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Factors Influencing Knowledge Transfer in Ethiopian Sugar Industry

A Thesis

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I dedicate this thesis to my Dad who passed away before a week.

I keep thinking about you, Tesfyi, even though it hurts…

No words more than this, but a pierce to my heart ● might speak my feeling.

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LIST OF ACRONYMS AND ABBREVIATIONS

AVE	Average Variance Extracted
EKT	Effective Knowledge Transfer
ESC	Ethiopian Sugar Corporation
ESDA	Ethiopian Sugar Development Agency
GTP	Growth Transformation Plan
IRch	Industrial Research
IRM	Information Research Mechanism
ITI	Information Technology Infrastructure
KCD	Knowledge Codifiability
KIC	Knowledge Infrastructure Capability
KM	Knowledge Management
KT	Knowledge Transfer
KTM	Knowledge Transfer Mechanism
KTO	Knowledge Transfer Office
OECD	Organization for Economic Co-operation and Development
PBO	Project-Based Organizations
PLS	Partial Least Square
SECI	Socialization, Externalization, Combination, Internalization
SEM	Structural Equation Modelling
SPSS	Statistical Package for Social Science
VIF	Variance Inflation Factor
WSSF	Wonji-Shoa Sugar Factory

ABSTRACT

Knowledge transfer (KT) is regarded as an increasingly important process of knowledge management and a key element of a firms' strategic management. Nevertheless, this process of KT between the levels of the hierarchy of the organization or between the units of different organizations poses practical problems.

In sugar industry realization of benefits of research activity relies on the effective transfer of the research knowledge and the application of it by production units. Nevertheless this practices and related influencing factors of the KT has insufficiently been studied. Therefore this study aimed to analyze these elements in light of knowledge management.

Drawing from the knowledge transfer, information systems, and communication literatures, an integrated theoretical model is developed that posits the influences of relationships, information technology, the nature of knowledge itself and the mechanisms for transferring it.

The data gathered through self-administered questionnaires from a population of 101 researchers, professional trainers, coordinators and operation managers in Ethiopian Sugar Corporation head office and Wonji-Shoa sugar factory. Of those 87 answered the questionnaire correctly. After questionnaire collected, the Partial Least Squares (PLS) approach was used to analyze the research model of this study.

In particular the result indicates that knowledge transfer by the research unit to operating units is positively and significantly influenced by cooperation. The quantitative data gathered in this study may not robust enough to explain the complex issue of KT. Nevertheless, the study provides important insights about the knowledge transfer process in the industrial research units. qualitative data could be used to complement the survey data in future studies.

Keyword: Ethiopia Sugar industry; Knowledge management; Knowledge Transfer

CHAPTER ONE

1. INTRODUCTION

1.1 Background

Prusak et al. (1998, p. 37) define 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.”.

In this current digital age knowledge considered as one of the main strategic resource in organizations and a competitive advantage (Sousa et al., 2019).

Knowledge management is the utilization of this resource and the application of knowledge activities on knowledge resources constrained and facilitated by wide range of factors (Holsapple et al., 2002).These knowledge management activities identified by scholars as: knowledge acquisition, knowledge selection, knowledge generation, knowledge use, knowledge internalization, and knowledge transfer.

Knowledge transfer concerned with the movement of knowledge across the boundaries created by specialized knowledge domains (Carlile et al., 2003). It is the conveyance of knowledge from one place, person or ownership to another. This transfer of knowledge, i.e., to get the "right" knowledge to the "right" participant at the "right" time in the "right" form and at the "right" cost, is one of the greatest challenges of knowledge management.

Alavi and Tiwana (2002) suggests that one of the biggest reasons for focusing on knowledge transfer is that knowledge generation by itself cannot lead to superior performance for the organization. Rather, companies have to create value by using that knowledge, and knowledge

can only be utilized if it is transferred successfully and effectively from knowledge creation unit to knowledge application unit.

Schulz and Jobe (2001) asserted that, knowledge management can support Industrial research (IRch) processes, a system that stands between operational units, requiring and using research results, and a system of technological providers and academic laboratories.

The case study of this thesis is on one of this KM component, knowledge transferring process of Ethiopian sugar industry research unit to production units at factory level.

KT in this study and in the context of the sugar industry research setting is the application of the knowledge of the research center into the sugar industry, leading to innovation that improves its ability to operate in terms of improved profit, productivity or efficiency.

1.2 The Ethiopian Sugar Corporation

The agro-based industries like sugar and coffee play an important role in the national economy and socio-economic development of Ethiopia. Sugar and it's by product are used for local consumption and export. Thus, Ethiopia is on the verge of establishing new sugar factories with large tract of sugarcane plantation besides expanding the existing ones.

The Sugar industry sector in Ethiopia commenced in 1951. It is large conglomerate of more than ten sugar factories and projects located in different regions of the country and administered by the Ethiopian Sugar Corporation (ESC) that was established in October, 2010. ESC took over operational responsibilities for the country's sugar industry, which had been formerly overseen by the Ethiopian Sugar Development Agency (ESDA). Under GTP I, the government has entrusted ESC with the arduous task of increasing sugar cane production and processing capabilities in order to achieve a threefold objective: to meet growing domestic demand; Creation of employment opportunities; and increase foreign exchange income from exporting refined sugar.

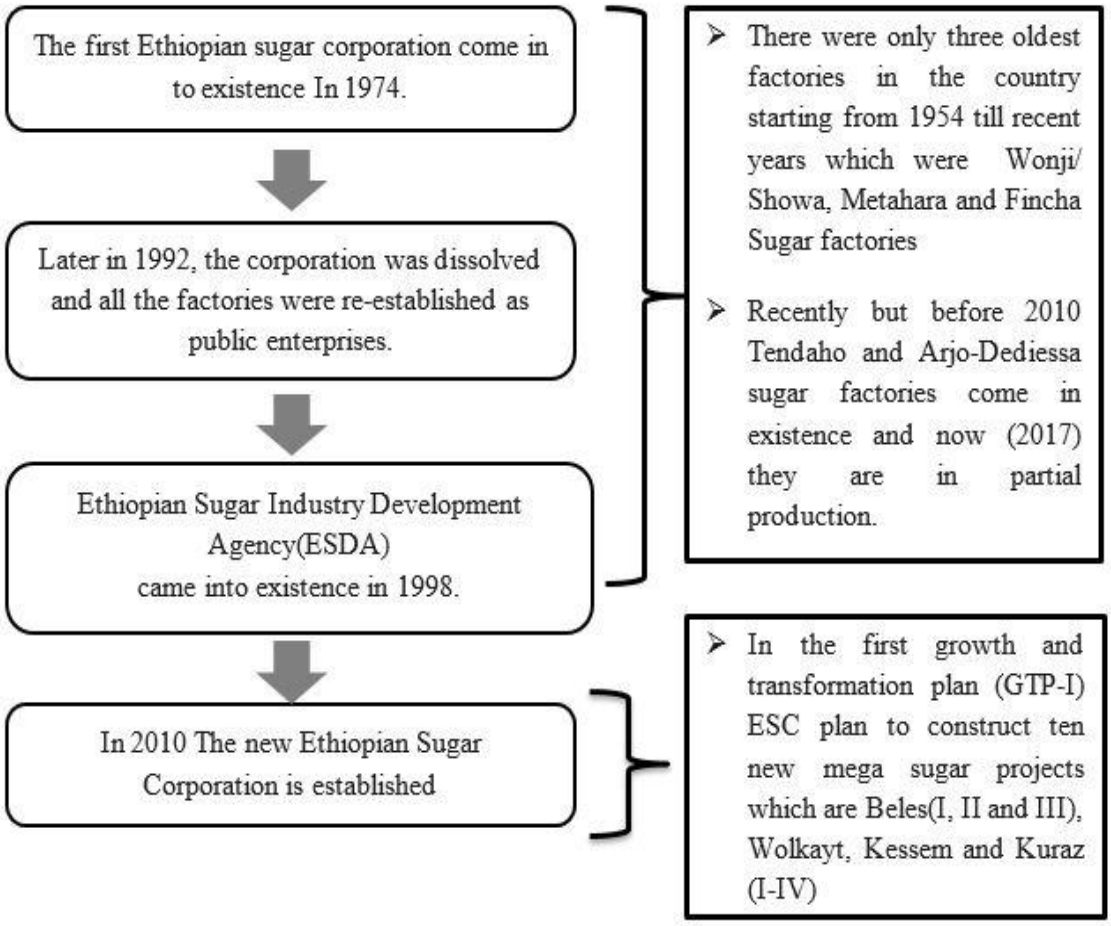

Figure 1.1: Background history of Ethiopian Sugar Industry (Genie, 2020)

Among the sugar estates, three of them, i.e., -Wonji, Metehara and Fincha counted more than 3 decades of sugar production experience and capacity of 316,000 tons of sugar annually whereas the rest are in their infant stages include: Tana Beles (three factories) in the Amhara Regional State; Welkayt, in the Tigray Regional State, Kessem and Tendaho in the Afar Regional State, and the Kuraz project for six factories in the South Omro Zone of the Southern Nations Nationalities and Peoples' Regional State. Recently the Ethiopian Sugar Corporation (ESC) made heavy investments into the country's sugar sector, among which are the construction of new sugar processing factories; the revitalization of older factories; and the expansion of land under sugar cultivation.

Each projects and factories have two large divisions of factory and agriculture. The factory division is responsible for construction, management and operation and conversion of sugarcane to sugar crystal process and ethanol production. The agriculture operation unit is responsible for commencing up various sugar cultivation practices in sugar growing states.

Taking into account the great interest of the sugar factories to expand their scale of sugar and sugar cane production the need for extraordinary research support is necessitated and Sugar Industry Research center is established under the umbrella of ESC with its headquarters located in Wonji. It is a major sugar production research and knowledge hub has been developing new methods, technologies and know-how for improved varieties, better soil and water management practices, improved cropping systems and better crop management. This center is committed to boost sugar productivity per unit area envisioning that innovations made would break yield barriers and brings sugar production improvement. On the other way the role of the center goes beyond simply being research provider and it engaged with a broader base of KT activity to sugar industry units and staffs (Ethiopian Sugar Development Agency, 2007).

The sugar industry knowledge is very complex. It may be understand by study of the product (sugar and ethanol) manufacturing life cycle i.e. stages – from farming to processing. As an agro-based system, the knowledge domain of the industry can be seen broadly as a combination of sugar cane farming/agriculture system and sugar processing/manufacturing system knowledge. These two categories has their own list of inter-disciplinary knowledge that encompasses: agricultural science & technology knowledge, sugar/ethanol technology and engineering knowledge, instrumentation and computer controlled systems knowledge, operations and maintenance knowledge, industrial management knowledge, industrial safety and environmental science knowledge, project management knowledge supported by administration, finance, material supply & management, marketing and sales knowledge.

Knowledge of ESC means the collective capabilities, experiences, values and understanding of its people and units on technologies, plans, process, operations, methods and techniques to produce sugar and sugar bi-products.

Both explicit and implicit type knowledge supposed to be transferred in everyday life and interactions between groups and individual level in the organization.

Therefore, this thesis aims to identify and analyze factors influencing the KT process of the research unit to production units in the context of knowledge management.

1.3 Statement of the problem

With its present level of sugarcane and sugar production in Ethiopia, the sugar industry is facing a large number of challenges. With an ever-increasing population, there is immense pressure on the available natural resources like land and water and fast declining factor of productivity in sugarcane cropping systems and rapidly shrinking resource base. There is also a need for a second green revolution with an emphasis to produce more without further depletion of natural resources. These factors call for development of new methods, technologies and know-how in sugar production management and the transferring of them to the right people, at the right time and to the right place.

According to Easterby- Smith et al. (2008), KT is a complex phenomenon. Hence successful transfer of it is often not easy to achieve in practice. Even transferring knowledge from one unit to another within the same firm is not straightforward as there are a number of factors that may affect the effectiveness and the outcome of transfer (Szulanski et al., 2000). Thus, it brings more complexity as result of the multifaceted nature of the boundaries, cultures, and processes involved in the firm environment.

Ethiopian Sugar industry research center has been working towards improving sugarcane productivity and sugar recovery since its inception. The technologies emanated from this center have played a substantial role in improving the cane yield and sugar recovery. Nevertheless, a study conducted to improve service delivery of the research unit unfold the KT process has faced many issues such as, a weak linkage existing between the unit and stakeholders. Additionally, the background of the training activity from the past to the present revealed that the

organizational set up is not in a way that can solve the problems of the industry (The Ethiopian Sugar Corporation, 2017).

Schulz et al. (2001), asserted that, IRch activities are directly linked to the environment of customer and external information providers posing limitations on internal research processes. Customer or service receiving unit's practices and operations have effects on costs, quality, risks and delay and this in turn have a direct influence on IRch processes. In simple terms, the operations and process of the research unit is constrained thereby affecting the information flow between the different systems and the management of knowledge.

In sugar industry manufacturing and producing a satisfactory sugar product and deciding what should be done to produce that is not straight forward and transfer of unambiguous knowledge-based information to operating units is still hampering and unsatisfactory to the industry stake holders (The Ethiopian Sugar Corporation, 2017). The global market in sugar industry is becoming volatile, multi-dimensional, ruthless and exhaustive on the other hand. The success in such dynamic and competitive market relies on the use of advanced technologies, skilled man-power, and low costs of production. Considering this fact, the, a full-fledged Ethiopian Sugar Academy established in 2017, upgrading the existing training center (The Ethiopian Sugar Corporation, 2017).

To deliver outcomes and to provide innovations in the industry, the need for an integrated approach to develop research solutions is inevitable. For example, in light of increasing sugarcane plantation the demand for improved, high yielding varieties is increasing. The application of it and its related knowledge to the industry farms brings a leap in sugarcane production (Kibruyisfa et al., 2019). However, the process of its application to the sugarcane is not easy.

KT between research unit and industry operating units is an important driver of innovation and economic growth as it eases the commercialization of new scientific knowledge within the sugar industry. Gutema (2020) emphasized that, research knowledge and output drive the industry

towards improved productivity, profitability and sustainability. Nevertheless, the realization of these benefits of the research activity relies on the uptake of the industry research efforts and the translation of these outputs into practice. Finally, yet importantly, the context of sugar industry and research setting looks complex and related challenges of KT process has insufficiently been studied. The ESC research unit has a considerable body of knowledge on a wide range of subjects, and this knowledge should be transferred to the industry in a timely and effective manner.

Therefore, this study aims to assess and analyze the factors of current KT challenges of the research unit of the sugar industry in addressing the right people, exchanging new ideas with experts and informing operational units about new research activities and results successfully.

To this end, this study attempts to explore and answer the following research questions.

- How knowledge is transferred between ESC research unit and production units?
- What are the factors that affect KT practices between the research unit and production units?
- What are the most important factors influencing the KT practices between ESC research unit and production unit?

1.4 Objective of the study

1.4.1. General objective

The general objective of this research is to examine factors influencing KT practices between ESC units.

1.4.2. Specific objectives

The specific objectives of this study include the following:

1. To review the various KT models and theories applicable in IRch KT in general and in the sugar industry in particular

2. To assess the KT practices between the ESC units
3. To determine the KT factors that are affecting the KT practice of the research center
4. To develop a model of the critical KT challenges faced by the Ethiopian sugar industry research center
5. To propose practical recommendations to the ESC research center on how to enhance its KT practices.

1.5 Significance of the study

This thesis will benefit research institutes engaged in process industry by shedding light on success factors, problems and challenges of KT process. The work will help them to improve the performance of their KT initiatives and programs.

Furthermore, limited research has been worked in the area of industrial research KT, and this work will help on better understanding of the nature of the phenomenon. It will enhance effectiveness of IRch process of KT and will be a valuable contribution to effectively facilitate the second vital role of IRch process. It helps the research community to knowledge building or learning and understanding of facilitators of intra-organizational knowledge process.

1.6 Scope and limitation of the study

Broad studies stated on KT in the context of academia-business and community interaction. The term used and understood in other sectors also, where it is interpreted differently. In this study KT is considered to be the practical problem of transferring knowledge from one part of an organization unit to another area of the organization unit.

KT in this study is the application of the knowledge of the ESC research unit to the production unit, leading improved profit and productivity. This mean the scope of the study is at intra-organizational level.

The data required for the KT study is collected from the ESC head of in Addis Ababa, ESC main research office and WSSF (Wonji-Shoa sugar factory) in Wonji from August 13 - 20, 2021.

KT study can be analyzed at nodal (focusing behavior of one party), dyadic (focusing on the joint behavior of on a pair), and systemic (focusing on the behavior of a system) levels (Gupta & Govindarajan, 2000). This research is a dyadic level and may have some limitation in contrast to systemic perspective on its predictive power.

1.7 Ethical consideration

Ethical approval and clearance letter btained from Addis Ababa University Ethical Review Board before carrying out the study. Permission also sought from the Ethiopian Sugar Corporation and particularly from research units. Prior to data collection study participants briefed about the benefit, harm and objective of the study. Confidentiality will be assured by omitting names of the respondents from the questionnaire.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Knowledge

Knowledge is a combination of data and information (from an information technology perspective) and a mixture, for example, of know-how, experience, values, ideas, hunches, curiosity, motivation, attitude and the ability to trust and manage the complexity around an asset. with which the ability to act can be enhanced and decision making can be supported (Mancinelli, 2018).

Prusak et al. (1998) argued, knowledge is neither data nor information, but it refers to someone or something that may contain facts, information, description or skills acquired through experience or education. It can refer to the theoretical or practical understanding of a subject and be implicit (such as with practical skills or expertise) or explicit (such as with theoretical understanding of a subject). Knowledge and know-how are distributed throughout the organization and are often closely linked by individuals or work units (Choo, 1996).

2.1.1 Data, Information, Knowledge

Kebede (2010) noted, the knowledge hierarchy, the three manifestations of information are understood and represented as logically linked, with data turning into information and information into knowledge in order to naturally become more valuable, useful, meaningful and complete. This knowledge is all encompassing, and the most useful form has made knowledge the desired form on which the emphasis should be directed.

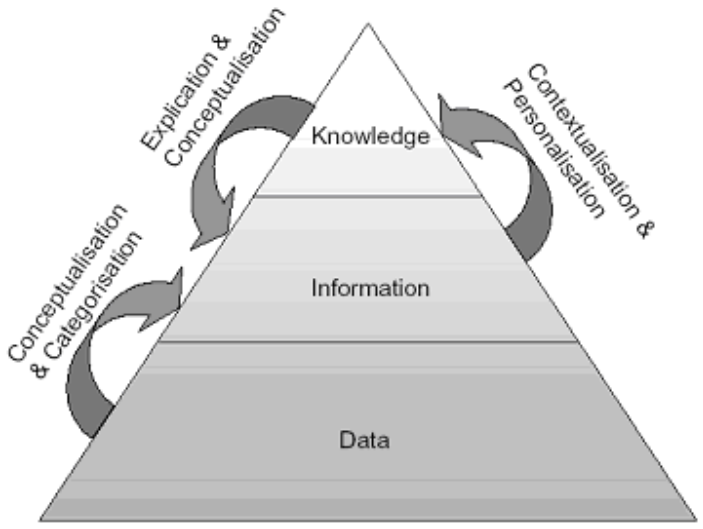

Figure 2.1: Knowledge Hierarchy Model (Hoppe et al., 2011)

(Nonaka, 1994, p. 15) explained the difference between information and knowledge. He argues that information is a flow of messages that is independent of its context. While knowledge is generated and organized by this flow of information, it is context specific and, more importantly, related to human action. This relation to human action underlines the essential aspect that knowledge "is anchored on the commitment and convictions of its owner". Therefore, knowledge is more difficult to transfer than information. This last characteristic is known as “transferability” (Grant, 1996) and aims at the transfer of knowledge within and between organizations and individuals.

2.1.2 Defining Knowledge

Knowledge can be defined as experiences; contextual comprehension, value-added information or insights based on the frameworks of understanding that reside in the minds of individuals or groups (Parent et al., 2014).

Most definitions of knowledge relate to experts and experience, where knowledge relates to the abstraction of data and information. For example, Tiago et al. (2007, p. 27) defined knowledge as “a higher level of abstraction residing in the minds of people” and “excludes perception,

skills, training, common sense and experience". Likewise, Liebowitz et al. (1997) view knowledge as the complete set of ideas, experiences, and procedures believed to be right and true, and therefore guide people's thoughts, behavior, and communication. Knowledge is acquired from the experience of working on different fronts. Knowledge (set of information) is based on the experience of certain things. It is an intelligent observation of cause and effect (Armstrong, 2019).

Casselman et al. (2005) advanced the two types of knowledge, explicit knowledge and implicit knowledge. Explicit knowledge can be represented by signs (symbols, texts and images) and thus stored electronically. Tacit knowledge is always linked to a subject, that is to say to a mind, and therefore cannot be stored in a technical system. Nevertheless, it is possible to initiate processes that lead to the generation, externalization, internalization and therefore to the exchange of implicit knowledge.

2.1.3 Industrial Knowledge

The concepts of 'industry' and 'organizational knowledge' help us to understand what the definition of industrial knowledge mean.

Forsyth (2014) in Collins English Dictionary defined the term Industry as the work and processes involved in collecting raw materials, and making them into products in factories and the adjective industrial used industrial to describe things which relate to or are used in industry. Marsden et al. (1998) depicts, for example, Agro-industry is the generic term applied to the industrial processing of raw materials and intermediate products derived from the agricultural sector (defined broadly to include forestry and fishing as well as crop production and animal husbandry).

Organizational knowledge on the other hand as Alan Frost does: "all the knowledge resources within an organization that can be realistically tapped by that organization. It can therefore reside in individuals and groups, or exist at the organizational level"(Frost, 2016). It is knowledge

specific to the organization: it is generally gained by experience. It is information that is used and shared to achieve the organization's objectives (Tesfay, 2021, p. 40).

It can be based on:

- Internal sources (e.g., intellectual property; know ledge gained front experience; lessons learned from failures and successful projects; capturing and sharing undocumented knowledge and experience; the results of improvements in processes, products, and services).
- External sources (e.g.. standards; academia; conferences; gathering knowledge from customers or external providers).

Thus, this defintion lead us to conclude industrial knowledge to mean both a breadth and depth of industy related knowledge needed by the industry to produce goods and services to its customers.

Corporate organizations generate new knowledge through their in-house R&D activities, and introduce new products and services to the market by combining their own new knowledge and the knowledge generated by others, e.g. universities (Doloreux et al., 2018).

According to Carneiro (2000), Industrial research plays important role through experiment, demonstrate and validate models with new technological and methodological solutions in order to combine them and propose new possible solutions to the requirements of the operational system.

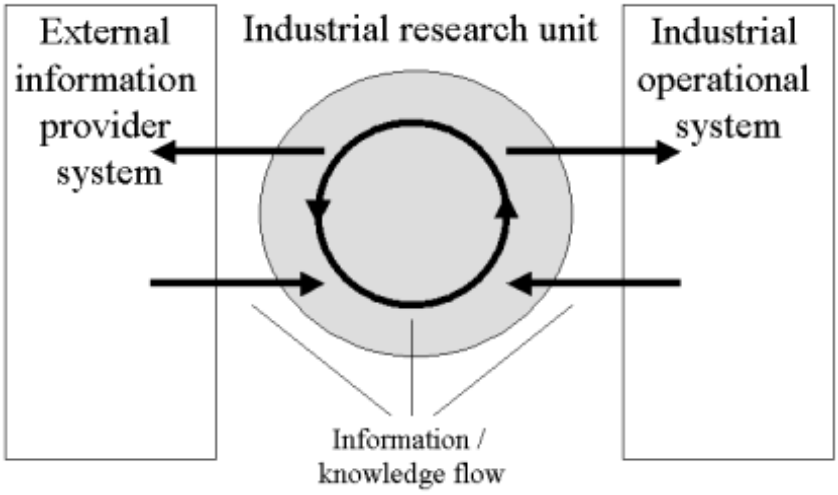

Figure 2.1: Industrial research processes – a macroscopic description (Frank et al., 2002)

2.1.4 Industrial Research Knowledge

Corporate organizations generate new knowledge through their in-house R&D activities, and introduce new products and services to the market by combining their own new knowledge and the knowledge generated by others, e.g. universities (Doloreux et al., 2018).

According to Carneiro (2000), Industrial research plays important role through experiment, demonstrate and validate models with new technological and methodological solutions in order to combine them and propose new possible solutions to the requirements of the operational

The European Union defined industrial research as (Europeia, 2014, p. 6):

> "The planned research or critical investigation aimed at the acquisition of new knowledge and skills for developing new products, processes or services or for bringing about a significant improvement in existing products, processes or services."

Industrial research is characterized by industrial laboratories that stand out from production facilities, those trained in science and advanced engineering who work towards a deeper understanding of business-related science and technology (Ferguson, 1996, p. 134).

.Furthermore, Samsonowa (2011) stated industrial research in its broad sense can also include activities that begin at the end of basic research and end in the product development phase. These definitions of industrial research are quite uneven. They range from basic research to product development in its broadest definition to applied research in its narrowest definition presented in Frascati manual (OECD, 2002)

(Chorafas, 1958), on the other hand, identifies industrial researches as applied research and development rather than pure research. He went on to explain this as the former focuses more on exploring something unknown, while the latter is about turning the discoveries of pure research into practical products. He also notes that industrial research departments have been set up to address specific research areas and look for industrially viable solutions.

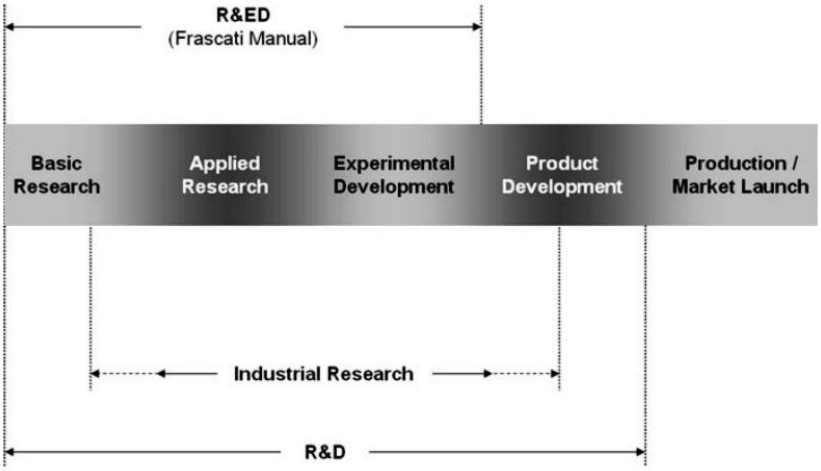

Figure 2.2: Scope of activities in industrial research (Samsonowa, 2011)

The R&D process is increasingly seen today through a lens of knowledge use and knowledge creation. Research and development knowledge is created through a process in which information and know-how are exchanged and combined through various exchanges. When independently developed thoughts and ideas are shared over time among members of the R&D team, a combined understanding and intuitive insights are developed, which ultimately facilitates the creation of new knowledge (Mori, 2014).

2.2 Knowledge Management

Seiner (2001) states knowledge management (KM) is a concept in which a company collects, organizes, shares, and analyzes information about individuals and groups in firms in a way that has a direct impact on performance. As such, it applies to all functions, work processes, and seeks to embrace constitutional learning and share best practices for the benefit of the entire company and its customers. Rao et al. (2012) extends that, KM is a managerial activity that develops, transfers, transmits, stores, and applies knowledge as well as provides real information to members of an organization to respond and make the right decisions to achieve excellence and business efficiency.

Nonaka (1994), depicts KM is a systematic method of managing a company's knowledge resources to create value and meet tactical and strategic needs. KM focuses primarily on ensuring organizational learning and the creation and production of knowledge.

Thus, the main objectives of KM include the creation of Knowledge repositories, the improvement of knowledge success, the improvement of the knowledge environment and the management of knowledge as an asset knowledge is gained from experience working on different fronts.

It is important to disseminate knowledge throughout the organization before it can be used at the organizational level (Bhatt, 2001). In order to carry out the KM activity effectively and efficiently the need to focus three key elements: organizational people, process and technology is important, he emphasized. It is this KM core function the focus of this thesis work.

2.2.1 Knowledge flows

A common example of knowledge transfer occurs in the process of training. The flow of knowledge is one directional, from the knowledge owner to the recipient(s) (see Figure 2.3). In this case, there is generally only one knowledge owner and one or more recipients. In contrast, knowledge sharing normally occurs via social interaction

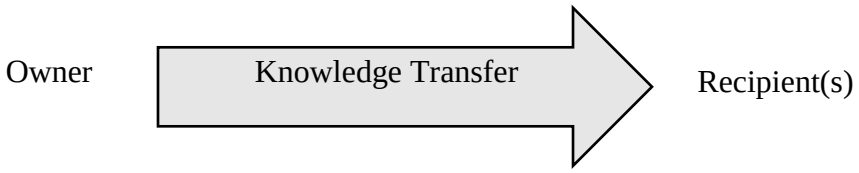

Figure 2.3 Knowledge Transfer

There are many knowledge owners and recipients and each party involved can be a knowledge owner and a recipient simultaneously. Knowledge flows in many directions between all parties (see Figure 2.4).

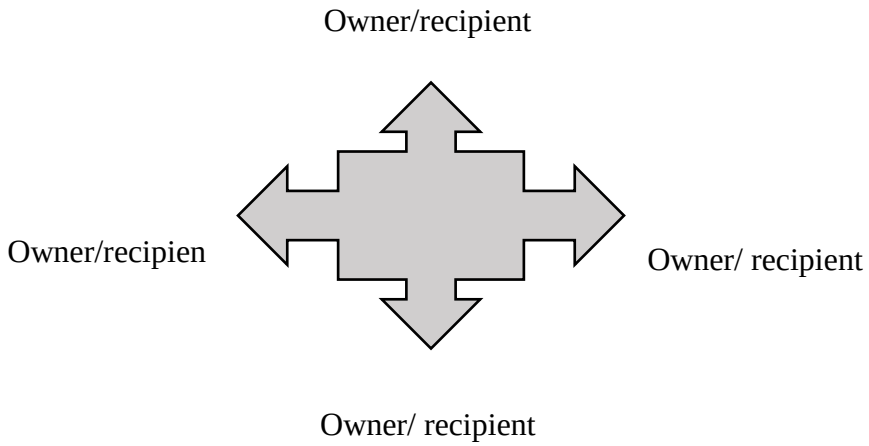

Figure 2.4 Knowledge Sharing

Knowledge exchange is similar to knowledge transfer in that there is one knowledge owner, but generally, there is only one recipient. The flow of knowledge is carried through two different channels; one for sending the knowledge and another for receiving the knowledge (Figure 2.5).

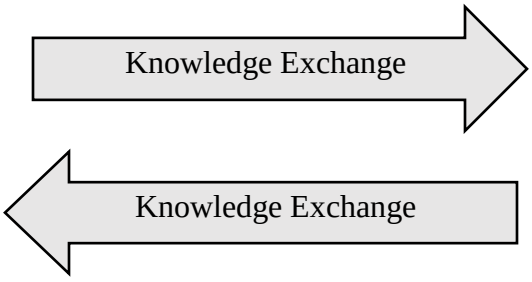

Figure 2.5 Knowledge exchange

2.2.2 Knowledge Transfer (KT)

There is much literature on the subjects of knowledge transfer, knowledge share, and knowledge exchange. However, these terms are often used interchangeably by some authors; Table 2.1 presents five existing definitions of the aforementioned terms. Table 2.2 describes the definitions made by the authors.

Table 2-1**:.** Examples of existing definitions of knowledge transfer/share/exchange

Author(s)	Knowledge Transfer	Knowledge Sharing	Knowledge Exchange
Argote, Ingram, et al. (2000, p. 151)	The process through which one unit is affected by the experience of another		
Watson et al. (2006, p. 143)	The codification and storage of existing knowledge into knowledge repositories or databases such that it can be accessed and reused.		
Gooderham et al. (2006, p. 36)	The accumulation or assimilation of new knowledge in the receiving unit		
Riege et al. (2007, p. 48)	The application of prior knowledge to new learning		
Christensen (2007, p. 37)	Identifying existing and accessible knowledge, in order to transfer and apply this knowledge to solve specific tasks better, faster and cheaper than they would otherwise have been solved		

In the case of knowledge transfer, the transfer process can be involuntary and voluntary at different times, depending on the situation. For example, in the case of training, the knowledge transfer may be involuntary as the knowledge owner has been asked to transfer their knowledge to a colleague and is not motivated to do so. However, another scenario could result in the knowledge owner being motivated and wanting' to share their knowledge in the training process

as social interaction is taking place. This means that the knowledge transfer process is dynamic and has different characteristics depending on the motivations of those involved.

Table 2-2: Authors' definitions of knowledge transfer/share/exchange

	Knowledge Transfer	**Knowledge Share**	**Knowledge Exchange**
Definition	Applying existing knowledge from one context to another	Disclosure of existing knowledge to others - thus creating new knowledge	Imparting of knowledge for something in return
Voluntary Involuntary	Involuntary. Voluntary	Voluntary	Involuntary
Reciprocal Non- Reciprocal	Non-Reciprocal	Reciprocal	Reciprocal
Via	Training' Social Interaction	Social Interaction	Contract

KT is an area of KM concerned with the movement of knowledge across the boundaries created by specialized knowledge domains (Carlile et al., 2003). It is the conveyance of knowledge from one place, person or ownership to another. Successful KT means that the transmission leads to the receiving unit accumulating or absorbing new knowledge (Liyanage et al., 2009).

KT is the communication of knowledge from a source so that it is learned and applied by a recipient (King, 2011). The source and recipient may be individuals, groups, teams, organizational units, or entire organizations in any combination. Lee et al. (2010) added knowledge can be transferred in either or both of the following directions: from headquarter to subunit; from subunit to headquarter, and successful KT results in the receiving unit accumulating or assimilating new knowledge.

According to Ranjan et al. (2012), knowledge transfer is about identifying existing knowledge, obtaining and then using this knowledge to develop new ideas or improve an existing idea to

make the process faster, better or safer than they would be otherwise. Effective KT promotes better understanding in organizational and reduces uncertainty among stakeholders.

KT is regarded as an increasingly important process of KM and a key element of a firms' strategic management. It increases both organizational performance, efficiency and effectiveness (Argote, 2013; Tsai, 2001; Zack et al., 2009). Nevertheless, this process of KT between the levels of the hierarchy of the organization or between the units of different organizations poses practical problems (Nguyen et al., 2014). Hence, Szulanski et al. (2016) asserted that, methods of knowledge are complex and needs to be better understood.

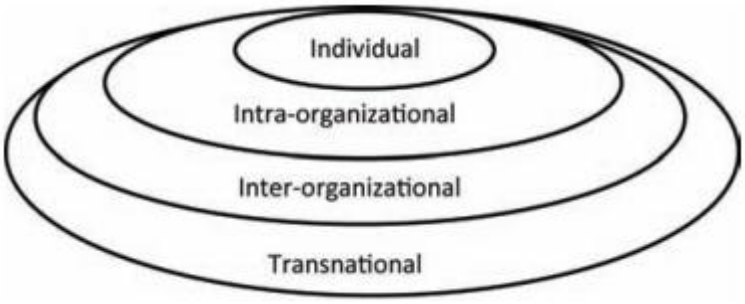

Figure 2.6: KT levels (Duan et al., 2006)

A major issue in knowledge transfer has to do with the antecedents, or determinants, of effective KT. In other words, what factors most importantly influence successful knowledge transfer?

2.2.3 Knowledge sharing (KS)

Knowledge sharing is learning something from someone (Mtega et al., 2018) that enhances sharing of know-how, understanding and skills. KS is critical to organizations that wish to use their knowledge as an asset to achieve competitive advantage. It may occur between and among individuals, within and among teams, among organizational units, and among organizations (Ipe, 2003). A major focus of knowledge sharing is on the individual who can explicate, encode, and communicate knowledge to other individuals, groups, and organizations (King, 2011).

In a study conducted by Tangaraja et al. (2016) said that KS can be seen from two perspectives namely bidirectional and unidirectional. In the bidirectional perspective there is an exchange of knowledge from each individual. Both individuals are active as the giver as well as the recipient of knowledge where this activity involves knowledge donating and knowledge collecting. In unidirectional concept KS is only carried out in one direction, namely between the information provider and information recipient.

2.2.4 KT versus KS

Knowledge transfer and knowledge sharing are sometimes used synonymously or are considered to have overlapping content. Several authors have pointed out this confusion while other authors have attempted to clarify the differences and define the terms (Paulin et al., 2015).

King in Jennex (2008, p. 123) stated there is agreement that knowledge transfer is different from knowledge sharing, which may be an unfocused exchange among individuals or groups who have little intention to send or receive knowledge. Transfer implies focus: a clear objective, and unidirectionality, knowledge may be shared in unintended ways multiple directionally without a specific objective. For example, when an enterprise resource planning (ERP) systems consultant transfers implementation knowledge to a potential user of a system, or when a franchiser's training team transfers knowledge about how to operate a franchise to a franchisee's team. Such KT are between a clearly defined source and a recipient, have a focus, and have a clearly identified objective. Of course, knowledge sharing may also have a focus as when persons engage in a brainstorming group session in order to generate new ideas or enhance creativity.

Common dividing line between KT and KS is related to the levels of analysis, in that KS is used more frequently by authors focusing on the individual level, while KT is used more frequently when groups, departments, organizations or even businesses are in focus (Argote & Ingram, 2000). This view can still be regarded as valid since there is support for this in a more recent review (Choo et al., 2010).

According to Tangaraja et al. (2016), KS has a relationship with knowledge transfer, referring to two strategies of knowledge transfer namely personalization and codification.

KS is a people-to-people process as it is defined by several scholars as the exchange of an individual knowledge, experience and skills with others with in an organization, whereas KT is a broader concept than knowledge sharing using the personalization strategy, KS is seen as one of the process involved in KT using codification strategy (Tangaraja et al., 2016). The processes involved in KS and KT differ according to the strategy used in KT and perspective chosen in KS. KS is unidirectional as reflective concept (viewed so far), whereas KS (bidirectional), KT (personalization) and KT (codification) as formative concepts.

(Tangaraja et al., 2016)and (Wang 2010) noted KS differs from the similar term KT in that the prior is entirely behavioral concept because it involves observable actions. On the other hand, KT encompasses both behavioral and non-behavioral features through various processes. KT and KS are two varied concepts, even though they are interlinked in some ways and KS is a component of KT.

Perhaps the best way to conceptualize knowledge transfer and knowledge sharing is that they are at two ends of a spectrum (King, 2011). The knowledge transfer end is formalized, with a clearly defined purpose, and is unidirectional. The knowledge- sharing end is multidirectional, informal, and has no clear objective and few rules. Between these extremes lies a wide range of possible combinations involving individuals, teams, groups, organizational units, and organizations. Different people may use different terminology to describe these possible situations, but the end points are well grounded in theory and in practice.

2.2.5 Industrial KT

On the other hand, Ferreira et al. (2019) noticed, KT refers to the multiple ways in which knowledge from universities (and public research institutes) can be used by industry to create economic, social and competitiveness value in broader sense.

One of the challenges come in this thesis is really to define the context of the sugar industry center and to decide the relation type is an academia-Industry or an industrial firm- research unit. This dissimilarity of the setups discussed in different literatures.

According to Niedergassel (2011, p. 3), universities and companies have fundamentally different in cultures and goals. Whilst the primary focus of the prior is the creation and dissemination of knowledge, the latter is to provide products and services within a highly competitive environment. Pavitt (1998, p. 795) added also "one of the main purposes of academic research is to produce codified theories and models that explain and predict natural reality". With the above discussion therefore has chosen to be on the basis of a perspective of a typical industrial research context.

2.3 KT Models and Theories

Most of KT models/ frameworks are slightly diff erent, have much resemblance with the basic phenomenon of source (sender) receiver of Shanon's communication model (Daud et al., 2017).

Cummings et al. (2003) integrate inter and intra organizational transfer factors in the context of Multi-National Corporations, and empirically tested a KT framework, which consists of five contexts: knowledge context, recipient context, relational context, activity context, and environmental context.

An interesting work on a comparison of 5 different frameworks drawn from the literature presented by Daud et al. (2017), one of which was the well-known process models for intra-organizational KT was developed by Szulanski et al. (2000). The model contains four stages – initiation, implementation, ramp-up and integration.

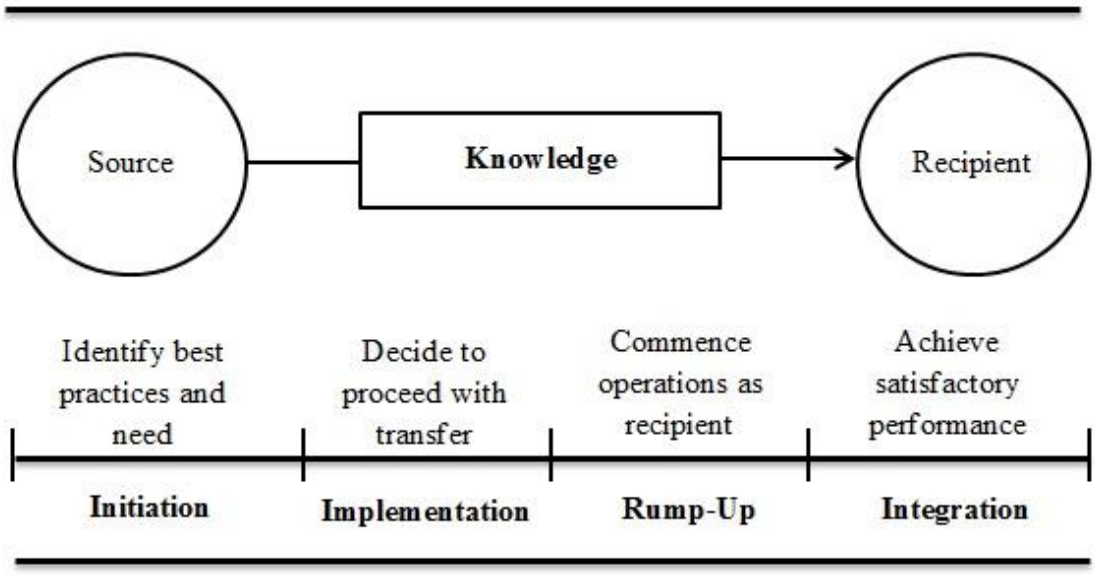

Figure 2.7: Knowledge Transfer Process (Szulanski et al., 2000)

A KT model by Liyanage et al. (2009) is an interesting and inclusive of both explicit and implicit that mainly built upon two main elements, source and receiver or known as 'an act of communication'. Four factors have been introduced in the model: knowledge relevance, knowledge distribution, acquisition and absorptive capability.

Ward et al. (2010) have developed a framework for KT process of project-based organizations (PBO) which illustrates five factors or components linked through a multidirectional process: problem identification, utilization, involvement, and context analysis and knowledge research. Finally, the van Waveren et al. (2014) framework is based on knowledge transfer between projects in project-based organizations (PBOs), which has a great influence on the success of organizations. Accordingly, this framework theoretically brings together the process of knowledge transfer and factors in this context include the type of knowledge, the transfer mechanism and the success of the transfer.

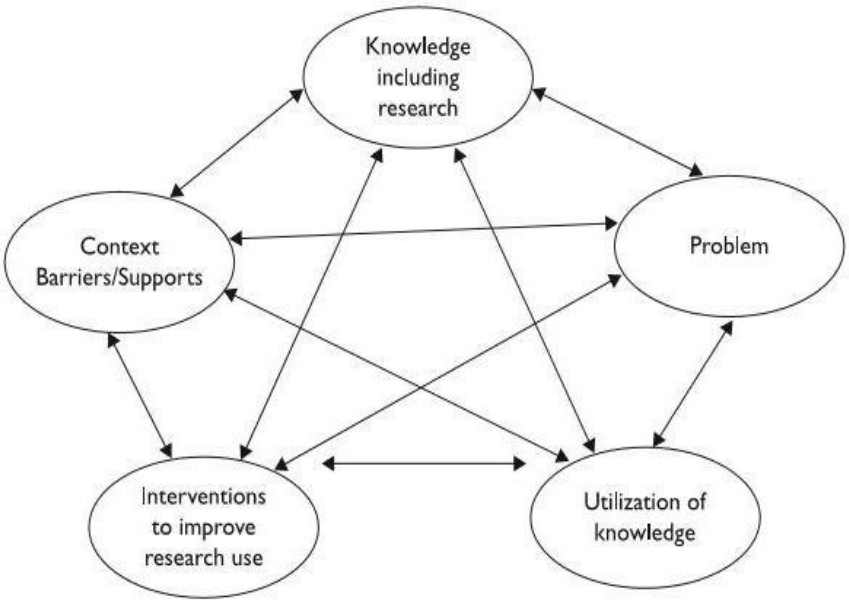

Figure 2.8: Conceptual model of knowledge transfer process (Ward et al., 2010)

Schwartz (2007) provides a comprehensive review on barriers to KT by aggregating these barriers, which are key factors affecting KT success, as pertaining to one of three categories: Source, Recipient, and Organization.

Albino et al. (1998) also presented four categorizations of factors affecting KT process "actors" who are involved in the KT process; the "context" where the interaction takes place, the "content" transferred between actors; and the "media" by which the knowledge is transferred. The comprehensive summary of this model is presented by Duan et al. (2006) in his seminal work of Transnational KT.

Most of KT models depicted above offer a dynamic view of stages and processes (Duan et al., 2006); however, that they need to be empirically tested and validated. More over despite a breaking down of the phases in several stages, this global model of KT as a process is not convenient for closely representing interaction between stakeholders (Frank et al., 2014).

Goh (2002), combines five factors: leadership, problem-solving behavior, positive capacity, support structure and types of knowledge proposed in an integrative and holistic framework of factors affecting KT (see Figure 2.6). The contribution of this conceptual framework is that it integrates all the aforementioned factors and explains how effective KT can be managed in an organization. The framework clearly demonstrates the relationships among the key factors and unveils the important factors affecting KT from organizational perspective (Duan et al., 2006).

Some other models in the literature on the other hand are more focused on the way knowledge is transformed during the KT process rather than a process approach. The Socialization, Externalization, Combination, Internalization (SECI) model is probably one of the most popular ones. It focuses on how knowledge is created and transformed over successive 'tacit and explicit knowledge (Von Krogh et al., 2000).

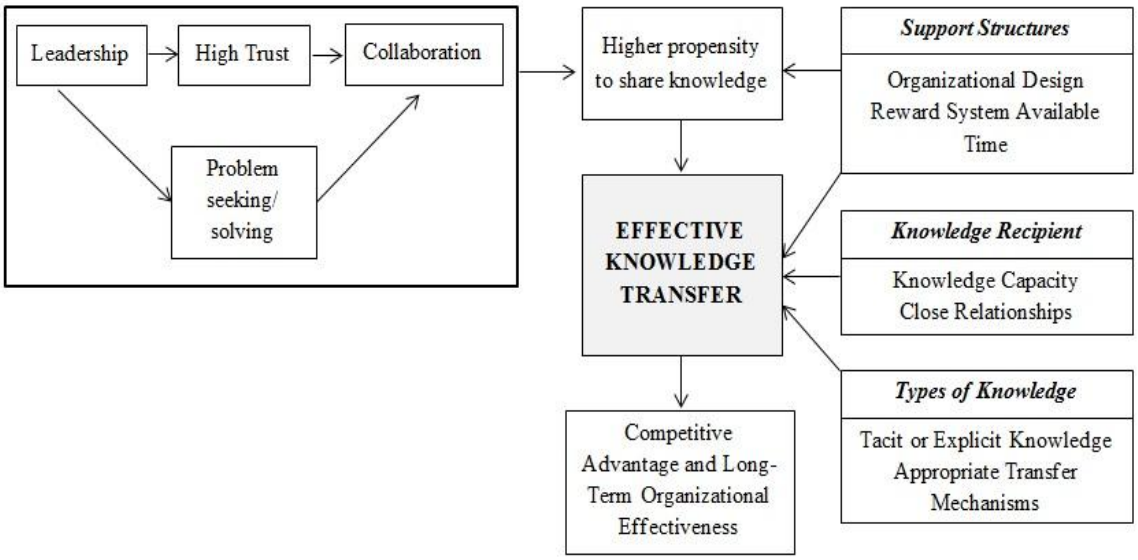

Figure 2.9: An integrative Framework: Factors influencing effective KT (Goh, 2002)

2.3.1 Industrial KT Models and Theories

Munyai et al. (2017) developed a knowledge transfer model depicted in Figure 2.7 for productivity improvement of cable industry manufacturing firm of South Africa.

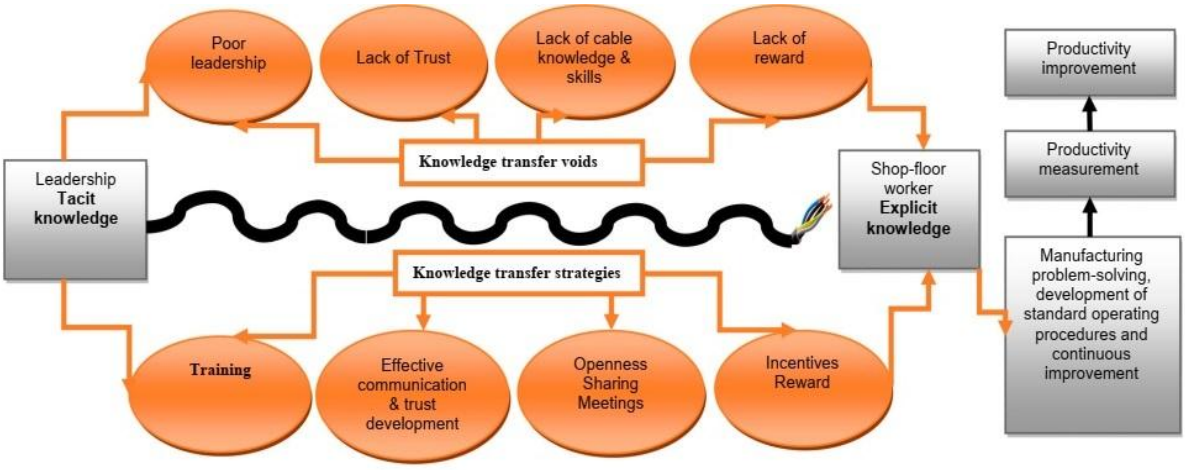

Figure 2.10: KT model for cable manufacturing industry (Munyai et al., 2017)

The framework plotted considering many factors proposed by different researchers' including: leadership, trust, skill, reward system, training, communication and transparency as ailments that can imped successful implementation of knowledge transfer in the cable manufacturing industry.

2.3.2 Intra-organizational KT Models and Theories

Wide-ranging research has been conducted to examine knowledge transfer within an organization. Consequently, different models and framework conditions are developed to elucidate the phenomena of knowledge transfer in this context. One of the well-known process models for knowledge transfer within the organization was developed by Szulanski et al., (Szulanski et al., 2000). The model has four phases: launch, implementation, start-up and integration. Initiation means the initiation of a transfer; the implementation represents the initial effort of implementation: the start means that the implementation starts with a satisfactory performance; Integration represents the following Monitoring and evaluation efforts to integrate the practice with other beneficiary practices.

An integrateive framework developed by Goh (2002), is also often cited as a model by researchers incorporates some key factors that have a significant impact on the knowledge transfer capacity. He suggests transferring knowledge in an efficient, cooperative and

cooperative manner culture must be created. It also discusses the importance of leadership, problem solving / research behavior, support structure, absorption and retention skills, and types of knowledge in knowledge transfer. The contribution of Goh (2002) conceptual framework is that, it is integrated all of the above and explains how effective knowledge transfer can be managed in an organization. The framework clearly shows the relationships between key factors and underlines the importance of organizational culture, which makes individuals or groups more inclined to share their knowledge.

In summary, Szulanski's model helps to understand knowledge transfer from a process perspective, and Goh's model reveals the important factors that influence knowledge transfer from an organizational perspective.

2.3.3 Contexts for managing Intra-organizational knowledge transfer process

Despite the diversity of research on knowledge transfer, theoretical explanations of this the phenomenon can be organized in to three organizational contexts ; the properties of the units, the properties of relationships between units, and the properties of knowledge itself (Argote, 2013).

Properties of units

The context of the unit is one of the main dimensions for learning (Argyris et al., 1997). Then, the culture of this unit and how it is designed and organized is a source of efficiency in the absorption process of a new knowledge. The realization of these potential synergistic benefits depends on the openness of the unit and how effectively linkages between business units are managed (Gupta et al., 1991). Transmission and absorption together have no useful value if the new knowledge does not lead to some change in behavior or the development of some new idea that leads to new behavior.

Properties of the relationships between units

The network structure in which the units are embedded also affects the effectiveness of knowledge transfer (Reagans et al., 2003). Knowledge transfer is a prerequisite to learning but

requires effective networks and appears difficult across different units of an organization if pre-existing relationships are absent (Szulanski et al., 2000). (Tsai, 2001) argues that networks of inter-unit links favor access to and exchange of knowledge between different units in an organization that makes the centrality of position critical.

Properties of knowledge

Knowledge transfer can also be facilitated or inhibited by the degrees of tacitness of knowledge (Nonaka et al., 2007). Regarding the nature of knowledge itself, explicit knowledge is more obviously transferable, and tacit knowledge is better transmitted through actionable and social experiences. Therefore, tacit knowledge is best transferred through rich communication media such as observation rather than more explicit media (Nadler et al., 2003).

Another dimension of the properties is the ambiguity of knowledge which is an important pediment to transfer (Simonin, 1999). For Kostova (1999), the transfer of routines (organizational practices) is determined by the transferability of meaning and value, in addition to the transferability of knowledge.

2.4 Empirical Works

Karlsen et al. (2004) conducted a study to determine factors affecting knowledge transfer in IT projects in Norway revealed total project success is related to the extent of culture mainly. The research collected data on knowledge transfer and project success. The factors evaluated in the KT variable were information technology, systems and procedures, and culture while on the variables of IT project success include project performance, project outcome, system implementation, benefits for the client organization, and benefits for the stakeholders.

Landaeta (2008) examined the associations between the level of knowledge transfer across project effort, the body of knowledge of projects obtained from other projects, and the project performance. In the study a survey of 46 organizational projects located in Europe, Central America, North America, and South America provided and data to test 3 hypotheses used. The

results show that the body of knowledge of projects obtained from other projects is positively associated with project performance. Moreover, the result demonstrates that the level of knowledge transfer across project effort is associated with an increase in the capabilities and performance of projects.

A survey study by Rhodes et al. (2008a), in High Tech firms of Taiwan identified the key factors influencing the rate of organization knowledge transfer is relatively unknown. His findings indicated that among some organizational factors, IT systems had the most significant impact on organizational knowledge transfer followed by a structured learning strategy, and an innovative organizational culture. also noted that personalized (tacit) knowledge transfer had a strong influence on innovative capabilities development.

A study conducted by Lashari et al. (2017) attempt to present empirical evidence that assessing the extent of transfer practices of academic research of the PhD faculty members of universities offering degrees in field of Environment in Sindh Pakistan. Accordingly, 28 practices of academic knowledge transfer have been identified and grouped together based on their characteristics by making 7 clusters as, publications, networking, mobility of researchers, joint research, intellectual property and co-operations including spin-off companies and sharing of equipment. comparison of the clusters of revealed research findings, publications in terms of research papers in journal, networking and co-operations are found to be common practices of academic knowledge transfer. However, a smaller number of academic knowledges has been transferred through other practices of knowledge transfer such as, Intellectual Property and joint research programs.

An empirical study of knowledge transfer within Vietnam's IT companies by Ngoc (2005) explores the key factors and their relationships with the knowledge transfer within an organization. The results of this survey on 104 respondents in several IT firms in Hanoi revealed that a communal culture (high sociability and high solidarity); social interaction, transformational leadership and application of communication technologies, are significantly correlated with the level of knowledge transfer among organizational members. Furthermore,

individual absorptive capacity, relationship closeness and interactive organizational communication also noted to have significant impact on the process of intra-firm knowledge transfer.

Asrar-ul-Haq et al. (2016) highlighted and summarized the possible antecedents and factors that facilitate or impede knowledge management and knowledge sharing in organizations by conducting a meta-review of 64 articles for the years 2010–2015. The study includes both quantitative and qualitative studies related to antecedents and barriers to knowledge management and knowledge sharing. He concluded that Cooperation bias is the most frequent limitation in most studies included in the meta-review.

Van Wijk et al., (2008) conducted a meta-analytic technique to examine how knowledge organization and network level antecedents differentially affect organizational knowledge transfer. This work consolidate research on the relationship between knowledge transfer and its consequences. it in sighted well how the intra- and inter-organizational context, the directionality of knowledge transfers, and measurement characteristics moderate the relationships.

Mwangi (2019) conducted an applied mixed methods research with cross-sectional survey design study in Kenya State Corporations on employee KT process. Multiple regression analysis and inferential analysis was carried out. The study found positive significant relationship between knowledge transfer processes and employee performance. Information communication technology was found to be an enabler of knowledge transfer processes though it did not significantly moderate the relationship between peer to peer training and employee performance. Coaching was the strongest predictor of the variance in employee performance.

Using survey research method Fiseha (2017) presented an interesting paper that drawn challenges hindering the effectiveness of knowledge transfer in offshore outsourced ethiotelecom project settings. His major findings comprise; lack of organizational readiness, undesirable organizational politics, national culture differences, language barrier and inappropriate client-vendor relationships.

There is plenty of literature on knowledge sharing and transfer. However, existing findings are not consistent due to the influence of contextual factors (Assefa et al., 2014). Most of the researches weakness is an attempt to examine the factors affecting the process of knowledge transfer across the organizational boundaries and little attention been given KT with in firm (Ngoc, 2017). Moreover, many of them lack guideline for scaling-up of successful implementation of research findings and of proven models, ensuring knowledge receipts have access and applied the knowledge transferred.

This study has similarity with the previous in that as it tries to examine the factors of knowledge transfer with similar methodology. Nevertheless, it differs with regard to attempting to explore the context in developing nation industrial environment and to close the gaps by proposing a guideline for the findings implementation at the same time.

2.5 Research Model

Despite the diversity of research on knowledge transfer, theoretical explanations of this the phenomenon can be organized in to three organizational contexts ; the properties of the units, the properties of relationships between units, and the properties of knowledge itself (Argote, 2013)

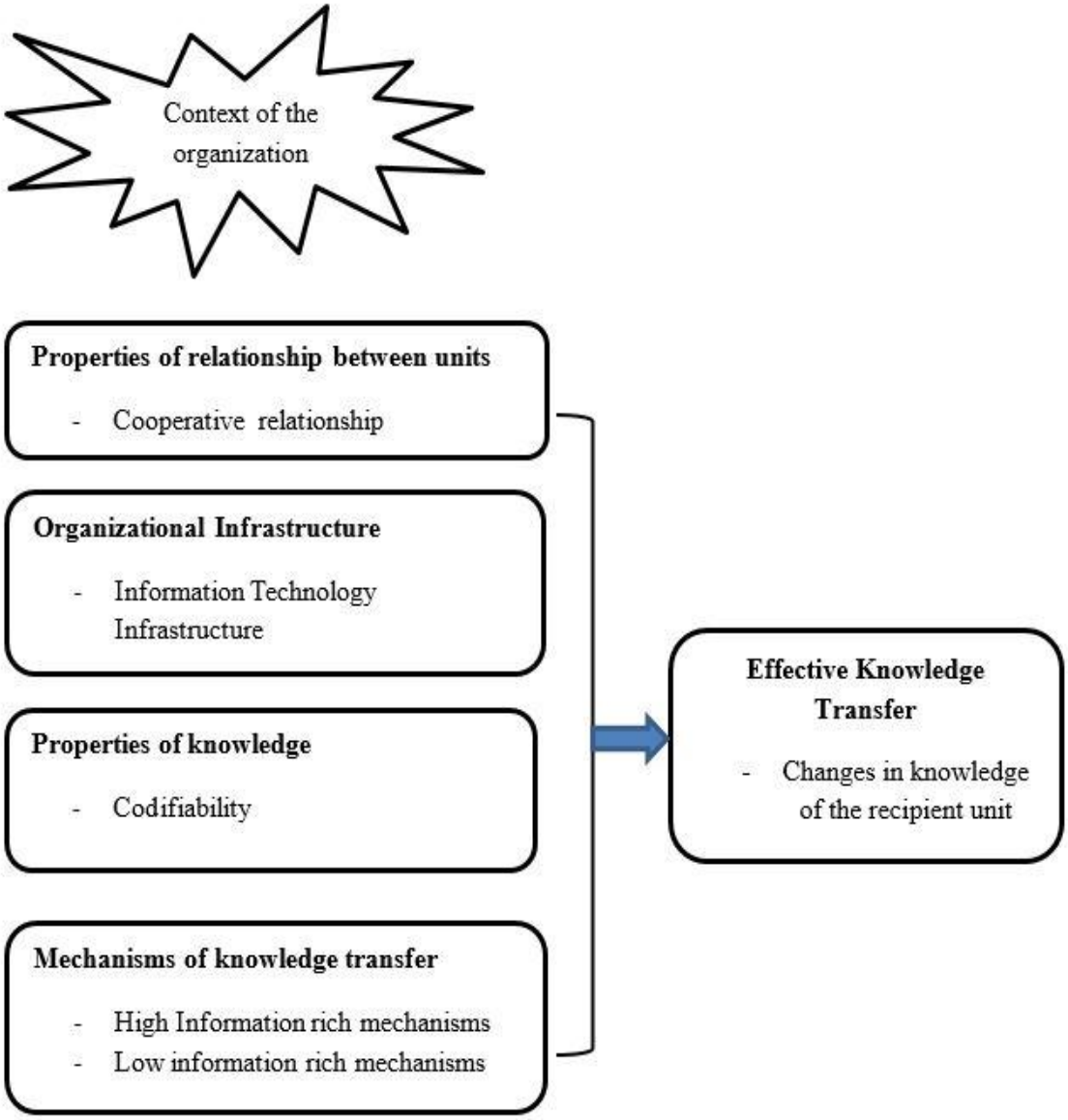

Figure 2.11: The Research model

CHAPTER THREE

3. METHODOLOGY

This chapter presents the methodology followed to achieve the objective of the study. First, we provide an overview of the study area and the purpose of the study. This is followed by formulating the Research approach and Research Design. To conduct survey, study population, sampling method as well as the data source are defined. Finally, to prepare questionnaire for data analysis the selected research model with the formulated hypotheses is presented.

3.1. Study Area

Together with the research unit, the sugar academy, an intermediary inside the ESC has been making their endeavor to facilitate the implementation of knowledge transfer activities of agriculture and factory operation units of the ESC. Nevertheless, organizational setup, lack of technological facilities and other factors are hindering existing knowledge transfer system to make the work force more capable with the skill and knowledge required by the ESC. The premise of this thesis believes not only those antecedents mentioned in the report (Ethiopian Sugar Development Agency, 2007) have been impeding the KT practices (research collaborations, consultancy and training) but there are also other underlining challenges in the phenomenon. The research unit and the knowledge academy of ESC consists of about 61 researchers and professional trainers. Operating unit's middle managers actively involved in and core process of the sugar industry and KT activity with the research unit numbered 101 on average in each factory. These two teams make up a composition of 44.7% and 55.3% respectively.

3.2. Research Approach

Research approaches are plans and the procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation. It is an effective strategy to increase the validity of research (Creswell et al., 2017).

According to, Cohen et al. (2007) individuals attempt to understand the world using two types of thinking: inductive and deductive thinking. Hyde (2000) defined Inductive approach as a theoretical process which begins with the observation of certain instances and attempts to establish a generalization of the phenomenon studied. Conversely, a deductive approach begins with a known theory and applies it. For this research the deductive approach was used due to the fact that this study was grounded on a specific KT model (Goh, 2002).

MacDonald et al. (2008) stated, while conducting any type of research, researchers must either calculate things or have a conversation with individuals. From this, two types of research methods can be identified, namely quantitative and qualitative. Quantitative measurement is based on measurement of quantity or amount qualitative on the other hand is based on quality or kind (Kothari, 2004, p. 95). This research is a quantitative one, which follows a survey research method.

3.3. Research Design

Blanche et al. (2006, p. 34) defined research design as a strategic framework for action that serves as a bridge between research questions and the execution or implementation of the research. “A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure” (Selltiz, 1959).

It is used to guide research by defining the goal and purpose of a study. The framework guides a researcher in how data is collected, analyzed, and translated (Creswell et al., 2017). A research plan is divided into three types: descriptive, exploratory and causal. A descriptive research approach uses information from other studies, panels, analyses, and observation. In contrast, an exploratory research approach entails the use of surveys, case studies, information from other studies, and qualitative analyses. This research uses descriptive correlational approach and a survey method as it attempts to investigate relationship between two or more variables.

Correlational research is a type of research method in which two variables are examined in order to establish a statistically equivalent relationship between them. The goal of correlational research is to identify variables that have a relationship in that a change in one result in a change in the other (Kumar, 2018).

3.4. Study population and sampling

A research population is a well-defined collection of all the objects, individuals or members that are well-known to have a common binding characteristic or feature (Jha, 2014, p. 182).

The study population for this research is defined as all 101 researchers, coordinators, professional trainers who are currently employed in the Ethiopian Sugar Industry Research Unit. The study will involve the entire population (census) because the size of the population that the research focused is typically very small. If the study population is relatively small, we may choose not to sample but to examine the entire population (Jha, 2014, p. 187).

3.5. Data collection procedure

Based on the above distribution plan, the actual primary data has been collected from ESC head office and Wonji-Shoa sugar factory from August 13 up to August 20, 2021 for about a week.

There are two main types of data sources: primary and secondary. Primary data are those collected at first time , and has original in character secondary on the data other hand those already been collected by someone else (Kothari, 2004, p. 95). In this study, primary and secondary data sources were employed to gather the necessary data from ESC where a long-term relationships between industrial research and industrial operations basis for working together.

The sources of data, for this study, were both primary and secondary sources of information. For the primary sources, structured questionnaire used. To draw secondary sources of data, interview and both published and unpublished sources were also consulted.

This research collected empirical information by conducting a survey with target groups regarding the KT process and afterwards theory were applied and analyzed. The Questionnaire distributed for the respondents through paper-based formats and hand in hand.

The questionnaire concentrates on relevant questions and issues surrounding knowledge transfer, which draw on other studies on critical factors of effective and successful knowledge transfer. The measurement items of the variables adopted from the existing scales as shown below in Table 3-1.

Table 3-1:The measurement items of the variables adopted from the existing scales

Construct	Source
Information Technology Infrastructure (ITI)	(Rhodes et al., 2008b)
Cooperation (COP)	(Pais et al., 2014)
Knowledge Codifiability (KCD)	(Cantú et al., 2009b)
Knowledge Transfer Mechanisms (KTM)	(Windsperger et al., 2008)
Effective Knowledge transfer (EKT)	(Argote & Ingram, 2000)

Following this effort, multiple indicators (observed items) of 15 constructs (latent variables) of interest developed to address the research questions. (Table 3-2). The scale cooperation extracted from Pais et al. (2014) which validated the extent to which the respondent viewed his her or his group as the two units cooperative. The scale Information technology infrastructure consists four items extracted from (Rhodes et al., 2008a). They measure such as ‘we use database-oriented applications regularly in our daily operation’; ‘We have integrated Information system applications encompassing different functional areas’. The scale Knowledge codifiability from Cantú et al. (2009a) consists of three items which measures the degree to which the sugar industry knowledge can be encoded.

Table 3-2: Variables and constructs items

Constructs	Item Code	Items
COP	**COP1**	We shared a vision about what we were trying to accomplish.
	COP2	We openly shared information with one another.
	COP3	We shared credit for success with one another.
	COP4	We tried to reach a consensus on important decisions.
ITI	**ITI1**	We use database-oriented applications regularly in our daily operations.
	ITI2	We have integrated Information system applications encompassing different functional areas.
	ITI3	We frequently use electronic technologies (e.g., Internet browsers, email, etc.) to accomplish our tasks.
KCD	**KCD1**	A useful manual or document describing my area of expertise could be easily
	KCD2	Extensive documentation describing critical parts of my area of expertise exists in our industry.
	KCD3	Standardized procedures for applying my expertise to address applied problems could easily be developed.
KTM	**H-IRM**	We used intranet and internet, fax, telephone etc. largely.
	L-IRM	We used initial and annual training, conference meetings, and video conferencing largely.
EKT	**EKT1**	By acquiring, the transferred knowledge from the research unit and the operating unit's professional knowledge is significantly enriched.
	EKT2	By acquiring the transferred knowledge from the research unit, the operating units are resulting in new way of doing things.
	EKT3	By acquiring, the transferred knowledge from the research unit and operating unit's knowledge of sugar production is significantly increased.

The last item knowledge transfer mechanism by Windsperger et al. (2008), measure the extent respondents use higher or lower IR knowledge transfer mechanisms. The use of multiple-item measures enhances confidence that the measurement of the research construct will be consistent (Churchill Jr, 1979).

In this study, all measures assessed via a five-point interval scale ranging from '1 = strongly disagree' to '5 = strongly agree'.

3.6. Research Model and Hypotheses Development

This section proposes a research model, which posits factors influencing effective knowledge transfer in between the Research unit and operating units of the ESC. Figure 3.1 displays the research model that guides the execution of the study. The conceptual model is a result of a combination of three theories and models from Duan et al. (2006) and Goh (2002) with modifications to fit the needs of the study. The model consists of six variables (5 independent and 1 dependent variable) and five relations as shown in the Figure 3.1.

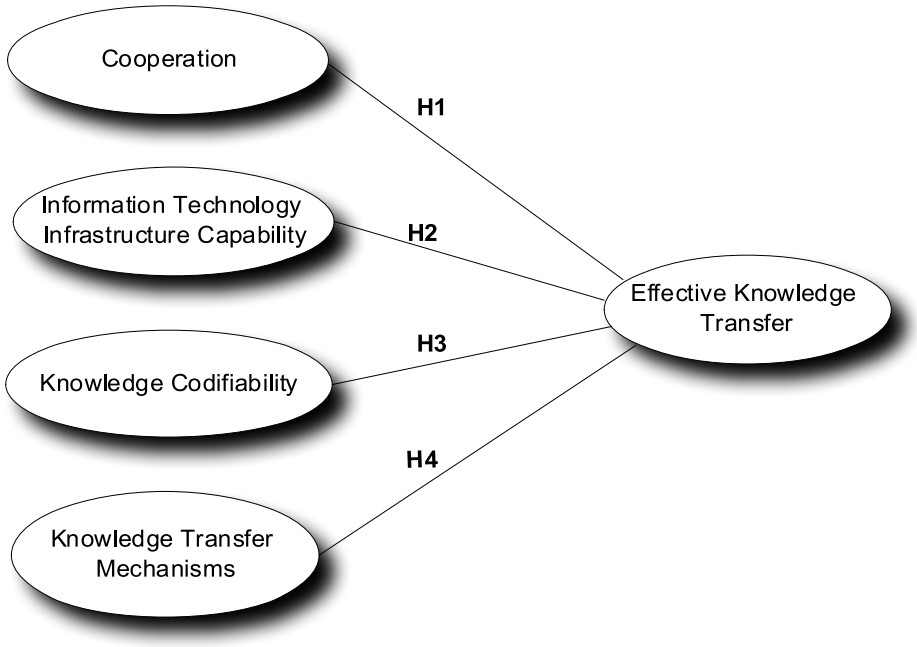

Figure 3.1: Conceptual model of factors influencing KT process by the research unit to production units - Adapted from Goh (2002)

i. Cooperation (COP)

The term cooperation on the other hand is related to and occurs when entities work together in order to reach a given common goal (Dzaldov, 2015, p. 49). Thus, willingness to cooperate mean individual and collective commitment in order to achieve organizational goals.

Theory of synergy reveals collaboration helps form a “1 + 1 >2" result, generating surplus value by synergistic action (Cheng et al., 2020). Triandis, (Triandis, 2001) added that, a strong willingness to collaborate promotes knowledge to transfer, making it easier for individuals to cooperate and improve the efficiency of knowledge collaboration.

Organizations, which have built mutual trust, are honest to each other. These organizations have full faith in each other’s resource and motivation, which means cooperative relationship, is more transparent (Nielsen, 2004). In such a way, knowledge stickiness is weakened and efficiency of knowledge transfer is enhanced. Based on this, this research hypothesizes:

H1: The cooperation between the research unit and operating units positively influence effectiveness of knowledge transferring by the research unit in ESC.

ii. Information technology infrastructure capability (ITI)

Information technology has created new means of knowledge transfer as knowledge can now be transferred faster and between a larger number of organizational members.

Groupware applications and intranets that have features such as transferred databases, collaborative spaces, advanced communication features, and expertise databases help to achieve this or possess relevant or required knowledge (Dorn et al., 2011).

Information technology is generally used for managing and codifying knowledge as well as creating networks. According to Phang et al. (2010), effectiveness of information technology in supporting knowledge transfer might to a great deal depend on the type of knowledge that is to be transferred. Most commonly, information technology is used to facilitate the capture, storage, retrieval and distribution of explicit knowledge, in order to make explicit knowledge even more accessible and more transferable (Sanchez, 2004). Thus, instead of codifying tacit knowledge, companies should utilize information technology to bring people together in sharing tacit knowledge without having to make it explicit. Based on this, the research hypothesizes:

H2: Information technology infrastructure positively influence knowledge transferring by the research unit to the operating units in ESC.

iii. Knowledge Codifiability (KCD)

Kogut et al. (2003) suggest three attributes of knowledge that affect KT as codifiability, teachability and complexity. Codifiability is the degree to which knowledge can be encoded (Edmondson et al., 2003). It refers to the ease by which knowledge is expressed in language, formal procedures, explicit techniques and manuals and computer programs (Zhang et al., 2004). The likelihood of KT increases with the degree to which knowledge can be codified and thought. This study proposes the following hypothesis for the KCD.

H3: *Knowledge characteristics of the sugar industry and its codifiability positively influence knowledge transferring by the research unit to the operating units in ESC.*

iv. Knowledge Transfer Mechanism (KTM)

Information richness theory (IR-theory) examines the question, which communication (knowledge transfer) mechanisms are effective under different degrees of ambiguity (or equivocality) of the communication task (Daft et al., 1983). "Richness" consists of four attributes of the communication mechanism: feedback capability, availability of multiple cues (voice, body, gestures, words), language variety, and personal focus (emotions, feelings) (Sheer et al., 2004). The more of these attributes a mechanism possesses, the higher is the degree of IR of the mechanism, and the greater is their capacity to handle ambiguity and hence the knowledge transfer capacity (Windsperger et al., 2008).

According to Daft et al. (1987) knowledge transfer mechanisms with a high degree of IR refer to face-to-face interactions and team-based mechanisms (meetings, trainings, seminars, workshops, visits) and knowledge transfer mechanism with a low degree of IR refer to written media, manuals, reports, data base and written instructions. Face-to-face is the richest communication mechanism because it has the capacity for direct experience, multiple information cues,

immediate feedback and personal focus. On the other hand written impersonalized documents, like standardized computer reports, databases, computer prints, are the media with the lowest information richness level. Face-to-face is the richest. Information richness is measured by the extent to which the employees use intranet and internet, fax, phone, initial and annual training, annual meetings between the research unit and operating units.

A hypothesis derived based on this:

> *H4: The knowledge transfer mechanisms positively influence effective knowledge transferring by the research unit to operating units in ESC.*

v. Effective Knowledge Transfer (EKT)

Argote and Ingram define knowledge transfer as the 'process through which one network member is affected by the experience of another. Knowledge transfer manifests itself through changes in knowledge or performance of the recipient unit' (Argote & Ingram, 2000, p. 151).

KT ranks as one of the top activities in the hierarchy of organizational tasks that enhance competitive advantage of firms (Jasimuddin et al., 2019). The availability of this potentially useful know-how facilitated by KT involves a dyadic relationship between the source and the recipient (Danis et al., 2012).

For the purpose of the study, effective KT is defined as the level of transferring necessary knowledge, technology and know-how from the research unit to the operating units in ESC, using an appropriate transfer mechanism that can bring performance and productivity improvement.

Effectiveness of KT (EKT) in organizations can be assessed through measuring changes in the knowledge of the recipient unit (Argote & Ingram, 2000). They posits further most of knowledge transfer research has adopted a "source and recipient" generic model.

3.7. Data analysis methods and procedures

The primary data was analyzed by using SmartPLS 3.0 student version developed by (Ringle et al., 2012). PLS is a structural equation model (SEM) based components or variants (variance). PLS is an alternative approach that shifts from SEM-based approach to a covariance based variant. In general covariance-based SEM is to test the causal relationship theory, while PLS is a more predictive model (Hair Jr et al., 2014). An SEM structural model is used to capture the causal influences (regression effects) of the exogenous variables on the endogenous variables and the causal influences of endogenous variables upon one another (Golob, 2003).

In this study four exogenous variables: COP, ITI, KCD, KTM and 1 endogenous variable: EKT are identified.

Prior studies appearing in scholarly journals including those more critical of the PLS-SEM method indicate that PLS-SEM overcomes problematic model identification issues and that it is a powerful method to analyze complex models using smaller samples (Reinartz et al., 2009).

According to Ringle et al. (2012) PLS-SEM can indeed be a "silver bullet" in research situations with models that are relatively complex and representative sets of data are rather small. Hence, it may be reasonable to mention the appropriateness of this technique for this research dealing with limited population. Nevertheless, like any other statistical technique, PLS-SEM is not immune to threats from data inadequacies and researchers should make every effort to provide support for its statistical power in the research setting at hand with, the identification and treatment of outliers and other influential observations or the handling of missing values.

CHAPTER FOUR

4. DATA ANALYSIS AND DISCUSSION

This chapter discusses the overall process of data analysis including data preparation (preprocessing), data processing and analyzing results. The statistical analysis presented in the first part is descriptive that quantifies respondents' demographic and topic related characteristics. In the main analysis part, both structural and measurement model results have been presented and discussed. To perform main data analysis, a datasets were formed based on the respondents' response on the questionnaire.

4.1. Data Preparation

During data preparation, the data which have been collected from a cross-sectional survey using structured close-ended questionnaires were coded in to computer using google forms and google sheets. Google form was preferred for easily inserting and retrieving of data using forms and saving outputs to other statistical tools' file formats. Thus, the primary data collected and inserted to Google is saved in spread sheet (.xls) file format and the result screened. Following this response items presented in text format for respondent's easy understanding, all were converted to numerical values as only numbers are treated well by SmartPLS data analysis tool.

Two questionnaires with straight lining responses and three questionnaires with missing values of more than two items rejected. As Hair et al. (2019, p. 68) suggested, the amount of missing value should not be more than 15%. After this filtration, 87 responses out of 101 distributed questionnaires were considered valid for further data processing that makes 86.13% valid response rate.

This step is then followed by descriptive analysis of the demographic data of respondent and determining of basic frequency based statistical measures file using and importing to Statistical Package for Social Science Students (SPSS) version 21-tool.

Four missing values handled with mean replacement mechanism as Wong (2013) suggested and complete dataset then saved in .csv file format.

4.2. Respondents' Profile

The respondent's demographic detail consists of three characteristics that includes Level of education, work experience and his area of work focus. All the three characteristics were directly responded by the respondents.

The respondents were selected from the ESC research units and operation units. The research department consists of coordinators, researchers and professional trainers from the offices located in Wonji. The operating department respondents were middle level managers employing in ESC's and Wonji Sugar Factory (WSSF) core business process or operations units. Support units of the ESC were not included in this study, as they have not accounted actively in the KT process. Moreover, except WSSF the other 13 factories are not be involved in this study as most of them are found in remote districts of the country and due to constraints of time and security to reach them out in the study period.

Table 4.1 shows that, 54% of the respondents were with educational level of Postgraduate degree, 46% of the respondents were university degree, 55% were engaged in research and training activities, 45% were engaged in operation management activities. Furthermore, most of the respondents had more than 5 years of professional work experience in the sugar industry, which is an indication of the good response rate, as the respondents have related experience of the subject area.

Table 4-1: The Socio-demographic characteristics of the respondents

Respondents' Profile		Number	Percent (%)
Educational Level			
	Postgraduate degree	52	54.2
	University degree	35	45.8
Area of work focus			
	Production	47	55.3
	Research	40	44.7
Working experience in the sugar industry			
	2 - 5 years	4	4.7
	More than 5 years	83	95.3

4.3. Data Analysis

In the analysis by PLS, there are three things done. First, model specification, second, assessing the outer model or measurement model, and the third, assessing the inner model or structural model (Ringle et al., 2012). Assessment of outer model is a test of reliability and validity of research variables. There are three criteria to assess the outer model, i..: the convergent validity, discriminant validity, and composite reliability. Assessment inner model or structural model made is to look at the relationship between constructs, significance values, and R-square of the research model (Chin, 1998).

4.4. Reliability and Validity

Reliability and validity are the two most important and fundamental characteristics of the evaluation of any measuring instrument or tool for good research. Validity is about what an instrument measures and how well it is doing. Reliability on the other hand concern with faith, that one can have in the data obtained from the use of an instrument (Mohajan, 2017).

4.5. Content validity

Content validity is defined as "the degree to which items in an instrument reflect the content universe to which the instrument will be generalized" (Boudreau et al., 2001). In the field of IS (Information Systems), it is highly recommended to apply content validity while the new instrument is developed. In general, content validity involves evaluation of a new survey instrument in order to ensure that it includes all the items that are essential and eliminates undesirable items to a particular construct domain (Lewis et al., 2005). The judgemental approach to establish content validity involves literature reviews and then follow-ups with the evaluation by expert judges or panels.

In order to ensure the construct validity of the instruments an exhaustive literature reviews to extract the related items done and all the items adopted from tested scales and items.

4.6. Assessment of the outer model (measurement model)

The analysis of the measurement model is required to ensure the reliability and validity before drawing any conclusion (Hair et al., 2019).

To analyze the measurement model individual item reliability, internal consistence and discriminant validity are tested (Table 4.2).

4.6.1. Individual Item Reliability

Individual item reliability has been tested by examining the individual loadings of the measures to see the links between measures and factors. According to Hair et al. (2019), factor loading estimate should be higher than 0.7. This study chosen 0.7 as cut off for factor loadings. Thus all 15 items loaded satisfactorily.

4.6.2. Convergent Validity

Convergent validity is the extent to which the construct converges to explain the variance of its items.The metric used for evaluating a construct's convergent validity is the average variance extracted (AVE) for all items on each construct.

Table 4-2: Indicators, loadings (λ), Compose Reliability (CR), and Average Variance Extracted (AVE) of results of the model

LV Indicator	Indicator	Indicator Reliability Outer Loadings (λ)	Convergent Validity (AVE)	Composite reliability (CR)	Discriminant validity Square roots of AVE
EKT	EKT1	0.92	0.80	0.92	0.89
	EKT2	0.92			
	EKT3	0.83			
ITI	ITI1	0.80	0.61	0.82	0.78
	ITI2	0.76			
	ITI3	0.78			
KCD	KCD1	0.78	0.67	0.86	0.82
	KCD2	0.82			
	KCD3	0.86			
KTM	L-IR	0.84	0.65	0.79	0.81
	H-IR	0.87			
COP	COP1	0.74	0.62	0.87	0.79
	COP2	0.73			
	COP3	0.83			
	COP4	0.84			

To check the convergent validity, each latent variable‘s Average Variance Extracted (AVE) has been evaluated. From table 4.2 it was found that all the values of AVE are greater than the acceptable threshold of 0.5 (Hulland, 1999). Hence the convergent validity has been confirmed.

4.6.3. Composite reliability

According to McDonald (1996) when parameter estimates from a structural equation model are reported, it is common to report the reliabilities of the constructs represented in the model. Cronbach (1951) coefficient alpha is a popular measure for composite reliability assessment. Hair Jr et al. (2014) argued that composite account the different indicator loadings, which is consistent with a PLS algorithm (McDonald, 1996). In PLS analysis, it is required that the

composite reliabilities of each construct to have value above 0.7 (Hulland, 1999). Thus All the constructs to load composite ratio (CR>0.7) confirmed, as shown in table 4.2.

4.6.4. Discriminant validity

Discriminant validity also captures some of the aspects of the goodness of fit of the measurement model, i.e., how well the measurement items relate to the constructs. Discriminant validity is shown when each measurement item correlates weakly with all other constructs except for the one to which it is theoretically.

In this study, the discriminant validity tested based on Fornell and Larcker criterion and cross loadings. The first method compare the square root of the AVE with the correlation of the latent constructs (Hair Jr et al., 2014). A latent construct should explain better the variance of its own indicator rather than the variance of the latent constructs. associated (Gefen et al., 2005).

Table 4-3: The summary of the correlations

	COP	EKT	ITI	KCD	KTM
COP	0.79				
EKT	0.37	0.89			
ITI	0.38	0.24	0.78		
KCD	0.30	0.26	0.31	0.82	
KTM	0.28	0.31	0.34	0.21	0.81

Table 4.3 above shows that all of the correlations were smaller relative to the squared root of average variance exerted along the diagonals, implying satisfactory discriminant validity. This proved that the observed variables in every construct indicated the given latent variable confirming the discriminant validity of the model.

Table 4.4 above shows that the cross-loading of all observed variables was more than the inter-correlations of the construct of all the other observed variables in the model. Therefore, these findings confirmed the cross-loadings assessment standards and provided acceptable validation for the discriminant validity of the measurement model. As a result, the suggested conceptual

model was supposed to be acceptable, with confirmation of adequate reliability, convergent validity, and discriminant validity and the verification of the research model.

Table 4-4: The cross-loading assessment

	COP	EKT	ITI	KCD	KTM
C0P1	0.74	0.22	0.20	0.13	0.18
C0P2	0.73	0.29	0.34	0.29	0.40
C0P3	0.83	0.22	0.33	0.24	0.23
C0P4	0.84	0.38	0.31	0.25	0.11
EKT1	0.34	0.92	0.23	0.26	0.32
EKT2	0.35	0.92	0.24	0.23	0.32
EKT3	0.31	0.83	0.17	0.19	0.15
ITI2	0.34	0.18	0.80	0.20	0.16
ITI3	0.24	0.15	0.76	0.18	0.27
ITI4	0.30	0.23	0.78	0.32	0.35
KCD1	0.16	0.14	0.31	0.78	0.25
KCD2	0.34	0.21	0.17	0.82	0.19
KCD3	0.22	0.25	0.30	0.86	0.12
H-IRM	0.20	0.29	0.22	0.19	0.89
L-IRM	0.27	0.19	0.36	0.14	0.72

4.7. Assessment of the inner model (structural model)

The measurement model was confirmed to be valid and reliable. The next step was to measure the Inner Structural Model outcomes. This included observing the model's predictive relevancy and the relationships between the constructs.

Hair et al. (2019) stated variance inflation factor (VIF), coefficient of determination (R^2), Path coefficient *(ß* value) and T-statistic value, Effect size *(f^2)*, the Predictive relevance of the model (Q^2), the q^2 effect size are the key standards for evaluating the inner structural model.

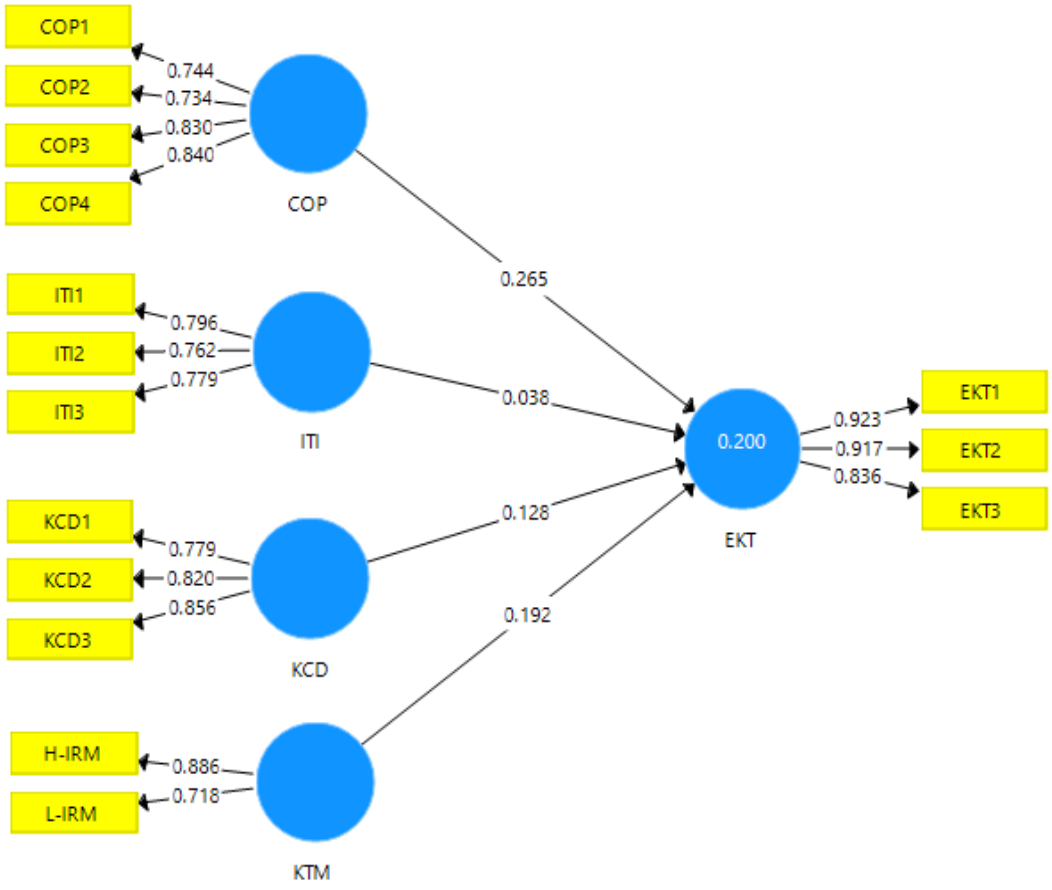

Figure 4.1: Influencing Factors of EKT by ESC research unit to production unit

4.7.1. Variance inflation factor (VIF)

The term VIF denote the degree to which the standard error has been increased due to the presence of collinearity (Hair et al., 2019). A VIF value of 5 and higher respectively indicate a potential collinearity problem and also an indication of common method bias (Kock, 2015). The result report in Table 4-5 shows VIF values between constructs are uniformly below the threshold value of 5, therefore ensured no collinearity issues.

Table 4-5: VIF values of the constructs

	VIF
COP	1.25
ITI	1.31
KCD	1.16
KTM	1.17

4.7.2. Measuring the Value of R^2

In PLS structural model, R^2 is an important criterion and is usually termed as coefficient of determination. It shows how much of variation in the models endogenous construct is described by the model's exogenous construct ().

Some authors such as Falk et al. (1992) regarded a value of at least 0.10 for the construct to be adequate and Cohen (1998) suggest 0.13 or above to be a moderate level of explanation of variance within a model. Other author regarded high levels of R square such as 0.19 Chin (1998) or 0.25 Hair et al. (2019) to provide a weak explanatory power only. However the acceptable range for value of R^2 is determined by the research context (Henseler et al., 2009). In some disciplines such as consumer behavior, value of 0.2 is considered high. While in academic research that focus on marketing 0.75, 0.50 and 0.25 are described substantial, moderate, and weak explanation of endogenous construct respectively.

In this study, the four independent constructs (COP, ITI, KCD and KTM) explain the model of effective knowledge transfer 20% variance for the sample. Thus R^2 value for the data sample indicate that the conceptual model is not substantial.

4.7.3. Measuring the Effect Size (f^2)

The f^2 is the degree of the impact of each exogenous latent construct on the endogenous latent construct. When an independent construct is deleted from the path model, it changes the value of the coefficient of determination (R^2) and defines whether the removed latent exogenous construct

has a significant influence on the value of the latent endogenous construct. This measure is referred to as the f^2 effect size. The effect size can be calculated as:

$$f^2 = R^2_{included} - R^2_{exluded}/1 - R^2_{included}$$

Guidelines for assessing the f^2 values are 0.35 (strong effect), 0.15 (moderate effect), and 0.02 weak effect (Cohen, 1992). Accordingly, the predictor variables for the data is weak to strong.

Table 4-6: Measuring the Effect Size

Exogenous Latent Variables	Effect Size f^2	Total Effect
COP	0.06	Weak
ITI	0.00	No effect
KCD	0.02	Weak
KTM	0.04	Weak

4.7.4. Predictive Relevance of the Model (Q^2)

Q^2 statistics are used to measure the quality of the PLS path model, which is calculated using blindfolding procedures (Tenenhaus et al., 2005) and cross-validated redundancy was performed with omission distance (D) value 7. The Q^2 criterion recommends that the conceptual model can predict the endogenous latent constructs. The resulting Q^2 values larger than 0 indicate that the exogenous constructs have predictive relevance for the endogenous construct under consideration.

Q^2 values of the blindfolding procedure for this study model was equal to 0.12, which was larger than the threshold limit, and supports that the path model's predictive relevance was sufficient for the endogenous construct for all cases.

The relative impact of the predictive relevance can be assessed by means of the measure q^2 values of 0.02, 0.15, and 0.35 reveal a small, medium, or large predictive relevance of a certain latent variabl (Hair et al., 2019) . Thus *q2* value calculated manually.

$$q^2 = (Q \text{ included} - Q^2 \text{ excluded}) / (1-Q^2 \text{ included})$$

Values of q^2 0.02, 0.15 and 0.35 revealed that, small, medium or large predictive relevance of a certain latent variable (Hair et al., 2019). Accordingly, the relative predictive relevance to be medium for all constructs of the model.

Table 4-7: Relative predictive relevance (q^2)

Exogenous Latent Variables	q^2
COP	0.26
ITI	0.25
KCD	0.27
KTM	0.28

4.7.5. Estimation of Path Coefficients (ß) and T-statistics

The path coefficients in the PLS and the standardized *ß* coefficient in the regression analysis are similar (Hussain et al., 2018). The *ß* refer the expected variation in the dependent construct for a unit variation in the independent constructs. The greater the *ß* value, the more the substantial effect on the endogenous latent construct (Kock, 2015). The *ß* values of every route in the hypothesized model was estimated, However, the *ß* value had to be verified for its significance level through the T-statistics test.

The absolute magnitude of the path coefficient indicates the relationship strength in which (Henseler et al., 2009) argued that path coefficients should exceed 0.1 to account for a certain impact within the model. Furthermore, the path coefficients should be significant at least at .05 which can be measured by using t-values in bootstrapping technique (Urbach et al., 2010).

When observing table 4-8 below, the relationship between COP and EKT, the path coefficient was 0.27 and the t-value was 2.94. These two drivers positively and significantly correlated, so H1 was accepted. Increasing ITI have positive impact on EKT represented by path coefficient at 0.04 (t = 0.34) but low magnitude and very insignificant. Therefore, H2 was not accepted.

Table 4-8: The summary of bootstrapping method T-statistics values for each construct

Hypothesized Path	Path coefficient	T Statistics	P Values	Decision
COP -> EKT **(H1)**	0.27	2.94	0.00	Accepted
ITI -> EKT **(H2)**	0.04	0.34	0.74	Not Accepted
KCD -> EKT **(H3)**	0.13	0.97	0.33	Not Accepted
KTM -> EKT **(H4)**	0.19	1.67	0.10	Not Accepted

Increasing KCD have positive impact on EKT represented by path coefficient at 0.13 (t = 0.97). However, it is not significant. Therefore, H3 was not accepted. Increasing KTM likely to have positive impact on EKT represented by path coefficient at 0.19 (t = 1.67) but not significant. Therefore, H4 was not accepted.

4.8. Guideline to improve KT practices

This study shows a need for some intervention to improve effective KT. Focus should be place and actions to be taken to factors related to the links (relationships), channels (transfer mechanisms) and documentation or codification process. The following guideline suggested to improve the KT practices and to design requirements in consultation with literature and the constructs considered.

Table 4-9: Guidelines to improve the research center KT practices

Variable	Result	Intervention
Cooperative relationship	Significantly and positively influencing the KT practices	• Develop and executes the research center's KM strategy in respect of working with the sugar industry units and users of research results • Increase impact by encouraging using computer supported cooperative work, • Establish relationships, create trust and facilitate the process of managing collaborative research.
Information Technology Infrastructure	Positively affecting the KT practices but its influence is insignificant	• Ensure availability of well local area and wide area networks, • Ensure availability and utilization of Intranet, • Develop a website, portals • Provided employees with email facilities • Establish knowledge-based systems that facilitate knowledge capture and storage
Knowledge Codifiability	Positively affecting the KT practices but its influence level is insignificant	• Collect explicit knowledge in distributable documents systematically • Familiarize with existing knowledge, procedures etc. • Allow and encourage employees to search for and retrieve codified knowledge • Use knowledge repository • Appoint chief knowledge officer (KCO) - his roles include championing knowledge management, managing knowledge mapping, integrating the organizational and technological resources and ensuring meaningful use of the knowledge repository • keep research results and documents confidential

Variable	Result	Intervention
Knowledge Transfer Mechanisms	Positively influencing the KT practices but its level is insignificant	• Increase use of communication mechanisms such as : face-to-face conversation, storytelling, shared experiences, teamwork, learning by examples, • Use application of interactive tools such as video-conferencing, knowledge mapping, recording the stories and experiences of experts and researchers on video • Use application of integrative tools, cross-functional information systems • Facilitate online collaboration through KT mechanisms such as Moodle tools. • Disseminate new knowledge through social networks and virtual workspaces.

4.9. Interview results

Respondent were requested to explain the knowledge transfer process of ESC research unit. To this end, the responses of three respondents are presented as follows:

> *"peer review, demonstration, scale-up, impact and training are the components of the knowledge transfer process in ESC research unit. The unit uses annual forum/reviews, meetings, conferences,seminar, workshops, demonstrations, trainings journals, publications (leaflets, brochures), personal communication, consultation, extension, advisory services and Personal and informal conversations for transferring knowledge to production units. But, the most knowledge transfer mechanisms used are training, conferences/seminars, and demonstrations. "*

Another question raised for the interview respondents to answer was possible factors affecting the KT practices. With regard to this the respondent provided his responses as :

" Lack of resources/inputs, exposure to new ways of doing, experiences and skills seen as the most factors affecting the sender side or the research unit. Taking in to ownership of the research results seen as the most affecting factors of the receiver side (production unit). Management support, organizational structure and lack of knowledge management system, cultural researcher-practitioner are also the other limiting factor."

Another respondent answer to the questions what are the knowledge transfer mechanisms between ESC research and production unit what factors influence the transfer process as follows.

"Annual forums, extension services, demonstrations and trainings are the most frequently used transfer mechanisms. Focus to involvement of stakeholders and participation (particularly the production staffs) at the beginning of the research work is the major hindrance for transferring the results at the end."

Another respondent answer to the questions what would you suggest in order to improve the KT process between the research unit and production unit in ESC?

"Acknowledging the importance of knowledge transfer and continually improving its effectiveness remains critical in ESC. Researchers and operation managers need a two way dialogue in which the research result is made clear, accessible, and relevant to the operation units. In turn, the operation units must make their management needs and challenges clear, as these often initiate new developments in the research. It is also importance that the researchers who are producing new knowledge work actively to transfer that knowledge to other users. Communicating with the operation unit should be part of the overall KT process, and the research unit and its staffs should seek and use all available communication opportunities."

4.10. Discussions

The relationship between two units has a formal aspect, which is determined by the organizational structure and the role of each unit within the organization (Chenhall et al., 1986). The extent of this formal structure inhibit cross-functional interaction impedes knowledge transfer success (O'dell et al., 1998). On the other hand cooperative relationships are primary facilitating mechanisms for knowledge transfer; aligning distance cognitive bases, motivate in depth communication and two-way interaction (Squire et al., 2009). A departmental culture that values high participation, cooperation, interaction, and involvement within the group as well as with other groups will positively influence KT success (De Long et al., 2000). The posited and tested statement in this study confirmed and robustly supported this concept.

Information technology infrastructure capability fundamentally represent the assets of such as integrated systems, architectures, networks and databases (Bharadwaj, 2000). Using proper technology as a transfer medium facilitates the transfer of KT process and its effectiveness (Goh, 2002) stressed. Furthermore appropriate technological infrastructure plays critical role in managing codified knowledge by supporting key enabling processes: knowledge search, capture, storage, and presentation (Zack, 1999). The results of this study indicate ITI only explains 4% of the variance of the KT variable.

This study exhibited that ITI to have very limited impact on the knowledge transferring by the research unit to operating units in ESC. Part of the explanation for this might be inflexible structure impending knowledge transfer success, rendering the implementation of technology solutions problematic as (Barki et al., 2001) pointed out.

KCD is a measures of the level of tacitness of knowledge i.e. the degree to which it can be encode (Edmondson et al., 2003). Research is in agreement that codifiable knowledge is more easily transferred than non-codifiable knowledge (Kogut et al., 2003). The positive impact of codifiable knowledge on KT performance is partly of its clarity, relatively low transfer cost, and the applicability of associated routines (Dhanaraj et al., 2004). In this papers KCD explains on

average only to 12.8% of variance of the KT indicate that codifiability of the sugar industry knowledge to have positively but insignificant impact on KT practices.

An effective knowledge transfer requires a fit between IR of the communication mechanism and the information processing requirements of the task (Sheer et al., 2004). The higher is the degree of IR of the mechanism, the greater is their capacity to handle ambiguity and hence the knowledge transfer capacity (Windsperger et al., 2008). In this study the the impact of H-IRM on EKT is positive supporting the hypothesis posited and approach to significance. Both the quantitative and qualitative result shows that ESC research unit use H-IRM such as (extension service, annual conferences and demonstrations) as most frequent transfer mechanism, which might be helping the KT process.

CHAPTER FIVE

5 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This study has focused on intra-firm knowledge transfer process and factors affecting knowledge transfer practice the ESC research unit to production unit.. It explores how knowledge is transferred between the units and what are the factors that affect the KT practices.

- One of the objectives of this study was to assess KT practices between ESC research unit and production unit. In this regard the finding of this study reveals that annual conferences and demonstrations identified as the frequently used KT mechanisms between ESC units.
- The second objective of the study was to identify factors influencing the effectiveness of KT practices in the two ESC units. In line with this, different questions under relationship, infrastructure capability and nature of knowledge and channel or media to the respondents forwarded. In this regard, the PLS analysis of the path analysis estimation result shows that cooperative relationship as the significant influencing factor followed by the transfer mechanism approach to influence the KT process. Whereas information technology capability and the nature of knowledge are not influencing the KT process at all in the ESC context.
- The interview of the respondents also identified taking in to ownership of the research results and absorptive capacity seen as the most affecting factors of the receiver side (production unit). On the other hand lack of resources/inputs, experiences and skills seen as the most factors affecting the sender side or the research unit. Leadership or management support, organizational structure and the difference in culture of the two units, the research and the production as (researcher-practitioner) mentioned also the other limiting factors."
- The result of the study provide more support for the idea that the social aspect of KM, cooperative relationship between intra-firm groups influences KT process significantly.

5.2 Recommendation

A recommendation for ESC is to closely assess, evaluate and monitor of the influencing factors and mechanisms of the KT process in its units aiming to improve its effectiveness and in order achieve a better success.

5.3 Future works

In interpreting the results of this study, some limitations have to be kept in mind. The study involved only employees of ESC in head office of Addis Ababa, research unit and WSSF of ESC. This means the study participants were geographically limited to nearby locales restricts the data from being a representative sample for broader application. Future research needs a more representative of all sugar factories.

R^2 value for the data sample indicate that the conceptual model seems low compared to some authors suggestion.Thus adding more independent variables or predictors to the model for further suggested increasing R^2 or predictive power of the model. In addition, there may be group differences and doing multi, group analysis (MGA) can give evidence for the cause of low prediction. Nevertheless, the findings of this study revealed that only weak variance in the factors are explained by the model, which demands further studies to identify other factors that yields significant variance.

The study suggest future research to extend the structural analysis mode adding more independent variables or predictors to the model and using other influencing factors in the KT dyad, such as culture, willingness to share, absorptive capacity etc.

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ANNEX

Section I: Introduction

Dear Respondent:

The purpose of this questionnaire is to collect data on the current practices and challenges of knowledge transfer in Ethiopian Sugar Corporation (ESC) as part of the fulfillment for the master of science in Information Systems. This study has a huge importance in contributing towards a better and inclusive understanding of the barriers to knowledge transfer in ESC. As such, the study is expected to contribute towards better usage of research knowledge to improve the sugar and associated products by ESC in particular and the sugar industry of the country in general. It also will have contribution to existing knowledge management theory. Your professional and honest response to the questionnaire will be indispensable to the success of the study. As a close-ended questionnaire, completing the questionnaire will take only about fifteen minutes of your time. If you have any enquire, you can contact the researcher at yihonalekye@gmail.com.

Direction:

This survey asks for your perception and experience about practices, challenges and factors of knowledge transfer in Ethiopian Sugar Corporation research activities. Because it asks for your judgment, there is no right or wrong answers. Please respond based on your own judgment, regardless of what others expect or what is socially acceptable. Your responses will be held in strict confidence and we guarantee complete anonymity. I would like to thank you for taking the time out of your busy life to respond to the attached questionnaire. Your answers are of the greatest importance to the success of this study. Please complete the questionnaire within three days.

Thank you for your time and effort.

Section II: Knowledge transfer study questionnaire

A. General information

Q.#	Question	Code
1	Level of education	☐1. Diploma ☐2. University degree ☐3. Postgraduate degree
2	Working experience in the sugar industry	☐1. Less than 6 months ☐2. 7 months -2 years ☐3. 2 - 5 years ☐4. More than 5 years
3	Your area of work focus	☐1. Research/Sugar Academy ☐2. Operations

No.	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
To what extent the research units and operating units cooperate each other?						
COP1	We shared a vision about what we were trying to accomplish.	☐	☐	☐	☐	☐
COP2	We openly shared information with one another.	☐	☐	☐	☐	☐
COP3	We shared credit for success with one another.	☐	☐	☐	☐	☐
COP4	We tried to reach a consensus on important decisions.	☐	☐	☐	☐	☐
No.	**Questions**	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

To what extent the following information technology infrastructure available in your firm.						
ITI1	We use database-oriented applications regularly in our daily operations.	☐	☐	☐	☐	☐
ITI2	We have integrated Information system applications encompassing different functional areas.	☐	☐	☐	☐	☐
ITI3	We frequently use electronic technologies (e.g., Internet browsers, email, etc.) to accomplish our tasks.	☐	☐	☐	☐	☐
To what extent the sugar industry knowledge can be encoded						
KCD1	A useful manual or document describing my area of expertise could be easily be developed.	☐	☐	☐	☐	☐
KCD2	Extensive documentation describing critical parts of my area of expertise exists in our industry.	☐	☐	☐	☐	☐
KCD3	Standardized procedures for applying my expertise to address applied problems could easily be developed.	☐	☐	☐	☐	☐
To what extent the following knowledge transfer mechanisms used between the research units and operating units.						
H-IRM	We used intranet and internet, fax, telephone etc. largely.	☐	☐	☐	☐	☐
L-IRM	We used initial and annual training, conference meetings, and video conferencing largely.	☐	☐	☐	☐	☐
No.	**Questions**	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

To what extent knowledge transferred by the research unit to ESC operating unit's is effective						
EKT1	By acquiring, the transferred knowledge from the research unit and the operating unit's professional knowledge is significantly enriched.	☐	☐	☐	☐	☐
EKT2	By acquiring the transferred knowledge from the research unit, the operating units are resulting in new way of doing things.	☐	☐	☐	☐	☐
EKT3	By acquiring, the transferred knowledge from the research unit and operating unit's knowledge of sugar production is significantly increased.	☐	☐	☐	☐	☐