowledge the unique role of an extensionist in the knowledge transfer process in expert system application to Agriculture. This implies that the role of the Extensionist in Knowledge transfer is a recent development and present an interesting direction for further research in other areas of knowledge transfer as in the case of higher education in Nigeria since the intermediary role of the extensionists really exist. As the demand for the intensive involvement of experts in KT increases in higher institutions of learning, coupled with the fact that we have insufficient number of such experts in the higher education sector, the role of the Knowledge extensionists in many of our higher institutions of learning remain relevant in order to bridge the gap created by this imbalance.

1.2 Statement of the Problem

In many higher institutions of learning in Nigeria today, the process of transferring knowledge does not usually follow the standards set for it. In most cases the sender (teacher) does not have the specified teaching qualifications required. This may be because of the high number of students enrollment and or the constant brain drain of lecturers, which could be the reason for the lack of sufficient manpower characterizing most of our government owned higher institutions of learning, thus forcing institutions to utilize the lecturers that are available. For instance in the polytechnics, the minimum teaching requirement for a lecturer is to have a second class lower degree in the relevant field of study (FME, 1998), but most of the times one finds people with lower qualifications handling certain courses. This trend can be found in many institutions across the country and probably may have certain implications to effective transfer of knowledge.

This study therefore incorporates knowledge extensionists into the KTHE model with a view to building up intermediary factors into the model.

1.3 Objectives of the study

The aim of this study is to investigate selective cases where knowledge transfer took place between teachers (both experts & extensionists) and students in Waziri Umaru Federal Polytechnic (WUFP) Birnin kebbi in order to identify the intermediary factors of extensionists for the KTHE model.

To achieve the aim, we set up the following objectives:

1. To develop conceptual model of KTHE that incorporates knowledge extensionists, there by improving the model to account for Nigeria's Higher Institutions.
2. To improve on the KTHE model developed by Ko *et al*., (2005) to accommodate the role of knowledge transfer Extensionsists.
3. To test the acceptability of knowledge factors, communication factors and motivation factor of intrinsic motivation as they affect KT.

1.4 Significance of the study

This study introduces the role of knowledge extensionists in the knowledge transfer process in higher education.

It also provides an opportunity to access and compare the performance of the extensionists vis-à-vis the experts as well as amongst themselves with respect to the different contributions they make in the knowledge transfer process in the light of the intermediary factors to be identified in this study.

1.5 Justification of the study

Economic and social developments are increasingly driven by the advancement and application of Knowledge. But the potential of higher education systems in many developing countries to provide qualitative and effective knowledge to attain such developments are thwarted by long standing problems of finance, efficiency, equity, quality and governance. Efforts to expand enrollments and improve educational quality are severely constrained by growing shortages of qualified academic staff.

For example, between 1997 and 1999, the numbers of academic staff in the federal universities in Nigeria declined by 12% even as enrollments expanded by 13%. Long term brain drain in the face of rising enrollments, has left the federal university system with only 48% of its estimated staffing needs filled. Staffing scarcity is most acute in engineering, science and business disciplines. Shortfalls are estimated at 73% in engineering, 62% in medicine, 58% in administration, and 53% in sciences. In contrast, no staffing shortages exist in the disciplinary areas of arts and education (NUC2002 in William *et al*).

Adeyemi (2000) Reports on a study which evaluated enrollment trends with the available academic manpower in Nigerian universities. Findings indicated that projections of student enrollment expected to increase by 5 per cent annually, far outpace projected numbers of academic staff available.

Ephraim (2004) found that Nigerian public institutions have high enrollments without enough qualified instructors. As a result, staff/student ratios have worsened to the detriment of student learning and academic research.

1. 6 Scope and Limitations

Although there are a large number of higher institutions of learning across the country where the role of the extensionists exist and therefore suitable to investigate, the data required for the various factors involved in this study may not be readily available and therefore difficult to obtain. For that reason this study is limited to the development of conceptual model for KTHE by investigating only Waziri Umaru Federal Polytechnic Birnin kebbi.

1.7 Research Hypotheses

The research hypotheses tested are:

1. H_o: there is no significant difference between the performance of students under experts and extensionists in terms of qualification

   H_1: there is significant difference between the performance of students under experts and extensionists in terms of qualification.

   $H_o^{'}$: there is no significant difference between the performance of students under experts and extensionists in terms of experience.

   $H_1^{'}$: there is significant difference between the performance of students under experts and extensionists in terms of experience.

   $H_o^{''}$: there is no significant difference between the performance of students under experts and extensionists in terms of background of the teachers.

   $H_1^{''}$: there is significant difference between the performance of students under experts and extensionists in terms of background of the teachers.

2. H_o: there is no significant difference between the performance of students under extensionists in terms of qualification of the teachers.

   H_1: there is significant difference between the performance of students under extensionists in terms of qualification of the teachers.

   $H_o^{'}$: there is no significant difference between the performance of students under extensionists in terms of experience.

   $H_1^{'}$: there is significant difference between the performance of students under extensionists in terms of experience.

H_o'': there is no significant difference between the performance of students under extensionists in terms of background of the teachers.

H_1'': there is significant difference between the performance of students under extensionists in terms of background of the teachers.

3. H_o: there is no significant difference between the performance of students under experts and extensionists in terms of qualification of the teachers.

   H_1: the performance of students tends towards lower values under experts than under extensionists in terms of qualification of the teachers.

   H_o': there is no significant difference between the performance of students under experts and extensionists in terms of experience.

   H_1': the performance of students tends towards lower values under experts than under extensionists in terms of experience.

   H_o'': there is no significant difference between the performance of students under experts and extensionists in terms of background of the teachers.

   H_1'': the performance of students tends towards lower values under experts than under extensionists in terms of background of the teachers.

4. H_o: there is no significant difference between the performance of students under extensionists in terms of qualification of the teachers.

   H_1: the performance of students tends towards lower values under extensionists with lower qualification than under extensionists with higher qualification.

   H_o': there is no significant difference between the performance of students under extensionists in terms of experience.

   H_1': the performance of students tends towards lower values under extensionists with no experience than under those with experience.

   H_o'': there is no significant difference between the performance of students under extensionists in terms of background of the teachers.

   H_1'': the performance of students tends towards lower values under extensionists with no background than under those with relevant background.

CHAPTER TWO
LITERATURE REVIEW

2.1 What is Knowledge?

There is no common definition of the term knowledge (Christian and Schwenke, 2008). The study of knowledge is both very old and very new. Philosophers have written a lot about it for millennia. But attention to the relationship of knowledge to the structure of the work place is relatively new. Drucker (2000) described knowledge rather than capital and labour as the only meaningful resource in the knowledge society. Nowadays, knowledge has become one of the critical driving forces for business success. Organizations are becoming more knowledge intensive; they are hiring "minds" more than "hands" and the need for leveraging the value of knowledge are increasing. Many attempts have been made in the literature to define knowledge by distinguishing between data, information and knowledge and providing an overview of different definitions and forms of knowledge. (Wiig, 1999).

2.1.1 Data, information and knowledge

Researchers dealing with knowledge and related terms have given various views and definitions about the terms data, information and knowledge and their strong tie. It is important to mention that these are not interchangeable objects (Davenport and Prusak, 1998). The connection and classifications between the three terms is reflected in Figure 2.1.

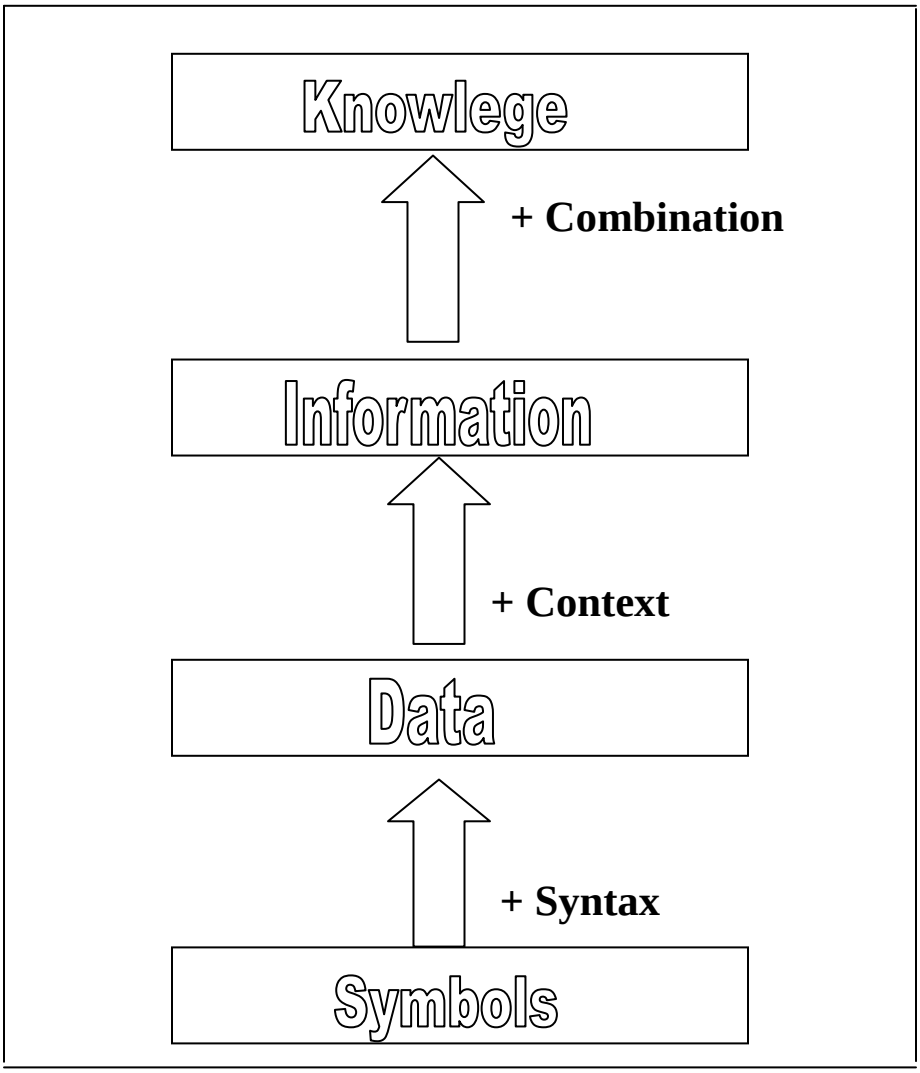

Figure 2.1 Data, Information and Knowledge
Chini, 2004 and Werner, 2004.

Data can be described as a bundle of objective facts or as a sequence of symbols and they do not contain any information of how to make use of them in a given context. Within an organizational context, data can be described as structured records of transition (Davenport and Prusak, 1998).

A collection of data is not information, the data collected may contain information but it will depend on the understanding of the one perceiving the data. Information is the understanding of the relationship between pieces of data, or between pieces of data and

other in formation with great dependence on context for its meaning and with little implication for the future (Koh, 2005).

The transition from data to information takes place by enriching the data at hand with a specific context and a meaning, thus making the symbols and facts significant. Davenport and Prusak (1998) refer to that as “adding value in various ways”.

Information will only become knowledge when one is able to realize and understand the patterns of information and their implications. A pattern, which represents knowledge, also provides a high level of reliability or predictability as to how pattern will evolve over time (Bellinger, in Koh, 2005).

Knowledge therefore results from combining various pieces of information, interpreting them and giving them a meaning as a whole. This suggests that individuals generate knowledge on the basis of information, which in turn derives from data that is perceived in their surroundings. Since perception differs from individual to individual due to their frame of reference, the complex stream of experience and information constitute the way we understand and perceive our surroundings (Weick, 1995). The process of sense making and giving meaning to data or information also varies from person to person. This makes knowledge individually unique.

Probst and Romhardt (1998) on the other hand did not strictly distinguish between information and knowledge, but speak about a “continuum” between the poles Data and Knowledge (see Table 2.1)

Table 2.1: Continuum of data-information-knowledge
Probst and Romhardt, 1999 and Chini, 2004

Data……Information……..……Knowledge
Unstructured…….Structured
Isolated……...Embedded
Context-independent……..Context-dependent
Low behavior control…….…….High behavior control
Signs……Cognitive behavioral patterns

Contrarily, Nonaka and Takeuchi (1995) again stress the differences between information and knowledge by mentioning three differentiating characteristics: “First, knowledge, unlike information, is about beliefs and commitment. Knowledge is a function of a particular stance, perspective, or intention. Second, knowledge, unlike information, is about action. And third, knowledge, like information, is about meaning. It is context-specific and relational”. The latter suggests that the existing similarities between knowledge and information lie in their characteristics of being context-specific and relational in that they depend on the situation and are created dynamically in social interaction among people (Nonaka and Takeuchi, 1995).

Bellinger in Koh (2005) went further to extend knowledge to wisdom. According to him, wisdom is deep knowledge based on considerable personal experience. Wisdom arises when one understands the foundational principles responsible for the patterns representing knowledge being what they are. And wisdom, even so than knowledge, tends to create its own context.

2.1.2 Definition of knowledge

The next paragraphs contain some of the most often quoted definitions of knowledge in the literature. This should point to the complexity of the term.

The Oxford English Dictionary defines knowledge as:

1. Expertise, and skills acquired by a person through experience or education; the theoretical or practical understanding of a subject,
2. What is known in a particular field or in total; facts and information or
3. Awareness or familiarity gained by experience of a fact or situation.

Davenport and Prusak (1998) understand knowledge as a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories, but also in organizational routines, processes, practices and norms”.

Sveiby (2001) states that “Knowledge defined as a ‘capacity to act’ is dynamic, personal and distinctly different from data (discrete, unstructured symbols) and

information (a medium for explicit communication). Since the dynamic properties of knowledge are in focus, the notion Individual Competence can be used as a fair synonym".

Nonaka and Takeuchi (1995) see knowledge as a "dynamic human process of justifying personal belief toward the truth".

Awad and Ghaziri (2004) defined Knowledge as the understanding that is obtained through the process of experience or appropriate study.

2.1.3 Forms of knowledge

In the literature one can find a multitude of different classifications with regard to knowledge. This section unites the most common approaches under one roof to relieve the overview.

Knowledge is saved in two different categories of the long-term memory, which are, in terms of neurophysiology, locatable and distinguishable with regard to their functions: the procedural and declarative memory. Further on, knowledge is generally subcategorized into explicit or articulated, and implicit or tacit knowledge. These two dimensions go back to the philosopher Michael Polanyi (1993), who observed that performers were capable of showing skills without being able to completely account for their cognitive basis. According to Polanyi (1993), all actions include tacit and explicit elements of knowledge, with the tacit part being extremely difficult to articulate and thus to transfer. Nowadays, a lot of researchers base their theories on the distinction of tacit and explicit knowledge (Chini, 2004).

Furthermore and with regard to its availability and the bearer of knowledge, knowledge can be ontologically differentiated by individual, collective and organizational knowledge.

The connection between the forms of knowledge is highlighted in Figure 2.2

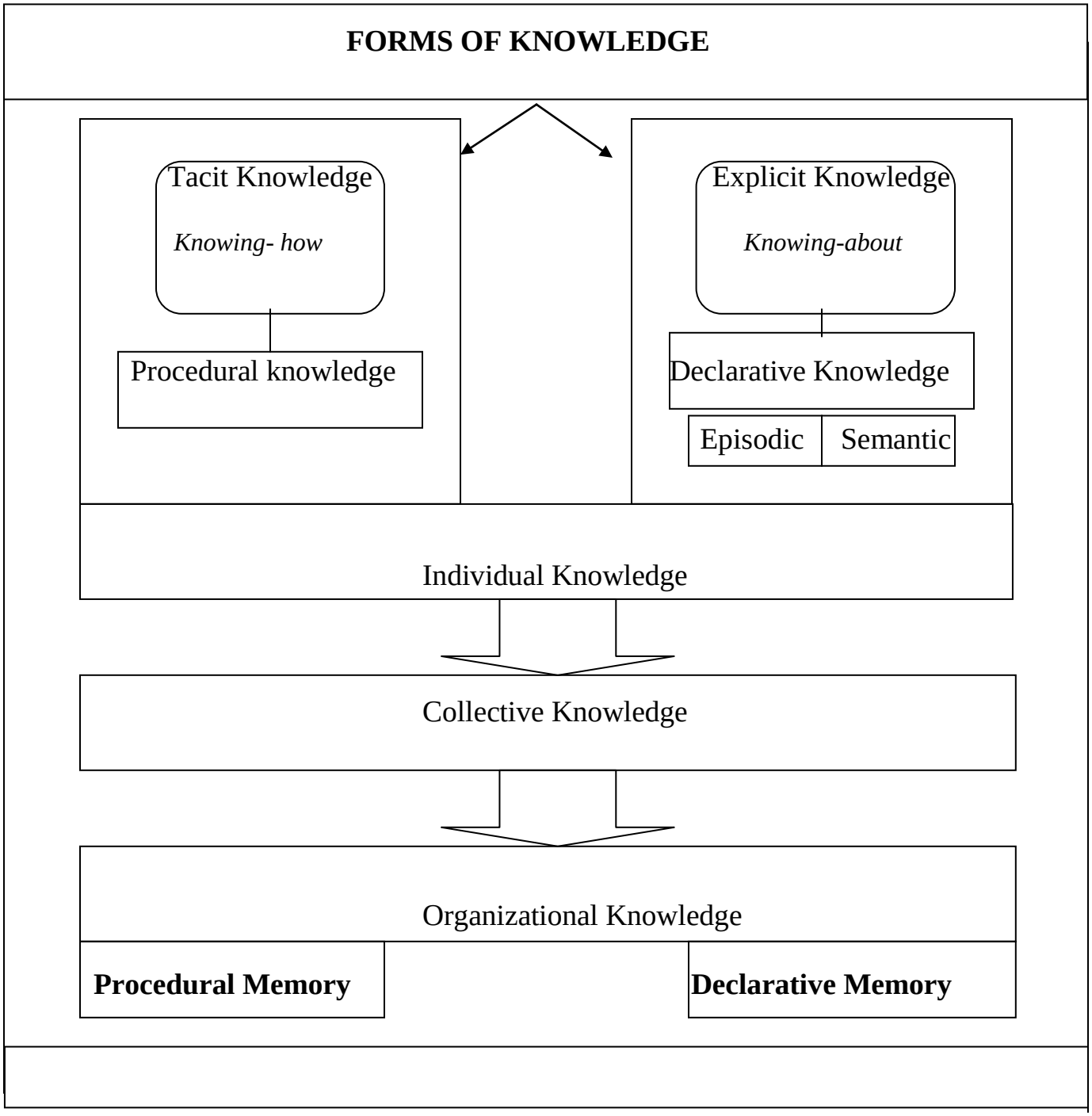

Figure 2.2: The different forms of knowledge

Chini, 2004 and Nickols, 2000

It is important to enlighten the different forms of knowledge, since the likelihood of successful knowledge acquisition and knowledge transfer depends on the form of

knowledge being transferred (Davenport and Prusack, 1998). For instance, the transfer of tacit/implicit knowledge is by far more complicated than explicit knowledge (Argote and Ingram, 2000).

i. Tacit and procedural knowledge

According to Polanyi (1993), we know more than we can tell. This form of knowledge is referred to as tacit or implicit knowledge. "Tacit knowledge is that which is understood within a knower's mind" (Jennex, 2006). Hedlund (as quoted in Chini, 2004) defines tacit knowledge as the non-verbalized, intuitive and unarticulated part of knowledge. The term tacitness of knowledge refers to its characteristic of being very difficult to transfer, since it includes beliefs and emotions and depends on one's individual experience, subjective insights, intuitions and hunches (Nonaka and Takeuchi, 1995, Nonaka *et al* in Nonaka and Teece, 2000). It is deeply rooted in actions, routines, procedures, commitment, values and ideals. Therefore, it cannot easily be shared or communicated (Nonaka and Takeuchi, 1995). Grant (1996) associates tacit knowledge with the expertise in knowing how to do something. Tacit knowledge thus spans a resource of a firm, which is, among others, based on skills, capacities, competences or technology. An often consulted example for the explication of tacit knowledge is the capability of riding a bike. There are not really any instructions or manuals of how to learn to ride the bike, yet nearly every person is capable of doing it and never unlearns doing so.

Within the area of procedural knowledge, a lot of differences in opinion exist. One view of procedural knowledge is that it is knowledge that manifests itself in the doing of something, thereby making it a reflection of motor or manual skills and of cognitive or mental skills. Another common view is that procedural knowledge is knowledge about how to do something, which is in conformity to Grant (1996), as mentioned above. This suggests that procedural knowledge is strongly connected to tacit knowledge. (Nickols, 2000)

In the literature there also seem to exist disagreements concerning the difference between tacit knowledge and implicit knowledge. While, for instance, Chini (2004) notes that tacit knowledge does not gain its value from being impossible to articulate, but from not having been articulated yet,

Nickols (2000) draws a straight line between tacit and implicit knowledge by claiming that tacit knowledge cannot be articulated at all and implicit knowledge did not happen to get articulated yet. In many other literatures, the terms implicit and tacit knowledge are used synonymously and interchangeably.

In the following sections, tacit knowledge is understood as knowledge, which has not been articulated yet – but it is possible to do so - and which is saved within the procedural memory, perceiving procedural knowledge as the skill to know-how and as the knowledge that is reflected in the doing of the knowledge bearer.

ii. Explicit and declarative knowledge

Explicit knowledge, in contrast to tacit knowledge, is codified through words, numbers and codes and can be precisely and formally articulated (Hedlund, as quoted in Chini, 2004). Nonaka, Toyama and Konno (in Nonaka and Teece, 2000) state that "explicit knowledge can be expressed in formal and systematic language" and shared in the forms of data, scientific formulas, specifications, manuals and such (Nonaka *et al*, in Nonaka and Teece, 2000). Another definition of explicit knowledge is given by Nonaka and Takeuchi (1995): "Explicit knowledge can be expressed in words and numbers, and easily communicated and shared".

Due to these characteristics it can be captured in form of text, diagrams, tables, product specifications, hard data, scientific formulas, manuals, codified procedures or universal principles (Nickols, 2000) (Nonaka and Takeuchi, 1995) (Nonaka, *et al* in Nonaka and Teece, 2000), and consequently passed on more easily than tacit knowledge. This suggests that by modern means of information and communication technology explicit knowledge can be saved, transferred and made use of. According to Grant (1996), explicit knowledge can be put on the same level with the capability of knowing about facts and theories.

Declarative knowledge has much in common with explicit knowledge, since the declarative knowledge consists of descriptions of facts and things or of methods and procedures (Nickols, 2000). The declarative or descriptive knowledge is the type of knowledge that is expressed in declarative sentences or indicative propositions, putting it in strong contrast to the procedural knowledge. This suggests that all declarative knowledge is explicit knowledge, since it is knowledge that has been articulated.

Furthermore, declarative knowledge itself is divided into episodic and semantic knowledge (Narteh, 2008):

Episodic: represents the memory for "episodes" (for instance, the context of an experienced event in terms of where, when, with who, etc…)

Semantic: represents the memory for knowledge one acquires during events in terms of facts about the world or meaning of words, etc… (for instance, knowing that April is the first month alphabetically, but January the first one chronologically).

Figure 2.3 summarizes the main differences between declarative and procedural knowledge in order to aid in sorting out matters.

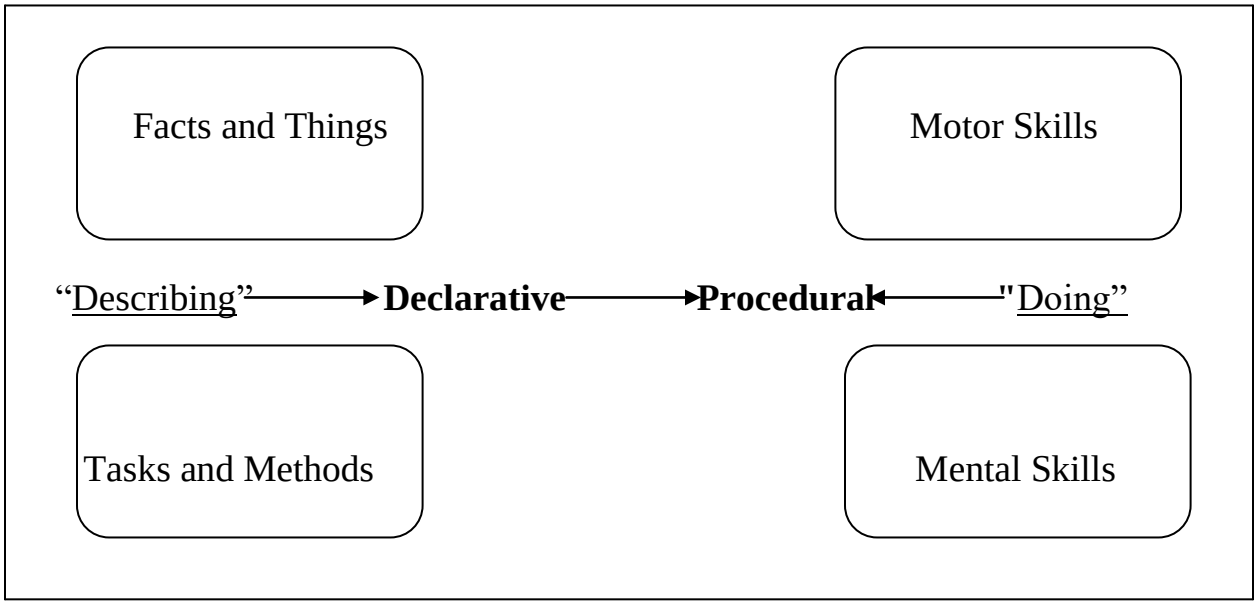

Figure 2.3: Declarative and Procedural Knowledge
Nickols, 2000

iii. Individual, Collective and Organizational Knowledge

"Individual Knowledge reflects individual experience and constitutes the basis for the development of organizational knowledge" (Chini, 2004). According to Probst and Romhardt (1999) and Werner (2004), collective knowledge in turn represents more than the sum of the individual knowledge of the members of that collective, since synergy effects may result from combining several extracts of individual knowledge to one entity. This, however, requires that the members of the group are potentially capable of linking

their individual knowledge (Werner, 2004). This suggests that collective knowledge is not carried by one single person in charge, but only from the group as a whole.

The organizational knowledge comprises both individual and collective knowledge and is continuously generated from these two forms, with tacit and explicit knowledge being elements of every ontological level of this hierarchy (Smith, 2006). While most explicit knowledge and all tacit knowledge is stored within the individuals, large of part of this knowledge is created within the firm and is therefore firm specific (Grant, 1996).

2.2 Knowledge management

From a strategic point of view, knowledge represents an important element for an organization. In order to maintain the important characteristics and substitutable, and potentially value generating resource, it has to be led by an effective and efficient knowledge management that aims at accumulating this knowledge and at stimulating its conversion into competitive advantages (Werner, 2004). This suggests the necessity of installments of knowledge management processes through which exploitation and utilization of knowledge is ensured. This section is aimed at introducing the fundamental approaches towards knowledge management in order to enable the classification and differentiation of knowledge transfer as a sub area of knowledge management.

2.2.1 Definition of knowledge management

A multitude of definitions concerning knowledge management can be found in the literature. “Knowledge management is concerned with the entire process of discovering and creation of knowledge, dissemination of knowledge and the utilization of knowledge” (Newman, in Koh, 2005).

Rowley (2000) describes the term KM as follows: “Knowledge management is concerned with the exploitation and development of the knowledge assets of an organization with a view to furthering the organization’s objectives. The knowledge to be managed includes both explicit, documented knowledge, and tacit, subjective knowledge. Management entails all of those processes associated with the identification, sharing, and creation of knowledge. This requires systems for the creation and maintenance of knowledge repositories, and to cultivate and facilitate the sharing of knowledge and organizational learning. Organizations that succeed in knowledge management are likely

to view knowledge as an asset and to develop organizational norms and values, which support them creation and sharing of knowledge".

Chini (2004) provides an overview of one of the most often cited definitions.

Table 2.2: Definitions of knowledge management
Chini, 2004.

Source	Definitions
Birkinshaw (2001, p. 12)	Knowledge management can be seen as a set of techniques and practices that facilitates the flow of knowledge into and within the firm.
Buckley and Carter (1999, p. 82)	Knowledge management contains "the internal mechanisms for coordination, that is, for pooling the key information garnered by managers whose task it is to monitor external volatility and discover new opportunities".
Davenport et al. (2001, p. 117)	Knowledge management is "the capability to aggregate, analyze, and use data to make informed decisions that lead to action and generate real business value".
Demarest (1997, p.379)	"Knowledge management is the systematic underpinning, observation, instrumentalization, and optimization of the firm's knowledge economies".
Leonard Barton (1995, p. xiii)	"The primary engine for the creation and growth and of technological capabilities is the development of new products and processes, and it is within this development context that we shall explore knowledge

	management . . . The management of knowledge, therefore, is a skill, like financial acumen, and managers who understand and develop it will dominate competitively."
Malhotra (1998, p.59)	"Essentially, it embodies organizational processes that seek synergistic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings."
Stewart *et al*. (2000, p. 42)	"The premise is that knowledge assets, like other corporate assets, have to be managed in order to ensure that enterprises derive value from their investment in knowledge assets."
Tsoukas &Vladimirou (1996, p. 973)	Knowledge management "is the dynamic process of turning an unreflective practice into a reflective one by elucidating the rules guiding the activity of the practice, by helping give a particular shape to collective understandings, and by facilitating the emergence of heuristic knowledge".

The discipline of KM has three major components (Bose, 2001):

- **People:** who create, share and use knowledge and who collectively comprise the organizational culture that nurtures and stimulates knowledge sharing.
- **Processes**: the methods to acquire, create, organize share and transfer knowledge.
- **Technology**: the mechanisms that store and provide access to data, information and knowledge created by people in various locations.

2.2.2 Knowledge extensionists

The word “extension” is derived from an educational development in England during the 19th century, when Oxford University and Cambridge University attempted to serve the rapid expansion of educational needs of society. It was called “university extension”. In the early 20th century, the word extension was applied to describe the transfer of knowledge and technology to serve the needs of rural development by American land-grant universities (Jones & Garforth, 1997). The actors engaged in facilitating the knowledge extension were termed “extensionists”. In the early literature, the role of the extensionist was reported to transfer the knowledge and skills originally in a social network, but more recently has been adopted in the agricultural sector. According to Nagel, (1997), the name “extensionist” is drawn from previous literature on educational and agricultural extension, which defines the “extension” as the organized exchange of information and the purposive transfer of skills.

2.2.3 Theoretical approaches towards knowledge management

In the following, a short explanation of a few approaches towards knowledge management as found in the literature is given.

i. The building blocks model by Probst and Romhardt

A very often quoted theoretical concept is the one developed by Probst and Romhardt (1999), which is characterized by its high practical relevance. Introducing eight related and interconnected building blocks allows for a comprehensive examination of knowledge management. With the help of these blocks, it is the aim to provide the employees with the opportunity to be better able to understand and describe emerging problems concerning knowledge within their organization. The definition of knowledge management, according to the authors, sees knowledge management as pragmatic development of ideas of organizational learning, whereby the focus is put on improving organizational capabilities on all levels of the organization by dealing with the resource knowledge more efficiently.

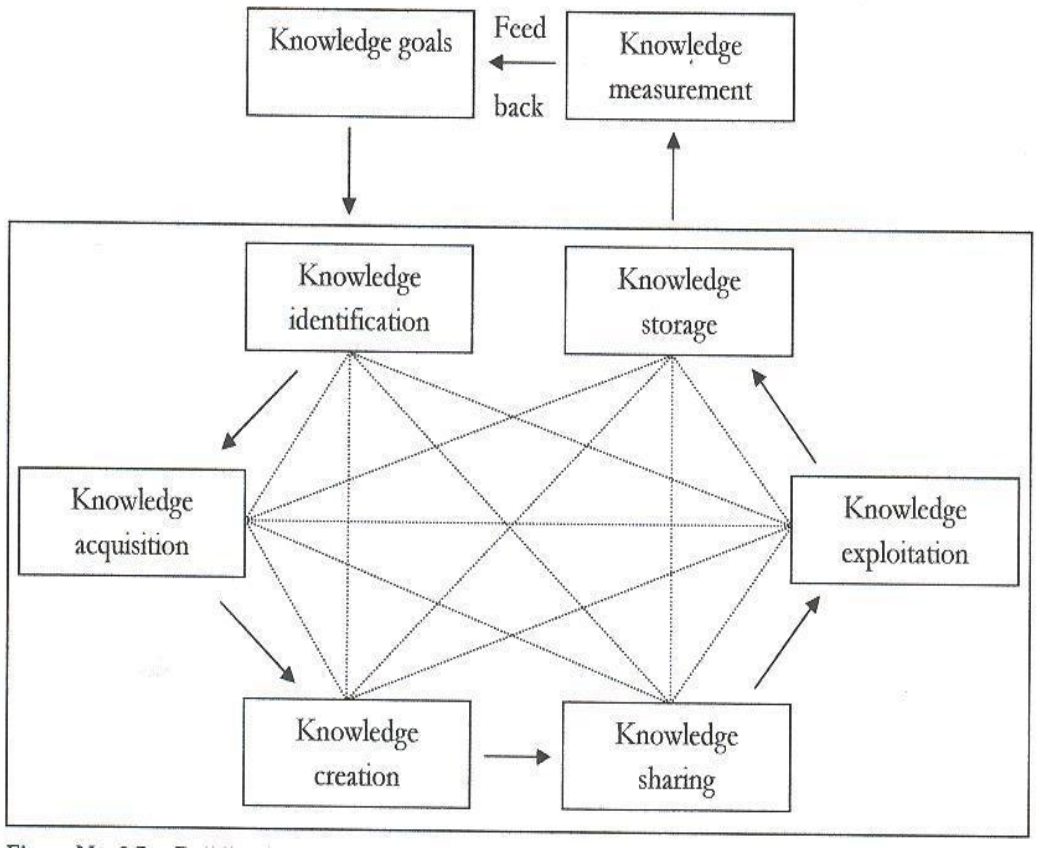

Figure 2.4: Building blocks of knowledge management
Probst and Romhardt, 1999

As highlighted in Figure 2.4 above, the disposition of the building blocks is split into an outer circle and an inner circle. The outer circle comprises the building blocks knowledge measurement and knowledge goals with the managerial tasks to set objectives, to implement them and to measure their success. The inner circle containing knowledge identification, knowledge acquisition, knowledge creation, knowledge sharing, knowledge exploitation and knowledge storage represents the functional part. An important characteristic of this model is the fact that the building blocks are directly connected to each other. Changing one building block will also cause the others to change, meaning that building blocks must not be regarded in isolation from the others. In the following, every single building block will be explained in more detail.

- **Knowledge goals**

Identifying knowledge goals stands at the beginning of the knowledge management chain and aims at providing a clear vision of what is desired to achieve, which can serve as a basis for control and implementation, and which is setting up a clear line that each activity within the knowledge management has to follow. Thereby, goals can be differentiated in normative, strategic and operative objectives. Normative goals deal with the creation and development of a knowledge-stimulating organizational culture, where sharing and enhancement of one's own capabilities build the fundament of efficient knowledge management. Strategic knowledge goals define organizational core knowledge and describe future needs of the organization for competence and knowledge, while operative knowledge goals are taking charge of actively implementing the knowledge management activities by concretizing the normative and strategic goals.

- **Knowledge identification**

Severe problems are being faced by organizations in keeping sight of their internal and external data, information and capabilities. Thus, it is the task of an effective knowledge identification to make the internal and external knowledge transparent and accessible. In that way, inefficient decisions can be avoided, and employees are supported in making use of their capabilities by being able to efficiently search for knowledge.

- **Knowledge acquisition**

Organizations are nowadays not capable of creating the knowledge they require to conduct various activities all by themselves. Instead, specific knowledge has very often to be acquired from different sources, which can encompass:

- The knowledge from other organizations (e.g. through mergers and acquisitions)
- The knowledge from stakeholders (e.g. acquiring knowledge from customers by integrating key customers in the development process)
- The knowledge from external knowledge bearer (e.g. recruitment of experts)
- Purchase of knowledge products (patents, blueprints, software, etc…)

- **Knowledge creation**

Complementary to knowledge acquisition, organizations can also enlarge their knowledge base by creating and developing knowledge by themselves through focusing

on manufacturing new capabilities, products, better ideas and more productive processes, which do not exist yet. This can not only be achieved by means of Research and Development, but also through promoting and rewarding creative working as well as the development of innovative ideas, and through corresponding communication among the employees.

The two building blocks knowledge acquisition and knowledge creation span processes which Davenport and Prusak (1998) refer to as knowledge generation.

- **Knowledge sharing**

Enabling the employees to utilize isolated or inaccessible knowledge or experience necessitates the sharing of knowledge within or between entire organizations. Thereby, Probst and Romhardt (1999) remark that not every employee has to know as much as the others, but that it is important to ensure that knowledge is shared and distributed to the employees and departments that are actually in need of certain knowledge. This requires the management and knowledge bearers respectively to be informed about the particular knowledge needs of every employee. Establishing an efficient process of sharing and distributing core parts of the organizational knowledge among every department and working place can also result in higher customer values through improved time and quality management: equally shared and distributed knowledge allows the employees to resort to that knowledge at various different locations and departments in an organization. Instead of inquiring specialized departments every time, it enables a more efficient and faster reaction of the employees to certain events or questions.

- **Knowledge exploitation/utilization/application**

Organizations are managing their knowledge in order to use it productively. Unfortunately, after knowledge has been successfully identified and wisely shared, it is not always the case that the "exposed" knowledge is being made use of in a proper way within the organization's everyday activities and processes. Especially the exploitation and utilization of "foreign" knowledge" is constricted due to several barriers, such as the "not invented here" phenomena, making employees feeling skeptical towards that knowledge since they were not integrated into the development process and have therefore only limited overview. Nevertheless, organizations have to make sure that

strategically important knowledge that has been created with a lot of effort being used and exploited in everyday routines and activities.

- **Knowledge storage**

Knowledge that has once been acquired is not automatically at disposal in the future. According to Probst and Romhardt (1999), a lot of organizations complain about losing knowledge due to re engineering processes. To store experience and knowledge permanently in some kind of individual or collective memory calls for a lot of effort on the part of the management and the employees. To keep knowledge from losing, certain steps of knowledge storage and corresponding processes have to be intentionally configured. Knowledge can be permanently stored by taking three steps into account:

1. **Selection:** select the knowledge, which is also still useable for third persons later, since only this sort of knowledge is worth to be stored.
2. **Storage**: try to transform tacit knowledge into explicit knowledge and create a common collective memory.
3. **Update:** keep the knowledge up-to-date and use it permanently.

- **Knowledge measurement**

Knowledge measurement aims at verifying, whether the knowledge goals have been achieved. Furthermore, the feedback resulting from the measurement process is helping to adapt the knowledge goals to the current conditions.

Probst and Romhardt (1999) claims that the measurement and evaluation of knowledge constitutes the biggest challenge that knowledge management has to overcome these days, with no remarkable breakthrough having been occurred yet, since knowledge managers – unlike finance managers – do not have large equipments containing indicators and measurement procedures at their disposal. This implies that new and innovative options have to be taken which have not been established yet.

ii. Knowledge management value chain

Chini (2004) introduces the term “the knowledge management value chain”, since researchers, such as Grant (1996), agree on considering knowledge management as a process rather than an object.

Within that context, Chini (2004) summarizes the different stages as they are perceived by other often cited authors of knowledge management. Hong (as quoted in

Chini, 2004), for example, divides knowledge management into the four stages of knowledge acquisition, information distribution, information interpretation, and organizational memory. Hedlund (as quoted in Chini, 2004) in turn, distinguishes between the storage, transfer and transformation of knowledge.

Figure 2.5, which is extracted from Shin, Holden and Schmidt (in Chini, 2004); provide an overview of different approaches with the aim to consolidate different contributions.

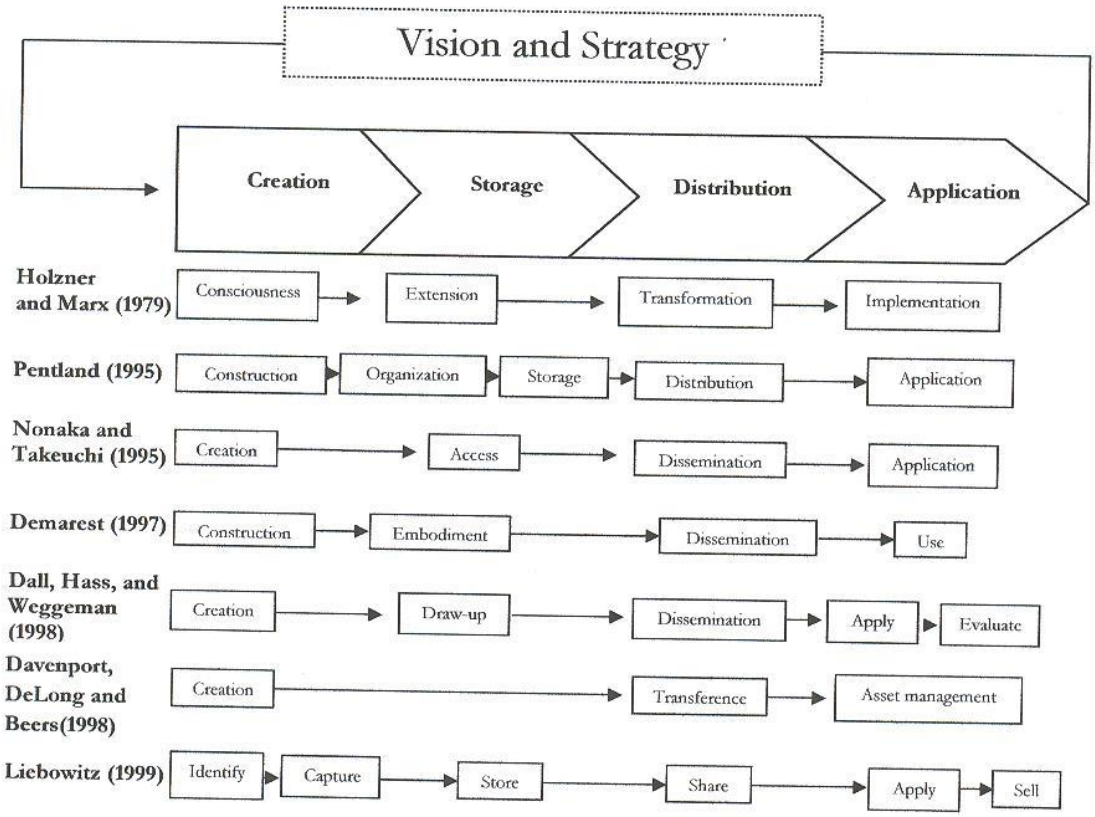

Figure 2.5: The knowledge management value chain
Chini, 2004.

As Figure 2.5 above reveals, a lot of authors differentiate several processes when it comes to their idea of how knowledge management should be carried out. The four main links in the value chain, creation, storage, distribution and application can be understood in conformity to the building blocks described in the previous chapter. Thereby, creation, as it is meant by Chini (2004), encompasses the building blocks knowledge identification, knowledge acquisition and its complement knowledge creation. Storage, distribution and application are in accordance with the building blocks

knowledge storage, knowledge sharing and knowledge exploitation/utilization/application. The part of the building blocks knowledge measurement and knowledge goals is taken over by the vision and strategy, which is driving the knowledge management value chain to realize the objectives of an organization, as it is highlighted in Figure 2.6. The figure furthermore reveals that the processes the main links creation, storage and application differ from author to author. However, where they seem to agree on is that the distribution stage solely comprises the process of knowledge transfer.

The different approaches explained above demonstrate the importance of knowledge transfer within the process of knowledge management. The connection between knowledge management and knowledge transfer has now been established and the general importance of that stage has been pointed out.

2.3 Knowledge behind knowledge Transfer

The process of knowledge transfer - or what some authors refer to as knowledge transformation, knowledge distribution, knowledge dissemination, knowledge sharing , knowledge conversions (Sveiby, 2001, Nonaka and Takeuchi, 1995) or "best-practice" (Szulanski, 2003) - is a very complex one. In the following sections, more light will be shed upon the complexity of knowledge transfer as a key activity during the knowledge management procedures.

2.3.1 Concept of knowledge transfer

Like with knowledge and knowledge management, there is no consistent definition of knowledge transfer throughout the literature. Argote and Ingram (2000) deliver a definition that researchers frequently come across when studying the issue of knowledge transfer:

"Knowledge transfer in organizations is the process through which one unit (e.g. individual, group, department, division) is affected by the experience of another." (Argote and Ingram, 2000).

Jennex (2006) argues that knowledge transfer in an organization occurs when members of an organization pass tacit and explicit knowledge to each other.

In knowledge transfer, knowledge is not only shared within a firm across different functional groups, product families, geographical locations or time periods, but is also

transferred between firms through inter-organizational alliances and linkages (Choo and Bontis, 2002). The literature thus distinguishes internal and external knowledge transfer (e.g. Sveiby, 2001): Internal knowledge transfer deals with the intra-organizational transfer of knowledge, i.e. the transfer of knowledge between parent company and subsidiaries, or between subsidiaries and subsidiaries – in short: between organizational units, while external knowledge transfer describes the phenomena of transferring knowledge to other organizations.

2.4 The process of knowledge transfer

Inkpen and Dinur (1998) identified two approaches of knowledge transfer that have been developed in the literature: the communication model by Shannon (1948) and the knowledge spiral model by Nonaka and Takeuchi (1995). These two approaches can serve as facilitator to unravel and to understand the complexity of knowledge transfer processes.

2.4.1 The communication model

Davenport and Prusak (1998) perceive knowledge transfer as a process that involves two actions: On one hand the transmission of codified knowledge, i.e. sending or presenting knowledge to a potential recipient, and on the other hand the absorption and decoding of that knowledge by that person or group. This procedure of sending and receiving can be based on the communication model, which has been published by Shannon in his mathematical theory of communication (see Figure 2.6).

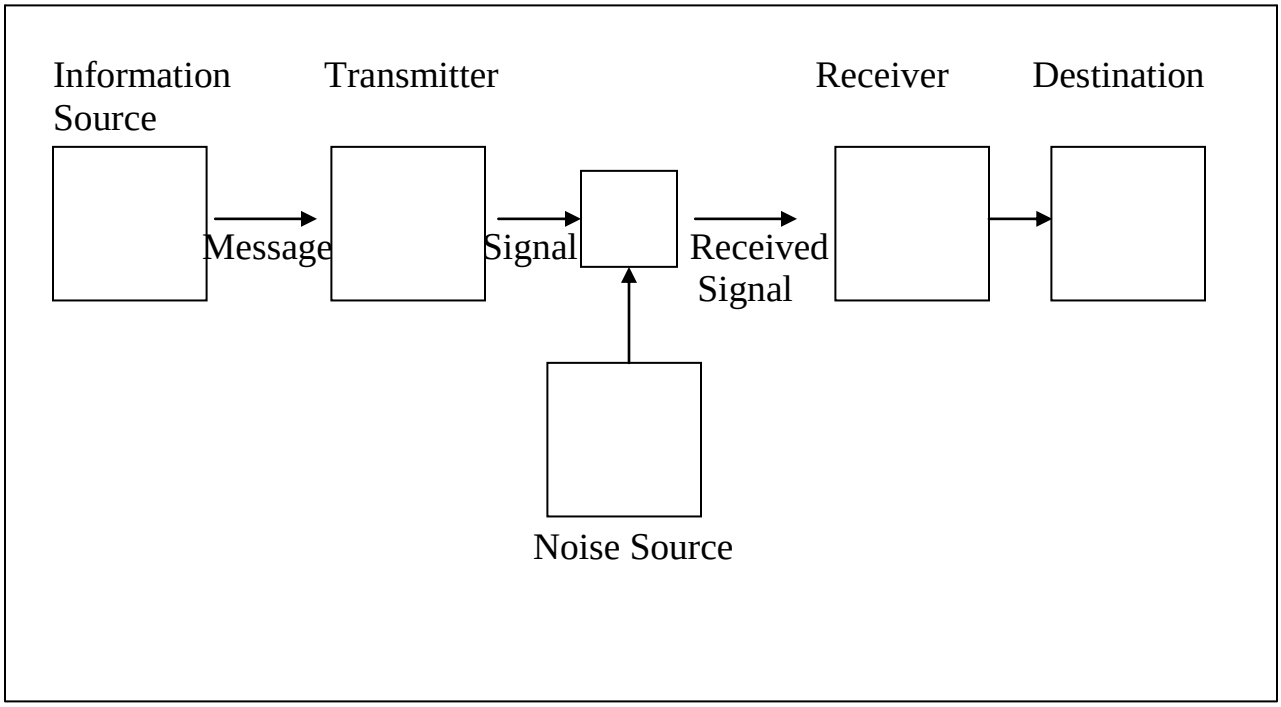

Figure 2.6: The communication model
Shannon, 1948.

The communication model consists of five essential parts (Shannon, 1948):

1. **Information source**: creates a message or sequence of messages to be communicated to the receiver.
2. **Transmitter**: operates on the message to produce a signal that is transmittable
3. **Channel**: in charge of transmitting the signal from the transmitter to the receiver.
4. **Receiver**: counterpart of the receiver, which reconstructs the message from the signal.
5. **Destination**: Person or group that is intended to absorb the message.

Due to "noise", errors can be introduced during the transmission, causing the signal to be received incorrectly. Thereby, the encoding phase, carried out by the transmitter, and the decoding phase (receiver) represent the two most critical stages within this model (Chini, 2004).

As mentioned above, Szulanski, in his article "Exploring internal stickiness: Impediments to the transfer of best practice within the firm", published 1996 in the Strategic Management Journal, was among the first to apply this model on the process of knowledge transfer, by seeing the transfer as a message transmission from a source to a

recipient in a given context (Inkpen and Dinur, 1998). Inkpen and Dinur (1998) analyzed and extended Szulanski's model, and there in distinguish four stages of the process:

1. **Initiation**: transferred knowledge is recognized.
2. **Adaptation**: knowledge is changed at the source location to the perceived needs of the recipient.
3. **Translation**: more alterations occur at the recipient unit as part of the general problem-solving process of adaptation to new context.
4. **Implementation**: knowledge is institutionalized to become an integral part of the recipient unit.

Thereby, four groups of related factors can be identified (Inkpen and Dinur, 1998):

- Source-related factors
- Recipient-related factors
- Factors relating to the relationship and distance between two units
- Factors related to the nature of the knowledge transferred.

2.4.2 Spiral model

Nonaka and Takeuchi (1995) developed a theory of knowledge creation, which is based on a critic towards the managerial and organizational theories of the western companies that only aim at acquiring already existing and articulated, hence explicit knowledge.

The cornerstone of their model is the differentiation between tacit and explicit knowledge. On the basis of an empirical research conducted in collaboration with Japanese companies, Nonaka and Takeuchi propose a model of how companies can create and use knowledge, which is referred to as the spiral model of knowledge. In order to create knowledge, the individual knowledge of the employees has to be activated, mobilized and transformed into organizational knowledge for further use (Nonaka and Takeuchi, 1995).

The basic concept of the model relies on permanent interaction between explicit and tacit knowledge, with the interaction between the two types of knowledge being labeled knowledge conversion (Nonaka *et al*, in Nonaka and Teece, 2000). Therefore, this model describes the process of knowledge transfer and conversion respectively, since the authors explicitly highlight that this conversion is a "social" process between

individuals and not confined within an individual. This conversion process results in the expansion of tacit and explicit knowledge in terms of both quality and quantity.

Since tacit and explicit knowledge exists on the ontological levels of individuals, groups and the organization, the interaction between these levels results in the creation of knowledge. “A spiral emerges when the interaction between tacit and explicit knowledge is elevated dynamically from a lower ontological level to higher levels” (Nonaka and Takeuchi, 1995).

The authors distinguish four modes of knowledge conversion in which the knowledge-creating process can take place. This process is also known as the SECI process, an acronym build out of the four modes:

1. **S**ocialization: from tacit knowledge to tacit knowledge
2. **E**xternalization: from tacit knowledge to explicit knowledge
3. **Combination**: from explicit knowledge to explicit knowledge
4. **I**nternalization: from explicit knowledge to tacit knowledge

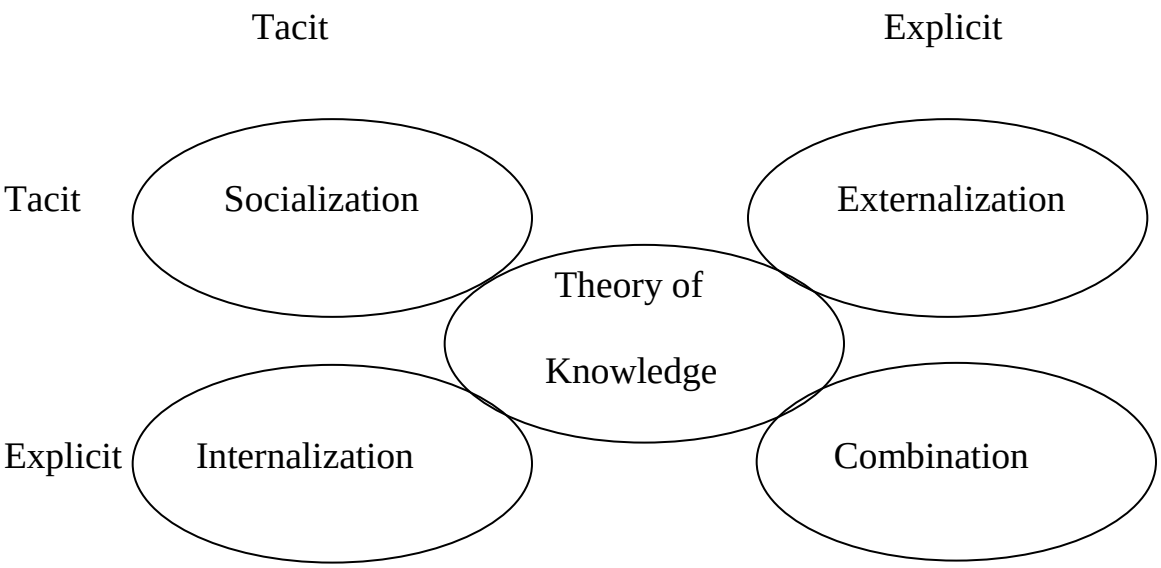

Figure 2.7: The spiral of knowledge
Nonaka and Takeuchi, 1995.

• **Socialization (tacit knowledge to tacit knowledge)**

During the process of socialization, new tacit knowledge is created through sharing experience between the actors involved, implying that due to the difficult transferability of tacit knowledge the actors have to spend a lot of time together or have to live in the same environment. New tacit knowledge can be created, for example, through shared mental models and technical capabilities.

According to Nonaka *et al* (in Nonaka and Teece, 2000), socialization typically occurs, for example, in a traditional apprenticeship, where apprentices learn the tacit knowledge they need for their craft by rather observing, imitating and listening to their master craftsmen than by spending time on reading manuals or textbooks. "The key to acquiring tacit knowledge is experience" (Nonaka, and Takeuchi, 1995).

• **Externalization (tacit knowledge to explicit knowledge)**

This process is performed by articulating and symbolizing tacit knowledge and with it, turning it explicit. During that stage, knowledge is crystallized, and it becomes the basis of new knowledge, allowing it to be shared with others on a corporate-wide basis. Due to these reasons, externalization forms the most important process when it comes to creating knowledge. "When we cannot find an adequate expression for an image through analytical methods of deduction or induction, we have to use a non-analytical method. Externalization is, therefore, often driven by metaphor and/or analogy" (Nonaka, and Takeuchi, 1995).

• **Combination (explicit knowledge to explicit knowledge)**

Through combination, explicit knowledge is converted into more complicated and systematic sets of explicit knowledge. Thereby, explicit knowledge is acquired from internal or external sources and then combined, edited or processed with the aim to create new knowledge, which then can be disseminated among the employees.

This process is supported through modern information and communication technologies, like video conferences, internet exchanges or other computerized communication networks. The combination mode of knowledge conversion can be seen when the management breaks down and operationalizes corporate visions or product or business concepts.

"Reconfiguration of existing information through sorting, adding, combining, and categorizing of explicit knowledge can lead to new knowledge. Knowledge creation carried out in formal education and training at schools usually takes this form. An MBA education is one of the best examples of this kind" (Nonaka and Takeuchi, 1995).

- **Internalization (explicit knowledge to tacit knowledge)**

Internalization means that explicit knowledge is circulating within the organization and absorbed by its members into their individual knowledge base. "It is closely related to learning by doing" (Nonaka and Takeuchi, 1995). Explicit knowledge stored in product concepts or manufacturing procedures has to be actualized in action and practice (Nonaka *et al* in Nonaka and Teece, 2000). Examples for internalization are training programs that can help trainees to understand an organization. By studying manuals or documents about the requirements their jobs call for and by reflecting on them, the trainees can internalize this explicit knowledge and enhance their own tacit knowledge.

"When experience through socialization, externalization, and combination is internalized into individual's tacit knowledge bases in the form of shared mental models or technical know-how, they become valuable assets" (Nonaka and Takeuchi, 1995).

A new spiral of knowledge is being set off, when the now tacit knowledge is accumulated at the individual level and then shared with other members of the organization in the process of socialization.

By taking a closer look at the explanations of each process, it can be seen that every one of these modes of conversion also involves a sender and recipient of knowledge, as it is demonstrated in the communication model. According to Chini (2004), this suggests that the sending and receiving units also have to engage in these conversion procedures in order to process the inflowing or out flowing knowledge.

In general, a process or procedure can be defined as a series of steps that are taken to accomplish a specific end. In that regard, the process of knowledge transfer also has to go through a sequence of different stages.

2.5 Stages of Knowledge transfer

This section will consider two different classifications of the stages involved in the process of knowledge transfer namely: the classification according to Szulanski and that of Krogh and Köhne.

2.5.1 Stages of knowledge transfer according to Szulanski

Szulanski (2003) investigated within an empirical research the barriers and influencing factors of knowledge transfer in an intra-organizational context. In order to provide further insight into this issue, the author splits the process of knowledge transfer into four stages in order to be able to analyze them in detail. Thereby, a milestone is defined for each stage that has to be achieved. The model is shown in Figure 2.8

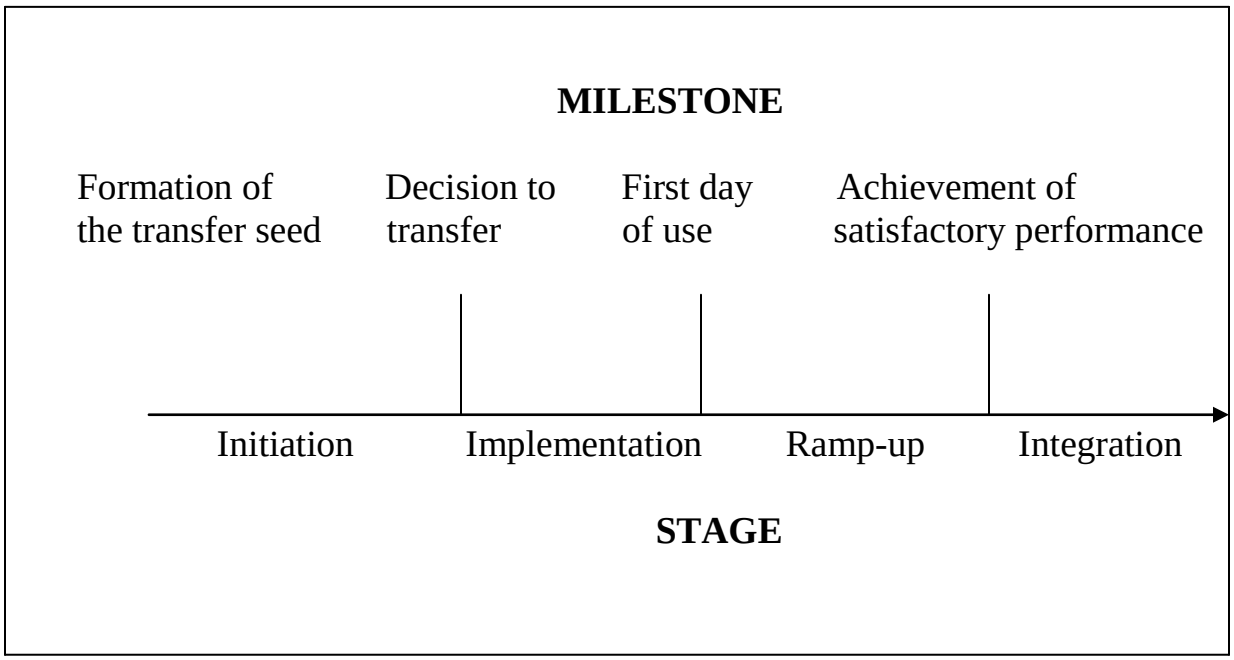

Figure 2.8: Stages of the knowledge transfer process
Szulanski, 2003.

The initiation stage contains all activities that lead to the decision to transfer. As Teece (as quoted in Szulanski, 2003) puts it, a transfer begins "when a need or a potential is recognized". In other words, a transfer of knowledge can be initiated as soon as there is a demand for knowledge, provided that this knowledge does exist within the context of the organization. Furthermore, the involved persons must be aware that the knowledge being transferred is feasible to address or fulfill their needs.

Therefore, a transfer seed is formed when a need and the corresponding knowledge to fulfill that need exists within the organization.

The knowledge transfer itself is carried out during the implementation stage, which begins after the decision to transfer has been made. This decision can be taken formally in a centralized, authoritative manner, or it can also be spontaneous, informal and sometimes even unobservable (Szulanski, 2003).

As soon as the knowledge transfer is completed, the ramp-up phase is initiated. The first day of use marks the beginning, where the recipient is actually using the new knowledge for the first time. The term "ramp-up" implies that at first the recipient will use the knowledge inefficiently, but over time the efficiency will reach a satisfactory level. The more complex the knowledge, the more time will pass by for the knowledge to be used efficiently.

The last stage, integration, is triggered when the recipient achieves satisfactory results by using the knowledge and the application of this knowledge becomes routine. (Szulanski, 2003).

2.5.2 Stages of knowledge transfer according to Krogh and Kohne

Another model differentiating several stages of the process of knowledge transfer is proposed by the German researchers Georg von Krogh and Marija Köhne in their book "Der Wissentransfer in Unternehmen: Phasen des Wissenstransfers und wichtige Einflussfaktoren" ("Knowledge transfer within organizations: Stages of knowledge transfer and important influencing factors), which was published 1998 in the Swiss journal of business research and practice called Die Unternehmung (The Company).

According to Krogh and Köhne (1998), the process of internal knowledge transfer comprises three stages that are highlighted in Figure 2.9. This model contains the elements of tacit, explicit, individual and organizational knowledge.

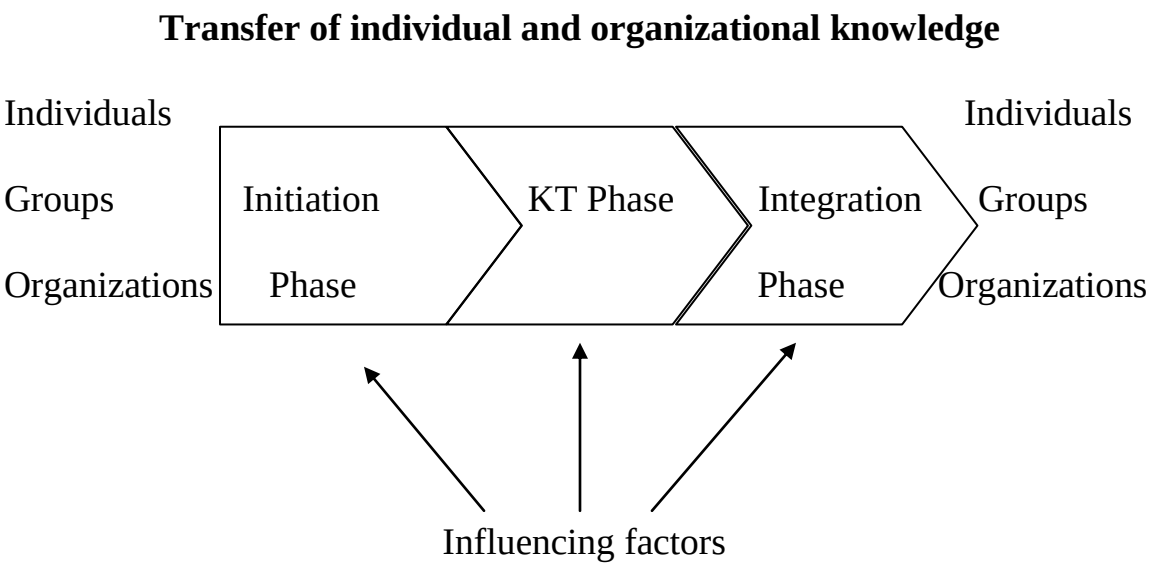

Figure2.9: The stages of knowledge transfer
Krogh and Köhne, 1998

In conformity to Szulanski's (2003) procedural distinction, an initiation phase marks the beginning of the knowledge transfer process.

The initiation phase is characterized by the desire and wish of the employees to transfer knowledge. As soon as this demand is articulated, the form and scope of the knowledge to be transferred is determined. Moreover, the involved employees have to identify the possibilities to conduct the knowledge transfer, and the corresponding recipients have to be selected and integrated into the pre arrangements.

According to Krogh and Köhne (1998), the actual knowledge flow takes place in the following phase, which also is consistent with Szulanski's perception of the different stages. The transfer of tacit and explicit knowledge is reached through interaction and communication of the people involved in this process. Thereby, knowledge can be transferred by various means. There are methods that are particularly suitable for transferring tacit and explicit knowledge. Tacit knowledge can be transferred through actions that emphasize personal contacts, interactions and the sharing of experience between the people involved. Appropriate methods for transferring explicit knowledge are less complicated and context-bound and can take place by exchanging, for example, documents, or manuals.

At the final stage, the integration phase, the receiver of the knowledge has to absorb it into his or her environment, to classify it based on his or her existing experience, and lastly to integrate it into his or her knowledge base through active utilization of this knowledge. Incongruent to Szulanski
(2003), the authors Krogh and Köhne (1998) do not explicitly mention an additional phase that describes the efficiency with which the newly received knowledge is being utilized. Their description of the last stage suggests that the knowledge is instantly being made use of in a proper way.

Additionally, Krogh and Köhne (1998) mention the possible occurrence of interferences during the entire knowledge transfer process that affect its course and outcome. In that regard, Szulanski (2003) not only points to those inhibiting factors, but also based his empirical research on the issue, what type of influencing factors actually cause the knowledge to be difficult to transfer.

2.6 The influencing factors and barriers of internal knowledge transfer

With his research about the possible inhibiting factors, barriers and problems that can occur during each stage of the knowledge transfer process; Szulanski (2003) concentrated and limited his research to the internal side of knowledge transfer.

Thereby, his aim was to filter out the factors that cause the knowledge to be "sticky", meaning difficult to transfer. As a result of his research he identified nine possible influencing factors in four categories.

1. **Characteristics of knowledge and stickiness**

- **Causal ambiguity**

According to Szulanski (2003), causal ambiguity is one of the main reasons why knowledge transfer is challenging. Due to the idiosyncratic features and conditions of the new environment the knowledge is used in after its transfer, he states that it is impossible to recreate capabilities or results (for example a production function or process) that are generated by recreating knowledge and putting it to use. There may be an "irreducible uncertainty that prevents a complete understanding of how features of the new context affect the outcome of the recreation effort" (Szulanski, 2003). This uncertainty may result from causal ambiguity, which in turn emanates from the obscurities concerning the application of the new knowledge. Rumelt (in Szulanski, 2003) argues that causal

ambiguity is present, if the reasons for success and failure in replication of a capability in a new setting cannot be determined. Hence, causal ambiguity indicates the lack of knowledge why something is done, including why a given action results in a given outcome. Causal ambiguity can therefore be seen as a situation where it is impossible to connect the consequences of an event to its initial causes or states. Szulanski (2003) concludes that the higher the causal ambiguity, the more difficult it will be to replicate results from the use of the transferred knowledge.

- **Unproven knowledge**

As the term suggests, knowledge is unproven with regard to its usefulness, if it lacks empirical substantiation or if it has been used for only a short period of time or on a limited scope or scale. The recipients may be reluctant to re-create that knowledge and to make use of it respectively, since they may not consider the knowledge as reliable and therefore valuable.

2. Characteristics of the source and stickiness

- **Source lacks motivation**

"The motivation of the source of knowledge to supply conceptions of the practice or to facilitate access to the recipient may influence the degree of difficulty experienced during a recreation effort" (Szulanski, 2003). A lack of motivation can, for instance, result from the source's fear of sharing important information, because this may be accompanied with the fear of losing one's ownership (what Szulanski refers to as the "Invented here" syndrome) or position of superiority, whose loss could cause a feeling of becoming dispensable. Additionally, especially during the first moments of knowledge transfer, the source has to commit a lot of time and effort to support the recipient, which can interfere with the source's ability to attend to its main tasks. However, if the main task incorporates a part of the effort, then a decrease in motivation could follow.

- **Source lacks credibility**

The behavior and performance of the recipient is strongly influenced by the degree of credibility the source can convey. In the case that the recipient considers the source's conception of the practice, its knowledge, as credible and therefore convincing and trustworthy, the receiver will be less suspicious of what is offered to him or her and with it be more open and receptive to its details. This leads to more voluminous and

efficient exchange of information and to lower costs of exchange. By being able to communicate a larger load of information, the receiver may get a better grasp of the source's conception being transferred.

3. Characteristics of the recipient and stickiness

- **Recipient lacks motivation**

"A recipient's motivation to accept knowledge from an external source, and to engage in the necessary activities to recreate and apply this knowledge, may prove critical to ensure a no eventful replication" (Szulanski, 2003). Lacking motivation can be demonstrated through passivity or hidden sabotage and can manifest itself in throughout the transfer process as well as in the activities that follow. In correspondence to the "invented-here" syndrome, as mentioned under 2.), lack of motivation on part of the recipient can also result from psychological barriers like the contrary "Not-invented-here" syndrome.

- **Recipient lacks absorptive capacity**

The success of the knowledge transfer process largely depends on the absorptive capacity of the recipient, which makes the level of prior related knowledge an important factor, since this level determines the ability of the source to exploit the outside sources of knowledge and, according to Cohen and Levinthal (in Szulanski, 2003), the absorptive capacity of a recipient of knowledge. A recipient lacking the capacity to absorb new knowledge will less likely be capable of recognizing the value of that knowledge, recreating that knowledge and applying it on everyday activities.

- **Recipient lacks retentive capacity**

Knowledge transfer can only be considered successful, if the recipient is permanently utilizing this knowledge and to integrate it within one's own knowledge base. "The ability of a recipient to institutionalize the utilization of new knowledge is a reflection of its retentive capacity" (Szulanski, 2003).

4. Characteristics of the context and stickiness

- **Barren organizational context**

The term barren context refers to the first stage of knowledge transfer in the understanding of Szulanski, namely the initiation stage and the corresponding milestone "Formation of the transfer seed", as it is explained in section 2.5. In that connection, a

transfer seed embedded within a barren organizational context is not able to grow and to mature, which is automatically precluding their transfer. An organizational environment actively promoting and efficiently stimulating the growth of such seeds can therefore be called "fertile" context. Next to a barren or fertile context, the possible existence of an organizational context is imaginable, in which the seeds remain totally unrecognized.

- **Arduous relationship between the source and recipient**

The nature of the pre-existing relationship between a source and a receiver is another important factor. Thereby, a strong and intensive relationship is necessary, since the transfer of knowledge does not encompass a singular event, but an iterative exchange process. This process often pre supposes a close collaboration before the actual transfer, because potential recipients require to be informed about the knowledge intended to be transferred in order to prove if it matches its needs. During the transfer itself, a strong tie between the involved parties facilitates the selection of appropriate components to transfer since closer look can be taken at the recipients needs.

2.7 Knowledge transfer in Higher Education

Knowledge transfer is the primary key to effective teaching and learning in higher education. It contributes to guiding and improving students' professional development (Teresa *et al*, 2008).

In the knowledge-based economy, higher education improves human resources. Through education, learners gain knowledge that improves individuals' professional development and capability (Alavi and Leidner, 2001). Liao (2004) states that in the light of the knowledge-based economy and new competitive dynamics, educational institutions must combine speed and knowledge to improve quality, responsiveness, and competence and can lead to competitive advantage for educational institutions.

As a knowledge source in higher education institutions, a highly effective teacher transfers knowledge successfully to students. However, knowledge-, motivation-, and communication-related factors concerning both teacher and student also have been shown to affect knowledge transfer (Ko et al., 2005). As Steyn (2004) states, the knowledge transferred through higher education is increasingly codified knowledge.

2.7.1 Measuring Knowledge transfer in Higher education

In education, the nature, degree, and appropriateness of transfer are related to the learners' cognitive, motivational, and emotional capacity to adapt (Volet, 1999).

Prior research considers measurement of knowledge transfer to be a useful approach in evaluating the effectiveness of teaching and learning performance (Alvarez *et al*., 2004; Simon and Soliman, 2003; Joshi *et al*., 2004; Steyn, 2004; Robson *et al*., 2003; Liao, 2004 in Teresa *et al*,2008). These studies suggest that the dependant variable knowledge transfer in higher education can be influenced by three set of factors: knowledge, motivation, and communication factors.

2.7.2 Knowledge–Related Factors

- **Absorptive Capacity**

Several studies on absorptive capacity (AC) (Cohen and Levithal, 1990; Nonaka, 1994; Szulanski, 1996; Nahapiet and Ghoshal, 1998; Bosch *et al*., 1999; Zahra and George, 2002; Ko *et al*., 2005) considered it as the ability to value, assimilate, and apply new knowledge. Zahra and George (2002) expanded the theory to a more comprehensive concept of absorptive capacity as two dimensions: potential absorptive capacity and realized absorptive capacity. Potential absorptive capacity comprises of knowledge acquisition and assimilation capabilities, and realized absorptive capacity includes knowledge transformation and exploitation capabilities. The higher level of absorptive capacity may lead to better understanding of the new knowledge and a higher level of harnessing knowledge from external sources. In education absorptive capacity is directly related to the student and it influences knowledge transfer (Alvarez *et al*, 2004).

- **Shared Understanding**

Shared understanding (SU) is considered pivotal for the quality of interaction (Mulder *et al*., 2002; Yuen and Ma, 2004). It represents the extent to which the work values, norms, philosophy, problem-solving approaches, and prior work experience of a dyad are similar (Nelson and Cooprider, 1996; Ko *et al*., 2005). So the interaction between teacher and student is influenced by shared understanding between source and recipient. Kogut and Zander developed and empirically tested the argument that the accumulation of experience in an activity facilitates communication and understanding of relevant knowledge (Zander and Kogut, 1995; Joshi *et al*., 2004).

- **Arduous Relationship**

Prior studies have suggested that one important factor affecting the transfer of knowledge is the relationship between a source and a recipient (Argote, 1999). The relational context includes the nature and extent of communication between the source and the recipient and the extent of arduous relationship (AR) between the source and the recipient (Joshi, 2005). Szulanski (1996) said that emotional distance between source and recipient may affect the source's ability to transfer and the recipient's ability to learn and apply knowledge. Knowledge transfer can require many interactions between both sides (Nonaka, 1994). A successful interaction depends on the quality of the relationship (Ko *et al*., 2005). In higher education, a teacher seen as difficult to communicate with or who either does not encourage or actually discourages students to visit them outside of class would create an arduous relationship that hinders knowledge transfer.

2.7.3 Motivation–Related Factor

- **Intrinsic Motivation**

In the empirical studies of Szulanski (1996) and Ko *et al*. (2005), motivation constitutes a set of factors identified as potentially influencing knowledge transfer. Motivation affects the amount of time and energy that people are willing to devote to learning. Humans are motivated to develop competence and to solve problems; they have, although extrinsic rewards and punishments clearly affect behaviour, people work hard for intrinsic reasons, as well, according to Joshi *et al*. (2005). The nature of student motivation is related to a student's desire to participate in the learning process.

It is important to view transfer as a dynamic process that requires learners to actively take part in the knowledge transfer process. Argote (1999) found a positive relationship between motivation and knowledge transfer. This active view of transfer assumes that transfer is adequately reflected by learners' abilities to be aware of, to learn, and to solve a set of transfer problems right after they have engaged in an initial learning task. Those students who exhibit more intrinsic motivation (IM) should also exhibit greater knowledge transfer within the course.

2.7.4 Communication–Related Factors

In the knowledge transfer process, face-to-face communication is a crucial factor influencing the quality of knowledge transfer (Alavi and Leidner, 2001). The concern

here is about the qualifications and the pedagogic skills of the higher education teacher. In contrast to primary and high school teachers, higher education teachers are not required to have been trained in or acquired skills in pedagogy.

- **Communication Encoding Competence**

In the study of Ko *et al*. (2005), communication encoding competence (CE) is the ability to demonstrate the appropriate communication behavior to effectively achieve one's goals (Monge *et al*., in Teresa *et al*, 2008). Communication processes and information flows drive knowledge transfer in organizations (Alavi and Leidner, 2001). In higher education, then, the teacher's communication will affect the knowledge transfer process.

- **Source Credibility**

In the knowledge transfer process, source credibility (SC) is the extent to which a recipient perceives a source to be trustworthy and an expert. In past knowledge transfer research, trust and reputation of a knowledge source collectively define a source's credibility (Ko *et al*., 2005; Joshi *et al*., 2005). Szulanski discovered that when a source is not perceived as trustworthy or reliable, the recipients are less motivated to internalize the knowledge that is communicated to them by the knowledge source. Recipients often use a source's reputation for the purposes of knowledge valuing (Szulanski, 1996; Ko *et al*., 2005; Joshi *et al*., 2005). In education, the teacher's credibility not only affects knowledge transfer, but also affects the attitude and the relationship between teacher and student.

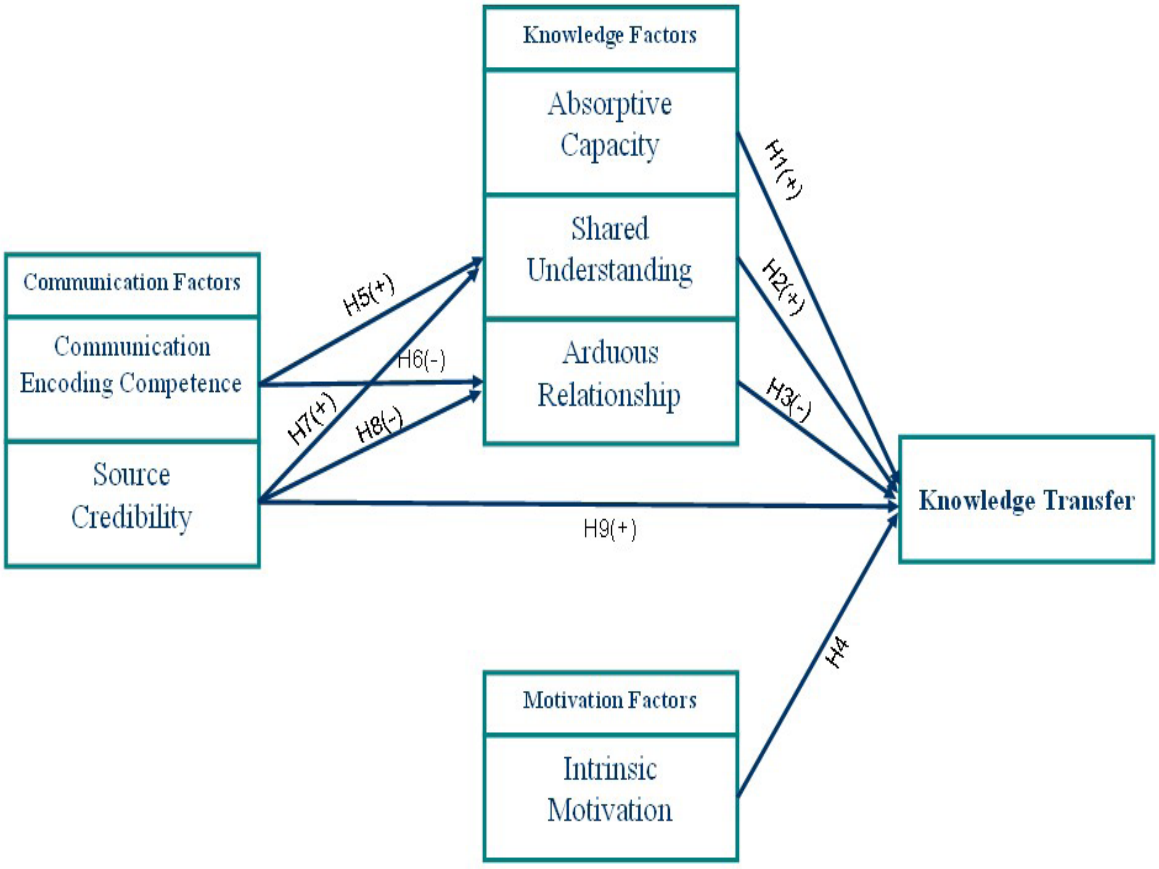

Figure2. 10: Knowledge transfer in Higher Education -KTHE model.
Adopted from Teresa *et al*, 2008

Accordingly, the following relationships were found to exist between the various factors from these studies:

1. The greater the absorptive capacity of the student, the greater the knowledge transferred.
2. The greater the shared understanding between a teacher and a student, the greater the knowledge transferred.
3. The more arduous the relationship between a teacher and a student, the lower the knowledge transfer.
4. The more intrinsically motivated the student, the greater the knowledge transfer.
5. The greater the teacher's communication encoding competence, the greater the shared understanding between teachers and students.

6. The greater the teacher's communication encoding competence, the less arduous the relationship between teachers and students.
7. The more credible the teacher, the greater the shared understanding between teachers and students.
8. The more credible the teacher, the less arduous the relationship between teacher and student.
9. The more credible the teacher, the greater the knowledge transfer.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 The Study Area

Waziri Umaru Federal Polytechnic Birnin-Kebbi was formerly known and called the Sokoto State College of Technology. It was then set up by state edict number 5 of 1976 which enabled the institution to take off on the 1st of October, 1977. The college then had its temporary site in Farfaru in Sokoto with 3 class rooms, 1 laboratory, 3 administration rooms and 1 staff room accordingly. When the college finally moved to the permanent site in Birnin Kebbi in 1980, the local government and the community provided it with a large site of about 152 hectares. Among existing facilities provided for the smooth take-off of the college were 30 offices, 24 classrooms and a workshop.

In 1980, the college changed to the status of the polytechnic of Sokoto state offering some sundry educational programmes. The bill enabling the change as set up by the government is known as bill number 5 of 1980, and this came into operation on the 1st of April, 1980. The institution became the polytechnic, Birnin Kebbi with the creation of kebbi state in August; 1991. On the 7th of January, 2002, the name of the polytechnic was changed to Waziri Umaru polytechnic.

Waziri Umaru polytechnic was handed over to the Federal government of Nigeria by kebbi state government in 2006. The Federal executive council at its meeting of Wednesday 14th March, 2007 accepted and approved the take-over. The institution is now called Waziri Umaru Federal Polytechnic, Birnin Kebbi consisting of the following colleges:

(a) College of Administration
(b) College of Engineering
(c) College of Environmental Studies
(d) College of Science and Technology

The polytechnic is still maintaining its temporary site within Birnin Kebbi town while efforts are being intensified towards moving to the permanent site. Already, a large number of staff and students are accommodated at the permanent site.

The institution runs various courses at preliminary, ND, NCE, HND and PGD levels while its population rose to over 8,000 in 2004 with students studying a wide range of subjects in different disciplines.

3.2 Materials

In this study, both primary and secondary data were used. The primary data was collected by administering questionnaire to lecturers in order to evaluate their views on the already established relationships on knowledge, communication and motivation related factors in the KTHE model.

The secondary data on the other hand was obtained from the examination records of various courses from different departments and units of WUFP Birnin kebbi in order to test and compare the performance of different set of students based on the intermediary factors of the knowledge extensionists identified.

Also, personal interview was conducted on some staff to supplement information obtained from the questionnaire. The use of multiple sources such as interview and questionnaire give the opportunity to obtain multiple measures on the same phenomenon, which in turn add to the validity of any scientific research.

A total of 80 questionnaires were administered to the respondents (20 to each of the 4 colleges) out of which 63 were completed and returned giving a return rate of 78.8%.

With regards to the secondary data collected, the total number of students who took the end of semester examination in the given courses under study was considered.

3.3 Statistical Analysis

Based on the research problem identified and the objectives of the study, the primary data that was collected through the administered questionnaire was analyzed using the “New Environmental Paradigm” (NEP) method developed by Dunlap and Liere (1978).

In eliciting preferences, the respondents were presented with statements about the factors affecting knowledge transfer and the relationships observed from previous studies. For each statement, the respondents were asked to indicate the extent to which he/she agrees or disagrees (use of lackart). The level of acceptability was then determined based on responses to all the statements (representing the number of relationships between the

factors). Following Dunlap et al., statements were coded from 5 to 1, where "5" indicates strongly agree, "4" indicates mildly agree, "3" indicates unsure, "2" indicates mildly disagree, and "1" indicates strongly disagree. The lecturer's acceptability levels were based on the mean response value. Thus, the resulting values of the acceptability level fall between 1 and 5. A value close to one indicates that the respondent has a low acceptability level. A value close to 5 indicates that the respondent has high acceptability level to the factors and their established relationships.

On the other hand, the secondary data that was obtained was analyzed using two non-parametric statistical tests:

1. The Mann-Whitney U Test
2. The Kolmogorov-Smirnov Test for Differences

This is because the non- parametric methods make fewer assumptions about the population from which they are drawn and therefore have a high probability of rejecting the null hypothesis when it is false.

3.3.1 The Man-Whitney U Test

This is a test designed for two samples of data that can be ranked. The test looks, not on the actual values of the data, but only on the ranks of the data (William, 1980).

To use the test, combine the two samples, ranking all the observations by score from lowest to highest.

Let n_1 be the number of observations in the 1st sample

Let n_2 be the number of observations in the 2nd sample

Let R_1 be the sum of the ranks in the 1st sample

The null hypothesis is that the two samples are drawn from the population, so that the expected value of the mean of the ranks from the two samples would be equal. To test H_o define the statistic

$$U = n_1 n_2 + \frac{n_1(n_1+1)}{2} - R_1 \quad \text{.....(1)}$$

It can be shown that the expected value of U, under the assumption of the null hypothesis, is

$$E(U) = \frac{n_1 n_2}{2} \quad \text{.....(2)}$$

and the standard deviation of U is

$$\sigma_U = \sqrt{\frac{n_1 n_2 (n_1 + n_2 + 1)}{12}} \quad \text{.....(3)}$$

When n_1 and n_2 are greater than 10, the sampling distribution of U is approximately normal. You can therefore test H_o using the standard normal variable

$$z = \frac{U - E(U)}{\sigma_U}$$

If two observations have equal values, they will share the same rank. In the case of tied ranks, each observation should be given a rank equal to the mean of the ranks that are shared by the tied values.

3.3.2 The Kolmogorov-Smirnov Test for Differences

This test compares two independent samples, but it is also able to detect not only differences in average but differences in dispersion between the two samples as well (William, 1980).

The Kolmogorov-Smirnov test compares the cumulative frequency distributions of two independent samples. To run the test, record the cumulative frequency distribution of each sample, using the same class intervals for each sample. Let

$$S_1(X) = \frac{K_1}{n_1}$$

where K_1 is the number of observations in the first sample less than or equal to each class X, and n_1 is the number in the sample; and let

$$S_2(X) = \frac{K_2}{n_2}$$

where K_2 is the number of observations in the second sample less than or equal to each X, and n_2 is the number in the second sample.

For each class, compute the difference

$$S_1(X) - S_2(X)$$

Let the minimum of these differences be

$$D = \max imum\left[S_1(X) - S_2(X)\right]$$

The null hypothesis is that there is no difference between the two populations. The alternative hypothesis is the one sided alternative that the first sample tends toward lower values than the second sample. According to the null hypothesis, the statistic

$$\frac{4D^2 n_1 n_2}{n_1 + n_2}$$

is distributed approximately as χ^2 with 2 degrees of freedom. If the value of this statistic is greater than or equal to the critical value of χ^2 as designated in the table, you can reject H_o at the designated level of significance. This is a one tailed test; rejection H_o means that you assert that the first sample has a lower average, or lower extreme values, than the second sample.

The test statistic is only approximately distributed as χ^2 , though the approximation gets better as the sample sizes get larger.

For convenience, and accuracy, a statistical software MINITAB for windows was used for the Mann-whiteney tests to determine if there was any significant difference between the students' performances.

In view of the above, students performance in end of semester examination were used as a yard stick in measuring effectiveness of Knowledge transfer based on the general assumption that if the transfer is effective, student's performance will tend to be high in terms of grades obtained and vice versa.

The set of hypotheses were tested at the 5% level of significance.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Results

The tables below show the results obtained from the questionnaire administered to the respondents with respect to certain characteristics:

Table 4.1: Distribution of sex of respondents by qualification

	Qualification				
Sex	NCE/HND	B.sc	PGD	Msc	PhD
Male	7	18	5	23	2
Female	2	3	1	2	1

There were 85.9% male respondents. The dominant qualification among the male lecturers was Msc degree with 41.82% while for the females it was B.sc with 33.33% of the respondents.

Table 4.2: Age Distribution of respondents by Sex

	Age					
Sex	20-24	25-29	30-34	35-39	40-44	45 & Above
Male	-	2	7	10	11	25
Female	-	1	2	1	3	2
Total	-	3	9	11	14	27

The highest concentration of male lecturers in this research was in the age group 45 and above while the female ones were dominant in the 30-34 age group.

Table 4.3: Distribution of Respondents with Respect to Number of years

In service

	Number of Years in Service				
Sex	1-5	6-10	11-15	16-20	21 & Above
Male	4	7	9	14	21
Female	1	-	4	1	3
Total	5	7	13	15	24

With respect to the number of years spent in service, the highest figure for the male lecturers included in the study was 21 years and above while it was 11-15 years for the female lecturers and were spread across the four colleges in the institution with different areas of specialization.

The analysis of the information extracted from the examination records of various courses from different departments and units of WUFP Birnin kebbi are presented below. The study compared the students performance in the selected courses at the end of semester examination under the following broad categories:

i. Experts vs. extensionists with respect to qualification
ii. Experts vs. extensionists with respect to experience
iii. Experts vs. extensionists with respect to background of the teachers
iv. Extensionists vs. extensionists with respect to qualification
v. Extensionists vs. extensionists with respect to experience
vi. Extensionists vs. extensionists with respect to background of the teachers

The Mann-Whitney Test results

1. **Expert vs. Extensionists with respect to qualification**

Expert $N_1 = 40$ Median = 44.000

Extensionist $N_2 = 62$ Median = 43.500

Point estimate for Exp-Ext is 4.000

95.0 Percent CI for Exp-Ext is (-1.000, 14.001)

W = 2232.5

Test of Exp = Ext vs. Exp not = Ext is significant at 0.2384

The test is significant at 0.2375 (adjusted for ties)

Cannot reject at alpha = 0.05

2. **Expert vs. Extensionist with respect to experience**

Expert $N_1 = 43$ Median = 44.00

Extensionist $N_2 = 34$ Median = 43.00

Point estimate for Exp-Ext is 1.50

95.1 Percent CI for Exp-Ext is (-3.00, 5.00)

W = 1753.0

Test of Exp = Ext vs. Exp not = Ext is significant at 0.4386

The test is significant at 0.4370 (adjusted for ties)

Cannot reject at alpha = 0.05

3. **Expert vs. Extensionist with respect to background of the teacher**

Expert $N_1 = 11$ Median = 55.00

Extensionist $N_2 = 7$ Median = 46.00

Point estimate for Exp-Ext is 6.00

95.4 Percent CI for Exp-Ext is (-6.01, 22.00)

W = 117.5

Test of Exp = Ext vs. Exp not = Ext is significant at 0.2576

The test is significant at 0.2561 (adjusted for ties)

Cannot reject at alpha = 0.05

4. **Extensionist vs. Extensionist with respect to qualification**

Extensionist $N_1 = 15$ Median = 40.00

Extensionist $N_2 = 20$ Median = 43.50

Point estimate for ETA1-ETA2 is -4.00

95.3 Percent CI for ETA1-ETA2 is (-7.00, 5.00)

W = 237.0

Test of ETA1 = ETA2 vs. ETA1 not = ETA2 is significant at 0.2787

The test is significant at 0.2773 (adjusted for ties)

Cannot reject at alpha = 0.05

5. Extensionist vs. Extensionist with respect to Experience

Extensionist N_1 = 32 Median = 47.000

Extensionist N_2 = 33 Median = 53.000

Point estimate for ETA1-ETA2 is -4.000

95.0 Percent CI for ETA1-ETA2 is (-9.999, 1.002)

W = 937.0

Test of ETA1 = ETA2 vs. ETA1 not = ETA2 is significant at 0.1200

The test is significant at 0.1195 (adjusted for ties)

Cannot reject at alpha = 0.05

6. Extensionist vs. Extensionist with respect to background

Extensionist N_1 = 32 Median = 49.000

Extensionist N_2 = 27 Median = 41.000

Point estimate for ETA1-ETA2 is 5.000

95.1 Percent CI for ETA1-ETA2 is (2.002, 9.003)

W = 1179.0

Test of ETA1 = ETA2 vs. ETA1 not = ETA2 is significant at 0.0009

The test is significant at 0.0008 (adjusted for Ties)

The Kolmogorov Smirnov Test for Difference Results

Table 4.4: Experts vs. Extensionists with respect to qualification

Scores	Expert			Extensionist			
X	f_1	K_1	$S_1(X)$	f_2	K_2	$S_2(X)$	$S_1(X)-S_2(X)$
A	1	1	0.0476	1	1	0.0435	0.0041
AB	3	4	0.1905	4	5	0.2174	-0.0269
B	3	7	0.3333	1	6	0.2609	0.0724
BC	2	9	0.4286	2	8	0.3478	0.0808
C	4	13	0.6191	3	11	0.4783	0.1408
CD	2	15	0.7143	2	13	0.5652	0.1491
D	3	18	0.8571	1	14	0.6087	0.2484
E	3	21	1.0000	7	21	0.9130	0.0870
F	0	21	1.0000	2	23	1.0000	0.0000

$$n_1 = 21, \quad n_2 = 23$$

$$S_1(X) = \frac{K_1}{n_1}, \quad S_2(X) = \frac{K_2}{n_2}$$

$$D = Maximum\ [S_1(X) - S_2(X)] = 0.2484$$

$$\chi^2 = \frac{4D^2 n_1 n_2}{n_1 + n_2} = \frac{4(0.2484)^2(21)(23)}{21+23} = 2.7092$$

$$From\ table, the\ critical\ value\ of\ \chi^2\ for\ 2\ \text{degrees of freedom}\ at\ the\ 0.05\ level\ of\ significance\ is\ 5.99.\ Accept\ H_0.$$

Table 4.5: Experts vs. extensionists with respect to experience

Scores	Expert			Extensionist			
X	f_1	K_1	$S_1(X)$	f_2	K_2	$S_2(X)$	$S_1(X)-S_2(X)$
A	1	1	0.01961	1	1	0.0185	-0.0011
AB	2	3	0.0588	2	3	0.0556	0.0032
B	3	6	0.1177	2	5	0.0926	0.0251
BC	5	11	0.2157	2	7	0.1293	0.0864
C	3	14	0.2745	5	12	0.2222	0.0523
CD	10	24	0.4706	8	20	0.3704	0.1002
D	4	28	0.5490	12	32	0.5926	-0.0436
E	18	46	0.9019	12	44	0.8148	0.0871
F	5	51	1.0000	10	54	1.000	0.0000

$$n_1 = 51, \quad n_2 = 54$$

$$S_1(X) = \frac{K_1}{n_1}, \quad S_2(X) = \frac{K_2}{n_2}$$

$$D = Maximum\left[S_1(X) - S_2(X)\right] = 0.1002$$

$$\chi^2 = \frac{4D^2 n_1 n_2}{n_1 + n_2} = \frac{4(0.1002)^2(51)(54)}{51+54} = 1.0544$$

$$From\ table, the\ critical\ value\ of\ \chi^2\ for\ 2\ \text{degrees of freedom at the}\ 0.05\ level\ of\ significance\ is\ 5.99.\ Accept\ H_0.$$

Table 4.6: Expert vs. Extensionist with respect to background

Scores	Expert				Extensionist		
X	f_1	K_1	$S_1(X)$	f_2	K_2	$S_2(X)$	$S_1(X)-S_2(X)$
A	1	1	0.0196	3	3	0.0880	-0.0684
AB	2	3	0.0588	0	3	0.0880	-0.0292
B	3	6	0.1177	1	4	0.1177	0.0000
BC	5	11	0.2157	2	6	0.1765	0.0392
C	3	14	0.2745	4	10	0.2941	-0.0196
CD	10	24	0.4706	5	15	0.4411	0.0295
D	4	28	0.5490	6	21	0.6177	-0.0687
E	18	46	0.9019	10	31	0.9118	-0.0099
F	5	51	1.0000	3	34	1.0000	0.0000

$$n_1 = 51, \quad n_2 = 34$$

$$S_1(X) = \frac{K_1}{n_1}, \quad S_2(X) = \frac{K_2}{n_2}$$

$$D = Maximum\left[S_1(X) - S_2(X)\right] = 0.0392$$

$$\chi^2 = \frac{4D^2 n_1 n_2}{n_1 + n_2} = \frac{4(0.0392)^2(51)(34)}{51+34} = 0.1254$$

$$From\ table, the\ critical\ value\ of\ \chi^2\ for\ 2\deg rees\ of\ freedom\ at\ the\ 0.05\ level\ of\ significance\ is\ 5.99.\ Accept\ H_{0.}$$

Table 4.7: Extensionist vs. Extensionist with respect to qualification

Scores	Extentionist$_1$				Extensionist$_2$		
X	f_1	K_1	$S_1(X)$	f_2	K_2	$S_2(X)$	$S_1(X)-S_2(X)$
A	4	4	0.1026	2	2	0.0513	0.0513
AB	2	6	0.1538	2	4	0.1026	0.0512
B	6	12	0.3077	1	5	0.1282	0.1795
BC	3	15	0.3846	6	11	0.2821	0.1025
C	6	21	0.5385	8	19	0.4871	0.0514
CD	9	30	0.7692	4	23	0.5897	0.1795
D	5	35	0.8974	9	32	0.8205	0.0769
E	4	39	1.0000	7	39	1.0000	0.0000
F	0	39	1.0000	0	39	1.0000	0.0000

$$n_1 = 39, \quad n_2 = 39$$

$$S_1(X) = \frac{K_1}{n_1}, \quad S_2(X) = \frac{K_2}{n_2}$$

$$D = Maximum\left[S_1(X) - S_2(X)\right] = 0.1795$$

$$\chi^2 = \frac{4D^2 n_1 n_2}{n_1 + n_2} = \frac{4(0.1795)^2(39)(39)}{39+39} = 2.5136$$

$$From\ table, the\ critical\ value\ of\ \chi^2\ for\ 2\,\text{degrees of freedom at the}\ 0.05\ level\ of\ significance\ is\ 5.99.\ Accept\ H_{0.}$$

Table 4.8: Extensionist vs. Extensionist with respect to experience

Scores	Expertensionist$_1$			Extensionist$_2$			
X	f_1	K_1	$S_1(X)$	f_2	K_2	$S_2(X)$	$S_1(X)-S_2(X)$
A	1	1	0.0303	2	2	0.0625	-0.0322
AB	1	2	0.0606	1	3	0.0938	-0.0332
B	2	4	0.1212	1	4	0.1250	-0.0038
BC	7	11	0.3333	1	5	0.1563	0.1770
C	2	13	0.3939	2	7	0.2188	0.1751
CD	12	25	0.7576	2	9	0.2813	0.4763
D	6	31	0.9394	6	15	0.4688	0.4706
E	2	33	1.0000	10	25	0.7813	0.2187
F	0	33	1.0000	7	32	1.0000	0.0000

$$n_1 = 33, \quad n_2 = 32$$

$$S_1(X) = \frac{K_1}{n_1}, \quad S_2(X) = \frac{K_2}{n_2}$$

$$D = Maximum\left[S_1(X) - S_2(X)\right] = 0.4763$$

$$\chi^2 = \frac{4D^2 n_1 n_2}{n_1 + n_2} = \frac{4(0.4763)^2(33)(32)}{33+32} = 14.7434$$

$$From\ table, the\ critical\ value\ of\ \chi^2\ for\ 2\,\mathrm{deg}rees\ of\ freedom\ at\ the\ 0.05\ level\ of\ significance\ is\ 5.99.\ \mathrm{Re}\ ject\ H_{0.}$$

Table 4.9: Extensionist vs. Extensionist with respect to background

Scores	Extensionist$_1$			Extensionist$_2$			
X	f_1	K_1	$S_1(X)$	f_2	K_2	$S_2(X)$	$S_1(X)-S_2(X)$
A	2	2	0.0308	3	3	0.0484	-0.0176
AB	4	6	0.0923	3	6	0.0968	-0.0045
B	3	9	0.1385	1	7	0.1129	0.0256
BC	6	15	0.2308	5	12	0.1935	0.0373
C	5	20	0.3077	5	17	0.2742	0.0335
CD	11	31	0.4769	10	27	0.4355	0.0414
D	11	42	0.6462	11	38	0.6129	0.0333
E	9	51	0.7846	14	52	0.8387	-0.0541
F	14	65	1.0000	10	62	1.0000	0.0000

$$n_1 = 65, \quad n_2 = 62$$

$$S_1(X) = \frac{K_1}{n_1}, \quad S_2(X) = \frac{K_2}{n_2}$$

$$D = Maximum\left[S_1(X) - S_2(X)\right] = 0.0373$$

$$\chi^2 = \frac{4D^2 n_1 n_2}{n_1 + n_2} = \frac{4(0.0373)^2(65)(62)}{65+62} = 0.1766$$

$$From\ table, the\ critical\ value\ of\ \chi^2\ for\ 2\ \text{deg}rees\ of\ freedom\ at\ the\ 0.05\ level\ of\ significance\ is\ 5.99.\ Accept\ H_{0.}$$

4.2 Discussion of Results

The variables covered on the lecturers from WUFP in this study included six major categories: gender, age, highest educational qualification, number of years in service, college and area of specialization (background of the lecturer).

After ranking all the respondents in this research based on their responses on the nine standard statements used previously by researchers that dealt with the relationship between the various factors that affect knowledge transfer in higher education, an overwhelming 87.27% of the male lecturers were classified as having a high acceptability level to the factors and their established relationships. In the same vein, 88.89% of the female lecturers were classified as having a high acceptability level.

The most influential factor to effective knowledge transfer according to the respondents included in this study was shared understanding between a teacher and a student with 61.82% of the male lecturers agreeing and 100% of the females following suit.

The results obtained from the Mann-Whiteney tests using MINITAB showed that all of the hypotheses for the sets of data were supported except hypothesis 6(extensionists vs. extensionists with respect to background). This meant there was an observable difference in the performance of the students when the extensionist was of the course background and when he was not.

For the Kolmogorov-Smirnov tests, the results showed that the set of hypotheses tested were all supported except hypothesis 5(extensionists vs. extensionists with respect to experience).

For the test comparing experts and extensionists with respect to qualification, the calculated value for χ^2 was 2.7092 while the table value was 5.99 which led to the acceptance of the null hypothesis. Similarly, for the test comparing experts and extensionists with respect to experience, the calculated χ^2 value was obtained as 1.0544 while from table at 5% level of significance the χ^2 value was 5.99 which also led to the acceptance of the null hypothesis. The same can also be said about the test comparing experts and extensionists with respect to background of the teachers. The calculated χ^2

value was obtained as 0.1254 while the table value was obtained as 5.99 which also led to the acceptance of the null hypothesis.

For the other test comparing extensionists with respect to qualification, χ^2 value calculated was obtained as 2.5136 while the table value was 5.99 which resulted in accepting the null hypothesis. But for the test comparing extensionists with respect to experience, the calculated value was 14.7434 whereas the table value was 5.99 which led to the rejection of the null hypothesis. This suggested that students taught by extensionists without much experience tends towards lower scores in their examination than those taught by more experienced extensionists.

Finally for the test comparing extensionists with respect to background, χ^2 value calculated was found to be 0.1766 and the table value was found as 5.99 which also led to the acceptance of the null hypothesis

4.3 Model Development

On the basis of our findings, this study has identified three factors with regards to the knowledge extensionists in higher institutions of learning in Nigeria that may affect successful transfer of knowledge to students: extensionists capability, extensionists experience and extensionists background in the course being taught. These were used to develop an integrated conceptual model.

As highlighted earlier, there are a broad range of factors that impact on the effectiveness of knowledge transfer between a source and a recipient. In the context of higher institution of learning in Nigeria, these various factors together with the intermediary factors of the extensionists identified in this study are synthesized into a single knowledge transfer model as presented in figure 4.1. The model organized the factors into four categories: knowledge- related factors, student- related factors, teacher-related factors and intermediary factors of the extensionists.

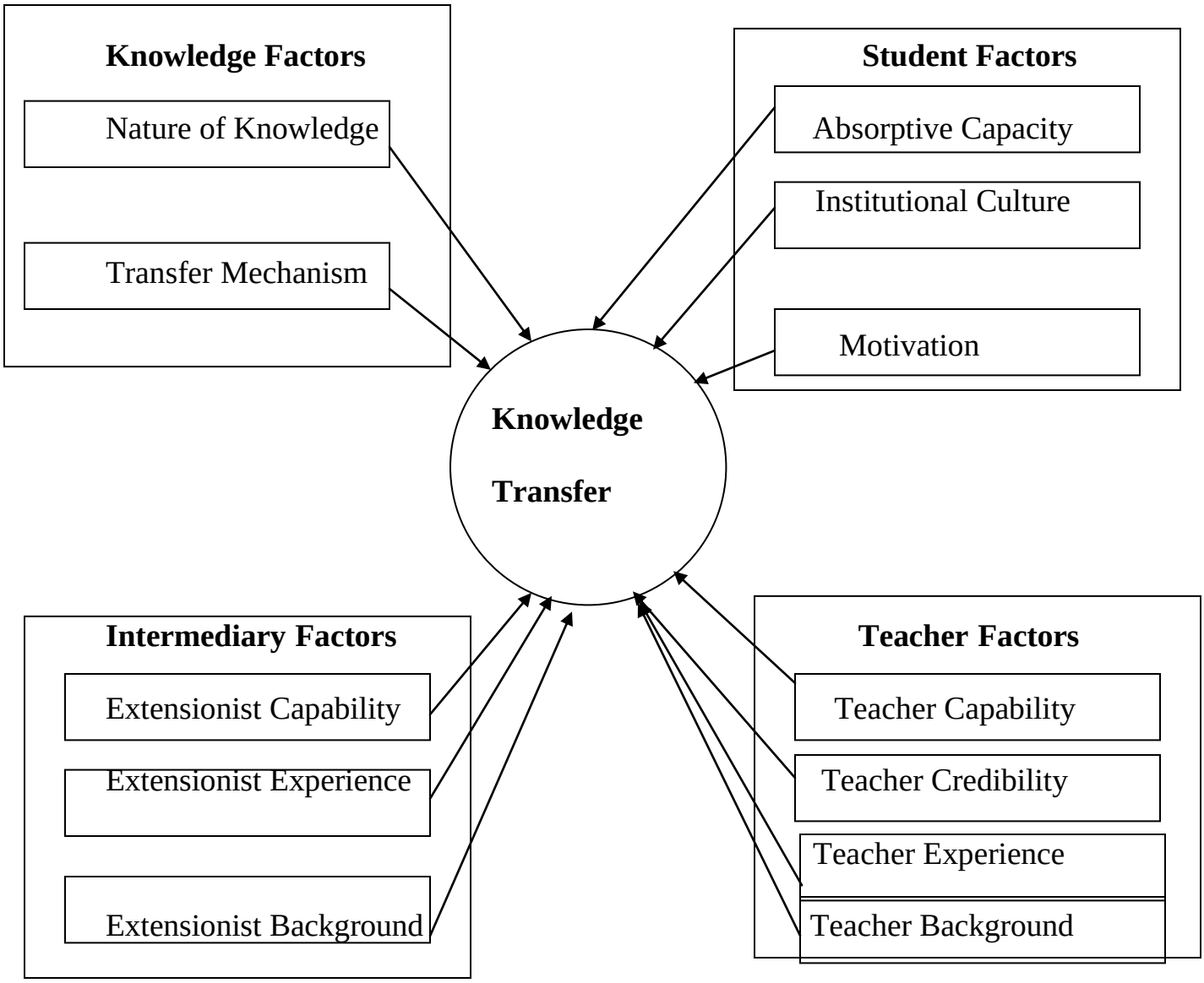

Figure 4.1: Conceptual Model of KTHE in Nigeria incorporating Intermediary Factors of Knowledge Extensionists.

Based on the above model, the following relationships were established with respect to the intermediary factors:

1. The more capable the extensionist, the greater the knowledge transferred
2. The more experienced the extensionist, the greater the knowledge transferred.
3. The more relevant the background of the extensionist, the greater the knowledge transferred.

Accordingly, the improved KTHE model incorporating the intermediary factors of the extensionists was developed as shown in figure 4.2 below.

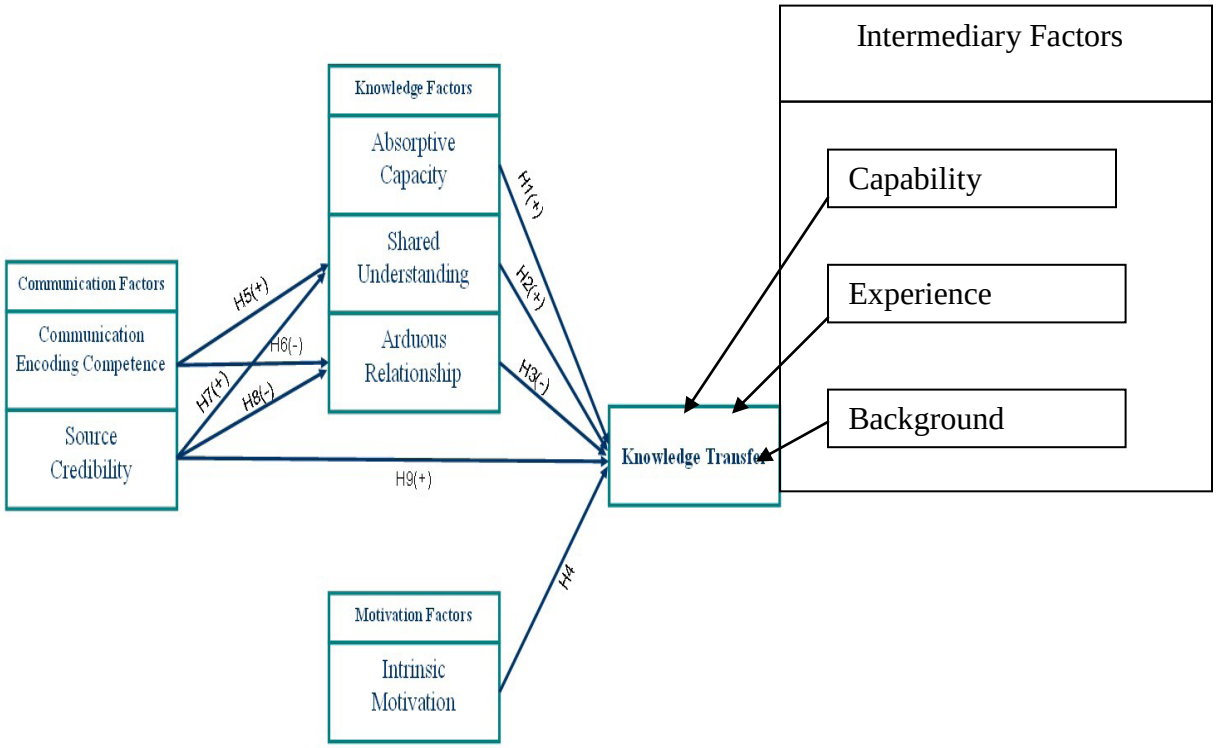

Figure 4.2: the improved KTHE model incorporating the Intermediary factors of the knowledge extensionists

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The aim of this study is to identify the intermediary factors of the knowledge extensionists in KT and use them to develop a conceptual model as well as improve on the already existing KTHE model developed by Ko *et al* (2005) to incorporate the role of the extensionists.

A structured questionnaire was designed and administered in order to evaluate lecturers views on the already established factors and their relationships in the knowledge transfer model. Similarly, data was extracted from the examination records of students at the end of semester examination and analyzed in order to compare and test their performance with respect to the intermediary factors identified between experts and extensionists and amongst the extensionists themselves.

The study was able to identify three factors with respect to the extensionists that may facilitate or hamper effective knowledge transfer namely: extensionists capability, experience and background. These were used to develop the required model with knowledge of other relevant factors. Similarly, an improvement was made on the already existing KTHE model to accommodate the role of the knowledge extensionists in our higher institutions of learning.

Results obtained showed that the already established factors and their relationships were overwhelmingly accepted by the respondents with 87.27% of the male and 88.89% of the female lecturers classified as having high acceptability level to the factors. Similarly, it was deduced from this study that out of the 3 intermediary factors identified, extensionists experience and background in the course being taught are more likely to affect effective knowledge transfer between lecturers and students and should therefore be accorded more attention when employing lecturers in our higher institutions of learning.

Finally, on the basis of our findings, conclusion was drawn on the study and several recommendations made.

5.2 Conclusion

In the light of findings in this study, it can be concluded that the role of the knowledge extensionists really exist in our higher institutions of learning and is very relevant in order to bridge the gap created by inadequate and in efficient manpower in most areas of study.

5.3 Recommendations

In the light of our findings, the following recommendations were made:

1. Attention should be focused on lecturers experience and background when recruiting academic staff in our higher institutions of learning in order to ensure effective knowledge transfer to students.
2. The field of knowledge management should be introduced in our higher institutions of learning to create awareness on the importance of knowledge and ways to acquire, recognize, capture, retrieve, use, measure and manage knowledge.
3. In order to be able to generalize the findings of this study for the whole country, further research should be conducted involving multiple higher institutions of learning. Such continued research can improve the knowledge transfer process of educational systems as well as contribute to social knowledge development.

APPENDIX 1: RESEARCH QUESTIONNAIRE

DEPARTMENT OF STATISTICS AND OPERATIONS RESEARCH
SCHOOL OF PURE AND APPLIED SCIENCES
FEDERAL UNIVERSITY OF TECHNOLOGY YOLA
ADAMAWA STATE-NIGERIA

QUESTIONNAIRE FOR LECTURERS

Sir/ Madam

I am a masters Degree student of the above named institution conducting research on the topic: **A conceptual Model of Knowledge Extensionists in the Process of Internal Knowledge Transfer in Higher Education.** This Polytechnic has been selected as the study area. Your cooperation is therefore being sought by way of responding to the issues raised in the questionnaire below. Your responses will be used for academic purpose only and shall be treated with utmost confidentiality.

Yours faithfully

Yakubu Musa Yeldu
Researcher

Section I: General Information

Please fill in the blank spaces provided below with the relevant information required.

1. Sex : male □ female □
2. Age: 20-24 □ 25-29 □ 30-34 □ 35-39 □ 40-44 □ 45 and above □
3. Highest educational qualification: NCE □ ND □ HND □ Bsc □ PGD□ Msc □ PhD □
4. Number of years in service: 1-5 □ 6-10 □ 11-15 □ 16-20 □ 21 and above□

5. College: Administration □ Science and technology □ Engineering □ Environmental studies □

6. Area of Specialization: …….

Section II

The following are standard statements used previously by researchers that deal with the relationship between the various factors that affect knowledge transfer in higher education. For each statement, please indicate the extent to which you agree or disagree. (Circle your response)

SA = Strongly Agree, **MA** = Mildly Agree, **U** = Unsure, **MD** = Mildly Disagree and **SD** = Strongly Disagree

1. The greater the absorptive capacity of the student, the greater the knowledge transferred. SA MA U MD SD

2. The greater the shared understanding between a teacher and a student, the greater the knowledge transferred. SA MA U MD SD

3. The more arduous the relationship between a teacher and a student, the lower the knowledge transfer. SA MA U MD SD

4. The more intrinsically motivated the student, the greater the knowledge transfer. SA MA U MD SD

5. The greater the teacher's communication encoding competence, the greater the shared understanding between teachers and students. SA MA U MD SD

6. The greater the teacher's communication encoding competence, the less arduous the relationship between teachers and students. SA MA U MD SD

7. The more credible the teacher, the greater the shared understanding between teachers and students. SA MA U MD SD

8. The more credible the teacher, the less arduous the relationship between teacher and student. SA MA U MD SD

9. The more credible the teacher, the greater the knowledge transfer. SA MA U MD SD

THANK YOU!!! PLEASE RETURN THE SURVEY AFTER COMPLETION.

APPENDIX 2: KEY TO GRADING SYSTEM USED

75% - Above	A =	4.00
70% - 74%	AB =	3.50
65 %– 69%	B =	3.25
60 %- 64%	BC	3.00
55 % - 59%	C	2.75
50% - 54%	CD	2.50
45 % - 49%	D	2.25
40 % - 44%	E	2.00
0 % - 39%	F	0.00

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