Curtin Graduate Business School

Assessment of the relationship between Knowledge Management and Effectiveness of Intelligent Decision Support System (IDSS) in Iranian Banks

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DECLARATION

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Signature:

Shaghayegh Sahraei

December, 2015

DEDICATION

TO MY LOVING FAMILY

Husband: Mohammadreza Mohammadi

Parents: Ali Sahraei & Zahra Yarahmadi

Lovely Children: Yasamin & Parsa

Siblings: Shahin, Narges, Parastoo, Mostafa

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ABSTRACT

The application of Knowledge Management (KM) and Intelligent Decision Support Systems (IDSS) is extremely important to both economic and non-economic activities. Thus, researchers have increasingly focused on the relationship between KM and IDSS. Past studies have not clearly demonstrated the contribution that KM makes to the effectiveness of an IDSS. Thus, it is crucial to determine the impacts of KM on the effectiveness of an IDSS and on the quality of decisions that are made using IDSS.

This study has developed a comprehensive integrated research model focused on the effectiveness of IDSS and decision quality. Following a positivist research paradigm, this study employs a mixed-method research design. A preliminary conceptual framework is developed following an extensive literature review and is refined after results are obtained from an in-depth field study. The final research model comprises five constructs which involve both reflective and formative measures. Partial least squares (PLS)-based structural equation modelling is employed to test the theoretical model with a cross-sectional data set of 300 participants in Iranian banks. Survey data were collected using a structured questionnaire by applying a random sampling technique.

The data is analysed via PLS-based structural equation modelling (SEM). The results show that Problem Processing Systems, Human Judgment, and Knowledge Systems are important antecedents of an effective DSS. The study also finds that other significant antecedents of an effective DSS include: creating new knowledge, codifying the knowledge in the knowledge management systems and providing assistance with the search and retrieval of knowledge. The results also reveal the significant impact and effectiveness of IDSS factors on the quality of decision-making. Therefore, results suggest that the use of KM techniques can enhance a bank's performance if intelligent tools are integrated with the decision support system and appropriately utilized to improve decision quality. Decision makers, managers and analysts, interested stakeholders, policy makers and the government may follow the study's outcomes and focus on increasing the decision quality with a view to attaining superior organizational performance.

It is hoped that this study will encourage concerned banking firms to look at the features of a knowledge management and decision support systems with a view to achieving effective IDSS usage. The study also suggests some changes and modifications to the banks' existing policies and strategies. The Iranian banks and even the Iranian government and policy makers should undertake huge promotional programs to encourage employees to use intelligent tools and decision support systems to make high quality decisions. Offering specialized training programs for managers, decision-makers and analysts in this area may motivate them to use KM techniques to increase the effectiveness of IDSS and improve the quality of decision-making.

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Table of Content

List of Tables

List of Figures

CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

Knowledge management is a critical part of the organizational decision-making process and has been recognized as an important source of competitive advantage and value creation (Courtney 2001, 18). Although the anecdotal evidence suggests that KM provides significant advantages in effectively and efficiently managing organizations and contributing towards quality decision making, the contributions of KM have been questioned in several circles in recent years. For example, Tabrizi et al. (2011), Oppong, Yen and Merhout (2005) and Holsapple (2001) explain the advantages of the KM concept, KM productivity, and KM efficiency. But there is a lack of research into the direct or indirect impact of knowledge management on the quality of decisions that are made by firms and their representatives. Therefore, there is a gap in this area which is related to the impact of KM on the quality of decision-making within an organization as a result of its influence on the effectiveness of the information system of a company. To fill this gap, this research aims to assess the role of KM in achieving organization goals and improving the quality of decision-making. Moreover, this research also investigates the relationship between knowledge management (KM) and the effectiveness of Intelligence Decision Support Systems (IDSSs) within organizations. Using the banking industry in Iran as a field study, the research focuses specifically on the influential perceptions that are held by banking business managers, analysts and executives regarding knowledge management factors that impact on the effectiveness of IDSS in banking. Another important aim of this study is to determine the direct effect of KM on the quality of decision-making and banks' goals, and to investigate the direct relation between KM and quality of decision-making which can be so important for future decision-making research, processes and activities. This research is guided by the positivist paradigm and a two-phase mixed method approach that combines qualitative and quantitative approaches (Tashakkori and Teddlie 2009, 25). An initial research model is

developed based on a comprehensive literature review. A qualitative field study is then conducted to determine whether a relationship exists between knowledge management and the effectiveness of IDSS and quality of decisions in selected Iranian banks. Results from the qualitative phase are employed to improve measures and the data-gathering device (questionnaire) applied in the next stage of the quantitative procedure. A survey is then distributed to analysts, decision makers and managers in Iranian banks to collect relevant data which is analysed using Partial Least Square (PLS) based Structural Equation Modelling (SEM) (Barclay, Higgins, and Thomson 1995, 290). The proposed research contributes to existing decision-support literature that will help future KM and IDSS researchers specifically in the banking industry. In terms of practical application, governments, managers and decision-makers, especially in the Iranian banking industry can use this research to manage organizational knowledge and decision-support tools in order to improve the quality of decisions and achieve the organization's goals.

1.2 BACKGROUND OF THE RESEARCH AREA

The importance of obtaining new knowledge to improve organizational competitiveness is currently well accepted (Gray 2001, 87). Therefore, as knowledge management adds value to a company's intangible assets, many companies currently are concerned with managing knowledge both within their organization and externally for the benefit of customers and shareholders (Rubenstein-Montano et al. 2001, 6). Moreover, decision-making incidents can be explained as knowledge intensive processes which operate on and supplement organizational knowledge resources (Holsapple and Joshi 2001, 39). In addition, decision support systems (DSSs) execute some part of the knowledge management (KM) activities that are essential to these processes (Holsapple and Joshi 2001, 39). An intelligent decision support system (IDSS), which combines DSS with intelligent tools, is not intended to provide a substitute for the decision maker. It just helps organizations to making decisions more effectively (Quintero, Konare and Pierre 2005, 655). As DSS and IDSS are a special kind of Information System (IS), the most important theoretical background and basic model for this research is that of DeLone and McLean (DeLone and Mclean 2003, 10). DeLone and

McLean claim that the use of the system and its information products affect the individual user's work and, collectively, these individual components impact on the organization as a whole (DeLone and Mclean 2003, 12) . Therefore, according to this model, as the success of IS can be measured through its impact on user satisfaction and finally on organizational impact, the impact of effectiveness of IDSS (a specific kind of IS) could be measured by its effect on decision quality which is a very important organizational impact. The literature review below covers the essential domains of this research.

1.2.1 Knowledge Management

Knowledge management (KM) is an important concept in the domain of management science. Compared with the knowledge-sharing concept which has a long history in management practices, KM is a relatively new discipline in this area (Oppong, Yen, and Merhout 2005, 416). However, KM literature is already rich with a variety of conceptual papers that establish theoretical foundations for knowledge management (Guo and Sheffield 2008, 674). As more organizations have come to comprehend and value the crucial importance of promoting an environment in which knowledge is valued as the organization's most valuable asset, KM has developed rapidly (Oppong, Yen and Merhout 2005,414).

Knowledge management involves the conceptualization, review, consolidation and action phases of creating, securing, and combining, coordinating and retrieving knowledge. In essence then, knowledge management not only involves the production of information but also the capture of data at the source, the transmission and analysis of this data, and the communication of information based on or derived from the data to those who can act on it. Moreover, an important aspect of KM is its purpose. The aim of KM is to ensure that the right knowledge is available at the right times to the right entities in the right forms at the right costs (Holsapple 2001, 1); this is the core significance and value of KM. Knowledge management combines different concepts from multiple disciplines, including human resources management, information technology, organizational behavior, artificial intelligence, and the like (Liebowitz 2001, 1). Knowledge management (KM) and decision support (DS) provide opportunities to enhance business processes, to improve training

Programs , to improve workforce commitment and morale, to reduce many forms of risk, and to ultimately deliver financial benefits (Metaxiotis 2010, 121). From an organizational viewpoint, intellectual capital management (ICM), competitive intelligence and initiatives such as DSS are all under the umbrella of KM (Oppong, Yen, and Merhout 2005, 417). Importantly, KM captures tacit knowledge, retrieves explicit knowledge, contributes to the achievement of business objectives, and manages the knowledge repository.

In this millennium, KM plays a significant role in companies as it impacts on the effectiveness of DSSs and their managers by providing an access point to all relevant information, which facilitates faster and more accurate decision-making (Oppong, Yen, and Merhout 2005, 417). Although there is ample evidence indicating the close relationship between KM and DSS, there are insufficient empirical studies on the impact of KM on IDSS and the effectiveness of IDSS. Therefore, in this research, the relationship between KM and the effectiveness of IDSS is assessed in order to determine the extent to which the KM factor can improve or decrease the effectiveness of IDSS. As noted earlier, DeLone and Mclean's model of information system success is used as the basis for conceptualizing this relationship.

1.2.2 Decision Support System (DSS)

From the late 1960s, decision support systems (DSS) technology and applications have expanded significantly (Shim et al. 2002, 111). A decision support system (DSS) is a specific kind of information system (IS) that is intended to enhance managerial decision-making (Arnott and Pervan 2008, 654). A DSS can be described as a computer system that is suitable for solving semi-structured or unstructured problems (Shim et al. 2002, 112). DSSs have also played a strong role in IT-based decisions and activities with important impacts on an organization's nature and performance (Arnott and Pervan 2008, 654). Current DSSs expedite different decision tasks such as gathering and analyzing the information, building the models, conducting sensitivity analysis, cooperation, alternative evaluation, and decision- making (Bhargava, Power and Sun 2007, 1083). Shim et al. (2002, 112) have found that the most important issue in this area regarding information technology is its impact on the efficiency and effectiveness of decision-making.

The recent widespread use of approval systems indicates the capability of DSS to improve performance as it provides a special kind of help to decision-makers through automated intelligent assistance (Liang 2008, 385). Moreover, today most organizations focus on knowledge as a strategic resource, and the ability of this strategic resource to support decision-making is a strategic ability (Zack 2007, 1664). Therefore, in this research, the relationship between DSS and KM is examined. This relationship can affect the effectiveness of one kind of DSS that integrates DSS and Intelligence, called IDSS. There is little research in this area and hence the current research is very unique. As mentioned previously, IDSS is a special kind of IS, and thus the most important theoretical background for this research is the model of DeLone and McLean for information system success that is focused on the assessing the level of information system successfulness DeLone and Mclean 2003, 10). DeLone and Mclean believe that the use of information systems (IS) affects the individual user in the conduct of his or her work, and these individual impacts combine to result in organizational impacts (DeLone and Mclean 2003, 12). Therefore, according to DeLone and Mclean, as the success of IS can be measured through its impact on user satisfaction and finally on the organization, the impact of the effectiveness of IDSS (a specific kind of IS) could be measured in terms of its impact on decision quality since this is most important in any organization.

1.2.3 Intelligence

Decision-making involves activities that comprise intelligence collecting, guidance setting, exposing alternatives, choosing a series of action, and execution (Nutt 2007, 604). Practically every decision-making process involves the collection of intelligence, but the intelligence process rarely considered in empirical research. In this research artificial intelligence is considered, not the general meaning of intelligence as a mental concept. According to Sabroux and Zarate Artificial Intelligence is the ability of computer to perform those activities that are normally thought to require intelligence(1997, 275).There is little information in past research about the impacts of intelligence or even about the way that intelligence is gathered as it is very difficult to document the sign-of-intelligence link (Nutt 2007, 605). Another significant fact in this area that makes recalling intelligence signals and tracing their impacts difficult, especially for decision makers, is recognizing these signals early when making decisions (Nutt 2007, 605). Intelligent techniques can be used to take

advantage of the decision-making process of an organization's information system, and to increase the sensitivity, accuracy and flexibility of this information system (Kahraman, Kaya, and Cevikcan 2011, 360). According to Turban, Aronson, and Liang (2005, 158), there are many signs of in telligence such as: recognizing the relative importance of different elements in a situation, understanding and inferring in ordinary rational ways, using reasoning to solve problems effectively, responding quickly and appropriately to a new situation, making sense out of ambiguous or contradictory messages, learning or understanding from experience, and applying knowledge to manipulate the environment. In addition, intelligence can create new knowledge and codify it in knowledge management systems, and help to search and retrieve knowledge in KM systems. Therefore, it is clear that intelligence is different from knowledge and information.

In this research, intelligence has been included through its links with DSS. IDSS is the result of combining DSS and intelligence. Although there are numerous researches and studies on different aspects of intelligence, there is a dearth of research on the relationship between KM and effectiveness of IDSS and then the impact of the effectiveness of IDSS on decision quality. Therefore, in this research this concept is investigated.

1.2.4   Effectiveness of Intelligent Decision Support System

An Intelligent Decision Support System (IDSS) is a very valuable tool for decision making. IDSS plays an important role in decision-making when information is incomplete or uncertain and therefore human judgment carries risk (Blair, Debenham and Edwards 1997, 277). Traditional DSS plus artificial intelligence (AI) functions provide IDSS with the goal of directing users in some part of the decision-making process or provide new capabilities (Phillips-Wren et al. 2009, 643). Moreover, the main reasons for designing Intelligent DSSs (IDSSs) are to assist the decision-making process by providing domain expertise recommendations and services to users to satisfy their requirements through communication, collaboration, and negotiation (Gao et al. 2007, 64). IDSSs also support unstructured tasks in dynamic collaboration as well as structured tasks such as data mining, information filtering, and data alteration (Wang 1997, 326). In addition, the effectiveness of IDSS is a focus of this

research and thus the concept of system effectiveness is considered. In other words, evaluating system effectiveness can be considered as a difficult aspect of the IS implementation process due to its multiple evaluator viewpoints, its qualitative and quantitative features, and its multidimensionality (Hamilton and Chervany1981b, 83). Also, according to Hamilton and Chervany (1981a, 67), the evaluation of IS effectiveness is difficult and needs a good and relevant model. Although there are several researches on the traditional DSS, few studies have focused on all its components for the evaluation of IDSS (Phillips-Wren et al. 2006, 3). But, because IDSS is a special kind of IS, DeLone and Mclean model (DeLone and Mclean 2003, 10) is also used as a basis for this research. In this research, the effectiveness of IDSS is evaluated by examining it effect on user satisfaction (Moreau 2006, 594). Also, in this research, decision quality has been conceptualized as the proxy for organizational impact which is affected by the effectiveness of IDSS.

1.2.5 Decision Quality

Profitable decision-making and better quality decisions are necessary for competitiveness (Holsapple and Joshi 2001, 52). The decision quality relates to the ultimate quality of the decision made by the decision-makers (Raghunathan 1999, 280). The decision quality improves with better information quality for a decision-maker who knows and understands the relationships among problem variables (Raghunathan 1999, 284). However, despite the availability of good information, the decision quality is less if decision-makers do not have sufficiently accurate knowledge of these relationships (Raghunathan 1999, 284). In addition, DSS helps decision makers to better understand a problem by helping them to organize their thoughts systematically and analyze the problem (Williams et al. 2007, 468). Moreover, literature suggests that decision-making improves with the support of KM and IDSS (Holsapple and Joshi 2001, 52). Thus, the aim of this research is to study the antecedents of decision quality in terms of KM and IDSS. It also has been observed that although many studies have dealt with specific DSS tools, there is much less research on the combined effect on decision quality when using both IDSS and KM. This research attempted to address this gap in the research.

1.2.6 Banking Industry

Banks play an important role in the business and financial environments (Doumpos and Zopounidis. 2010, 55). They safeguard the savings of the public and facilitate the business and trade by providing funds for them (Fethi and Pasiouras 2010, 189). Banking is a critical component of the global economy, and decisions taken by banking managers have significant impact not only on workers and firms, but also on stockholders, depositors, and the extended economy (Hensman and Sadler-Smith 2011, 51). Information technology and business forces have introduced financial innovation in the banking industry (Haghighi, Divandari, and Keimasi 2010, 4084). In today's competitive environment, financial institutions need efficient tools to support their restructuring policies in order to ensure customer satisfaction and keep their market share safe (Ioannou and Mavri 2007, 190). Efficiency is at the core of banking strategies, and decision support systems (DSSs) are necessary to assist management in making, deploying and maintaining effective plans and operations (Berger and Humphrey 1997, 194). An important factor that can affect the efficiency of operations in all kinds of firms, but especially in banks, is decision quality. This research used the Iranian banks as the field setting to study the relationships among the KM, IDSS and decision quality. It is noted that this study is the first of its kind in the context of Iranian banks.

1.3 RESEARCH QUESTION

Large companies have recognized the importance of knowledge management (KM) as a means of improving a company's efficiency and competitiveness (Chen and Chen 2011, 3862). Hence, companies are keen to ascertain the impact of KM on different aspects of their firms especially on decision-making, in order to improve and enhance these impacts. Therefore, this research identifies the effects of knowledge management on decision support systems and intelligence in specific companies in Iran. Recognizing the effects of KM on both intelligence and a decision support system that can merge and produce IDSS in an organization is just a first step (Kahraman, Kaya, and Cevikcan 2011, 361). The real challenge is to find how KM can affect the effectiveness of IDSS and how this effectiveness

can influence ultimate decision quality. To date, little empirical research has been found in KM literature on factors affecting the effectiveness of IDSS and its relationship with the quality of decision-making in an organization. For example, Metaxiotis (2010), Liebowitz (2001), Canongia (2007), Courtney (2001), Nemati et al. (2002), Pedersen and Larsen (2001), and Holsapple (2001) discussed the relationship between KM with IDSS and decision quality in an organization. However, no research articles have focused specifically on the impact of KM on the effectiveness of IDSS, and then the effect of this impact on the quality of decisions which are made based on this IDSS. Therefore, there is a huge gap in this area between KM and the effectiveness of IDSS in one hand, and the effect of IDSS on decision quality on the other hand which should be considered. Moreover, KM has a direct impact on the quality of decisions as well as an indirect impact on the effectiveness of IDSS.

Therefore, since no complete development study, standards or guidelines have been established in this area, this research attempts to fill this gap. It is anticipated that this study will provide guidelines to assist firms (for example banks) to successfully deploy KM so as to improve decision quality which is highly important in any organization. With this in mind, and in the context of Iranian Banks, the research topic can be formulated. The primary research questions are as follows:

- How does Knowledge Management impact on the effectiveness of Intelligence Decision Support Systems (IDSSs) in Iranian banks?
- How can Intelligence and DSS be integrated to develop an effective IDSS in Iranian banks?
- How does the effectiveness of IDSS improve decision quality within Iranian banks?

By answering these important questions, this research attempts to address the gap in the extant research.

1.4 RESEARCH OBJECTIVES

Based on the research questions above, the objectives of this study are as follows:

* To investigate the relationship between KM and the effectiveness of Intelligence Decision Support System (IDSS) in Iranian Banks.

* To identify the role of IDSS in improving decision quality within the Iranian banks.

* To identify the different effects of KM on decision quality in Iranian Banks.

1.5 DEFINITION OF TERMS

The following statements are the functional definitions of terms used throughout this study:

- **Knowledge Management (KM)**: "Knowledge Management (KM) is an approach to adding or creating value by more actively leveraging the know-how, experience, and judgment resident within and, in many cases, outside of an organization" (Ruggles 1998, 80).

- **Decision Support Systems (DSSs)**: "are interactive, computer-based systems intended to provide support to the decision makers engaged in solving various semi- to ill-structured problems involving multiple attributes, objectives and goals" (Nemati et al. 2002, 144).

- **Intelligence**: "Refers to artificial intelligent tools that can mimic human actions (Turban, Aronson, and Liang2005, 156). These tools can increase sensitiveness, flexibility and accuracy of information and decision management systems" (Kahraman et al 2011, 360).

- **IDSS**: "An Intelligent Decision Support System IDSS is an interactive system, flexible, adaptable and specifically developed to support the solution of a non-structured management problem for improved decision-making. It uses data, provides easy user interface, and can incorporate the decision makers own insights" (Quintero, Konare, and Pierre 2005, 655).

- **Effectiveness**: "Refers to how good a DSS is in solving organizational problems. The effectiveness of a DSS is predicted to interact with a user's motivation to perform a task to enhance actual DSS use" (Chan 2009, 219).

- **Effectiveness of system:** "Two general views can be taken concerning what system effectiveness means, the goal-centered view and the systems-resource view. In the goal-centered view, Effectiveness is determined by comparing performance to

objectives (Hamilton and Chervany 1981a, 55). In the systems-resource view effectiveness is determined by attainment of a normative state, e.g., standards for "good" practices" (Hamilton and Chervany 1981a, 56).

1.6 SIGNIFICANCE OF THE RESEARCH

This research offers both theoretical and practical contributions. In an attempt to investigate the relationship between KM and the effectiveness of Intelligence Decision Support System (IDSS) in Iranian banks, the research proposes a model for this relationship. This model, which is developed based on an extensive literature review and the previous discussions, is very significant and unique. Although there are numerous researches in the domains of KM, DSS, IDSS, Decision Quality and the banking industry, no significant empirical research has focused on the relationship between KM with Effectiveness of IDSS and KM with Decision Quality. Some of the previous researches which focused on the KM definition and discipline include Oppong, Yen, and Merhout (2005); Guo and Sheffield (2008); Liebowitz (2001) or Metaxiotis (2010). Past studies that have focused on the different features of DSS and its concepts include those of Shim et al. (2002), Arnott and Pervan (2008), Bhargava, Power and Sun (2007), Liang (2008), and Zack (2007) are very significant. Nutt (2007); Kahraman, Kaya, and Cevikcan (2011); and Turban, Aronson, and Liang (2005) provide some of the latest important theoretical resources for the Intelligence concept that was considered in this research. Blair, Debenham and Edwards (1997), Phillips-Wren et al. (2009), Gao et al. (2007); Wang (1997), and Chervany (1981a & b) are some of the past researches that provide valuable information on IDSS and its effectiveness.

Holsapple and Joshi (2001), Raghunathan (1999), and Williams et al. (2007) provided a better understanding of the concept of Decision Quality. These are some of the previous studies that were considered in this research; none of them focused on the relationship between KM with the Effectiveness of IDSS and Decision Quality.

Therefore, the determinant factors in this research focus on assessing the relationship between KM and DSS, KM and Intelligent, DSS and Intelligent with IDSS, the Effectiveness of IDSS and Decision Quality, and finally, KM and Decision Quality. Another valuable

aspect of this research is that it will determine the results of these relations and their impacts including the advantages, and the impacts on individuals and organizations as mentioned previously. All of these important issues highlight the uniqueness of this research. For researchers, the model suggests the types of variables that should be included in future empirical tests of the relationship between KM and the effectiveness of IDSSs. Consequently, the model extends the understanding of what is becoming an increasingly important impact on the effectiveness of IDSS as a result of integrating Intelligence and DSS.

From the practical point of view, it is expected that a better understanding of determinant KM factors that can affect the effectiveness of IDSS and decision quality, will be realized in the context of Iranian banking industry. As the banking industry is a very competitive environment, this knowledge is very valuable for member organizations. On the other hand, practitioners especially KM and IDSS applications developers and users such as managers, business analysts and decision-makers can also use this model to refine their thinking about KM and IDSS which can significantly influence their decision-making and subsequently the decisions made by their firms or representatives. By recognizing the relationship between KM and IDSS with decision quality, the decision makers, analysts and managers can focus on the main items in this area and make the best decisions possible. These kinds of decisions ensure continued success for organizations.

1.7 STRUCTURE OF THE THESIS

This thesis is organized and presented in eight chapters as illustrated in Figure 1.1. Following is a brief outline of each chapter.

Chapter 1   Introduction

This chapter discusses the importance of the research and the gap in the existing literature. The discussion presented the significant aspects of the research that lead to the formulation of the research questions. The research objectives are captured in the research questions which target very specific areas. This chapter also gives an overview of the overall thesis structure.

Chapter 2   Literature Review and Conceptual Model

Chapter 2 discusses the basics of KM, DSS, Intelligent, IDSS, Effectiveness of IDSS and Decision Quality, their definitions, applications and importance in the banking industry. This chapter also provides the rationale for studying the Iranian banking industry as the case subject, and presents some statistical information regarding the Iranian banking industry.

Chapter 3   Research Methodology

Chapter 3 describes the methodological basis of this research. This chapter provides the justification for the approach chosen for this research and discusses the appropriateness of the methodology that is employed. This chapter also describes the development process, and the tools and indicators that are used for data collection. The final important point that is considered in this chapter is the data analysis which is a crucial step in any research.

Chapter 4   Field Study and the Comprehensive Research Model

Chapter 4 presents the process and outcome of a qualitative field study. The field study was conducted through semi-structured interview questions, interviewing ten (10) managers, business analysts and decision-makers of six selected Iranian Banks. A content analysis approach was used to analyse the findings of the study. Based on the findings from the qualitative data analysis, the initial research model was modified. Then the previous factors were contextualized to provide the comprehensive research model.

Chapter 5   Hypotheses and Questionnaire Development

Chapter 5 expands the hypotheses of the proposed research models (in Chapter 4). The details of the questionnaire used for the research survey are also provided in this chapter.

Chapter 6   Survey and Quantitative Data Analysis

Chapter 6 presents the findings from analysing the data of the final survey that was conducted to examine the research models of this study. The Partial Least Square (PLS)-

based Structural Equation Modelling technique was used to analyse the survey data and determine the findings. Confirmation of the research hypotheses is made based on the findings of the analysis.

Chapter 7   Results and Discussions

The findings from data analysis of the research survey are discussed in this chapter. The implications of the research findings have also been considered. Overall, this chapter discusses the research results from the theoretical and practical perspectives.

Chapter 8   Conclusion and Future Research Directions

The final chapter presents a summary of the research and its significant contribution to theory and practice. This chapter considers the limitations of the current research and makes recommendations for possible future research directions.

Structure	Description	Output
Chapter 1	**Introduction of the thesis** *Establish the research problem	Determines the research questions and objectives
Chapter 2	**Literature Review** * Find out existing research gap based on conceptual and empirical research. *Discussion on needs of new model	Discusses the relevant literature and proposes initial research-models
Chapter 3	**Research Methodology** *Describe the Methodology	Present mixed method approach to conduct this research
Chapter 4	**Field study** * Details of the field study * Analysis of the field study	Suggest comprehensive research model
Chapter 5	**Hypotheses and questionnaires development** * Detail of the hypotheses * Detail of the questionnaire	Provides the hypotheses and questionnaire
Chapter 6	**Survey and Quantitative Data Analysis** * Describe the details of the survey * Data analyses using Partial Least Square (PLS)	Presentsand analyses the data
Chapter 7	**Results and Discussion** Discusses all the findings of the research	Discusses implications of the research findings
Chapter 8	**Conclusion and Future Research Direction** * Overview of the research * Acknowledgement of the Limitations * Suggestion for the future research direction	Presents the overview of the research and then provides some suggestions for further research.

Figure 1.1: Structure of the thesis

1.8 SUMMARY

This chapter provided the background of the current research and established the scope of this research thesis. This chapter provided an overview of the existing literature gap and described how the gap has been addressed by this research. It discussed the existing research in the area of KM, IDSS and Decision Quality in organization, and then defined the research aims and objectives that this research later addresses. Finally, this chapter provides an overview of the thesis' structure in order to give a clear idea of the contents of each chapter.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter presents the theoretical foundation for the current study. As identified in Chapter 1, little research is available for investigating the relationship between Knowledge Management and the Effectiveness of IDSS in the banking industry. However, there have been a number of studies regarding knowledge and its management, as well as the acceptance and implementation of new technologies or other innovations. Reviews and summaries of these studies can improve our understanding of knowledge management and its relationship with IDSS and Decision Quality. This chapter is organized as follows. First, definitions, general categories, prior research and the status in Iran are presented for: knowledge management, Decision Support System, Intelligence, Effectiveness of IDSS and Decision Quality. This is followed by an explanation of the research gap. Next, in order to provide a theoretical background for developing the research framework according to the research objectives of the current study, the main theory regarding the causes and relationship between Knowledge Management and the Effectiveness of IDSS is presented. The main theory applied in this study is the theory presented by DeLone and McLean's information system success (DeLone and Mclean 2003, 10).

2.2 KNOWLEDGE MANAGEMENT

2.2.1 Overview of Knowledge Management

Knowledge management is not a new concept and practice for humans. Knowledge management was practised by the first civilized people in the world (Ives, Torrey and Gordon 1998, 270; Wiig 1997, 8). According to Duke, Makey and Kiras (1999, 32) knowledge has been preserved and passed from one generation to another, enabling people to comprehend the past and then create the future. However, knowledge management that was

started 4,000 years ago did not really take off until a few decades ago(Wiig 1997, 7; Bollinger and Smith 2001, 14). Some practitioners even questioned whether knowledge management was only a management fad, or whether knowledge management could indeed create strategic value for organizations. However, during the past several years, knowledge management has become a critical topic among academic researches and has been improved with ideas, methods, and technologies being contributed by diverse domains such as social science, management science, and information science (Oppong, Yen, and Merhout 2005, 416). Some researchers try to classify knowledge management studies according to specific groups. The Woods and Cortada (2000, 215) classification classifies the topics of knowledge management studies under four main groups: The nature of knowledge and its management; knowledge-based strategies; knowledge management and organizational performance; and knowledge management factors, techniques and tools. These categories are explained further in the following section that references Woods and Cortada (2000, 215) and several more recent studies:

1. The nature of knowledge and its management: The tacit and explicit nature of knowledge and the ecology of knowledge management are discussed in this group (Halal 1997, 67; Durrance 1998, 32; Plesk 1998, 83; Sveiby 1998, 21; Comeau-Kirschner and Wah 2000, 25; Horvath 2000, 65; Nickols 2000, 15; Liebowitz 2001, 1; Bolloju, Khalifa, and Turban 2002, 166; Guo and Sheffield 2008, 674).

2. Knowledge-based strategies: This category focuses on the strategic view of knowledge (Ulrich1998, 132; Davenport, DeLong and Beers 1998, 48; Berreby 1999, 73; Birkinshaw 1999, 115; 48; Holsapple and Joshi 2001, 40).

3. Knowledge management and organizational performance: this involves organizational performance, the effects of collection and codification of knowledge in firm, the result of knowledge transfer on company s function, as well as implementation of effective knowledge management (Bednar 1998, Ruggles 1998, 82; 216; Forman 1999, 233; Miller 1999, 45; Spangler, and Peters 2001, 118; Nemati et al. 2002, 148, Kebede 2010, 420).

4. Knowledge management factors, techniques and tools: This targets issues such as knowledge management factors, knowledge management tools, knowledge management

techniques and measurement of knowledge management effectiveness (Cohen 1998, 397; Pearson 1999, 34; Teresko 1999, 323; Valenzuela et al 2008, 322; Huang et al. 2010; Venters 2010, 161).

2.2.2 Definition of Knowledge Management

Depending on the purpose of research, knowledge management has been defined in numerous ways; (Quintas, Lefrere & Jones 1997, 387; Davenport, DeLong and Beers 1998, 49; Ruggles 1998, 80; Carayannis 1999, 222; Sarvary 1999, 96; Duke, Makey & Kiras 1999, 29; Woods and Cortada 2000, 215; Alavi & Leidner 2001, 113; Liebowitz 2001, 1; Nidumolu, Subramani & Aldrich 2001, 118; Bolloju, Khalifa, and Turban 2002, 166; Nemati et al. 2002, 145). Ruggles (1998, 80) defines knowledge management as an approach to adding or creating value by more actively leveraging the know-how, experience and judgment, which reside with and in several cases, outside of an organization. Sarvary (1999, 96) defined knowledge management as a business process that firms create, and use their institutional or collective knowledge through it. According to Carayannis (1999, 222) knowledge management refers to a socio-technical system of tacit and explicit business functions and policies, that are facilitated by the strategic unification of information technology tools and human, intellectual and social capital. Another definition of knowledge management was provided by Alavi and Leidner (2001,113) who stated that knowledge management is "a systemic and organizationally specified process for acquiring, organizing and communicating both tacit and explicit knowledge for employees so that other employees may make use of it to be more effective and productive at work".

Moreover, according to Liebowitz (2001, 1), knowledge management is the processes of identifying, capturing and leveraging knowledge to help the company compete. Knowledge management can be viewed as "a set of activities using individual and external knowledge to produce outputs and the activities include knowledge acquisition, creation and application" (Nidumolu, Subramani and Aldrich 2001, 118). Furthermore, Bolloju, Khalifa, and Turban (2002, 166) suggest that knowledge management is managing organizational knowledge for providing competitive advantages and business value. After considering several important

definitions of knowledge management, this researcher settled on the Ruggles' definition of knowledge management: knowledge management is an approach to adding or creating value by more active leveraging the know-how, experience and judgment, which reside with and in several cases, outside of an organization (Ruggles 1998, 80).

2.2.3 Prior Research on Knowledge Management

Knowledge management research has grown rapidly during the last decades (Hensman and Sadler-Smith 2011). The importance of obtaining new knowledge to improve organizational competitiveness is currently well accepted (Gray 2001, 87). Therefore, as knowledge management involves the invention of value from a company's impalpable assets, many companies currently keep busy in managing knowledge and its influence within their organization and externally in terms of their customers and shareholders (Rubenstein-Montano et al. 2001, 6). Most of the recent studies in the knowledge management area focus on the linkage between knowledge management and firms' functions related to decision making, decision quality, effectiveness, and firm performance (Holsapple 2001; Holsapple and Joshi 2001; Gray 2001; Liebowitz 2001, Bolloju, Khalifa, and Turban 2002, Nemati et al. 2002, Oppong, Yen and Merhout 2005; Guo and Sheffield 2008; Tabrizi and et al. 2011). These studies' findings suggested that KM provides significant advantages in effectively and efficiently managing organizations and contributing towards quality decision making, firm performance and customer satisfaction. For example, Holsapple and Joshi (2001, 39) developed a framework of knowledge resources that was relatively successful in terms of accuracy, clearness, conciseness, completeness, and conciseness criteria. This research demonstrated the different effects of alternative knowledge resource portfolios, and showed how an organization could conduct its KM including its decision-making functions. In the same year, another researcher, Gray, developed a system for knowledge management based on two dimensions: the KM role in the problem-solving process, and the type of problem being addressed (Gray 2001, 88). The findings of this study support the proposed framework and revealed the importance of managing tacit and explicit knowledge as a critical part of

problem solving and providing business value for organizations (Gray 2001, 91). This research suggested a new way to understand the connection between knowledge management and organizational goals (Gray 2001, 91).

Moreover, Liebowitz (2001, 2) concentrated on the fundamental role of knowledge management in the successful transformation of individual knowledge to organizational knowledge by means of intelligent tools. In this paper, Liebowitz discussed the link between knowledge management and intelligence and their important roles in a firm's performance.

In addition, Bolloju, Khalifa, and Turban (2002) focused on the integration of the knowledge management processes and decision support system by using knowledge management techniques (Bolloju, Khalifa, and Turban 2002, 164). In their research, they concentrated on finding an effective integration framework by using knowledge management techniques and tools to build a firm's decision-making and decision support environment. These researchers revealed the benefits of integrating DSS and KMS in their model; these benefits included: improved quality of support provided to decision makers, supporting knowledge management functions such as creation, acquisition, and collection, and supporting resources for building up an organizational knowledge repository (Bolloju, Khalifa, and Turban 2002, 173).

Nemati et al. (2002) conducted another valuable research on knowledge management, decision support systems and their effectiveness. The main aim of this study was to find a suitable knowledge architecture that not only facilitated the capturing and coding of knowledge, but also enhanced knowledge-sharing in the organization (Nemati et al. 2002, 143). This knowledge (warehouse) model suggested different directions for DSS in firms in order to obtain the best results. This new direction indicated the broader application of decision support systems; that is, to improve knowledge. This enlarged purpose of DSS also suggests that the effectiveness of a DSS can be measured based on how well it enhances and promotes knowledge, understanding of the decision maker(s) and, finally, how well it has enhanced his/her.

On the other hand, Guo and Sheffield (2008, 674) presented classifications of knowledge and then used these to examine the various strategies, routines, and techniques through which different types of knowledge are captured, represented, codified, transferred,

And exchanged. They also recognized that knowledge management is very helpful for a decision support system as it provides a good decision-making process so that the best decisions can be made (Guo and Sheffield 2008, 676).

All of these studies considered the definition, concept and function of knowledge management and its relationship with decision support systems. The relationship between knowledge management and intelligent decision support system, as well as the decision quality, has never been considered by previous research. This research attempts to fill this gap. The researcher used the existing valuable information as the basis for this study and to determine the type and quality of the mentioned relationship.

2.2.4 Knowledge Management in Iran

Knowledge management is a growing concept in today's managerial world and all industries are implementing knowledge management in order to gain competitive advantage. In order to compete successfully with regional and global rivals, Iranian organizations must adopt the latest managerial techniques (Borousan, Hajiabolhasani, and Hojabri 2012, 9595). Thus, knowledge management which is playing a major role in today's competitive business environment is attracting the interest of Iranian managers (Ahmadi 2012, 209). However, the implementation of knowledge management will present managers with numerous challenges relating to issues of culture and infrastructure; moreover, since Iran is a developing country, there are greater challenges in terms of implementing knowledge management in industries (Borousan, Hajiabolhasani, and Hojabri 2012, 9559).

In spite of these challenges, different Iranian industries such as oil and gas, mining, information and communication, insurance, manufacturing, education, health and medical, tourism and finance used knowledge management functions and methods (Ahmadi 2012, 209; Behzadi and Sanji 2012, 25; Borousan, Hajiabolhasani, and Hojabri 2012, 9559). Many studies have been conducted to examine the extent to which KM is implemented in Iranian organizations (Valaeim, and Ab. Aziz 2011; Ahmadi 2012; Behzadi and Sanji 2012; Borousan, Hajiabolhasani, and Hojabri 2012; Ramezani, Fathain, and Tajdin 2013).

Valaeim, and Ab. Aziz (2011) examined the extent to which KM employment in Iranian companies, especially in SMEs, and then provided a comparative analysis of companies in Taiwan and Hong Kong (Valaeim, and Ab. Aziz 2011, 8). They investigated the degree of utilization, infrastructure and process capabilities of Iranian companies and found that knowledge management in Iranian firms is partially, not fully, deployed (Valaeim, and Ab. Aziz 2011, 12). Moreover, Behzadi and Sanji (2012) assessed the knowledge management strategies and functions in various Iranian industries, and in Iranian government portals. The findings of this research indicated that the Iranian government encourages all Iranian industries to focus on knowledge access, knowledge creation and knowledge transfer in order to make better use of their knowledge and then produce better performance (Behzadi and Sanji 2012, 24). This study indicated that there were many weaknesses in the use of knowledge management in Iranian industry that must to be examined and addressed by planning, taking a scientific approach, and seeking expert opinion (Behzadi and Sanji 2012, 24). Therefore, Iranian industry and organizations are using KM as an important tool to increase the quality of their decisions and achieve firm's goals. Furthermore, Ramezani, Fathain, and Tajdin (2013) evaluated the status of knowledge management (KM) in an Iranian research organization in order to identify and classify the most relevant and critical KM success factors and their impact on the firm's performance (Ramezani, Fathain, and Tajdin 2013m114).

The aforementioned studies concentrate on different functions of knowledge management within Iranian industries and companies. As the main aim of this study is to find the relationship between knowledge management and intelligent decision support system in the Iranian banks, as well as the quality of decision-making (which is a huge gap in this study area), the researcher used this valuable information as the basis for this study to address this gap and determine the type and quality of the mentioned relationship in the Iranian banking industry.

2.3. DECISION SUPPORT SYSTEM (DSS)

2.3.1 Definition of Decision Support System (DSS)

Since the early 1970swhen the term *Decision Support System* (DSS) was coined, numerous studies have been conducted in this research area (Finlay and Martin 1989, 527, shim et al.2002, 111). Many researchers have taken an interest in DSS concepts and functions and have undertaken relevant studies (Bonczek, Holsapple and Whinston 1981; Keen 1987; Sprague 1987; Sol 1987; Radermacher 1994; Shim et al. 2002; Bhargava, Power and Sun 2007; Arnott and Pervan 2008; Liang 2008; Ackermann et.al 2010). For several decades, since the term was first coined, various definitions of DSSs have been offered by researchers and scientists (Keen 1987, 258). In fact, DSSs have been defined according to criteria that vary depending on the perspective of the individual scientist or researcher; hence, there are many different definitions. These criteria may comprise objectives, components, functions, usage patterns, capabilities, and development processes (Sprague 1980, 14; Radermacher 1994, 261; Turban 1996, 2543; Keen 1987, 260; Bonczek, Holsapple and Whinston 1981, 182; Shim et al. 2002, 112; Bhargava, Power and Sun 2007, 1083). The various definitions of a DSS focus on several aspects of the DSS concept, and target different audiences. The definition of a DSS that we use in this study was provided by Sprague (1980) who defined a DSS as: A computer-based system that helps decision-makers to address complex problems through direct interaction with data and analysis models (Sprague 1980, 15).

Each part of this definition contains a key concept that describes the uniqueness of a DSS. In addition, a DSS can be described as a computer system that is suitable for solving semi-structured or unstructured problems (Shim et al. 2002, 112). DSS also has been a significant area of IT-based decisions and activities with important impacts on an organization's culture and performance (Arnott and Pervan 2008, 654). Current DSSs expedite different decision tasks such as gathering and analyzing information, building the models, sensitivity analysis, cooperation, alternative evaluation, and making decisions (Bhargava, Power and Sun 2007, 1083). On the other hand, Keen (1987) tried to investigate the balance between the 'D', 'S', and 'S' of DSS in his study. He explained that:

- 'D': is the abbreviation of 'Decision'. 'Decision' relates to the functional, non-technical, and analytic features of DSS. This 'D' or 'Decision' is used as an important criterion when choosing suitable applications (Keen 1987, 2).

- 'S': The first 'S' stands for 'Support'. 'Support' which involves implementing and comprehending the ways in which real people act, and how to help them (Keen 1987, 2).

- 'S': The second 'S' is an abbreviation of 'System', which directly focuses on the skills associated with the development and design of technology (Keen 1987, 2).

It is clear that in order to create the perfect DSS, it is necessary to focus on all of these components. For example, if researchers focus just on 'Support' and 'System' factors and do not pay enough attention to the 'Decision' component, the study will be concerned only with building a commodity system instead of providing value-adding expertise. On the other hand, if researchers focus only on the 'Decision' and 'System' components and do not search for better understanding and action that lead to extended 'support', the implementation of DSS will restrict a firm instead of improving it. In addition, if a specific study ignores the new developments in technology, the scope of DSS in terms of 'decision', 'support' and 'system' will be limited. Therefore, the relevant research problems that have been identified in this area include different approaches to the building of a DSS, different methodologies used by a DSS and the different tools used to formulate the decision support and to implement a DSS (Sprague 1987, 199; Te'eni and Ginzberg 1991, 131; Angehm and Jelassi 1994, 271; Khoong 1995, 225; Rudowski, East and Gardner 1996, 162; Kasper 1996, 223; Holsapple and Joshi 2001, 39; Courtney 2001, 20; shim et al. 2002, 114; Zack 2007, 1664; Liang 2008, 385).

2.3.2 Features of Decision Support System (DSS)

The notion that a DSS is meant to help managers in their decision- making in complex situations emerged more than 40 years ago (Shim et al.2002, 112). It was acknowledged that DSS is designed to support managerial decision-making in complex situations with a view to

improving the effectiveness of decision-making, rather than efficiency (Sprague 1980, 15, Courtney 2001, 20; Shim et al. 2002, 112). This opinion still shapes the basic fundamental assumption underlying most DSS research and studies (Arnott and Pervan 2008, 654). Numerous paradigms, models and frameworks have been recommended to establish and implement a DSS in different firms (Bonczek, Holsapple and Whinston 1981, 156). The literature on DSSs has always focused on the main benefit to be derived from a DSS, that is, it improves the quality of decisions as a result of the effectiveness of decision-making (Radermacher 1994, 261; Courtney 2001, 27; Phillips-Wren et al. 2009, 643). According to Angehra and Jelassi (1994, 272) and Moreau (2006, 595), it is possible that by using computers to assist with problem solving, performance and decision-making can lead to better decisions being made within firms. On the other hand, some studies have suggested that DSS affects the development of decision outcomes. These studies examined the ways in which the quality of decisions was improved as a result of implementing a DSS (Zack 2007, 1666; Hensman and Sadler-Smith 2011, 57). Moreover, some researches also tested how the introduction of DSS, after controlling the task familiarity, contributed to decision quality (Barr and Sharda 1997, 137). A good DSS environment, by accelerating the learning process and providing practical methods, makes the decision-making process more informed (Sprague 1987, 201; Holsapple and Joshi 2001, 39; Burstein and Widmeyer 2007, 1648).

Shim and et al. (2002, 110) described the three main features of a DSS: it is extremely flexible in performing a decision support task; it is interactive and highly user friendly; and, it is dedicated to supporting an important decision-making function by using its data base, methodology base, knowledge base and other facilities. In addition, a DSS is used to support decision-making activities in firms in response to semi-structured to unstructured problems where human intervention is necessary to making the decisions (Radermacher 1994, 261; Holsapple and Joshi 2001, 41). This human intervention can take many forms and at different times such as: during the problem structuring; during the solution process; and during the phase of desirable choice making (Kasper 1996, 223; Courtney 2001, 26). An important point regarding the DSS domain is that, although the domain of DSS is involved with semi-structured to unstructured problems, some kind of structure is established to address the problems during the model and problem structuring process (Rudowski, East and

Gardner 1996, 165; shim et al. 2002, 111).

2.3.3 Prior Research on Decision Support System (DSS)

Many researchers have investigated the DSS in their studies (Keen 1987; Sol 1987; Bhargava, Power and Sun 2007; Liang 2008). Then there are so many different tools and methodologies with various level of effectiveness that were used in the DSS literature and DSS field study (Barr and Sharda 1997; Holsapple and Joshi 2001; Courtney 2001, Nemati et al. 2002; Shim et al. 2002; Zack 2007; Arnott and Pervan 2008; Phillips-Wren et al. 2009). DSS literature involves areas such as:

- Management information systems for system improvement processes (Nemati et al. 2002, 143)
- Management science for development (Courtney 2001,32)
- Organizational behavior theory for managing the introducing the new system (Barr and Sharda 1997, 138)
- Computer science for technical plans (Arnott and Pervan 2008, 667)
- Ergonomics and human factors for human-machine interface design (Shim et al. 2002, 122)
- Applied psychology for prescriptive system support (Shim et al. 2002, 112).

Therefore, DSS research had been done in different areas and disciplines. For example, Keen (1987) concentrated on the DSS field to acquire a better understanding of this concept since it is vital for the future of firms. He attempted to show where different companies and researchers stand regarding the DSS in terms of both research and practice, and highlights the plan for the next decade (Keen 1987, 253). In their research, Keen, Holsapple and Joshi (2001) revealed valuable information about DSS. They explained that a decision support system involved technologies for representing and processing knowledge in order to facilitate decision-making (Holsapple and Joshi 2001, 52). A critical DSS component is its "knowledge system" which comprises descriptive, procedural, and or reasoning knowledge (Holsapple and Joshi 2001, 39). Another key element of DSS is its problem processing system which can draw on the knowledge representations in the course of recognizing or

solving problems that happen in a decision-making process (Holsapple and Joshi 2001, 39). Put simply, Holsapple and Joshi (2001, 52) believed that "DSS is a computer-based technology that aims to get the right knowledge in the right form to the right persons at the right time so they can better make decisions and make better decisions".

Moreover, Shim et al. (2002) conducted another valuable research study in the DSS area. They discussed in their paper the evolution of DSS technologies and issues related to DSS definitions, applications, and impacts. Then, these researchers presented effective decision support tools for collaborative support systems (Shim et al. 2002, 122). This paper described two specific kinds of DSS for the next millennium as well: optimization-based decision support and active decision support (Shim et al. 2002, 111).

The research undertaken by Zack (2007, 1667) suggested that computer-based decision support technologies are appropriate for decision-making under conditions of complexity and uncertainty, while human-centric approaches may be more appropriate under conditions of equivocality or vagueness. However, both approaches must be strongly aligned for organizational learning to occur (Zack 2007, 1672). This researcher's framework was illustrated with a case study of the execution of a decision support system used for price citing in a leasing firm (Zack 2007, 1673).

All of these studies focused on the definition, concept and function of the decision support system and its components or different combinations of DSS with other organizational factors that influenced firm performance. Moreover, these studies explained the relationship between DSS and KM from different perspectives. However, no article or research focused specifically on the impact of the KM on the effectiveness of an intelligent format of DSS and then its subsequent impact on the quality of decisions which were made based on this Intelligent DSS. Therefore, there is a huge gap in this area between KM and the effectiveness of Intelligent DSS on the one hand, and the effectiveness of Intelligent DSS in terms of decision quality on the other hand, which should be considered. This research attempts to fill this gap.

2.3.4 Decision Support Systems (DSSs) in Iran

Because of the vital role played by decision support systems in achieving organizations' goals, companies worldwide are implementing this type of information system. Iranian companies are no exception, and utilize this information system in order to assist decision-makers to make appropriate and better-informed decisions. Moreover, as successful decision support systems depend on an IT infrastructure that gathers, stores, and provides appropriate information, Iranian firms (especially banks) should provide an effective IT infrastructure for their firms in order to make maximum use of their DSS. However, IT is changing rapidly, and IT managers struggle with the resulting uncertainty. They need to understand the problems of such change and their interrelationships.

As explained previously, DSS is related to different disciplines and environments; hence, studies in the DSS domain have been conducted in different contexts and for different issues. Many studies have been done to determine the extent to which DSSs have been implemented in Iranian organizations (Makhdoum 2002; Vafaei and Harati 2010; Mohammadi Nasrabadi, Hosseinpour, and Ebrahimnejad2013). For example, Makhdoum (2002, 151) stated that decision support system (DSS) has provided some solutions and mathematical analysis of the system forenvironmental problems to show that internal structure of the problem is not always possible which is very significant and useful result. He also provides a DSS model to address the decision-making problems in Iran, (Makhdoum 2002, 153). This model is a compromise between knowledge-based decision support systems, fundamental theorem of environmental economics, information models, and detailed models (Makhdoum 2002, 153).

In addition, Vafaei and Harati (2010) provided a quantified method for developing decision-making in a specific firm. They discussed the application of strategic management in a spatial decision support system (DSS) for the analysis and modelling of flood management. Moreover, they use SWOT analysis to obtain the best result. The main

contribution of this paper is that it provides a systematic method for choosing the best strategic alternative for flood management. The new methodology in this study shows that the application of quantitative methods, with a combination of DSS and SWOT analysis, can be adopted successfully for flood management, and helps other managers to decrease uncertainties and human errors.

The study undertaken by Mohammadi Nasrabadi, Hosseinpour, and Ebrahimnejad (2013) focused on providing a modular decision support system to conclude the best marketing strategy with an acceptable risk (Mohammadi Nasrabadi, Hosseinpour, and Ebrahimnejad 2013, 14). This DSS helps organizations to choose suitable segments to develop their business while taking the risk into account (Mohammadi Nasrabadi, Hosseinpour, and Ebrahimnejad 2013, 14). They also consider the effects of the strategies and their success based on priorities which may change over time (Mohammadi Nasrabadi, Hosseinpour, and Ebrahimnejad 2013, 1).

These are several examples of DSS researches in the Iranian context. As discussed previously, no article or research has focused specifically on the impact of KM on the effectiveness of intelligent format of DSS and then the effect of this impact on the quality of decisions which are made based on this Intelligent DSS in the context of Iranian companies. Therefore, the huge gap in this area of research has motivated this researcher's study.

2.4. INTELLIGENCE
2.4.1 Definition of Intelligence

The concept of intelligence has been greatly debated in the psychology and related literature (Jensen 2000, 86). Since a standard definition for intelligence still remains evasive and is not available, some literature-based common characteristics of "human intelligence" could be considered (Phillips-Wren et al. 2006, 7). This kind of intelligence includes:
- A learning ability to increase conceptual and procedural knowledge

- Understanding and communication of messages to make sense of messages and generate expected responses
- Making decisions and problem solving in a rational way
- Developing new abstract and physical artifacts to cope with survival and development society (Phillips-Wren et al. 2006, 7).

In addition, the human mind is a natural symbol-processing system, and the research efforts of Artificial Intelligence are basically focused on the design and testing of symbolic systems using the computer as the experimental site (Newell and Simon 1976, 113). Hence, the intelligence level of a system can be measured "by its ability to achieve stated ends in the face of variations, difficulties and complexities posed by the task environment" (Newell and Simon 1976, 114). This suggests that the long-term aim of Artificial Intelligence is the engineering of intelligence.

On the other hand, decision-making involves activities that comprise intelligence collecting, guidance setting, exposing alternatives, choosing a series of action, and execution (Nutt 2007, 604). Practically every thought related to decision-making involves the collection of intelligence, but the process of intelligence acquisition is rarely considered in empirical research. (Nutt 2007, 605) explained the impacts of intelligence and the way that intelligence is gathered as it is very difficult to document the signs of an intelligence link. Another significant fact in this area that makes recalling intelligence signals and tracing their impacts difficult, especially for decision makers, is recognizing these signals early in decision-making attempts (Nutt 2007, 605). Intelligence techniques can be used to take advantage of the decision-making process of an organization's information system, increase sensitiveness, accuracy and flexibility of this information system (Kahraman, Kaya, and Cevikcan 2011, 360). According to Turban, Aronson, and Liang (2005, 199), there are many capabilities that are considered signs of intelligence such as:

- recognizing the relative importance of different elements in a situation
- understanding and inferring in ordinary rational ways

- using reasons in solving problems and directing effectively
- responding quickly and successfully to a new situation
- making sense out of ambiguous or contradictory messages
- learning or understanding from experience
- applying knowledge to manipulate the environment

In addition, some impacts of Intelligence are: creating new knowledge; codifying the knowledge in the knowledge management systems, helping in the search for and retrieval of knowledge in knowledge management systems (Liebowitz 2001, 5; Turban et al. 2011, 534). Therefore, it is clear that Intelligence is different from knowledge and information.

2.4.2 Prior Research on Intelligence

Research in the area of Intelligence (Artificial Intelligence, Intelligence techniques, and intelligent tools) has increased rapidly during the last decades. Numerous researchers have focused on this interesting issue (Sabroux, and Zarate 1997; Birkinshaw 1999; Liebowitz, 2001; Albus and Meystel 2001; Turban, Aronson, and Liang 2005;Phillips-Wren et.al. 2006; Nutt 2007; Kahraman, Kaya, and Cevikcan 2011; Turban et.al 2011). Each of these studies investigated Intelligence in different areas and different situations. They also focused on various functions that Intelligence can perform or assist with. For example, Sabroux, and Zarate (1997) assessed several articles that focused on Intelligence and made one important point in this area. They explained that Artificial Intelligence is now completely planned to offer credible and strong tools, and has been shown to be a promising field (Sabroux, and Zarate 1997, 275). This special concept aims to present the potentialities of combining Artificial Intelligence techniques and tools with more traditional theoretical procedures to the DSS community as an aid to decision-making (Sabroux, and Zarate 1997, 275). Then, in 2001, Liebowitz, made another significant point about Intelligence. Liebowitz (2001,2), a scientist, claimed that intelligent tools play a critical role regarding the transformation of individual knowledge into organizational knowledge in an organization. In addition, he posited that the link between intelligence and knowledge management is a significant factor that can affect a firm's performance. Moreover, Albus and Meystel (2001, 6) stated that the ability of a system to behave appropriately in an uncertain condition, where suitable behavior

is that which maximizes the likelihood of success in achieving the system's goals, is directly affected by intelligence. In their research, they intended to extend the spectrum of capability from simple to complex and recognize degrees of intelligence (Albus and Meystel 2001, 6). Moreover, they argued that the degree of intelligence is affected by three factors: sophistication of the underlying processes or models, available computational memory and power, and the quality and quantity of information and values available to the system (Albus and Meystel 2001, 10).

In this research, intelligence has been included through its links with DSS. Although there are numerous studies on different aspects of Intelligence, there is no research that focuses on the relationship between KM and Intelligence and then Intelligence with the effectiveness of IDSS. Therefore, this research tries to fill this gap and discover how KM, Intelligence and effectiveness of IDSS can impact on each other.

2.4.3 Intelligence in Iran

According to the important role of Intelligence in improving the decision quality in a company and enhancing the firm performance, most Iranian companies use intelligence techniques and tools to enhance the decision-making in their firms. Moreover, some studies and researches had been done in the context of Iranian firms and companies regarding the usage of intelligence in different areas. For example, Jandaghian et al. (2008, 684) investigated the appropriate intelligence tools and decision-making strategies to obtain the best result within the Iranian Railway system. They explained that by using intelligence tools and techniques, decision-makers can be able to establish efficient decision-making strategies which produced better performance in the railway system in Iran (Jandaghian et al. 2008, 685).

Another study that focused on Intelligence was undertaken by Khodadad and Ahmad (2012). They examined the use of intelligent tools to create a leadership model based on broad practical experience to enhance organizational performance in a specific Iranian company (Khodadad, and Ahmad 2012, 83). Moreover, they described that although in their intelligent leadership model the basic goal is to create a universal leadership model, the staffs

and their relations should be a common factor that should be applied in different parts of the organization and community (Khodadad and Ahmad 2012, 84).

Esmaeili and Hashemi (2015) conducted another research study in the Intelligence area in Iran. They used new information and communicative technologies to enhance the level of intelligence, convenience, availability, information and humanization of Iranian public transportation systems. In addition to management services, intelligent transportation systems can provide passengers, drivers and other institutions with other services such as trip planning, tracking and so forth (Esmaeili, and Hashemi 2015, 3). All of these events occurred through e-commerce and particularly m-commerce in order to improve the transportation management and presentation of user-centric services (Esmaeili and Hashemi 2015, 5). These are some examples of Intelligence researches in the Iranian environment. As discussed previously, there is not an article or research that specifically focused on the impact of intelligence on the effectiveness of an intelligent format of DSS and then the effect of this impact on the quality of decisions which was made based on an Intelligent DSS in the context of Iranian companies. Therefore, there is a huge gap in this area that this researcher aims to address in this research thesis.

2.5. INTELLIGENCE DECISION SUPPORT SYSTEM (IDSS)
2.5.1 Definition of Intelligent Decision Support System (IDSS)

According to Pau (1986, 12), during the past decades, Intelligence has experienced a wonderful surge in terms of research and implementation. Intelligence, as a powerful tool, allows people to easily control the realization of a task by providing perceptive supplement or reinforcement. Banks, financial services, economists, as well as many department managers are interested in this surge of function (Pau 1986; Spangler 1991;Blair, Debenham and Edwards 1997; Phillips-Wren et.al 2006; Kahraman, Kaya, and Cevikcan 2011). Moreover Fordyce, Nordern and Sullivan (1986) pointed out and explained that research in the area of artificial intelligence is generally divided into two major categories: understanding intelligence and making machines more useful to humans.

Since the focus of this thesis is on the relationship between knowledge management and the effectiveness of an intelligent decision support system and decision- making, it deals with the implementations of Intelligence which functions as tools in support of the decision-making, which is related to the 'understanding intelligence" category. As this focus specifically deals with the combination of intelligence and DSS, the literature pertaining to intelligence, and integrating DSS with intelligence, will be principally reviewed here. According to Blair, Debenham and Edwards (1997) an Intelligent Decision Support System (IDSS) is defined as "a class of computer programs that uses knowledge and problem-solving techniques on a skill level comparable to those of human experts and intends to serve as consultants for decision making". These systems comprise facts, knowledge base, heuristics methods, situation patterns, and rules. An Intelligent Decision Support System differs substantially from formal computer programs in that their goals may have no algorithmic solution, and they must make deductions based on uncertain or incomplete information (Phillips-Wren et.al 2009, 646). In addition, as researchers have found large amounts of knowledge, rather than complicated reason techniques in them that is responsible for the success of the approach; these systems are called expert systems (Pau 1986, 86).

An Intelligent Decision Support System (IDSS) is one of the key tools in leading DSS into the next stage in the evolution from passive data storage to highly active systems that are involved in the decision-making process (Moreau 2006, 594). IDSSs enable information system builders to move problem domain knowledge from the human to the computer so as to support problem recognition, problem structure and problem solving (Klein and Methlie 1995, 43). Moreover, intelligent decision support systems play two different roles, supporting and replacing a decision maker, at different organizational levels (Quintero, Konare and Pierre 2005, 657). Furthermore, IDSSs provide so many potential benefits that firms and managers are encouraged to use them (Pau 1986, 91). These benefits are:

- the ability to handle uncertainty when data are incomplete
- the ability to solve problems that have extremely large sets of possible solutions to explore
- the ability to codify human expertise permanently
- wider accessibility to that precious expertise

- a second opinion to that of a practising expert (pau 1986, 91)

2.5.2. Prior Research on Intelligent Decision Support System (IDSS)

Because decision-making has become very complex, the active involvement of the user and the computer in an intelligent way is essential in the decision-making process (Klein and Methlie 1995, 58). When human expertise is not available, Intelligent Decision Support Systems provide expertise more quickly and uniformly, and assist experts to make decisions in complex situations (Barr and Sharda 1997, 144). It has become a trend that DSS products tools and techniques from artificial intelligent (Pau 1986, 95). The tools of intelligence are an emerging technology that DSS developers recognize as both a key challenge and a key puzzle (Keen 1987, 258).

Many researchers such as Pau (1986), Klein and Methlie (1995), Blair, Debenham and Edwards (1997), Barr and Sharda (1997), Liebowitz (2001), Papamichail and French (2005) Turban, Aronson, and Liang (2005), Moreau (2006), Kahraman, Kaya, and Cevikcan (2011), have studied the integration of Intelligence within the DSS framework. For example, Klein and Methlie (1995, 63) compared intelligence and DSS, and found that both of them usually use a repetitive design or prototyping development approach. Some intelligence concepts may be transferable to DSS development. They also believed that Intelligence may have different business applications, and the application of both systems is likely to improve, as will their impact on decision-making and decision analysis (Klein and Methlie 1995, 65). Moreover, Blair, Debenham and Edwards (1997) claimed that intelligence can make DSS a more active and more valuable part of the decision process. They explained in their study that the integration of intelligence in DSS- not only can answers the 'what if' questions; it is also able to find answers to the 'why' questions (Blair, Debenham and Edwards 1997, 281). On the other hand, Turban, Aronson, and Liang (2005, 554) suggest two kinds of possible connections between the DSS and Intelligence which are:

- Intelligence as an additional component of DSS
- Intelligence integration into the conventional DSS components

According to Turban, Aronson, and Liang (2005, 559) a diversity of technical, design and behavioral issues were discussed that must be addressed in the DSS- intelligence integration. Furthermore, Papamichail and French (2005, 85) indicated that Intelligent Decision Support Systems use expert systems techniques to improve the capabilities of decision-makers in understanding a decision problem and selecting a suitable solution. These scientists also believed that Intelligent Decision Support Systems assists decision makers in the formulation and ranking of alternatives and communicates its recommendation in a natural language form (Papamichail and French 2005, 104). Moreau compared DSS and intelligence, highlighting their many similarities and indicating that both of them are capable of playing a significant role in the enhancement of a firm's performance (Moreau 2006, 603). He focused his research on analyzing the impacts of IDSSs on firm performance by examining their effect on users (Moreau 2006, 593). According to this research, the workers who are satisfied with IDSS functions, perceive their tasks as being more enriching and the systems themselves as being more useful which lead to the successful performance of the user's task and then better firm performance (Moreau 2006, 603). Another significant research in this area is Kahraman, Kaya, and Cevikcan's study undertaken in 2011. In this paper, the roles of intelligence techniques and decision-making are discussed as a means of establishing a successful business strategy. According to this study, Intelligence techniques are rapidly emerging as new tools in information management systems which can be used in the decision-making process of enterprises information management (Kahraman, Kaya, and Cevikcan 2011, 375). They also claimed that IDSSs that make extensive use of artificial intelligence (AI) techniques can increase sensitiveness, flexibility and accuracy of information management systems (Kahraman, Kaya, and Cevikcan 2011, 361).

All of these aforementioned studies focused on the definition, concept and function of IDSS and its component: an Intelligent and Decision Support System. As the main aim of this study is to find the relationship between knowledge management and IDDS, as well as the decision quality, there is a gap in this area that was not previously considered by researchers. Therefore, since no more research has been established in this area, this study

attempts to fill this gap. Then researcher focused of this valuable information as the basis of this study and determined the type and quality of the mentioned relationship.

2.5.3 Intelligent Decision Support System (IDSS) in Iran

By including Intelligence in a Decision Support System, IDSS was created. Most of the Iranian companies use IDSS to increase their efficiency and productivity. The Iranian government tries to facilitate IT infrastructure in the market, especially for financial companies and bank. This facilitation can help employees to make better use of the data and have access to the required information in order to make the best decisions. Several researchers have examined the role of IDSS in the Iranian companies and firms (Sianaki et.al 2010; Taremian and Naeini 2011; Shirazi, Mahdavi and Solimanpur 2012). One such research is that of Sianaki et al. (2010). They discovered that one of the main goals of Smart Grid is to achieve Demand Response (DR) by increasing the end users' participation in decision-making and increasing the awareness that will lead them to manage their energy consumption more efficiently (Sianaki et al. 2010, 156). In this paper, they developed a special model based on an intelligent decision support system that will assist the users to achieve demand response (Sianaki et al. 2010, 157). Furthermore, Taremian and Naeini (2011) conducted significant research regarding the IDSSs in Iran. They used a genetic algorithm and neural networks to provide a special kind of Intelligent Decision Support System for loan officers to predict the credit risk of the Iranian banks' customers (Taremian and Naeini 2011, 171). Genetic algorithms improved the decision support system function by using reinforcement learning to obtain more precise results (Taremian and Naeini 2011, 171). Moreover, according to their research findings, the performance of the mentioned Intelligent Decision Support System (IDSS) for credit assessment is much better than other methods both in terms of both type and number of errors (Taremian and Naeini 2011, 169). Shirazi, Mahdavi and Solimanpur's paper titled "Intelligent decision support system for the adaptive control of a flexible manufacturing system with machine and tool flexibility" describes an intelligent decision support system (IDSS) for real-time control of a flexible manufacturing system (FMS) (Shirazi, Mahdavi and Solimanpur 2012, 3290). The proposed system is

implemented by combining a rule-based IDSS, a simulation block and a centralized simulation optimizer for elicitation of shop floor control knowledge (Shirazi, Mahdavi and Solimanpur 2012, 3310). In this paper, an intelligent decision support system was used to the Iranian manufacturing sector.

The aforementioned studies concentrate on the different functions of an Intelligent Decision Support System (IDSS) within Iranian industries and companies. As the main aim of this study is to find the relationship between that knowledge management and intelligent decision support system in Iranian banks, as well as the decision quality (which is a huge gap in this study area), the researcher used this valuable information as the basis for this study to fill this gap and find the type and quality of the mentioned relationship in the Iranian banking industry.

2.6. EFFECTIVENESS OF INTELLIGENT DECISION SUPPORT SYSTEM (IDSS)
2.6.1 Definition of Effectiveness

Two general views can be taken concerning what system effectiveness means and how it should be measured: the goal-centred view and the systems-resource view (Hamilton and Chervany1981a, 83).

1. In the goal-centred view, the way to assess system effectiveness is firstly to determine the task objectives of the system, or of the organizational units utilizing the system, and then to develop criterion-based measures to assess how well the objectives are being achieved. Effectiveness is determined by comparing the performance against the objectives (Hamilton and Chervany1981a, 83). An example of the goal-centered view of system effectiveness would be to compare actual costs and benefits against budgeted costs and benefits (Hamilton and Chervany1981a, 84).

2- From the system-resource perspective, system effectiveness is determined by the attainment of a normative state, e.g., standards for "good" practices. Effectiveness is conceptualized in terms of resource viability rather than in terms of specific task objectives (Hamilton and Chervany1981b, 63). For example, system effectiveness in terms of human resources might be indicated by the nature of communication and conflict between MIS and

user personnel, user participation in system development, or user job satisfaction. In terms of technological resources, system effectiveness might be indicated by the quality of the system or service levels (Hamilton and Chervany1981b, 68). The system resource model recognizes that systems fulfil other functions and have other consequences besides accomplishment of official objectives, and that these need to be considered when assessing system effectiveness.

In order to achieve its objectives, IDSS has to perform its functions satisfactorily as planned, by providing correct and useful information (Blair, Debenham and Edwards 1997, 277). Although the concept of effectiveness is widely-used by many researchers, there are various opinions about its precise meaning. Hence, the concept of efficiency in the literature of IS varies (Wang 1997, 326). Following is a review of the "degree of compatibility of the actual output with the planned outputs".

Another belief is that any judgment about the effectiveness of the IDSS must be based on effectiveness criteria, since effectiveness is achieved if the system achieves the general objectives set for it (Phillips-Wren et al. 2009, 12). Others employ the term 'needs'; thus, effectiveness in their view, is "the system's ability to achieve or meet the needs of users, but needs are merely nothing more than the objectives (Phillips-Wren et al. 2006, 3). Given the various definitions of effectiveness, it appears that effectiveness varies in terms of the form it takes, and is consistent in terms of substance and outputs. The majority of definitions relate effectiveness to objectives or effectiveness and output, since effectiveness is selecting or determining the best method of performance in order to reach a desired and pre-established goal (Barr and Sharda 1997, 118). The researcher concludes that effectiveness is associated with the ability of the Intelligent Decision Support System to achieve its objectives, and the system that achieves its objectives is effective, whereas the system that does not achieve its objectives is not effective (Courtney 2001,86). The researcher defines the effectiveness of IDSS in terms of its ability achieve its objectives, mainly to provide information and is characterized by its convenience and reliability that help internal and external decision-makers to achieve their goals.

2.6.2 Definition of Effectiveness of an Intelligent Decision Support System (IDSS)

An IDSS is very valuable tool for decision making. IDSS plays an important role in decision-making when there is incomplete and uncertain information which means that the decisions which must be made according to human judgment and preferences may involve risk (Blair, Debenham and Edwards 1997, 277). Traditional DSS plus artificial intelligence (AI) functions provide IDSS with the goal of directing users in some part of the decision-making process or providing new capabilities (Phillips-Wren et al. 2009, 643).

Moreover, the main reasons for designing the Intelligent DSSs (IDSSs) is to helping the decision-making process by providing domain expertise recommendations and providing services to users to satisfy their requirements through communication, collaboration, and negotiation (Gao et al. 2007, 64). IDSSs also support both unstructured tasks in dynamic collaboration and structured tasks such as data mining, information filtering, and data alteration (Wang 1997, 326). In addition, the effectiveness of IDSS is an important topic in this research and thus the concept of system effectiveness is considered. In other words, evaluating system effectiveness can be considered as a difficult aspect of the IS implementation process due to its multiple evaluator viewpoints, its qualitative and quantitative aspects, and its multidimensionality (Hamilton and Chervany1981b, 83). Also, according to Hamilton and Chervany (1981a, 67), the evaluation of IS effectiveness is difficult and needs a good and relevant model.

Although there are several researches regarding the traditional DSS, few studies have focused on the unifying structure for the evaluation of IDSS (Phillips-Wren et al. 2006, 3). The majority of definitions relate effectiveness to objectives or effectiveness and output, since effectiveness is selecting or determining the best method of performance in order to reach a desired and pre-established goal (Barr and Sharda 1997, 118). The researcher concludes that effectiveness is associated with the ability of the Intelligent Decision Support system to achieve its objectives, and the system that achieves its objectives is effective, whereas the system that does not achieve its objectives is not effective (Courtney 2001,86). The researcher defines an effective IDSS as "the ability of the Intelligent Decision Support system to achieve its objectives, mainly to provide information characterized by its

convenience and reliability that help internal and external decision makers to achieve their goals".

2.6.3 Prior Research on Effectiveness of Intelligent Decision Support System (IDSS)

Since the early 1980s, the evaluation of the effectiveness of decision support systems (DSS) has attracted a great deal of research. As artificial intelligence methods have been combined into systems to create intelligent decision support systems (IDSS), researchers have tried to determine the value of the additional capabilities. Therefore, several researchers, such as Hamilton and Chervany (1981a), Hamilton and Chervany (1981b), Gilberto (1992), Barr and Sharda (1997), Courtney (2001), and Moreau (2006), Phillips-Wren et al. (2006), and Hong and Jie (2008) have focused on evaluating the effectiveness of IDSS. These researchers have focused on the effectiveness of an information system, the effectiveness of DSS and the effectiveness of an Intelligent Decision Support System and its impacts on the system's performance and goals.

For example, Hamilton and Chervany (1981a, 61) stated that an evaluation of IS effectiveness is difficult and needs a good and relevant model. Moreover, they recognized that conversation of information system effectiveness and the studies endeavouring to measure this construct, frequently concentrate on the question of what performance measure to use (Hamilton and Chervany 1981a, 66). These researchers also mentioned that there are several measurements for evaluating the effectiveness of IDSS such as changes in surrogate measures of user satisfaction, and changes in organizational performance.

On the other hand, Gilberto (1992) discovered that the effectiveness of IDSSs can be guaranteed only in the case of certain decision types. This means that for evaluating the effectiveness of IS in uncertain situations, and in coherent reasoning, it is clearly advantageous to integrate human and machine expertise (Gilberto 1992, 135). Moreover, he maintained that an effective IDSS can help to provide intelligent analysis, intelligent evaluation and intelligent advice in organizations (Gilberto 1992, 115).

Hong and Jie (2008, 519) provided a framework for an Intelligent Decision Support System of military communication effectiveness based on a data warehouse. It includes the model

base and its management system, knowledge base, method base and its management system (Hong and Jie 2008, 519). This framework provides the functions of a traditional DSS and also improves the intelligent level of the system by effectively arranging the evaluation data base and combining this with data mining (Hong and Jie 2008, 519). Moreover, they concluded that evaluating the effectiveness of an IDSS is a complicated system engineering process that can be on line analysis processing from simulation data (Hong and Jie 2008, 520). Since no more research has been undertaken in the area of KM and the effectiveness of IDSS and their relationship, this study attempts to fill this gap. The researcher has examined the existing valuable information and used this as a basis for this study on the type and quality of the mentioned relationship.

2.6.4 Effectiveness of Intelligent Decision Support Systems (IDSSs) in Iran

By continuously using Intelligent Decision Support System some Iranian companies evaluated the effectiveness of IDSS in their companies. In other words, as IDSS helps decision-making process by providing domain expertise recommendations and by providing services to users to satisfy their requirements through communication, collaboration, and negotiation it becomes so important for Iranian managers and decision makers (Gao et. al. 2007, 64).Therefore, some researches and studies had been done in this area within the Iranian companies and universities. For example Shakiba, and Hamadani (2013), Shirazi, Mahdavi and Solimanpur (2012), Taremian and Naeini (2011) had been done some researches in this area.

Taremian and Naeini (2011) did significant research regarding the IDSS in Iran. As it has been explained before, they provided a special kind of intelligent decision support system that is an effective system which can predict the credit risk of the Iranian bank's customers (Taremian and Naeini 2011, 171).Their method enhanced Intelligent decision support system function by using reinforcement learning to obtain more precise results and then increase its effectiveness (Taremian and Naeini 2011, 171). In addition, Taremian and Naeini concentrated on improving the performance of the mentioned Intelligent Decision Support System (IDSS) for credit assessing in the way that is much better than other methods both in the type of errors and number and type of errors (Taremian and Naeini 2011, 169).

Furthermore, Shakiba, and Hamadani (2013, 389) tried to evaluated the effectiveness of IDSS by assessing the results of those decisions that was made by IDSS. It means that for evaluating the effectiveness of IDSS, the impacts and the results of decisions must be evaluated (Shakiba, and Hamadani 2013, 389). Moreover, they explored that an effective IDSS provide some significant advantages for company such as increasing the profits and enhancing the quality of decision making (Shakiba, and Hamadani (2013, 389).

The above mentioned studies concentrate on effectiveness of Intelligent Decision Support System (IDSS) within the Iranian industries and companies. As the main aim of this study is finding the relationship between the knowledge management and effectiveness of intelligent decision support system in the Iranian banks, as well as the decision quality (which is a huge gap in this study area) the researcher used this valuable information as the base of this study to fill this gap and find the type and quality of the mentioned relationship in the Iranian banking industry.

2.7. DECISION QUALITY
2.7.1 Definition of Decision Quality

Decision Analysis (DA) was usually employed to arrive at the right answer in decision-making situations and this has developed into an established set of practices and tools (Scholten 2007, 539). However, it is recognized that in complex organizational settings, it is likely that multiple parties with different perspectives, motivations, and biases need to be involved in making key decisions (Barron, and Barrett 1996, 1516). In this regard, an important point must be made regarding DA. If organizations deal only with analytical complexity, they can obtain the 'right' answer, but if there is organizational complexity, it takes more than the achievement of clarity to arrive at a good decision.

Decision Quality provides the defining framework for a good decision (Wood and Highhouse 2014, 224). It is an extension of Decision Analysis (DA) and is a set of concepts and tools that produce clarity about the best choice in an uncertain and dynamic environment (Decision Quality Defined 2012). DQ uses DA to get to the "right" answer, and then engages

the most important parties to the decision process to achieve alignment and commitment to action (Scholten 2007, 541).

In order to ensure that quality decisions are made, decision-makers approach every problem through the paired lens of analytical and organizational complexity, making it possible to find and commit to the course of action that "gets decision makers the most of what they truly want" in difficult decision situations (Kopeikina 2005, 48). The processes, principles, and practices of decision quality can be applied to individual decisions as well as to resource allocation in portfolios of decision situations (Raghunathan 1999, 280). Full adoption of decision quality for an organization has a transformative effect on the behaviours, support staff, governance processes, and tools related to decision-making (Kopeikina 2005, 53).

Another significant point about the decision quality is that it relates to the ultimate quality of the decision made by the decision-makers (Raghunathan 1999, 280). The decision quality improves with better information quality since a decision-maker has knowledge about the relationships between problem variables (Williams et al. 2007, 469). However, the decision quality degrades despite higher information quality if decision-makers do not have sufficiently accurate knowledge of this relationship (Raghunathan 1999, 284). Better information quality plays a critical role in improving the quality of decisions in company (Kopeikina 2005, 231).

Decision quality can be defined by several factors such as "decision maker's information". It is clear that the quality of the information available to the decision-maker has a direct impact on the decision quality (Carmeli and Schaubroeck 2006, 443). Moreover, by modelling the possible result of decisions, selecting the best option and making the best decision based on the high quality information that was produced by this modelling would be easy (Kopeikina 2005, 112). In addition, Courtney focused on the importance of considering all aspects of the decision-making problem in order to improve the quality of decisions as a result of better information quality (Courtney 2001, 19).

Furthermore, according to the Raghunathan (1999, 276), by improving information accuracy, the quality of decisions would be improved. These factors help to provide better definition of decision quality and produce better research.

2.7.2 Prior Research on Decision Quality

According to the critical effects of each decision on the firm performance, decision quality and its features is an attractive topic for researchers in this area. Numerous studies on decision quality have been undertaken, including those of: Burleson, Levine and Samter (1984), Raghunathan (1999), Courtney (2001), Carmeli and Schaubroeck (2006), Williams et.al (2007), Davern, Mantena, and Stohr (2008), Hensman and Sadler-Smith (2011) and Aksoy, Cooil, and Lurie (2011).

The first example in this area is related to the study by Raghunathan in 1999. His study focused on the relationship between the decision-making process and the quality of decisions. Raghunathan (1999, 275) explained that the quality of decision-making has a direct and positive relationship with making high quality decisions and producing better results in a company. He also discovered in their research that team work with personnel who have relevant and different expertise is another factor that leads to improving the quality of decisions in all organizations (Raghunathan 1999, 275).

Another study regarding decision quality was undertaken by Williams et al. who examined the effect of DSS use on the decision quality and decision-makers (Williams et.al 2007, 469). The experiments undertaken in this study did not show general support for the often tacit assumption that the use of DSS enhanced decision quality (Williams et al. 2007, 479). Rather, Williams and his colleagues (2007, 479) found that, whereas a DSS can help decision-makers develop a better understanding of the essence of a decision problem and can decrease logical error, the accidental errors may outweigh the benefits of using a DSS, leading to poorer quality decisions (Williams et al. 2007, 479).

Davern, Mantena, and Stohr's study (2008, 127) examined and identified decision quality from its impacts. These researchers discussed that timely decision-making helps managers and decision-makers to make the best relevant and timely decisions which subsequently increase the viability of an organization. They also mentioned that because an alignment of decisions with organizational goals improved the quality of decisions, managers should pay attention to this alignment in order to improve the quality of decisions (Davern, Mantena, and Stohr 2008, 129).

Moreover, Hensman and Sadler-Smith (2011, 54) explored the notion of intuitive decision-making by providing enough related information and thereby increasing the decision quality. In addition, they believed that by using an effective information system, organizations can provide a flexible environment in order to make better use of information, provide better and more flexible decision-making and subsequently, better-informed decisions (Hensman and Sadler-Smith 2011, 55).

All of these studies focused on the definition, concept and function of decision quality and its impact on a firm's performance. As the main aim of this study is to find the relationship between knowledge management and effectiveness of intelligent decision support systems, as well as the decision quality, there is a gap in this area that has not previously been addressed by researchers.

2.7.3 Decision Quality in Iran

As the quality of decisions plays an important role in the success of organizations, all companies in the world try to improve the quality of decisions in order to obtain better results. Iranian companies are no exception and decision makers are encouraged to make better and more informed decisions. Moreover, as Information Technology infrastructure provides appropriate information and facilitates good decision-making, Iranian companies should focus on this important issue in order to provide high quality decisions.

As explained previously, decision quality is related to different disciplines and environments, making studies in this area complicated. Numerous studies have been conducted into the quality of decisions made in Iranian companies (Zangeneh, Jadid and Rahimi-Kian.2009; Zendehdel et.al.2010; Sadeghi and Ameli 2012; Vafaeipour et.al.2014). For example, Zangeneh, Jadid and Rahimi-Kian (2009, 5752) focused on the sensitivity analysis of the decision-making process and decision quality that is performed based on the state regulations to indicate how the variations of the attributes' weights influence the decision quality as well as the distributed generation alternatives' priority .This proposed analytical framework is

implemented in several Iranian companies under different conditions and with various energy resources (Zangeneh, Jadid and Rahimi-Kian 2009, 5752).

In addition, Zendehdel et al. (2010, 394) believed that one of the important factors that is resulted to high quality decisions is socially acceptable decision-making. They discussed that socially acceptable decision-making is only possible if there is the flexibility that allows stakeholders' sometimes conflicting preferences to be taken into account (Zendehdel et.al 2010, 394). To successfully address this issue, Zendehdel and his colleagues provided a decision-making method that considers each stakeholder's preferences by determining social intensities of preferences to be processed by an outranking method.

Another study in the Iranian Decision Quality discipline that was considered in this research is that of Sadeghi and Ameli (2012). In their study, they focused on making the best decisions for choosing the best allocation of energy subsidy among subsectors ,that can be a very complex activity (Sadeghi and Ameli 2012, 24). They proposed a comprehensive AHP model to solve these multi-objective problems that have many qualitative and quantitative criteria (Sadeghi and Ameli 2012, 28). This AHP model is a decision-making framework using a hierarchical relationship among decision levels and in order to provide high quality decisions by incorporating both qualitative and quantitative criteria when assessing the sub-sectors (Sadeghi and Ameli 2012, 30).

The above are just a few examples of decision quality researches in the Iranian environment. As discussed previously, no article or research focused specifically on the impact of the quality of decisions on the performance of Iranian banks. Therefore, there is a huge gap in this area which motivated the researcher to undertake the current study.

2.8. BANKING

2.8.1. Prior research on Banking Industry

Banks in all societies have a significant role to play in the financial and business sectors (Doumpos and Zopounidis. 2010, 55). These financial institutes are major organizations in the global market and their functions strongly influence all businesses, trades and the economy both locally and globally (Hensman and Sadler-Smith 2011, 51).Moreover, because

of their critical role in enhancing the economic standard of every society, numerous researches have been conducted on this topic such as those of Belaid Kridan and Steven Gouldin (2006), Celik and Karatepe (2007), Ioannou and Mavri (2007), Holland (2010), Doumpos and Zopounidis(2010), Fethi and Pasiouras (2010).

These researchers focused on various aspects of banking industry, their features and their environments. Each of these studies focused on one issue in the banking industry. For example, Belaid Kridan and Steven Gouldin (2006,211) explained that based on their findings, implementation of Knowledge Management mechanisms can result in services and process improvement, and the creation of a centralized communication system for the banking industry. They also believed that the environment and circumstances in banking corporations are important factors to consider before engaging in any KM initiatives since more support is required from the banks' management in terms of their structure, people, technology, goals and objectives and internal and external environment Belaid Kridan and Steven Gouldin (2006, 220). Celik and Karatepe (2007) conducted a valuable study on the banking industry. They focused on the performance of neural networks in evaluating and forecasting banking crises (Celik and Karatepe 2007, 809). They compared an artificial neural network model which works with the banking data belonging to the same date with another artificial neural network model which works with cross-sectional banking data (Celik and Karatepe 2007, 810). Finally, Celik and Karatepe (2007, 814) found that artificial neural networks which are capable of producing successful solutions for semi-structural and non-structural problems, can be used effectively in evaluating and forecasting banking crises.

In 2010, John Holland explained an interesting issue regarding the banking area. He discovered that the failing banks neither implemented existing knowledge nor created new knowledge to deal adequately with the new issues that emerged from their new business models (Holland 2010, 181). He also explored how these problems could be solved by taking an active approach to learning and knowledge creation in banks which is so significant finding in this area (Holland 2010, 182). Another critical issue that Holland showed in his study is related to involvement of bank top management in KM activities. According to

Hollan (2010, 182), this means that knowledge alone will not solve the problems outlined and the active participation of the banks' top managers is vital.

In addition, Doumpos and Zopounidis (2010, 55) tried to provide an efficient method for bank rating that is a major issue in the banking industry. They discussed that as a bank rating indicates a bank's overall viability, performance and risk exposure, then it is a significant factor when evaluating the bank's situation in the market (Doumpos and Zopounidis 2010, 56). Moreover, Doumpos and Zopounidis (2010, 55) discovered that bank rating is performed through empirical procedures that combine financial and qualitative data into an overall performance index. These researchers presented a case study on the implementation of a multi-criteria approach to bank rating based on their research findings in this area (Doumpos and Zopounidis 2010, 61).

2.8.2 Banking Industry in Iran

The Central Bank of Iran (CBI) was founded in 1960 following the ratification of the Monetary and Banking Law of the country. According to the 2nd chapter of the Iranian law, the entire activities and processes related to banknote printing and coin minting is to be carried out solely by the CBI. In addition to that, the printing of banknotes, which was based on the law confirmed on 21 July 1954, was previously handled by a joint board exclusively vested to CBI based on articles 14 and 18 regarding the means of minting and printing fees. These institutions, as government banks and the banks responsible for printing and minting of banknotes and coins, gradually took the role of the banks as well. In general, central banks also have the responsibility of ensuring economic stability and are responsible for improvements to the banking system. Banks have important duties to perform, the most important of which are to maintain the value of the country's currency and control inflation. In general, Iranian banks perform the following tasks which are among their most important duties: sole provider and printer of notes in circulation; banker of the government; banker of banks; responsible for management of country's foreign reserves; lender of last resort; and regulatory authority of the country's monetary policy. There are thirty-four local banks in this country. Of these thirty-four banks, six of the most significant were selected to

participate in this survey. Some of these banks are private and some of them are public. There are several studies related to the banking industry in Iran such as Haghighi, Divandari, and Keimasi (2010), Ahmadirezaeia (2011), Khajeh dangolania (2011), Hanafizadeh et.al (2014), Arjomandia, Valadkhanib, and O'Briena (2014).

Haghighi, Divandari, and Keimasi conducted valuable research on the Iranian banks on 2010. They explained that Information technology and business forces have provided financial innovation in the banking industry in Iran (Haghighi, Divandari, and Keimasi 2010, 4084). According to their research findings, IT tools help Iranian banks to deliver quick, safe, easily managed and highly qualified financial services to their customers (Haghighi, Divandari, and Keimasi 2010, 4086). Moreover, Haghighi, Divandari, and Keimasi (2010, 4052) recognized that efficiency, which is a strategic issue in banks, can improved by using information technology in all kinds of activities in these financial institutions.

Another valuable study that has been done on the Iranian banking industry is Ahmadirezaeia's study in 2011. He confirmed Haghighi, Divandari, and Keimasi's findings and focuses on one specific Iranian bank (Saderat) to test the impact of information technology on this company's function (Ahmadirezaeia 2011, 23). He discovered that, very evidently, IT leads to decreasing operational costs, facilitating transactions among customers of bank Saderat Iran within the same network and saving the time of the customers and the employees (Ahmadirezaeia 2011, 26). Although the findings of this study are limited only to specific Iranian banks, they revealed the advantages of having information technology as an integral part of banking systems that help these companies to win in the competing world (Ahmadirezaeia 2011, 26).

Arjomandia, Valadkhanib, and O'Briena's research in 2014 is another study in this area. Their research findings showed that under the intermediation approach, public banks were considerably more efficient than private banks in the post-regulation period (Arjomandia, Valadkhanib, and O'Briena 2014, 111). Moreover, this study illustrated that under the operating approach, private banks were fully technically efficient and mix efficient in both pre and post-reform eras (Arjomandia, Valadkhanib, and O'Briena 2014, 122). In addition, this research reflected that the public banks' mission is to maximise loans to target

groups while private banks are motivated more by financial profit (Arjomandia, Valadkhanib, and O'Briena 2014, 122).

These are some examples of researches in the Iranian banking industry. As explained previously, there is no research or study that has focused specifically on the KM and effectiveness of IDSS in the context of Iranian banks. Therefore, there is a huge gap in this area that needs to be addressed.

2.9. SUMMARY OF THE RESEARCH GAP

Recognizing the effects of KM on both intelligence and a decision support system that can merge and produce IDSS (Kahraman, Kaya, and Cevikcan 2011, 361) in an organization is just a first step. The real challenge is to find how KM can influence the effectiveness of IDSS and how this effectiveness can impact upon ultimate decision quality. For example, Metaxiotis (2010), Liebowitz (2001), Canongia (2007), Courtney (2001), Nemati et al. (2002), Pedersen and Larsen (2001), and Holsapple (2001) discussed the relationship between KM with IDSS and quality of decisions in organizations. But no article or research has focused specifically on the impact of the KM on the effectiveness of IDSS and then the effect of this impact on the quality of decisions which were made based on this IDSS. However, there is a huge gap in this area between KM and the effectiveness of IDSS on the one hand, and the effectiveness of IDSS on decision quality on the other hand which should be considered. Moreover, KM has a direct impact on the decision quality in addition to the indirect impact resulting from the KM effects on the effectiveness of IDSS that is considered in this research. Therefore, since no comprehensive study has yet to establish standards or guidelines in this area, this research attempts to fill this gap. Hence, it is important to provide guidelines to assist firms (for example banks) to successfully deploy and use KM with regards to improving decision quality. With this in mind and selecting Iranian banks, the topic for the research arises.

The works of Holsapple and Joshi (2001); Raghunathan (1999) and Williams et al. (2007) were examined in this research in order to acquire a better understanding about the decision quality. These are some examples of previous studies that were considered in this

research; it was found that none of them focused on the relationship between KM and the effectiveness of IDSS and decision quality.

Therefore, the determinant factors in this research focus on assessing the relationship between KM and DSS, KM and Intelligence, DSS and Intelligence with IDSS, the Effectiveness of IDSS and Decision Quality, and finally, KM and Decision Quality. Another valuable aspect of this research is determining the results of these relations and their impacts including relative advantages, and the individual and organizational impacts that were mentioned previously. All of these important issues increase the uniqueness of this research. Then, for researchers, the model suggests the types of variables that need to be included in future empirical tests of the relationship between KM and the effectiveness of Intelligence Decision Support Systems (IDSSs). Consequently, the model extends our understanding of what is becoming increasingly important – the impact of the integration of Intelligence and DSS on the effectiveness of IDSS.

As the banking industry operates in a very competitive environment, this knowledge is very valuable for this sector. Moreover, practitioners, especially KM and IDSS applications developers and users such as managers, business analysts and decision-makers can also use this model to refine their thinking about KM and IDSS. This will significantly influence their decision making and subsequently the quality of decisions made by their firms. By recognizing the relationship between KM and IDSS with decision quality, the decision-makers, analysts and managers can focus on the main issues in this area and make the best decisions that they can. These kinds of decisions ensure an organization's success and viability.

2.10 THEORETICAL BACKGROUND

The importance of obtaining new knowledge to improve organizational competitiveness is currently well accepted (Gray 2001, 87). Therefore, as knowledge management adds value to a company's intangible assets, many companies currently are concerned with managing knowledge both within their organization and externally for the benefit of customers and shareholders (Rubenstein-Montano et al. 2001, 6). Moreover,

decision-making incidents can be explained as knowledge intensive processes which operate on and supplement organizational knowledge resources (Holsapple and Joshi 2001, 39). In addition, decision support systems (DSSs) execute some part of the knowledge management (KM) activities that are essential to these processes (Holsapple and Joshi 2001, 39). An intelligent decision support system (IDSS), which combines DSS with intelligent tools, is not intended to provide a substitute for the decision maker. It just helps organizations to making decisions more effectively (Quintero, Konare and Pierre 2005, 655).

Because research on Knowledge Management and effectiveness of IDSS and their impacts on decision quality are still in its infant stage, recent studies in this area (KM and Effectiveness of IDSS) have focused on discovering the significant factors that produce better decisions. However, these studies are predominantly in the areas of Knowledge Management or Decision Support Systems. Therefore, understanding and incorporating the distinctive factors mediating the relationship between KM and the effectiveness of IDSS and its impacts on decision quality in the banking industry demands more effort. To address this issue, this research attempts to provide a model for this relationship. This model has been developed based on an extensive literature review and the previous discussions in this area. As IDSS is an intelligent version of DSS and DSS is a special kind of Information System (IS), in order to evaluate the effectiveness of IDSS, the researcher refers to the very reliable and valid theoretical background in this area. It means that by focusing on the current valid model in IS research, the validity of this research is improved.

Much research effort went into selecting a valid and useful model regarding IS effectiveness or success. Finally, DeLone and McLean's model was selected as the theoretical background and basic model of this research based on its alignment with the issues and concepts of this research. DeLone and McLean's model which is one of the most reliable models in this area, evaluates the success of Information Systems (DeLone and Mclean 2003, 10).This model explained that the use of the system and its information products affect the individual user's work, and these individual impacts in a collective manner result in organizational impacts (DeLone and Mclean 2003, 12). In other words, according to DeLone and McLean's model, the success of IS can be measured through its

impact on user satisfaction and on the organization. As a result, the impact of the effectiveness of IDSS (specific kind of IS) could be measured on decision quality as a very important organizational impact. This model provides a very important theoretical basis for many studies in the IS research area.

2.10.1. DeLone - McLean and Related Models

The model of DeLone and McLean's information system success (DeLone and Mclean 2003, 10) provides the theoretical foundation for this research. DeLone and McLean's is a framework and model for measuring complex dependent variables in IS research. This model claims that the use of the system and its information products affects the individual user's work, and these individual impacts, collectively, have organizational impacts (DeLone and Mclean 2003, 12). An important point about this model which is made by its authors is that "IS success is a multidimensional and interdependent construct and that it is therefore necessary to study the interrelationships among, or to control for, those dimensions" (DeLone and Mclean 2003, 11). Figure 2.1shows the basic Delone and Mclean s Model.

Therefore, according to this model, as the success of IS can be measured through its impact on user satisfaction and finally on organizational impact, the impact of the effectiveness of IDSS (specific kind of IS) could be measured based on decision quality as a very important organizational impact.
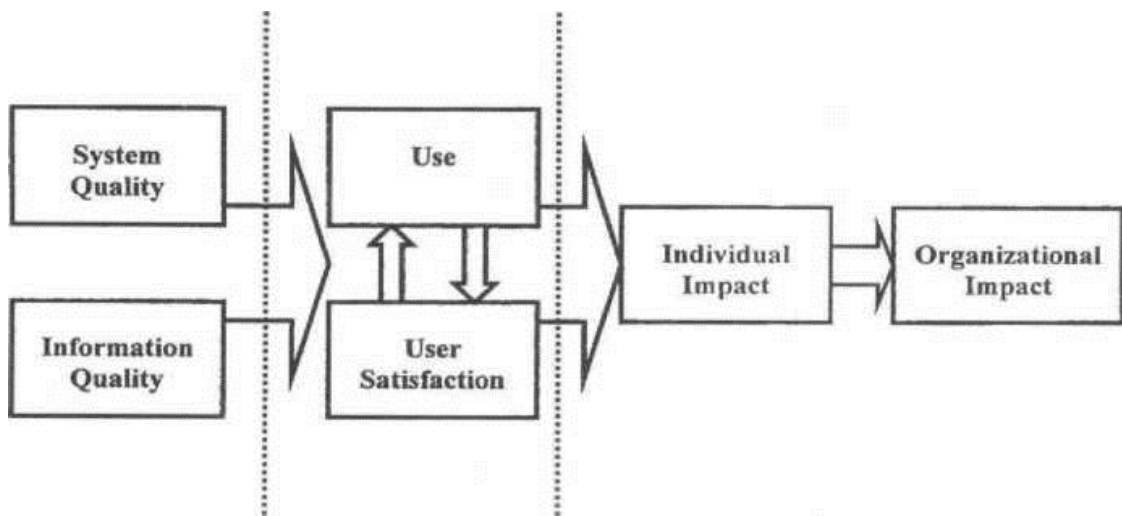
Figure 2.1: W. DeLone and E. McLean, Information Systems Success

Recently, DeLone and McLean (2003) discussed many of the important IS research efforts that have applied, validated, challenged, and proposed enhancements to their original model, and then proposed an updated DeLone and McLean's IS success model which depicts the relationship between system quality, information quality, service quality, use, user satisfaction, and net benefit.

This model has provided a very important theoretical basis for many studies in the IS research area in the past decades. For example, Moreau (2006) selected the DeLone and McLean's model as the theoretical background and basis of her study. She investigated the impact of intelligent decision support systems on intellectual task success (Moreau 2006, 593) and used the DeLone and McLean model to evaluate this impact. She proposed the research model (Figure2.2) based on DeLone and McLean's model to investigate and evaluate the impact of IDSS users' perceived satisfaction regarding their jobs and then on their success in fulfilling their intellectual tasks (Moreau 2006, 594). Figure 2.2shows the Moreau's proposed research model based on the Delone and Mclean s Model.
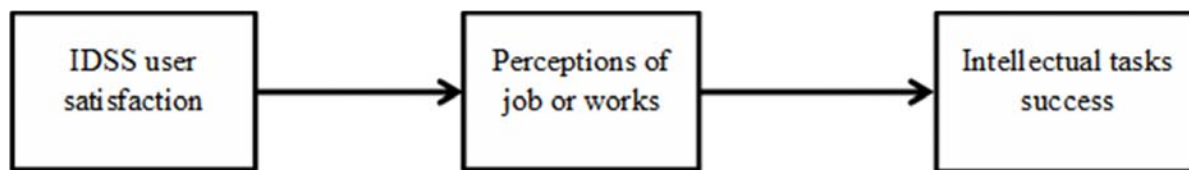
Figure 2.2: Moreau Proposed research model

Finally, based on the research findings, she investigated whether the positive impact of information systems improved user or departmental performance (Moreau 2006, 603). Moreover, the findings of this research identified links between user satisfaction and modifications to work design and intellectual task success (Moreau 2006, 603).

Another example is the study undertaken by Wang, and Liao (2008). They assessed the success of e-Government systems based on the DeLone and McLean model of information systems success (Wang, and Liao 2008, 717). They believed that their study provides the first empirical test of an adaptation of DeLone and McLean's IS success model in the context of G2C e-Government (Wang and Liao 2008, 717). Their research model consists of six dimensions: information quality, system quality, service quality, use, user satisfaction, and perceived net benefit (Wang and Liao 2008, 718). Except for the link from system quality to use, the hypothesized relationships between the six success variables were significantly or marginally supported by the data (Wang and Liao 2008, 730). Figure 2.3 shows the proposed research model in Wang, and Liao study based on the Delone and Mclean s Model.
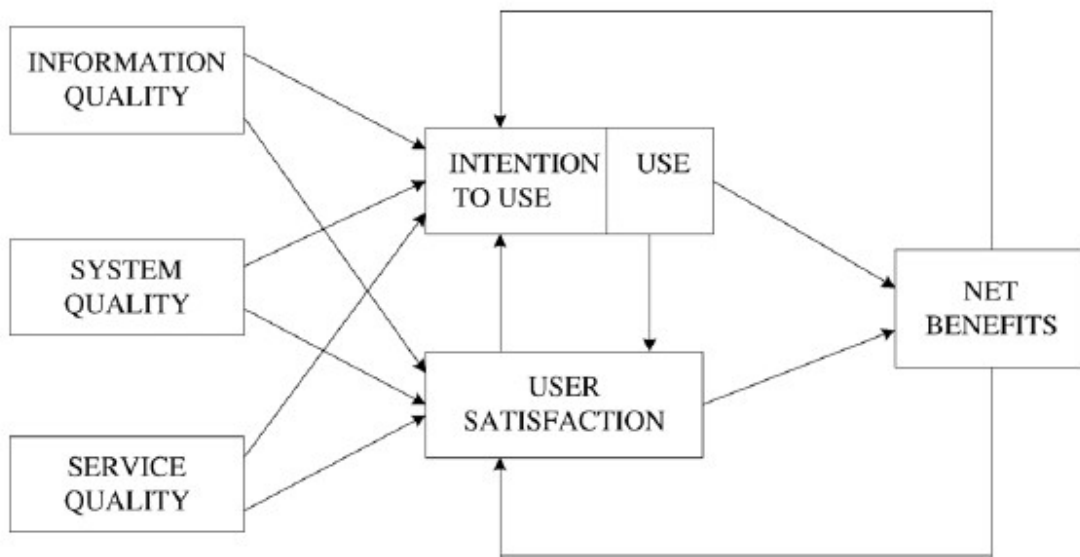
Figure 2.3: Proposed research model in Wang, and Liao study

The final example of research that was done based on the DeLone and McLean model is that of Baraka, Baraka, and Gamily (2013). They introduced a model to evaluate the performance of call centers based on the DeLone and McLean model (Baraka, Baraka, and Gamily 2013, 99). A complete set of performance indicators for call centers are identified and mapped to the six dimensions of the DeLone model. Figure 2.4 shows the proposed research model in this study. They introduced a weighted performance index to calculate the call center overall performance (Baraka, Baraka, and Gamily study 2013, 101).The analysis of the different weights cases gave priority to the user satisfaction and net benefits dimension as the two outcomes of the system (Baraka, Baraka, and Gamily study 2013, 107). Decision-makers in call centers can use the tool to tune the different weights in order to achieve the objectives set by the organization (Baraka, Baraka, and Gamily study 2013, 107).
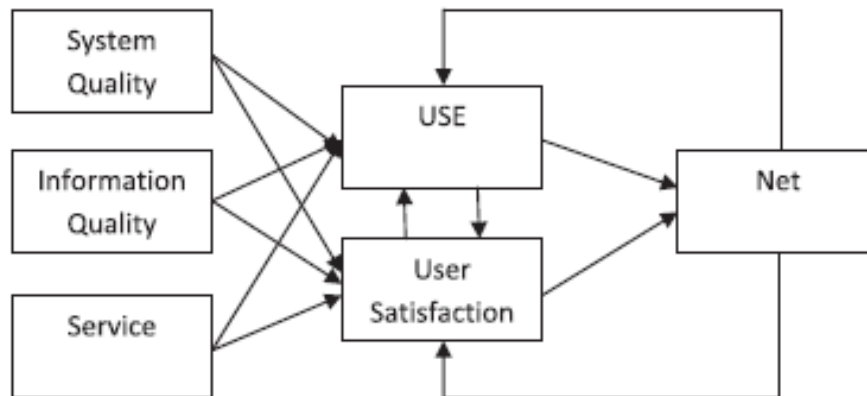
Figure 2.4: Proposed research model in Baraka, Baraka, and Gamily study

2.11. PRELIMINARY RESEARCH MODEL

According to all information that was provided in this chapter, the preliminary research model for this study was prepared. The main construct in this model are: Knowledge Management (KM), Decision Support System (DSS), Intelligence, Effectiveness of IDSS and Decision Quality. As can be seen in Figure 2.5, KM is related to DSS, Intelligent and Decision Quality. Moreover, DSS and Intelligence can affect the Effectiveness of IDSS as well. Finally, Decision Quality was affected by KM and Effectiveness of IDS.

This model which is developed, based on extensive literature review and the previous discussions, is very significant and unique. As discussed previously, this model was based on the DeLone and McLean's information system success model (DeLone and Mclean 2003, 10). According to the DeLone and McLean's model, the success of IS can be measured by its impact on user satisfaction and finally on organizational impact. Then, in this unique model for evaluating the effectiveness of IDSS (specific kind of IS), its effects on the decision quality as a very important organizational impact was measured. Put simply, based on the DeLone and McLean model, the success of IS can be measured through its impact on user satisfaction and finally on organizational impact. Hence, the researcher evaluated the effectiveness of IDSS within the Iranian banks by assessing its impacts on the quality of

decisions that were made in the different departments and branches in these companies. This impact indicated the extent of the effectiveness of an Intelligent Decision Support System that was affected by Knowledge Management in Iranian banks. Moreover, in this model for estimating the relationship between KM and effectiveness of IDSS, the determinant factors focus on the relationship between KM and DSS, KM and Intelligent, DSS and Intelligent with IDSS, the Effectiveness of IDSS and Decision Quality and KM and Decision Quality. Another valuable aspect of this research model is that it estimates the results of these relationships and impacts including relative advantage, individual and organizational impact that will be mentioned later. Therefore, given the specific features of this model, the uniqueness of this research which can be used in the similar studies in Iran or other countries in the future is increased. Then, for researchers, the model suggests the types of variables that need to be included in future empirical tests of the relationship between KM and the effectiveness of Intelligence Decision Support Systems (IDSSs). Consequently, the model extends our understanding of what is becoming an increasingly important effect of the integration of Intelligence and DSS on the effectiveness of IDSS. All these concepts, relations and impacts will be revisited in the following chapters.
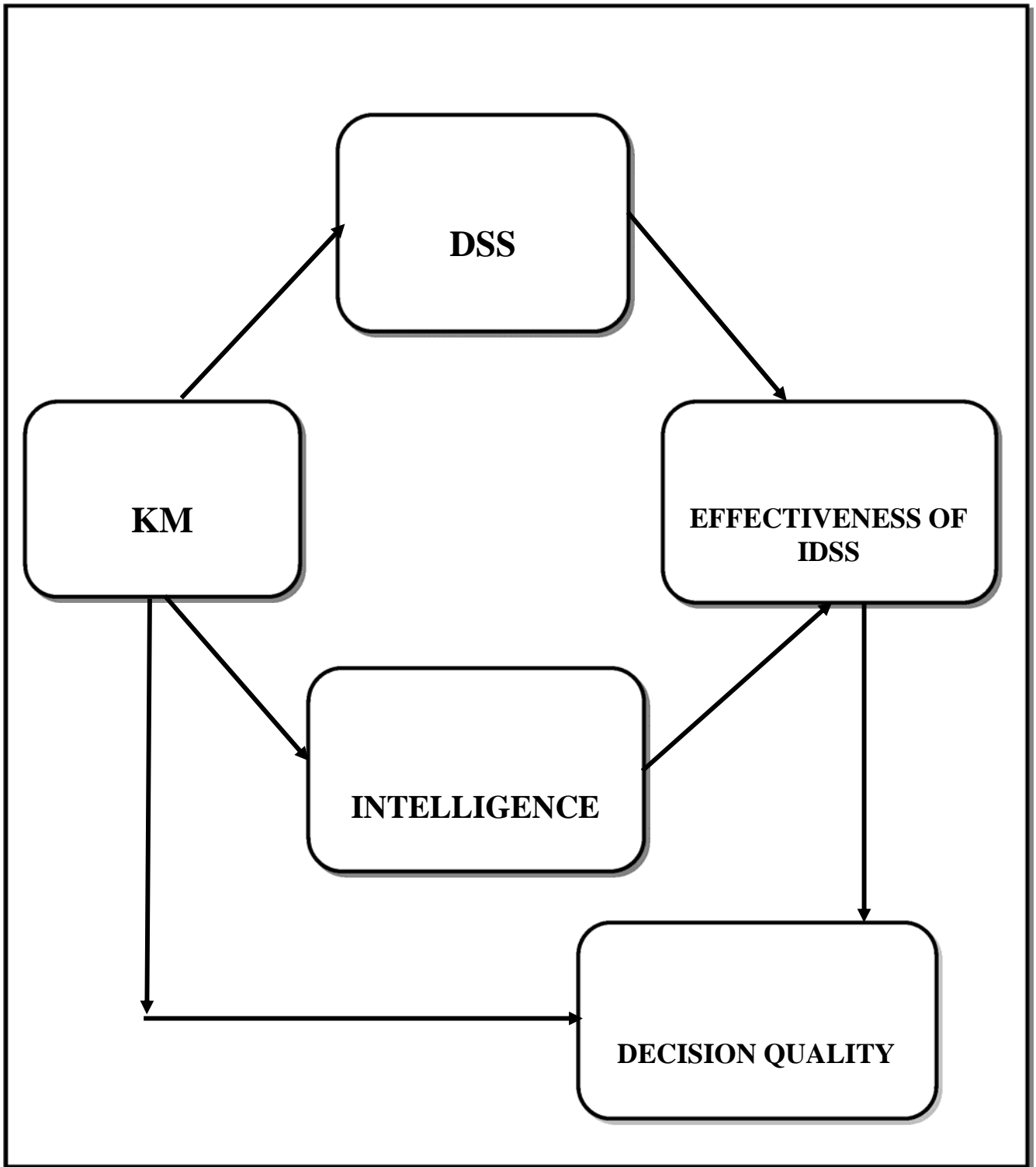
Figure2.5: Preliminary Research Model

61

2.12 SUMMARY

This chapter presented the literature background of this current research. The relevant details of theoretical concepts from KM, DSS, Intelligence, Effectiveness of IDSS and Decision Quality have been explained. In summary, the relationship between KM and the Effectiveness of IDSS is a new and contemporary phenomenon. The analysis suggests that although none of these theories and models could be applied as such to this relationship in organizations, integrating the constructs across the models will be more appropriate and will assist in providing a coherent understanding of the research problem. Hence, this chapter presented a preliminary research model, based on the existing literature, which will further be improved by integrating the contextual factors.

CHAPTER 3
RESEARCH METODOLOGY AND DESIGN

3.1 INTRODCUTION

The previous chapter provided a conceptual model aimed at investigating the relationship between KM and the Effectiveness of IDSS and the impacts of this relationship on the decision quality on the one hand, and the direct impacts of KM on decision quality on the other hand in the context of the banking industry in Iran. This chapter provides an overview of the research approach which leads to the selection of an appropriate method for conducting the research. As described in Chapter 2, the model of DeLone and McLean's information system success (DeLone and Mclean 2003, 10) has been applied as the theoretical foundation for this research. The findings of past knowledge management researches and unique features of the banking industry in Iran were employed to extend the current theories to develop the research model in this study.

Therefore, in order to acquire a better understanding of the research topic, validating and understanding the conceptual model, and obtaining and analysing the data, a combination of both quantitative and qualitative methods, which is called 'mixed methods', was applied (Tashakkori and Teddlie 2009, 10). The philosophical basis that was used in this research was positivism. This chapter explains this selected method in detail. Discussion about the research paradigm, which leads to the justification of the mixed-methods approach for this research, is the first part of this chapter. The next section provides a definition of and research design for the mixed-methods approach; this is followed by a discussion of the research process that has been matched. This section presents a summary of the chapter.

3.2 RESEARCH PARADIGM

According to Collis, Hussey, and Hussey (2003, 110), the research paradigm is the development of scientific practice according to people's assumptions and philosophies about

the world. Put simply, a paradigm prepares a conceptual framework that describes how a research is formed, how data is collected and explained, and finally how the findings are conveyed. Moreover, a paradigm can be considered as a set of basic opinions that help researchers to deal with first or final principles (Guba and Lincoln 1994, 108).

There are three major research paradigms especially within the IS discipline: positivist, interpretivist, and critical research (Crotty 1998, 128; Mingers 2001, 240; Mingers 2003, 234; Guo and Sheffield 2008, 676). A research can be considered positivist if there is some proof of formal plans, quantifiable estimates of variables, formulation of hypothesis, hypothesis evaluating, and illustration of inferences about a phenomenon from the sample to a target population (Orlikowski and Baroudi 1991, 5). The positivist approach is in contrast to the scientific concept or research idea that can be observed and measured objectively; a non-scientific research idea or concept is so intangible that it cannot be estimated or monitored (Hessler 1992, 45). Hence, the positivist paradigm is connected to the quantitative research method where the formulating and testing of the hypotheses is essential (Creswell 2011, 58). The underlying assumption of positivism is that "the data and its analysis are value-free and data do not change because they are being observed" (Krauss 2005, 760). Another important point in the positivist paradigm is related to the reality that is to be an independent item from the knower (Johnson and Onwuegbuzie 2004, 16). Therefore, the positivist researchers do not obtain results from their own logical thinking or perception as they usually maintain a distance from the participants and what is being studied, and they observe reality as 'being' instead of 'becoming' (Guo and Sheffield 2008, 675). Therefore, in terms of research design, quantitative research is normally undertaken by the positivist researchers.

The second kind of research paradigm is the interpretivist paradigm. The interpretivist approach tries to develop science through social interpretation (Neuman 2003, 163). In contrast to the positivist paradigm, the interpretivist researcher refuses to accept a disconnection of researcher and participant, as they believe the researcher should interact and affect the topics being studied (Guo and Sheffield 2008, 676). Therefore, interpretivist researchers view the reality and thus have to dive into the actor's mind by hearing, observing and feeling how the actor explains a thing (Dwivedi 2008, 53). The interpretivist researcher

suggests that the researcher should "allow the questions to emerge and change as one becomes familiar with the study content" (Krauss 2005, 760), and see all things as 'becoming' as opposed to 'being'. Therefore, in terms of the research design, qualitative research is normally undertaken by interpretivist researchers.

A third type of research paradigm is the critical analysis. Critical analysis normally concentrates on the contrasts, conflicts, and inconsistencies (Myers 1997, 242). Critical analysis is not a very common research paradigm. Mingers (2003, 236) found that 75% of the IS research involved a positivist paradigm, 17% interpretivist and only 5% used critical research.

The nature, aims, and the context of this study determined the research paradigm and research method. Since this study provides proofs of hypotheses, quantifiable measures of variables, hypotheses assessing, and the illustration of inferences about an issue from the selected sample to a stated population, the positivist paradigm is considered appropriate for this research.

3.3 RESEARCH METHOD

The positivist paradigm has been supported by numerous studies in its explorations of reality. Now it is necessary to find a suitable research method based on this research paradigm. Although both of the common research methods, qualitative or quantitative, have their strengths and are successfully utilized in different fields of study especially in multidisciplinary researches, such as organizational theory, IS, marketing, behavioural science and social sciences etc., in fact, each of these research methods, has its own limitations (Greene, Caracelli, & Graham, 1989, 260). Therefore, the selection of an inappropriate research method could lead to inadequate and/or inaccurate results.

Thus, a combination of the two methods, termed the *mixed-methods approach*, has been proposed for this study (Tashakkori & Teddlie, 1998). The mixed-methods research approach is based on the notion that the combination of quantitative and qualitative methods would compensate for any interactive and overlapping weaknesses (Greene, Caracelli, &

Graham, 1989, 260) as well as providing consistent and cohesive results (Hohental, 2006, 178). Mixed-methods research based on Tashakkori and Teddlie (2009, 11) "is defined as research studies which use qualitative and quantitative data collection and analysis techniques in either parallel or sequential phases". Having selected the mixed methods approach, this study begins by developing the experimental model (see Figure 2-1) that is based on the comprehensive literature review. This is followed by the qualitative field study conducted by means of interviews. The next step is to refine the initial research model and develop a comprehensive research model based on it. Research hypotheses and questionnaires are developed according to the comprehensive research model. Finally, quantitative empirical studies are directed through the pilot study and the major survey in order to measure and assess the proposed hypotheses.

The mixed-methods approach is appropriate for this research for the following reasons:

1- Mixed-methods research can answer this research's questions that the other methodologies cannot (Tashakkori and Teddlie 2009, 25). Most quantitative research is corroborative and involves theory confirmation, while much qualitative research is investigative and involves theory production. Accordingly, a significant advantage of mixed-methods research is that it enables the researcher to answer corroborative and investigative questions at the same time, and thus confirms and produces theory concurrently which is most appropriate for this research (Tashakkori and Teddlie 2009, 26).

2- Mixed-methods research develops better and stronger deductions. Greene, Caracelli and Graham (1989, 266) recommend that mixed methods lead to multiple deductions that verify or complete each other. Moreover, in mixed-methods research, the deduction that was made at the end of one step such as the qualitative study lead to the questions design of a next phase as in a quantitative study (Greene, Caracelli, and Graham1989, 271).

3- The mixed-methods approach provides the opportunity for collecting a greater variety of divergent views. The mixed-methods approach alerts the researcher to the multifaceted aspect of the issues that can be more than they may have initially anticipated (Creswell 2011, 77).

Moreover, there are different types of the mixed-method research approach; they are triangulation design, embedded design, explanatory design and exploratory design (Creswell, 2011, 79). Triangulation design refers to the collection and then comparison of the data from both quantitative and qualitative methods with the view to using the qualitative data to validate or expand the quantitative estimates. Embedded design focuses on the collection of both quantitative and qualitative data while either of these data plays a supplementary role within the overall design. Explanatory design leads to the collection and analysis of quantitative data followed by the subsequent collection and analysis of qualitative data. The last option, exploratory design, focuses on the qualitative data in order to explore a phenomenon, and subsequently estimates the quantitative data.

For the current research, it was essential to again reflect upon the objectives. As discussed in Chapter 1 (see section 1.4) the main aim of this research was to investigate the KM, DSS and Intelligence factors that affect the decision quality as a result of the effectiveness of Intelligence Decision Support Systems (IDSSs) in Iranian Banks. In this study, based on previous theoretical frameworks and empirical studies, the preliminary model (see Figure 2.2 in Chapter 2) was proposed. The model must to be tested in terms of its validity and applicability to provide sufficient comprehensiveness to describe such behaviour. Then, a field study comprising semi-structured interviews was conducted. Finally, to assess the comprehensive model to ensure its generalizability and improve its explanatory power, a survey was carried out (the details of the process are in the next section). Based on the research objectives and the description of the process, a triangulation design was employed. In triangulation design, in order to increase the reliability and validity of the research, the data from both quantitative and qualitative methods is compared and merged during the analysis. Furthermore, triangulation has been acknowledged as the most commonly used mixed-method approach (Creswell, 2011, 79).

3-4 RESEARCH PROCESS

As there has been limited past research on the relationship between KM and the Effectiveness of IDSS and Decision Quality, the research process is divided into a number of steps. All parts of this research process are depicted in Figure 3.1.

Step-1: Literature Review

The research started with an analysis of current literature on KM, DSS, IDSS, and Decision Quality. The literature was conducted using a variety of available sources including books, journals, working papers, case studies and seminar proceedings. The current and past related works and the gap in the literature gap were found with the comprehensive literature. After conducting a comprehensive examination of the relevant literature, sever problems were identified and these were formally expressed as research objectives. These were broken down into specific research questions in order to make the research more manageable and its objectives more easily achievable.

Step-2: Preliminary Research Model Construction

Based on the review of the existing literary works, a preliminary research model of the relationship between KM and Effectiveness of IDSS and Decision Quality was developed (see Figure 2.1). The initial model was evaluated in a continuous process that was refined by current publications.

Step-3: Qualitative Field Study

A field study through interviews was then conducted with ten analysts, decision makers and managers in Iranian banks. The main goals of these interviews were to (1) search and investigate the procedures and concepts that might not be described or recognized in the literature review, and (2) evaluate the value of the concepts recognized
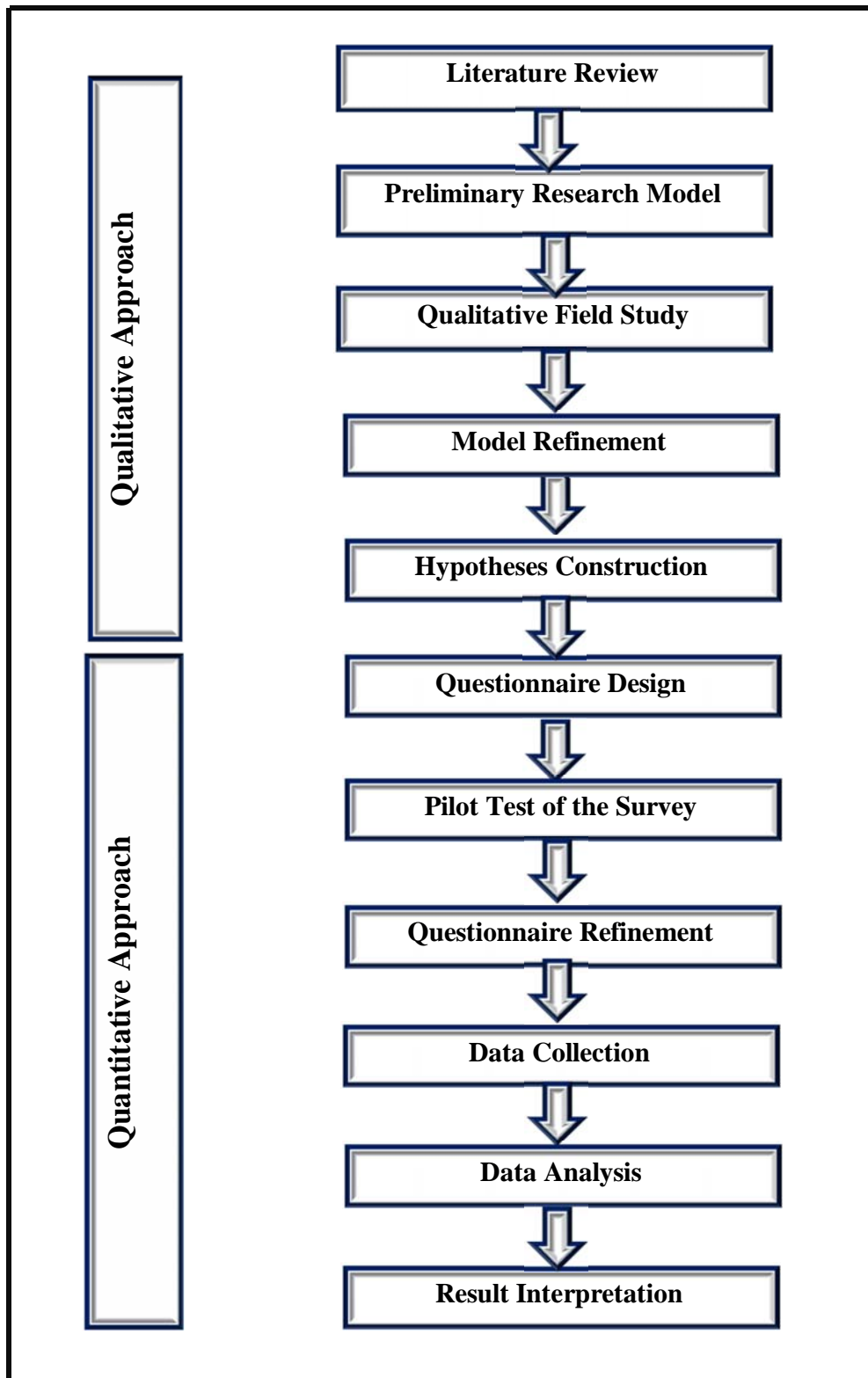
Figure 3.1 The sequential presentation of the research approach in the literature review.

The interviews were conducted using a semi-structured interview question, which was developed with the help of the literature review. The researcher was mainly responsible for transcribing the interviews. The transcribed data were analysed by the researcher in two stages. Firstly, each individual interview transcript was dealt with, and in the next stage the researcher cross-referenced all the individual factors, variables, and their relationships to produce the combined model. Chapter 4 describes this process in detail.

Step-4: Model Refinement

The preliminary research model was refined based on the qualitative data analysis findings and the literature review. In this step, duplicate constructs and items were eliminated, and essential items or constructs were added. The research model was then finalized.

Step-5: Hypotheses Construction

At this stage, based on the final research model and the theories from the literature, hypotheses are established. The corresponding theories were used in the construction of the hypotheses.

Step-6: Questionnaire Design

An experimental questionnaire was designed based on 6 hypotheses that had been constructed in the previous step. Measurements in the questionnaire relied heavily on the available tools designed in the later literature. Moreover, new measurements were based on the findings from the qualitative field study. The combination of measurement items is subjected to a pre-test to ensure the reliability and validity of the questionnaire before conducting the survey.

Step-7: Pre-test of the Questionnaire

The tentative questionnaire was pre-tested before it was widely distributed. The pre-test was conducted with 50 analysts, decision-makers and managers in Iranian banks as well as the

academic researchers who are experts in this area. The most important aim of the pre-test is to acquire experts' knowledge in the relevant field in order to improve content validity.

Step-8: Questionnaire Refinement

In this step, in order to refine the experimental instruments based on the pre-test results, essential changes were made prior to the actual surveys being conducted. Then the final complete questionnaire was ready to be distributed among the respondents of the survey.

Step-9: Data Collection

The quantitative data collection process started with the questionnaire being given to the decision-makers, managers and analysts in Iranian banks. Three hundred valid responses were collected. The amount of valid data collected satisfied the analysis requirement.

Step-10: Data Analysis

Data gathered through the survey were analysed by SPSS and PLS-based Structural Equation Modelling (Chin, Marcolin, and Newsted 2003, 21). The SPSS analyses provided descriptive statistics while PLS tested discriminate validity, convergent validity, and the hypotheses.

Step-11: Result Interpretation

In the final part of the research, the findings from both qualitative and quantitative data-analysis were explained. The research results were interpreted and discussed in terms of the previously developed research questions and objectives.

3.5 QUALITATIVE FIELD STUDY

This phase of the study attempted to explore the relationship between KM and Effectiveness of IDSS and Decision Quality, to validate and improve the factors and variables that were recognized as part of the comprehensive literature review. Because of the exploratory nature of this part of the research, the qualitative method is considered as the most suitable.

Scholars believe that when textual data are quantified, the comprehension of a phenomenon from the participant's view is difficult (Kaplan and Maxwell 1994, 48). Therefore, a 'simulated case study' that included a qualitative study of a few participants would fulfil the objectives of this part of the study.

Hence, a field study approach has been chosen as the research method for the qualitative phase (Patton 1999, 1191). Moreover, qualitative methods allow the researcher to study selected topics in depth and detail. Therefore, the field-study was performed without being forced by preordained outcomes; rather it relied on frankness and detailed qualitative inquiry to ensure the positivist stand of this research (Patton 1990, 1192).

3.5.1. Sample Selection

For the qualitative part of the study, this research took a comfort sampling procedure. This sample was selected based on the available subjects who were close at hand or easily obtainable (Berg 2012, 156) and is usuallyt a feature of business research (Zikmund 2003, 254). Ten key persons from the banking industry who were willing to participate in this field study were selected. The main criteria for selecting these people were that they must be involved in acquiring, analyzing and utilizing information for decision-making activities and then decision-makers, analyst and managers were approached. The participants were contacted via phone to confirm their willingness to participate in the research interviews.

3.5.2. Data Collection

In this stage, semi-structured interviews were designed in order to collect the data. There are three important types of interview structures: the structured or standardized interview, the unstructured or unstandardized interview, and the semi-structured semi-standardized interview (Merriam 2001, 89; Nieswiadomy 2011, 110). In this research, the semi-structured interview was suitable for collecting relevant data and to explore and then refine the research model of knowledge management, intelligent decision support system and decision quality in the Iranian banking industry. The comprehensive literature review was the main basis for developing semi-structured questions. An initial interview was conducted in one of the

selected banks. Minor corrections were made based on the feedback obtained from that pre-test interview. As mentioned previously, ten interviews were conducted in the field study. All interviewees were firstly approached via phone and informed about the research background and objective. Then for better understanding of the study, an interview information sheet was sent to them via email. All interviews were audio-taped and saved with the permission of the interviews and transcribed immediately after the interviews.

3.5.3. Data Analysis

In the next part of this research, the qualitative data was analysed using the content analysis technique (Siltaoja, 2006, 97). Qualitative data analysis includes two approaches: inductive and deductive (Berg, 2012, 126). These approaches are used to compare the qualitative data with the theoretical framework and to improve a causal relationship between the constructs under study (Berg, 2012, 126). The inductive process explored the variables and factors by themes, sub-themes and concepts explaining the variables and factors. The measurement scales of some variables or factors also were investigated in this process. Moreover, the variables and factors that were explored by the induction process were used to produce a common framework. Then, after comparing this framework with the initial research model developed from the literature review, a comprehensive conceptual framework that was the final objective of the field study was prepared. Finally, the qualitative study refined the study model and developed hypotheses that formed the basis for the quantitative study, the main concern of this research.

3.6 QUANTITATIVE STUDY METHOD

The next phase of this research which involved the verification of the factors and variables and demonstrated the links among the constructs was undertaken after developing the research model with the help of literature review and qualitative field studies. As discussed previously, the quantitative method is the most appropriate for this phase.

3.6.1 Developing the Questionnaire

A powerful instrument for collecting data is the questionnaire. A questionnaire can be described as a formalized set of questions for obtaining information from respondents (Malhotra 2007, 85). For the researcher who engages in research based on quantitative primary data, the questionnaire is a very significant research instrument. The principle behind the development of a questionnaire is the concept of translating the information into a question format. As a questionnaire is an effective means of gathering the required information, researchers should develop it very carefully. It is very important to select a suitable style, language and symbols for the questions that are appropriate to the respondents' culture and status, and respondents should be made to feel motivated and comfortable to answer. With a well-developed questionnaire, respondents are encouraged to offer precise information that not only guarantees that correct information is being gathered, but also minimizes response mistakes.

One of the important and critical issues regarding the questionnaire development is selecting a suitable scale. The scaling technique which asses the deviation in data collected by subjective measures, produces the highest level of information possible in a given situation that enables the use of a great diversity of statistical analyses. In this research, the Likert scale has been used as it is easy to administer and construct. This rating scale is very common in psychology, sociology and business research. According to Aaker, Kumar and Day (2004, 313) the Likert scale provides a complete picture of a phenomenon for the respondents so they can easily show the level of their agreement or disagreement with a variety of statements related to the phenomenon. An effective and suitable scale should include a fair number of points. This kind of scale can provide a perfect scope for variations in perception on the one hand and on the other hand, it is easily practicable and perceivable by the respondent. Therefore, this study has selected a 5-point rating scale when developing the questionnaire.

3.6.2 Pilot test of the Questionnaire

The quantitative survey process conducted a pilot test to identify any problem with the survey tool before the real survey was distributed. The aim of this pilot study was to check the descriptive statistics and whether the participants find difficulty with recognizing any of the items or they prefer a different kind of presentation of the survey. The pilot test process took a convenient sample of managers, decision-makers and analyst from six selected Iranian banks who were involved in the field study. The researcher asked participants to record the time needed to complete the survey and report any problem with wording or any such other issues with the questionnaire that they found. Finally, by making several changes after acquiring the participant's opinion regarding the meaning and clarity of the questions, the questionnaire was finalized.

3.6.3 Sampling

Sample selection is one of the major tasks in a research project and survey research. The main result of this research was produced by analysing quantitative data (collected by sample survey) in order refute invalid hypotheses and discover implications for policy. This study was designed derive a conceptual framework from literature survey and to contextualize this framework through the findings from a qualitative field study. If the sample includes the characteristics that are the same as those of the population, the survey's findings can be regarded as representative. The application of reasonability principles in sample selection may assist to provide a representative subset of the population. The findings from an analysis of the data that was collected from a representative subset of the population make the anticipating so strong. Moreover, the size of the sample is another important factor to consider ensuring the representativeness of the sample as well as its suitability for utilization with the proper statistical tools. The sample size may vary depending on the type of statistical analysis that will be used. In this regard, a diversity of opinions exists in the literature even when applying the same tools (Tabachnick and Fidell, 2013, 530; Hair, Anderson, and Tatham, 1998, 278). For example, Tabachnick and Fidell (2013, 532) recommend that 200-300 is a good sample standard and sophisticated statistical analysis involves structural equation modelling (SEM). Based on the above-mentioned points, this

study has selected a sample size of 300 as structural equation modelling (SEM) was used for data analysis.

The survey in this research was conducted among the banking companies in Iran. There are thirty- four local banks in this country. Of these, six of the most significant were selected to participant in this survey. Three hundred respondents including managers, business analysts and decision-makers from these selected banks who deal with knowledge Management and Decision Support Systems in their organizations were selected for the survey. In addition, the participators were selected based on the fact that they represented banks that were involved in various stages of knowledge management implementation for decision-making. All these peoples participated in this research voluntarily and they represented distinctive individual background, such as gender, education, and tenure.

3.6.4 Sampling Quantitative Data Collection

The participant banks were approached via phone to obtain their approval and ascertain the contact persons. Then the questionnaires were sent to the contact person to distribute them to the target sample in various branches and departments. The questionnaires included a cover letter explaining the purposes and instructions of the research. The respondents were given three weeks to return the completed questionnaires. After three weeks, phone calls were made to the contact persons to encourage the return of more questionnaires. To improve the response rate, the packages including copies of questionnaire, reminding letters, and reply-paid envelops, were sent out to the relevant key persons. Moreover, an electronic version of the questionnaire was sent via e-mail to all respondent to facilitate this survey.

3.6.5 Analysis of Quantitative Data

In this research, quantitative analysis was conducted using the Structural Equation Modelling (SEM) technique. SEM techniques such as PLS and LISREL are second-generation data analysis techniques. PLS or LISREL could be used to test the research model of this study. Both LISREL and PLS handle causal modelling that works by "simultaneously assessing the reliability and validity of the measures of the theoretical constructs and estimating the relationships among these constructs or variables" (Barclay, Higgins, and Thomson 1995,

287). Compare with LISREL, PLS is more suited to causal modelling when the sample size is comparatively small and when the model is complex (Hulland 1999, 198; Teo, Wei, and Benbasat 2003, 30). Moreover, PLS is more suitable when the measurement items are not well recognized and are used within a new measurement context (Barclay, Higgins, and Thomson 1995, 290). In other words, when the main objective of the research is the interpretation of the model variance for one or more constructs and when the research focus is on theory development, PLS is suitable. Since the existing literature on the relationship between KM and the effectiveness of IDSS is very limited, the proposed research model in this research is not based on strong theory. Therefore, the greater emphasis of this research is on the theory development, rather than examining the strong theory-based model. Moreover, handling the reflective as well as formative indicators and constructs is one of the capabilities of PLS. Finally, as the previous studies found, the PLS approach provides an inclusive model which maps paths to many dependent variables as well as analysing the paths at the same time rather than one at a time (Fornell and Bookstein 1982, 48). Therefore, according to the above, the most fitting data analysis tool for the quantitative part of this study is Smart PLS which is the latest version of PLS. In this study, Smart PLS is used to set up the relationship between constructs and then testing the hypotheses. The data that was collected in this study was analysed using the Smart PLS technique by taking advantage of the Smart PLS version 2.0 computer software (www.smartpls.de).

3.6.6 Smart Partial Least Squares (PLS) Procedures

Smart PLS analysis includes two steps: assessment of the measurement model and assessment of the structural model (Table 3.1). The details of the analysis are explained in Chapter 6. The KM, Effectiveness of IDSS model was evaluated in the following manner as identified by Barclay, Higgins, and Thomson (1995, 297) using the (Smart) PLS technique.

Table 3.1: The two step approach of PLS analysis

Step	Data Examination	Analysis
1	Assessment of measurement model	i- Item reliability
		ii- Internal consistency
		iii- Discriminant validity
2	Assessment of structural model	i- Amount of variance explained (R^2)
		ii- Path coefficient (β)
		iii- Statistical significance of t-values

i. Step 1 - Assessment of the Measurement Model

This step involves the relationships between the constructs and the observed variables (Igbaria, Guimaraes, and Davis 1995, 96). Items are considered which illustrate the observed variables, measure the constructs. The analysis of the measurement model leads to the calculations of loadings that indicate the strength of the measures.

ii. Step 2 - Assessment of the Structural Model

This step focuses on the relationships between the paths in the model (Igbaria, Guimaraes, and Davis 1995, 96). The estimated path coefficients for the different paths in the model were calculated with PLS analysis. The results of this step provide an indication of the strength and direction of the theoretical relationship.

3.6.6.1 Assessment of measurement model

The assessment of the measurement model step determines the constructs' validity or the extent to which the obvious indicators reflect their fundamental constructs (Santosa, Wei, and Chan 2005, 363). The main procedures in PLS frameworks are: examining individual item-reliability, internal consistency, and discriminant validity to evaluate the suitability of the measurement model (Barclay, Higgins, and Thomson 1995, 297; Hulland 1999, 201; Santosa, Wei, and Chan 2005, 365). The 2-stage procedures undertaken in step 1 of

measurement model assessment in this study are displayed in table 3.2. The next sections will discuss the details of each stage.

Table 3.2: Two-Stage Assessment Procedure of Measurement Model

Measurement Acceptable value	
1. Convergent validity	
a) Item reliability	Item loading ≥ 0.7
b) Internal Consistency	
i. Composite Reliability	Calculated value ≥ 0.7
ii. Average Variance Extracted (AVE)	Calculated value ≥0.5
2. Discriminant Validity	
a) Construct level	Square root of AVE of construct>correlation Between the construct and other constructs
b) Item level	Item loadings of construct > all other cross-item loadings of the construct

Convergent validity

Evaluating the convergent validity of the model is the first step in the assessment of the measurement model. Convergent validity is completed by executing the following two steps:

a) Item Reliability

Determining the item reliability is the first step in the assessment of the measurement model. Item reliability assessment can be defined as an analysis of estimating the amount of variance in every individual item's measure that is due to the construct (Barclay, Higgins, and Thomson 1995, 295). Item reliability that sometimes refers to simple correlations, evaluates how well each item can be related to their corresponding construct. It means that item reliability assessed the loadings for each individual item. Therefore, if low loading items are retained, this could reduce the correlation between the items in the construct (Nunnally 1994, 326). The level of random error for each construct also can be measured by item reliability; the lower the item loading, the higher the level of random error. Therefore, the items in a particular construct that could increase the construct's level of random error could be

identified and eliminated in this procedure (Fornell & Larcker 1981, 40). Although the prior literature supported some accepted level of item loadings initially for justly reliable measures, high item loadings exhibited the reliability of the measures of the latent variable (Igbaria, Guimaraes, and Davis 1995, 92; Hair, Anderson, and Tatham 1998, 245). Igbaria, Guimaraes, and Davis (1995, 99) considered 0.4 as an acceptable minimum loading. Hair, Anderson, and Tatham (1998, 247) stated that loadings higher than 0.3 were significant, higher than 0.4 were more significant and higher than 0.5 were very significant. Chin (1998a, xiii) suggested that item loadings should be at least 0.6 and ideally at 0.7 or more. Moreover, Barclay, Higgins, and Thomson (1995, 297) focused on 0.707 as the lowest limit. However, Nunnally (1994, 332) suggested that regarding strong theoretical support, more reviews of low loading items were needed. This would be especially appropriate if the low loading items supplemented the descriptive power of the model. According to all the important points in the literature, and to maximize the measurement model's ability to meet the requirements of convergent validity, 0.7, the value proposed by Chin (1998a, xiii) was selected for this study.

b) Internal Consistency

. Composite Reliability

According to Fornell & Larcker (1981, 42) internal consistency is measured by calculating composite reliability. As this kind of reliability is not affected by the number of indicators, it can be considered greater than traditional measures of consistency such as Cronbach's alpha (Hanlon 2001, 33). Internal consistency was calculated by Equation 3.1:

$$\alpha = \frac{\left(\sum \lambda \gamma_i\right)^2}{\left(\sum \lambda \gamma_i\right)^2 + \sum Var(\varepsilon_i)} \textbf{Equation 3.1}$$

α= Internal consistency,
λ= Component loading of an indicator,
Y = construct
i = item
$Var(Ei) = 1 - \lambda\gamma_i{}^2$

Igbaria, Guimaraes, and Davis (1997, 110) and Barclay, Higgins, and Thomson (1995, 297) suggested that constructs with a coefficient value of 0.70 and greater were reliable and therefore suitable for further analysis.

i. Average Variance Extracted (AVE)

Average variance extracted (AVE) should be at least 0.5 to satisfy the requirements for convergent validity (Fornell and Larcker 1981, 46). Although AVE is not a common measure of convergent validity, it was logically calculated to empowering the statistical analysis. The AVE was calculated by Equation 3.2:

$$AVE = \frac{\sum \lambda \gamma_i{}^2}{\sum \lambda \gamma_i{}^2 + \sum Var(\varepsilon_i)} \textbf{Equation 3.2}$$

λ = Component loading of an indicator
Y = construct
i = item
$Var(Ei) = 1 - \lambda \gamma_i{}^2$

Discriminant Validity

Discriminant validity is the third assessment of the measurement model. Barclay, Higgins, and Thomson (1995, 295) stated that discriminant validity refers to the degree to which constructs differ from others in the same model. Discriminant validity analysis in PLS statistically tests the degree of variance shared among constructs and items in the model. As an item potentially could share more variance with other constructs than the construct it intends to measure, discriminant validity checks this defect.

The square root of the AVE is compared to the inter-construct correlations to find the discriminant validity. Then, where items might tap into different constructs, it prepares the extending over construct. According to Fornel and Larcker (1981, 49) when the AVE for one's construct is greater than their shared variance, discriminant validity is adequate. Hence,

the variance shared between measures of two different constructs should be less than the AVE for the items measuring each construct (Fornell and Larcker 1981, 49; Barclay, Higgins and Thomson 1995, 296; Chin 1998a, xii; Santosa, Wei, and Chan. 2005, 366).

The PLS technique, by examining the correlation at both constructs and items level, assesses discriminant validity. These results can be compared using a table format. Cross loadings for each item in the last analysis are investigated and compared across all constructs and are then presented as a cross-loading matrix to find discriminant validity. Chin (1998a, xiii) and (1998b, 305) stated that the correlation of an item with respect to all of the constructs in the model, including the construct it intends to evaluate, is assessed by the cross-loading analysis in PLS. An item should not load higher on other constructs than on the constructs it intends to measure, to prove the discriminant validity; otherwise, it should be excluded from the model.

3.6.6.2 Assessment of structural model

The structural model includes the hypothesized relationships between latent constructs in the research model (Santosa, Wei, and Chan 2005, 367). The assessment process, that involves appraising the descriptive power of the independent variables (R^2), checks the direction of path coefficient and the value of t-statistics (Barclay, Higgins, and Thomson 1995, 299; Santosa, Wei, and Chan 2005, 366).

Amount of variance explained or R square (R^2)

According to Barclay, Higgins, and Thomson (1995, 299) that was confirmed by Santosa, Wei, and Chan (2005, 366) the predictive power of the proposed research model can be approached by obtaining the R^2 values. R^2 values will conclude the explanatory power of a component of the model by exhibiting the amount of variance in the construct which is described by its corresponding independent constructs. Then, the explanation of the R^2 is very similar to traditional regression model (Fornell and Larcker 1981, 45; Barclay, Higgins, and Thomson 1995, 299). Therefore, the R^2 values of the endogenous variables, provided by

the bootstrap method, allow for evaluating of the model's explanatory power (Chin 1998b, 302). It is noted that the well accepted value of R^2 for structural equation modeling based analysis is 0.1 or above (Teo, Wei, and Benbasat 2003, 32).

Path coefficient (β) and statistical significance of t-value

The next test was to assess the relationship of the construct as hypothesized in this research for establishing the explanatory power of the model by the amount of variance illustrated by the R^2 value. Specifically, the statistical analysis is examined by assessing the path coefficient (β) and the t-value. The β and the t-values were extracted from the bootstrapping procedures. Bootstrapping is a non-parametric test of significance that produces t-statistics to evaluate the significance of the structural paths.

3.7 SUMMARY

This chapter explained the research methodology that was used in this research. It compared the various approaches within the IS field, selected a suitable research approach for directing this particular research, and presented an overview of the research method and tools that have been used for this research. As this research used the mixed-methods research technique, the measures of this method also have been discussed.

CHAPTER 4

FIELD STUDY AND COMBINED RESEARCH MODEL

4.1 INTRODUCTION

This chapter describes the analysis and results of the field study and demonstrate the combined research model. The focus of this part of the research (field study) was to reinforce the factors and variables in the initial research model proposed in Chapter 2. The explanations of the factors and collaborated variables, as well as the associations among the concepts were also examined via the field study. Six banks which had different levels of knowledge management and Intelligent Decision Support System implementation were engaged in the field study by means of ten interviews conducted with their key managers, business analysts and decision-makers. To collect the data from these interviews, a protocol with semi-structured questions was utilized. After these interviews, content analysis was executed to produce the factors and variables recognized in the field study. In alignment with the findings of the field study and relating to the literature, the ultimate comprehensive research model was provided. A detailed description of the comprehensive research model was presented in the final section.

4.2 ADMINISTRATION OF THE FIELD STUDY

4.2.1 The Development of the Interview Questions

Overall, seven questions were designed to cover the main topic of this field study. Table 4.1 presents these questions with the possible probes for them. These interview questions were approved by Curtin University's Ethics Committee. Appendix B displays the sample of the interview questions. These questions were semi-structured. The questions were developed mainly from literature while the interview guidelines were prepared after having several discussions with academic research experts especially from the KM, IDSS, and Decision Quality area.

Questions and related Possible Probes in the field study

Questions	Possible Probes
Q1: What is your perception of managing knowledge in your organization?	How is knowledge managed in your organization?
	Are specific tools (software or model) used to manage knowledge in your organization?
	What part of your organization is involved with knowledge management activities?
Q2: How are decisions made in your organization?	Do you use IT/ IS for decision-making?
	Do you use a special model for decision-making?
	What is the decision-making process in your organization?
Q3: In what way does KM help in decision-making in your organization?	How is KM used to help decision-making?
	Describe a situation where KM was used to help with a decision.
Q4: What is your view of intelligence decision-making?	Do you use intelligence aids (AI/ES) in helping you to make decisions?
	If yes, give an example of how it was used.
	Do you think that intelligence decision making can give you better result than normal decision making? Why?
	Does this organization use an Intelligent Decision Support System?
Q5: Do you think knowledge gathered from your organization can boost the use of intelligence tools in decision-making?	Can you explain some example of how intelligent tools are used in your organization? For instance, using ES to providing customer history system? Or, looking at a customer's loan repayment pattern by using intelligent tools.
	Do you think intelligent tools can affect the quality of decisions?
Q6: Do you measure the usefulness of technology (IDSS, IS/IT) in decision-making activities?	How do you measure the use of technology tools in organizational decision-making activities?
	Why / Why?
	How would you, if you had the opportunity, measure the effectiveness of IDSS in your organization?
Q7: What is your perception of the quality of the decisions you make?	What factors do you think would increase the quality of decisions?

	Do you think that good and effective IDSS is necessary for decision making? Why?
	Do you think the quality of decision can be improved by knowledge management?

4.2.2 Sample Selection

The sample for this research included bank personnel who were very accessible or very close (Berg 2012, 156). The main criteria for selecting these people were that they must be involved in acquiring, analyzing and utilizing information for decision-making activities. Therefore, the participators were selected based on the fact that they represented the banks involved in various stages of knowledge management implementation for decision-making. Therefore, managers, business analysts and decision-makers who deal with knowledge management and decision support systems in their organizations were approached. As presented in Chapter 3 (part 3.6.3), there are thirty-four local banks in Iran. From these banks, ten persons including managers and business analysts and decision-makers from six selected banks were invited to participate in the field study. All these people participated in this research voluntarily and they represent distinctive individual background, such as gender, education, tenure and position.

4.2.3 Participants' Profiles

All of the banks participating in this study are local; some of them are new, whereas others had been established for several years. The number of employees in these banks ranged from 3,800 to over 30,000. All of these banks were involved in various stages of KM and decision-making via an intelligent decision support system. The interviewees comprised managers, decision-makers and business analysts from these selected banks; their tenures ranged from 5 to 26 years. There were four female and six male participants correspondingly in the field study. Their educational level was different from Bachelor degree to Master Degree in different discipline such as finance, accounting, management, and technology management. Table 4-2 shows some information about these participants. The interviews took different amounts of time but the minimum time was 1.50 hours according to the participants' work schedule. The last 4 rows of Table 4-2 display these important points:

*The knowledge about KM

*The knowledge about IDSS

*Use of KM tools for decision making in these banks

*Use of intelligent tools regarding the decision-making in these banks

	Bank A	Bank B	Bank C	Bank D	Bank E	Bank F
Size	26000staff	4500staff	30000staff	3800staff	5600staff	28350staff
Public/Private	Public	Private	Public	Private	Private	Public
Interview participant's position	Manager Business Analyst	Decision Maker	Business Analyst Decision Maker manager	Manager	Business Analyst	Manager Decision Maker
Interview participant's education	BA (Finance) MBA	MA (Management)	MA (ITM) MA BA(Finance)	MA(Accounting)	MA (Management)	MA (Technology Management) BA(science)
Tenure of Interviewee in the enterprise	15 years 22 years	5 years	14 years 9 years 26 years	12 years	8 years	24 years 7 years
Gender of interviewee	Male Female	Male	Female Female Male	Male	Male	Female Male
Knowledge about KM	Yes Yes	Yes	Yes Yes A little	Yes	Yes	A little Yes
Knowledge about IDSS	A little Yes	Yes	Yes Yes Yes	A little	Yes	Yes Yes
KM tools	Yes	Yes	Yes	Yes	Yes	Yes
Intelligent tools	Yes	Yes	Yes-Initial using	Yes	Yes	Yes

Table 4-2: Participants' Information

4.2.4 Data Collection

The data was gathered by utilizing the semi-structured interview approach. At first, all interviewees were contacted via phone in advance and after giving some information about the research, an interview information sheet which explained background and aim of the research (see Appendix A) was sent to them via e-mail. The semi-structured interview was intended to explore the factors and variables affecting the adoption and practice of knowledge management in banks. The interviews were scheduled at convenience of the

interviewees. The interviewees were notified that they could stop the interview at any time for any reason and without any prejudgment. Also, they were informed about the guidelines pertaining to the storage of data.

Given the semi-structured questions, a pre-test interview was conducted with the first participant. The guiding interview questions proved to be highly suitable and accorded with the research goals of this study, particularly since the pre-test interview feedback pointed to changes that were required. Ten interviews in total were conducted for exploratory purposes. The average interview time was approximately one and half hours. By using an identical interview protocol for all participants, reliability was achieved. The interviewer asked the questions of the interviewees and encouraged responses when needed.

The interviews were recorded whenever possible and then immediately substantiated within four days so as not to miss the vital points and information. These records were transcribed and rigorously reviewed for errors by the researcher. A sample interview transcript is provided in Appendix C. Another important point about the interview is that, following Seidman's (2005, p. 64) suggestion, during the interview the interviewer took just brief notes instead of detailed written ones. This writing strategy helped the interviewer to focus on the participant's response. Moreover, this method helped the interviewer to make note of a quick question to be asked at a later appropriate time without interrupting the participant. In order to develop the interview questions, the researcher used the Berg (2012, 165) guidelines.

4.2.5 Data Analysis

This study used content analysis to analyze qualitative data that was gathered from interview transcripts. According to the content analysis method (Berg 2012, 160) the data that was collected from ten interviews were written in code and classified according to the literature. The processes included reconsidering the interview transcripts and recognizing fundamental words or phrases, among which the patterns were sorted under different codes that demonstrate the factors and variables of the temporary research model.

There are several means by which to conduct context analysis (Siltaoja 2006, 97). Among these "different methods", inductive and deductive analyses were used in this research (Berg 2012, 162). See figure 4.1. In the inductive stage topics, sub-topics, and concepts describing variables, factors, and, occasionally, measurement scales have been investigated. In a later phase of the inductive stage, the investigated variables and factors were 'induced' into a single structure. This single structure or framework was compared with the primary research model which was developed from the literature.

The first step of the inductive stage was content analysis of each individual. The steps in this process were as follows:

1. Read the whole context of the interview transcripts carefully and discover the key subject/patterns.

2. Set up basic categories for these key subject/patterns.

3. Edit these categories and organize them by connecting them to the literature, and decide the main criteria of selection.

4. Classify the interview transcripts into the above categories according to the main selection criteria and then find their connections.

5. Find the connections among the factors and variables for each individual interview.

6. Organize tables of the categories with the factors and variables from each interview.

The second stage which principally handles joining the factors and variables from every interview was the content analysis of all interviews. This procedure involved the following steps:

1. Reconsider the table of categories with factors and variables and their relations acquired from the first stage.

2. Check the distinctions and similarities of the variables in every factor.

3. Join the same variables and create a common name, while retaining the singular variables.

4. Connect the unique models for six companies based the joined factors and variables.

5. Set up the merged table of joined factors and variables in which the number of entries from six banks was shown.

6. Improve the comprehensive model of KM, Effectiveness of IDSS and Decision Quality.

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│              ┌─────────────────────────────────────┐            │
│              │          Conduct Interview           │            │
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│  ┌──────┐    ┌─────────────────────────────────────┐            │
│  │      │    │        Transcribe Interview          │            │
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│  │ i    │    ┌─────────────────────────────────────┐            │
│  │ v    │    │    Develop model from each interview  │            │
│  │ e    │    └─────────────────────────────────────┘            │
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│  │ r    │    │  Develop an integrated model         │            │
│  │ o    │    │  consisting of all the variables     │            │
│  │ c    │    │  from each model                     │            │
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│  │ s    │                   ⬇                                   │
│  │ s    │    ┌─────────────────────────────────────┐            │
│  └──────┘    │  Compare the developed model with    │            │
│              │  the initial model, developed from   │            │
│  ┌──────┐    │  literature                          │            │
│  │      │    └─────────────────────────────────────┘            │
│  │ D    │                   ⬇                                   │
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│  │ d    │    │  Revisit the findings from the field │            │
│  │ u    │    │  study and select the constructs,    │            │
│  │ c    │    │  based on the generality and         │            │
│  │ t    │    │  commonality                         │            │
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│  │      │    │  Finalize and justify the dimensions │            │
│  │ P    │    │  of the constructs, based on the     │            │
│  │ r    │    │  existing literature                 │            │
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│  │ s    │    │      Comprehensive research model     │            │
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│  └──────┘                                                       │
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Figure 4.1: Data analysis process of the field study (Mustamil 2010)

4.3 FINDINGS (1st Stage: Inductive Analysis)

This section, based on the first stage of content analysis, displays the findings from the field study analysis. At first the factors and variables that were explored are presented, then the relationship between the variables, and finally the construction of the modified research model is presented.

4.3.1 Factors and Variables

By using the techniques of content analysis, seventeen factors and 102 variables, were recognized from the field study. The acquired factors and variables regarding KM, DSS, Intelligence, IDSS, Effectiveness of IDSS and Decision Quality are presented in Table 4-3. This table displays the list of variables recognized in each factor, as well as the banks which indicated the variables. The interview data were classified by means of cross-referencing to factors and variables of the initial research model that was improved in agreement with the literature. However, in the field study, some of the factors and variables were recognized as different from those in previous studies. The variables collected for each factor and their definitions were more specific in the context of knowledge management, effectiveness of intelligent decision support system and decision quality among Iranian Banks.

Table 4-3: Factors and variables

	Factor	Variable	Bank					
			A	B	C	D	E	F
KM	Managing tacit knowledge	Capturing tacit knowledge	✓	✓	✓	✓	✓	✓
		Enriching tacit knowledge	✓		✓	✓	✓	
		Sorting tacit knowledge		✓	✓	✓		✓
		Converting tacit knowledge to explicit knowledge	✓	✓	✓	✓	✓	✓
	Managing explicit knowledge	Retrieving explicit knowledge	✓		✓		✓	✓
		Filtering explicit knowledge	✓		✓	✓		
		Storing explicit knowledge		✓			✓	✓
		Disseminating explicit knowledge	✓	✓		✓	✓	
		Creating new knowledge	✓	✓	✓	✓	✓	✓

		Testing new knowledge		✓	✓			✓
		Facilitate sharing the knowledge	✓		✓	✓		
		Transforming knowledge	✓	✓			✓	✓
	Contribute in achieving the business results	Improving company performance	✓	✓	✓	✓		✓
		Enhanced customer handling			✓	✓	✓	
		Better employee skills		✓			✓	✓
		Reduced expenses	✓		✓	✓		✓
		Increased profits	✓		✓		✓	✓
		Further business opportunities	✓	✓	✓	✓	✓	✓
		Delivering more value to customers	✓	✓		✓	✓	✓
		Delegate more authority to employees.	✓		✓			✓
	Managing knowledge repository	Sending knowledge internally	✓	✓	✓		✓	✓
		Sending knowledge externally	✓		✓	✓		✓
		Availability of the right information in the right form	✓	✓	✓	✓	✓	✓
		Availability of the right information in the right time	✓	✓	✓	✓	✓	✓
DSS	**Problem processing system**	Gaining more and better information.	✓		✓		✓	
		Increased the number of decision-making alternatives	✓	✓	✓			
		Improved communication		✓	✓		✓	
		Great flexibility	✓		✓	✓	✓	
		Cost savings	✓	✓		✓		
		Time saving	✓	✓		✓	✓	
		Better control		✓	✓		✓	
	Human Judgment	More effective team work	✓		✓		✓	✓
		Fast response to unexpected situations	✓	✓	✓	✓	✓	✓
		Better understanding of the business	✓	✓	✓	✓		✓
		Better and qualified decisions	✓		✓	✓	✓	✓
		New insights and learning	✓	✓	✓		✓	✓
	Knowledge system	Better use of data resource	✓	✓		✓	✓	✓
		Interactive use of the system		✓	✓	✓		✓

			1	2	3	4	5	6
INTELLIGENCE		Enhance the tacit to explicit knowledge conversion	✓	✓	✓	✓	✓	✓
		Assists to internalizing explicit knowledge	✓	✓			✓	✓
	Creating new Knowledge	Facilitates learning and understanding	✓	✓		✓	✓	✓
		Better analysis of information	✓		✓	✓		✓
		Improved information sharing in virtual environment	✓		✓		✓	✓
	Codify the knowledge in the knowledge management systems	Applying knowledge to managing the environment	✓	✓		✓		✓
		Identifies system response at different situation.		✓		✓		✓
		Recognizing the relative importance of different elements in a situation	✓	✓		✓	✓	✓
		solving problems effectively	✓	✓			✓	✓
	Help to the search and retrieval of knowledge	Successfully respond to a new situation		✓		✓		✓
		Better communication between managers.	✓		✓	✓	✓	
		Improved flexibility	✓	✓		✓		✓
		Better decision-making	✓	✓	✓	✓	✓	✓
		Time savings		✓	✓		✓	
EFFECTIVENESS OF IDSS	**Decision-maker satisfaction**	Quick access to the required information	✓		✓			✓
		Facilitating the communication between decision makers and firm	✓		✓		✓	✓
		Recognizing the influenced variables for decision making	✓	✓		✓	✓	✓
		Facilitate decision-making process	✓		✓	✓		✓
		Improving the decision-making quality	✓	✓		✓	✓	✓
		Increased customer satisfaction	✓	✓	✓	✓	✓	✓
	Cost	Better use of information	✓		✓			
		Decreased decision-making cost.	✓	✓		✓	✓	✓
		Decreasing the organizational cost		✓	✓	✓	✓	✓
		Increasing the organizational profits	✓		✓			
		Facilitating financial services	✓		✓	✓	✓	✓
		Increase organization's market share	✓		✓			✓

Category	Subcategory	Item	1	2	3	4	5	6
	Decision making speed	Provides accurate information at the right time	✓	✓	✓		✓	✓
		Time saving	✓		✓	✓	✓	
		Quickly decision-making	✓	✓	✓	✓		✓
		Increased productivity	✓		✓			✓
	Decision making quality	Increased decision-making quality	✓		✓	✓	✓	✓
		Prevent of intuitive decision-making	✓	✓	✓		✓	✓
		Provide better result	✓	✓	✓	✓	✓	✓
		Increase flexibility		✓	✓	✓		✓
		Achieve organization goals	✓	✓		✓	✓	
		Increase the rate of growth in organization	✓		✓		✓	✓
DECISION QUALITY	Decision maker s information	Team works with relevant and different expertise	✓	✓		✓		✓
		Reducing the amount of administrative limitation.			✓	✓	✓	
		Knowledge of past similar experiences	✓	✓	✓	✓	✓	✓
		Consulting with people who involved in this problem	✓	✓			✓	✓
		Adequate knowledge about internal organizational factors and activities	✓		✓	✓		✓
		Adequate knowledge about external organizational factors	✓	✓	✓		✓	
	Higher information quality	Decision maker's quality		✓	✓	✓		✓
		Suitable and well-defined information system	✓	✓		✓		✓
		Modelling the possible result of our decisions			✓			✓
		Highly accurate information	✓	✓	✓		✓	
		Attention to the organization goals at all phases of decision-making process	✓		✓	✓		✓
		Considering to all aspect of the decision making topic		✓		✓		✓
		Do not decision-making based on the sense and feeling	✓		✓		✓	✓

		A	B	C	D	E	F
	Good understanding of the problem	✓		✓			✓
	On-time decision-making	✓	✓		✓	✓	✓
	Alignment with the organizational goals	✓		✓	✓		✓
Viability of the organization	Distributing authority		✓	✓	✓	✓	
	Be familiar with the organization's culture and rules		✓	✓		✓	✓
	Having enough authority and responsibility	✓	✓	✓	✓	✓	✓

4.3.1.1 KM factors

4.3.1.1.1 Managing tacit knowledge

It is evident from the field study that managing tacit knowledge is one of the main driving variables for knowledge management in the Iranian banking industry. All participants from the six selected banks agreed that managing tacit knowledge is an important part of Knowledge Management (Sveiby 1998, 21; Guo and Sheffield 2008, 674). Managing knowledge in all six banks is directly influenced by adding value to information by capturing the tacit knowledge (Bolloju, Khalifa, and Turban 2002, 164). Moreover, capturing knowledge in an organization cannot be useful without enriching tacit knowledge that is another significant item of managing tacit knowledge (Nemati et al. 2002, 145). Respondents from banks A, C, D and E confirm this valuable point that in order to manage their banks' knowledge, it is necessary that the investigating of tacit knowledge be improved. Another critical part of managing tacit knowledge is sorting this kind of knowledge (Horvath 2000, 65; Bednar 1998, 216; Venters 2010, 162). Four participants (B, C, D, and F) believed that "sorting tacit knowledge" is an important factor for managing knowledge. The interviewee from bank C stated: "Classifying or sorting the retrieved knowledge in the banks is a main item for managing the knowledge in our company". Converting tacit knowledge to explicit knowledge is the last item in managing tacit knowledge, and all participants emphasized its important role in managing knowledge in their companies (Horvath 2000, 65; Liebowitz 2001, 1; Venters 2010, 162). One manager from Bank F pointed out that, by transforming the valuable tacit knowledge to the explicit knowledge, this knowledge can be helpful to

achieving the company's goals. As all managers, analysts and decision makers in the selected banks focus on the strong relation between "managing tacit knowledge" with KM, it was selected as a powerful variable to check KM in this research.

4.3.1.1.2 Managing explicit knowledge

Managing explicit knowledge is another significant variable in evaluating knowledge management in Iranian bank. Participants in this research suggested various items regarding the management of explicit knowledge and explained the critical role that this variable plays in managing the knowledge in their companies (Guo and Sheffield 2008, 674). This variable contains various items that were mentioned by participants. Some of them are: retrieving explicit knowledge (Durrance 1998, 32; Bolloju, Khalifa, and Turban 2002, 166), filtering explicit knowledge ((Nemati et al. 2002, 145), storing explicit knowledge (Valenzuela et.al 2008, 322; Venters 2010, 161), disseminating explicit knowledge (Spangler, and Peters 2001, 123; Venters 2010, 163), creating new knowledge (Venters 2010, 161; Tabrizi, Ebrahimi, and Delpisheh 2011, 692), testing new knowledge (Spangler, and Peters 2001, 118; Huang et.al. 2010, 63), facilitate sharing the knowledge (Guo and Sheffield 2008, 674; Venters 2010, 161) and transforming knowledge (Durrance 1998, 32; Liebowitz 2001, 4; Guo and Sheffield 2008, 674). Each of these items is recognized by some or even all of the interviewees. For example, a senior decision-maker from bank C explained that by filtering, sorting and disseminating the existing knowledge, the refined and qualified knowledge is available for decision-makers to make the best decisions. Another participant from Bank B stated that by creating new knowledge, managers ensure that their company always has access to new and valuable knowledge, and remains competitive. Hence, all of the mentioned items were selected because of their critical role in evaluating KM.

4.3.1.1.3 Contribute in achieving the business results

All participants in this study considered that "contributes to achieving business results" was a major variable for KM. Hence, a critical function Knowledge Management is that it contributes to achieving business results, and this is due to a number of factors such as

improved company performance (Nickols 2000, 15; Valenzuela et al. 2008, 322; Huang et al. 2010, 63), enhanced customer handling (Tabrizi, Ebrahimi, and Delpisheh 2011, 692), reduced expenses (Plesk 1998, 83; Venters 2010, 162), better employee skills (Liebowitz 2001, 4; Tabrizi, Ebrahimi, and Delpisheh 2011, 692), increased profits (Valenzuela et al. 2008, 323), further business opportunities (Forman 1999, 233; Kebede 2010, 420), delivering more value to customers (Huang et al. 2010, 60; Nemati et al. 2002, 148; Valenzuela et al. 2008, 325), and delegate more authority to employees (Nickols 2000, 15). The senior managers from banks F and C noticed that without the contribution and assistance of KM, it is difficult to improve a bank's performance. This can be explained by the relationship that exists between the quality of the decisions that were made based on knowledge and the organization's achievements (Plesk 1998, 83; Forman 1999, 233). Moreover, other participants from banks A, D and E explained that with improved customer handling, improved employee skills, and delivering more value to customers, their department can play a significant role in achieving the firm's goals, all of which resulted from effective knowledge management. Therefore, in line with the respondents' recommendations and support found in the literature, this variable (contributes in achieving the business goals) was selected for this research study.

4.3.1.1.4 Managing the knowledge repository

Most of the participants in this research believed that for managing the knowledge in their firm they must manage knowledge repository in their company. In order to manage the knowledge repository, it is necessary to send knowledge to different sections of the organization (Miller 1999, 45; Teresko 1999, 323; Comeau-Kirschner & Wah 2000, 25; Bolloju, Khalifa, and Turban 2002, 164; Valenzuela et al. 2008, 326). Respondents from all banks except bank D confirmed that in the Iranian banks, the knowledge repository can be managed by different tools, one of which generates knowledge in the organization's departments and sections. In addition, one participant from bank F explained that by "sending knowledge externally", banks can be connected to the other various companies in the market. According to Comeau-Kirschner & Wah 2000, 25 and Valenzuela et al. (2008, 326) with distributing knowledge to the market, managing the knowledge repository is

improved. Moreover, Information can be valuable for all companies if this information is available in the right form with a high level of accuracy (Halal 1997, 67; Bednar 1998, 216; Miller 1999, 45; Chen and Chen 2011, 3862). This important concept was mentioned by all participants in this research. For example, one analyst from bank E emphasized that the quality, form and availability of the information are extremely vital to managing the knowledge repository. Therefore, "availability of the right information in the right form" is an important factor for managing a knowledge repository (Teresko 1999, 323; Holsapple and Joshi 2001, 40). The "right time" is also a significant factor together with the right form regarding the information that is used for decision-making (Chen and Chen 2011, 3862). All analysts, managers and decision-makers from these six banks who participated in this research, were dealing with knowledge management activities, and knew that without the right information available at the right time, managing knowledge cannot be efficient and totally accurate (Miller 1999, 44; Holsapple and Joshi 2001, 40). Hence, all of these four factors are significant items regarding the management of the knowledge repository and therefore were selecting for the assessment of KM in this research.

4.3.1.2 DSS factors

4.3.1.2.1 Problem processing system

Respondents in this research reported that "problem processing system" can be considered as a suitable variable for DSS because of its important related factors: gaining more and better information (Holsapple and Joshi 2001, 39; Burstein and Widemeyer 2007, 1648), Increased the number of decision making alternatives (Sprague 1987, 199; Courtney 2001, 29), improved communication (Courtney 2001, 20), great flexibility (Holsapple and Joshi 2001, 40; Zack 2007, 1666), cost saving (Courtney 2001, 20; Holsapple and Joshi 2001, 40), time saving (Holsapple and Joshi 2001, 50; Moreau 2006, 595), and better control (Holsapple and Joshi 2001, 39; Hensman and Sadler-Smith 2011, 57). Each of these factors was recognized by all or some of the participants in this research. For example, respondents from banks A, C, and E focused on the critical role of better and qualified information for resolving their firms' problems. Moreover, over 85% of the managers, decision-makers and analysts from six selected Iranian banks that were participated in this study mentioned that by increasing

the number of decision-making options, several other aspects of the business were improved including communication, flexibility, better informed control, and cost and time saving, and the problem-solving process. This increasing resulted to the improvement on the DSS infirm (Bonczek, Holsapple and Whinston 1981, 156; Zack 2007, 1666; Hensman and Sadler-Smith 2011, 57). Therefore, because participants emphasized the significant role of these factors as an appropriate variable for evaluating DSS as a problem-processing system, this variable was considered in this study.

4.3.1.2.2 Human Judgment

Human judgment was selected as another variable for evaluating KM in this research based on the both interviewer's idea and the literature. This critical variable involves several factors that helped the researcher to better understand the issue. For example, four participants (A, C, E, and F) believed that "more effective team work" was an important factor for Human Judgment and then for DSS. They believed that because of effective team work activities, the company employees exercised better judgment that resulted in better-informed decision making and decision support systems (Angehm and Jelassi 1994, 271; Holsapple and Joshi 2001, 40). In addition, all participants in this study focused on the significant relationship between "human judgment" and "fast response to unexpected situations" that was a result of an efficient DSS (Khoong 1995, 225; Shim et al. 2002, 123). Timely responses to unexpected situations are very in that they assist people to exercise better judgment. One decision-maker from Bank D stated that by responding quickly to unexpected situations, his company always had more business opportunities and then more competitive advantages and market share as well. Better understanding of the business is another factor related to human judgment that was recognized by respondents from all banks except for E. Human judgment can be enhanced in several ways, one of which is by having a better understanding of the business (Shim et al. 2002, 121). "Better and qualified decisions" (Rudowski, East and Gardner 1996, 162; Holsapple and Joshi 2001, 39; Zack 2007, 1664) and "New insights and learning" (Zack 2007, 1668) are two last factors of Human Judgment that were described by More than 83 percentages of the respondents. These respondents emphasized the critical relationship between DSS and these two factors that can be considered through human assessment ability.

One decision-maker from bank B explained that with new insights and learning within the DSS domain in his banks, the quality of decisions as well as the efficiency was improving significantly. Hence, based on this information, "human judgment" was considered as a DSS variable in this research.

4.3.1.2.3 Knowledge system

Most of the respondents explained that a knowledge system and its components can improve the DSS. Therefore, "knowledge system" was mentioned as a significant variable for the DSS. Respondents from all banks except for bank C mentioned that in the Iranian banks, the knowledge system can be improved in several ways, one of them being "(making) better use of data resources" (Kasper 1996, 223; Holsapple and Joshi 2001, 50; Shim et.al. 2002, 121). By making better use of data resources, employers in these banks can obtain an overall picture of the firm and then make better informed decisions (Zack 2007, 1668). In addition, "interactive use of the system" is another variable that was related to the knowledge system, as mentioned by respondents from four banks. Participants from bank B, C, D, and F mentioned that with the interactive use of the system firms decided to enhance their DSS to improve the quality and quantity of communication as a result of the knowledge system (Holsapple and Joshi 2001, 50; Moreau 2006, 594). An analyst from bank C explained that with the improvement in communicating with the system, the quality of their decisions improved. The conversion of knowledge from tacit to explicit is another critical part of a knowledge system that can improve DSS (Nemati et al. 2002, 145). One manager from Bank F pointed out that in order to make better decisions, tacit knowledge must be converted to explicit knowledge (Bolloju, Khalifa, and Turban 2002, 166). Finally, four participants (from banks A, B, E, and F) found that "assists to internalizing explicit knowledge" is an important factor for knowledge and decision support systems. The internalizing of explicit knowledge is an important concept that plays a vital role in making informed and appropriate decisions (Holsapple and Joshi 2001, 41; Nemati et al. 2002, 145). The interviewee from bank E pointed that this helped his company to focus on the better use of explicit knowledge as a

valuable tool. Based on these critical points, the variable "knowledge system" was selected for this study.

4.3.1.3 Intelligence factors

4.3.1.3.1 Creating new knowledge

The first variable that was considered in this study to evaluate intelligence is "creating new knowledge". The majority of participants in this research mentioned that by facilitates the learning and understanding in their firms, their ability to create new knowledge was improved. Therefore, the "learning and understanding" that was facilitated by intelligence was mentioned as a significant variable for "creating new knowledge" (Birkinshaw 1999, 115; Liebowitz 2001, 2& 4; Turban et al. 2011, 533). In other words, if learning is facilitated and workers acquire new understandings and skills, this will benefit the organization. Participants from bank A, C, D and F, mentioned that "Better analyzing of information" is another critical factor of creating new Knowledge regarding to evaluating the Intelligence. Moreover, as intelligence helps to enhance the quality of the firm's decision-making, banks have decided to use intelligence to better analyze the firm's information (Liebowitz 2001, 4; Turban et al. 2011, 533). An analyst from bank C explained that by improving the quality of analyzing, employees had access to reliable information which enabled better decisions to be made. "Improved information sharing in virtual environment" is another critical factor for "creating new knowledge". Most of the respondents explained that with improved information sharing in a virtual environment, the information required for decision-making is available to all employees, enabling them to make the best decisions (Liebowitz 2001, 4; Turban, Aronson, and Liang 2005, 541). The respondent who was employed by bank A emphasized that improved information-sharing helped bank personnel to be aware of all new policies and information regarding the banks' structure or market. Hence, it can be recognized that "creating new knowledge" is a very significant variable regarding intelligence and was therefore selected for study in this research.

4.3.1.3.2 Codifying the knowledge in the knowledge management systems

Codifying the knowledge in the knowledge management system is another variable that was driving from intelligence and was introduced by respondents. Participants from banks A, B, D, and F mentioned that "applying knowledge to manipulate the environment" is a significant factor of this variable regarding Intelligence. They believed that as intelligence facilitated this codifying knowledge in the knowledge management systems, firms decided to enhance their environment management process by applying appropriate knowledge to improve the quality and quantity of their activities as well as their decisions (Liebowitz 2001, 5). Moreover, half of the respondents in this study reported that "identifies system response in different situations" can be considered as a suitable factor for intelligence by "codify (ing) the knowledge in the knowledge management systems".

It was clear that some respondents believed that by identifying different situations, banks can respond appropriately to them by codifying previous knowledge gained from similar situations (Turban, Aronson, and Liang 2005, 540). The third significant factor of "codify the knowledge in the knowledge management systems" that was identified in this study is "recognizing the relative importance of different elements in a situation". Respondents from all banks except for bank C explained that by determining the importance of different elements of a situation, employees are able to codify the knowledge in their banks (Birkinshaw 1999, 115).

Four participants (A, B, E, and F) believed that "solving problems effectively" is an important factor for "codifying the knowledge in the knowledge management systems" and "intelligence". Solving problems is an important activity that plays a vital role in achieving a firm's goals (Liebowitz 2001, 4; Turban et al. 2011, 534). The interviewee from bank E mentioned that the ability to solve problems effectively is very useful in terms of achieving the bank's goals and capturing more market share. Based on these critical points, the variable "codifying the knowledge in the knowledge management systems" was chosen for this study.

4.3.1.3.3 Help to search for and retrieve knowledge

The last variable for evaluating "intelligence" that was recognized by respondents in this study is "help to search for and retrieve knowledge". Participants from bank B, D, and F, mentioned that this variable involves five important factors, the most important of which is "successfully respond to a new situation". One senior manager from bank D explained that by improving the quality of his bank's responses to new situations through the use of intelligent tools, this company is close to achieving its goals which is an important criterion for firm's success (Turban, Aronson, and Liang 2005, 544). Moreover, more than 66% of the respondents recognized the important role of "better communication between managers" in helping to search for and retrieve knowledge in their companies. Selected employees in bank A, C, D and F, focused on the relation between "better communication between managers" and knowledge retrieval in their banks (Liebowitz 2001, 4). A participant from bank C explained that by improving the manager's communications as a result of intelligence, the quality of knowledge retrieval was enhanced in his bank and resulted in better-informed decisions. In addition, most of the respondents explained that with more flexibility in their banks, the information required for decision-making could be easily and quickly accessed by all employees who could then make the best decisions. Therefore, "improved flexibility" that was facilitated by intelligence was mentioned as a significant variable for "help in the search for and retrieval of knowledge" by banks A, B, D, and F (Liebowitz 2001, 4; Turban, Aronson, and Liang 2005, 545). Finally, all participants emphasize the important role of "better decision-making" (Shim et al. 2002, 112) and "time-saving" (Moreau 2006, 595) to achieve their banks' goals. In other words, regarding the search for and retrieval of knowledge, the quality of available information was improved and then better decision-making occurred within a very short time. One manager from bank A explained that with better decision-making, the bank's goals were quickly achieved. Therefore, as all respondents focused on the strong relationship between "help to search for and retrieve knowledge" with intelligence, this variable was picked up as a powerful variable to check intelligence in this research.

4.3.1.4 Effectiveness of IDSS factors

4.3.1.4.1 Decision-maker satisfaction

This researcher found an important variable that was related to the effectiveness of IDSS: decision-maker satisfaction". The managers, analysts and decision-makers in these banks focused on the important impact of decision-maker satisfaction on the making of high quality decisions that is resulted to the effective IDSS. Participants in this study recognized several related factors that help to better understand this variable. These factors are: quick access to the required information (Moreau 2006, 595), facilitating the communication between decision makers and firm (Courtney 2001, 27), recognizing the variables that influence decision-making (Barr and Sharda 1997, 134; Moreau 2006, 595), facilitating the decision-making process (Barr and Sharda 1997, 145), improving the quality of decision-making (Moreau 2006, 595), and increasing customer satisfaction (Moreau 2006, 595). The managers, analysts and decision-makers in these banks acknowledged the important role of these factors which allow decision-makers to have a greater degree of satisfaction and make high quality decisions as a result of improving the effectiveness of IDSS. It means that this variable (decision-maker satisfaction) was a very significant item regarding the effectiveness of IDSS in the Iranian banking Industry. Hence, it was assessed in this research.

4.3.1.4.2 Cost

The second important variable regarding the effectiveness of IDSS is "cost". This variable was considered by managers, analysts and decision-makers who participated in this research. Cost plays a critical role in all kinds of decision-making (Papamichail and French 2005, 95). Therefore, in implementing effective IDSS, it is necessary to pay close attention to the cost (Moreau 2006, 595). In this regards, six significant factors were classified to better evaluate this variable; they are: better use of information (Courtney 2001, 29), decreasing decision-making costs ((Moreau 2006, 595), decreasing organizational cost (Moreau 2006, 595), increasing the organizational profits (Papamichail and French 2005, 96), facilitating financial services (Moreau 2006, 602), and increasing organizations' market share (Barr and Sharda 1997, 146).The respondents from banks B, C, F and D mentioned that if they focused on

making better use of information in their banks and decreasing the cost of decision-making, the firm's costs would decrease and the firm's efficiency, productivity and profits would increase. Moreover, the majority of the participants in this research mentioned that by facilitating financial services in their firms, customer satisfaction and then market share would be increased, and subsequently the overall costs for the company would be decreased. Hence, managers should carefully consider these factors and their impacts on the firm's costs as well as the effectiveness of IDSS. Therefore, because of this relationship between "cost'" and "effectiveness of IDSS" the mentioned variable in this part of the research (cost) was chosen for analysis.

4.3.1.4.3 Decision-making Speed

Most of the participants in this research stated that "decision-making speed" was an important variable in the relation of "Effectiveness of IDSS". They believed that the speed of the decision-making process can increase or decrease the effectiveness of IDSS in their firm (Papamichail and French 2005, 94). Moreover, during this study, several critical factors are discussed that played significant roles in terms of decision-making speed and hence, the "effectiveness of IDSS". Some of them can be: providing accurate information at the right time (Papamichail and French 2005, 94), time-saving (Moreau 2006, 595), quick decision-making (Raghunathan 1999, 275), and increased productivity (Courtney 2001, 31). By accessing accurate and timely information,, decision makers believe that they can do their best. Respondents from all banks except for bank D mentioned that in their banks, accessing accurate information at the right time had produced some great results, one of them being an increase in the speed and quality of decision-making (Papamichail and French 2005, 94). In addition, participants of four banks mentioned that "time saving" is an important variable when assessing the effectiveness of IDSS through decision speed. One participant from bank E explained that by using effective IDSS, banks can save a great deal of time that would otherwise be spent on decision-making (Moreau 2006, 595). According to a business analyst who was working for bank D, in the Iranian banks quick decision-making can be made by different tools, one of which is effective IDSS. In other words, if the decision-making process is quicker, organizations can provide timely and better responses to customers more

easily (Raghunathan 1999, 275). Finally, participants from bank A, C, E, and F, mentioned that "increased the productivity" is a significant variable regarding the effectiveness of IDSS. They believed that, as improving the decision making quality helped to increase productivity and enhance the effectiveness of IDSS, companies are increasingly focusing on improving their IDSS (Courtney 2001, 31). Therefore, according to this information, "decision-making speed" was considered as a variable of the effectiveness of IDSS. .

4.3.1.4.4 Decision making Quality

The last variable that was selected in this study in order to evaluate the effectiveness of IDSS is "decision-making quality". This important variable was considered by 83% of the respondents from banks A, C, D, E and F. The quality of decisions obviously played a critical role in producing better results for a company and increased the effectiveness of IDSS (Raghunathan 1999, 275). The managers, analysts and decision-makers in these five banks focused on six factors for this variable which are: increased decision making quality (Raghunathan 1999, 275), prevention of intuitive decision-making (Hensman and Sadler-Smith 2011, 54), achieving better results (Barr and Sharda 1997, 134), Increase flexibility (Increase flexibility), achieving organization's goals (Papamichail and French 2005, 95), and increasing the rate of growth of the organization (Gao et. al. 2007, 63). Respondents from all banks, with the exception of bank A, mentioned that the effectiveness of IDSS had several impacts on the firms such as decreasing or preventing intuitive decision-making by providing enough related information and improving the quality of decisions (Hensman and Sadler-Smith 2011, 54). Moreover, all participants in this research emphasized the important role of decision quality in producing better results and achieving their banks' objectives. In other words, if the quality of the decision-making improves, this in turn achieves better results for an organization in terms of adaptability to changing business environments, the achievements of business and all-round improvement. These benefits are the result of having an effective IDSS that improves the quality of decision-making as well as the quality of decisions (Barr and Sharda 1997, 134). Therefore, as the respondents focused on the strong relationship

between "decision-making quality" and "effectiveness of IDSS", decision-making quality emerged as a powerful variable worth investigating in this research.

4.3.1.5 Decision Quality factors

4.3.1.5.1 Decision maker s information

Several variables regarding "Decision Quality" emerged in this research. The first one that all respondents emphasized was "Decision maker's information". It is clear that the quality of the information provided to decision-makers had a significant impact on the decision quality (Carmeli and Schaubroeck 2006, 443). Therefore, the researcher attempted to discover the factors related to the decision-maker's information in order to make her study more valuable. In this regard, and in response to the participants' ideas, several critical factors were investigated: "Team works with relevant and different expertise" (Raghunathan 1999, 275) was mentioned by 66% of the respondents from banks A, B, D, and F; "Reducing the amount of constraint and limitation" (Kopeikina 2005, 176; Djamasbi 2007, 1708) was introduced by half of the respondents from banks C, D, and E who mentioned the critical role of reducing the amount of administrative limitation to increasing the quality of decisions as a result of greater use of decision-maker's information; "Knowledge of past similar experiences" (Barr and Sharda 1997, 134) was considered by all participants who believed that knowledge of similar past experiences helps decision-makers to make more qualified decisions; "Consulting with people who involved in decision problem" (Shim et.al. 2002, 122; Kopeikina 2005, 100) that played significant role to had real understanding of the problem and then makes the best decision to solve it; and finally, "Adequate knowledge about internal and external organizational factors" (Shim et.al. 2002, 111) is, according to the participants from banks A, C, D and F, a very effective means of increasing the quality of decisions, achieving organization goals, and raising the company's profit. Then, based on this information, "decision makers' information" was considered as a "decision quality" variable in this research.

4.3.1.5.2 Higher information quality

This researcher found another important variable related to decision quality. "Higher information quality" obviously plays a critical role in improving the quality of decisions in company (Raghunathan 1999, 279; Kopeikina 2005, 231). By modelling the possible result of decisions, selecting the best option and making the best decision based on the high quality information that was produced by this modelling would be easy (Kopeikina 2005, 112). Moreover, with increasing information, the accuracy and quality of decisions would be improved as a result of improving the quality of the information (Raghunathan 1999, 276)). In addition, it is crucial that all aspects of a decision-making problem be considered in order to improve the quality of decisions as a result of better quality of information (Courtney 2001, 19).

This important variable was considered by respondents from banks A, B, C, D, and F. Regarding this variable, there were several factors such as "Decision-making quality", "Suitable and well-defined information system "(Shim et al. 2002, 122), "Modelling the possible result of our decisions" (Courtney 2001, 18; Kopeikina 2005, 112), "High accuracy of information" (Kopeikina 2005, 10; Raghunathan 1999, 276), "Attention to the organization goals in all phases of the decision-making process" ((Kopeikina 2005, 191), "Considering all aspects of the decision-making problem" (Courtney 2001, 19),"Do not make decisions based on sense and feeling" (Holsapple 2001, 2), and "Good understanding of the problem" (Courtney 2001, 19; Kopeikina 2005, 100). These factors help to provide high quality information and then high quality decisions. Therefore, because of this relationship between "higher information quality" and "decision quality", this variable was chosen for analysis in this study.

4.3.1.5.3 Viability of the organization

Most of the participants in this research believed that the viability of an organization is another important variable regarding the "decision quality". In order to better understand this variable, the researcher concentrated on several factors that participants mentioned in the interviews and referenced them in the literature as: "On-time decision making" (Kopeikina

2005, 20; Davern, Mantena, and Stohr 2008, 127), "Alignment with the organizational goals" (Courtney 2001, 26; Kopeikina 2005, 214), "Distributing authority" (Courtney 2001, 27), "Be familiar with the organization's culture and rules" (Kopeikina 2005, 99; Hensman and Sadler-Smith 2011, 58), and "Having enough authority and responsibility" (Courtney 2001, 27). Each of these variables could improve the viability of the organization. According to Davern, Mantena, and Stohr (2008, 127), timely and judicious decision-making helps managers and decision-makers to improve the viability of the organization. In addition, participants from banks A, C, D, and F mentioned that since the alignment of decisions with organizational goals improved the quality of decisions, managers should pay attention to this alignment in order to improve the quality of decision-making (Kopeikina 2005, 214). Interestingly, one participant from bank B explained that with the distribution of authority between managers and decision-makers, all people in the decision-makers group have a special level of authority and responsibility to make significant decisions; as they were aware of the responsibility attached to this authority, they tried to do their best (Courtney 2001, 27). Therefore, as all respondents recognized the strong relationship between "viability of the organization "and "decision quality", this variable was picked up as a powerful variable to consider in this research.

4.3.2 Relationships among factors

Table 4-4 shows the linkages among the knowledge management, DSS, intelligence, effectiveness of IDSS and decision quality. The information regarding the perceived links was sought during the interview process and was extracted from the interview scripts by means of the content analysis techniques described earlier. Column 1 of Table 4-4 specifies the pairs of factors and corresponding linkages. For instance, it is indicated in row 1 of Table 4-4 that Knowledge Management factors have impacts on the Decision Support system and this linkage has been identified in all banks.

Table 4-4: Linkage between Factors

Linkage between Factors	Bank					
	A	B	C	D	E	F
Knowledge Management (KM) ⟶ Decision Support System (DSS)	✓	✓	✓	✓	✓	✓
Knowledge Management (KM) ⟶ Intelligence		✓	✓	✓	✓	✓
Intelligence ⟶ Effectiveness of Intelligent Decision Support System (IDSS)	✓	✓	✓	✓	✓	✓
Decision Support System (DSS) ⟶ Effectiveness of Intelligent Decision Support System (IDSS)	✓	✓	✓	✓	✓	✓
Effectiveness of Intelligent Decision Support System (IDSS) ⟶Decision Quality	✓		✓	✓	✓	✓
Knowledge Management (KM) ⟶ Decision Quality	✓	✓	✓	✓	✓	✓

This table has been developed from the analysis of the interview data, presented in the previous section (4.3). The table indicates the relationship between factors. For example, the notion of the effectiveness of Intelligent Decision Support System (IDSS) → Decision Quality represents the influence of the effectiveness of an IDSS on decision quality. It is observed that all bank personnel except for bank B find that the effectiveness of the Intelligent Decision Support System has a direct influence on the quality of decisions at their bank. This relationship between these two factors was indicated by participants' statements: "*it will rise by*" or "*the positive effect can be seen*".

4.4 COMPARISON BETWEEN FINDINGS OF THE FIELD STUDY AND THE INITIAL MODEL (2nd Stage: Deductive Model)

Most of the variables in the field study have been supported by literature which was discussed in Chapter 2. This section discusses the constructs and factors which either emerged from the field study or were different from those in the existing literature.

The field study, similar to the literature review, demonstrated that decision quality is affected by KM and the effectiveness of IDSS. The field study also supported the mediating role of DSS and intelligence to explain the influence of KM on the effectiveness of IDSS and then on decision quality. The existing literature proposed that the integration of DSS and intelligence in order to improve the effectiveness of IDSS leads to decision quality which

may be affected by many factors such as the knowledge system, human judgment, creation of new knowledge, problem processing system, etc. The primary model included five constructs to indicate the relationship between KM and effectiveness of IDSS and its impacts on decision quality. The field studies and the analysis of the interviews data confirm this situation and the primary model which was found in the existing literature. However, the field study explored several factors for each of these five constructs in the initial research model, most of which were discussed in the literature. Therefore, all of the constructs and factors that were discussed in the existing literature were explored and confirmed in the field study. The field study confirmed and displayed the constructs of this research model as: *Knowledge Management (KM), Decision Support System (DSS), Intelligence, Effectiveness of IDSS, and Decision Quality.*

4.5 LITERATURE REVIEW SUPPORT FOR FINDINGS

This section, with support from literature, provides the justification for the selected constructs and dimensions that were developed from the field study. It demonstrates that the factors and dimensions that were derived from the field study are also supported by the existing literature. Therefore, this justification establishes the capability and adequacy of each construct and dimension in the existing literature. Table 4.5 presents the factors and the dimensions that have been finalized and the relevant support from the literature.

Table 4.5: Confirmation in the literature of field study findings

Construct	Factors	Sources
Knowledge Management (KM)	Managing tacit knowledge	Nemati et al. 2002; Bolloju, Khalifa, and Turban 2002; Liebowitz 2001.
	Managing explicit knowledge	Bolloju, Khalifa, and Turban 2002; Nemati et al. 2002; Spangler, and Peters 2001; Tabrizi, Ebrahimi, and Delpisheh 2011; Huang et al. 2010.
	Contribute to achieving the business results	Huang et al. 2010; Bolloju, Khalifa, and Turban 2002; Tabrizi, Ebrahimi, and Delpisheh 2011; Liebowitz 2001; Kebede 2010.
	Managing knowledge repository	Chen and Chen 2011; Bolloju, Khalifa, and Turban 2002.

Decision Support System (DSS)	Problem processing system	Burstein and Widemeyer 2007; Courtney 2001; Zack 2007; Moreau 2006; Hensman and Sadler-Smith 2011.
	Human Judgment	Shim et al. 2002; Zack 2007.
	Knowledge system	Moreau 2006; Shim et al. 2002; Zack 2007; Nemati et al. 2002; Bolloju, Khalifa, and Turban 2002.
Intelligence	Creating new Knowledge	Turban et al. 2011; Turban, Aronson, and Liang 2005.
	Codify the knowledge in the knowledge management systems	Turban, Aronson, and Liang 2005; Turban et.al2011.
	Help with the search and retrieval of knowledge	Shim et al. 2002; Moreau 2006; Turban, Aronson, and Liang 2005.
Effectiveness of Intelligent Decision Support System (IDSS)	Decision-maker satisfaction	Barr and Sharda 1997; Courtney 2001; Moreau 2006.
	Cost	Papamichail and French 2005; Moreau 2006.
	Decision-making speed	Moreau 2006; Papamichail and French 2005.
	Decision-making quality	Gao et al. 2007; Raghunathan 1999; Hensman and Sadler-Smith 2011; Barr and Sharda 1997; Turban 2005; Papamichail and French 2005.
Decision Quality	Decision-makers' information	Carmeli and Schaubroeck 2006; Djamasbi 2007; Raghunathan 1999; Barr and Sharda 1997; Shim et.al. 2002.
	Higher information quality	Holsapple 2001; Raghunathan 1999; Courtney 2001; Shim et.al. 2002.
	Viabilityof the organization	Davern, Mantena, and Stohr 2008; Hensman and Sadler-Smith 2011; Courtney 2001.

4.6 THE COMPREHENSIVE RESEARCH MODEL

As explained previously, a comparison was made between the initial model and the findings of the field study. Then, justifications of the selected constructs and dimensions were given. As a result, this section developed a comprehensive model for the current research, as shown in Figure 4.2.

The comprehensive model demonstrates that KM and its variables impact on DSS. KM is concerned not only with knowledge description and processing; decision-making is a principal KM application. Moreover, as evident from the analysis, "Knowledge management is getting the right knowledge to the right people at the right time so they can make the best decision" (Holsapple and Joshi 2001). From the analysis, another variable that KM

influences is "intelligence". Since DSS and intelligence are merged to create an IDSS, KM thus influences the IDSS.

Another significant part of this model which was discussed in the analysis was the relationship between the effectiveness of an IDDS and its variable, decision quality. This part demonstrates that the effectiveness of IDSS can have some impact on the quality of decisions. In addition, it is posited that KM directly impacts on decision quality, which is important and should be considered (Rubenstein-Montano et al. 2001). As mentioned previously, the proposed model and now the comprehensive model are developed based on DeLone and Mclean's model on information system success (DeLone and McLean 2003). According to this model, the impact of the effectiveness of IDSS could be measured in terms of decision quality which is an important measure of any organization's success.

The most important difference between the initial model and the comprehensive model concerns the variables that were discovered during the field study and confirmed by the literature. For example, the researcher focused on the four critical variables for "KM" in the comprehensive model. Table 4.6 shows all the variables that were added to the initial model. Therefore, the final model was more comprehensive as it included the initial model's constructs and impacts in addition to variables related to the main constructs. This meant that during the field study, no further constructs or relationships emerged; hence, the comprehensive model in this research study was not significantly different from the initial model.

Table 4.6: Variables that were added to the initial model

Construct	Variable	Abbreviation
KM	**Managing tacit knowledge**	**T.K**
	Managing explicit knowledge	**E.K**
	Contribute in achieving the business results	**B.R**
	Managing knowledge repository	**K.R**
DSS	**Problem processing system**	**P.P.S**
	Human Judgment	**H.J**
	Knowledge system	**K.S**

Intelligence	Creating new Knowledge	C.N.K
	Codify the knowledge in the knowledge management systems	C.K
	Help in the search and retrieval of knowledge	H.R.K
Effectiveness of IDSS	Decision-maker satisfaction	D.M.S
	Cost	Cost
	Decision-making speed	D.S.M
	Decision-making quality	D.M.Q
Decision Quality	Decision-maker s information	D.M.I
	Higher information quality	H.I.Q
	Viability of the Organization	V.O
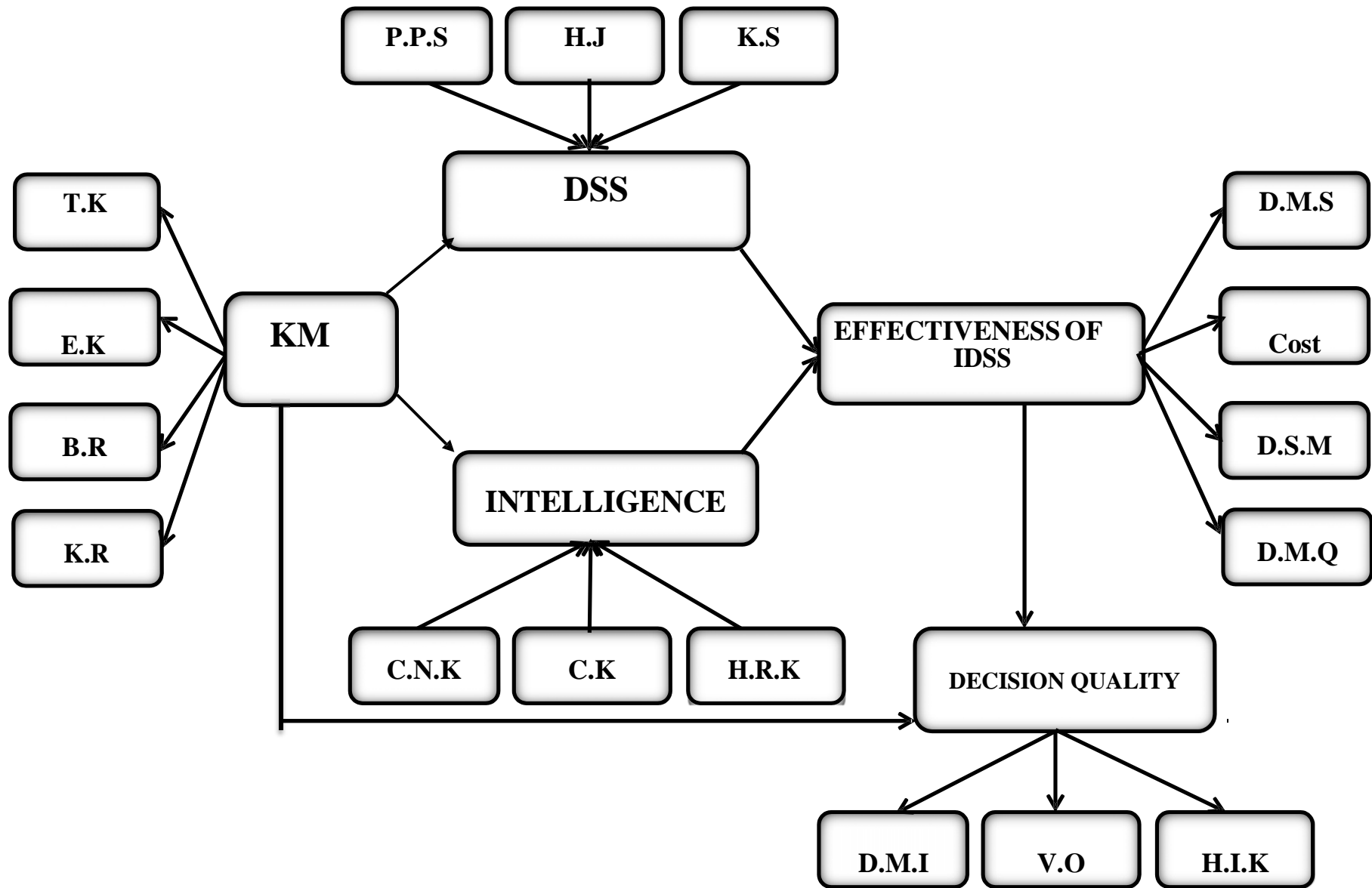
Figure 4.2: The comprehensive research model

4.7 SUMMARY

This chapter presents the findings of the field study and suggests a research model. Qualitative data were gathered from ten interviews conducted with ten managers, analysts and decision-makers in Iranian banks. The main objective of this field study was to test the suitability of the initial model suggested earlier, and to investigate the dimensionality of related constructs. To analyze the data, 'content analysis' techniques involving inductive and deductive phases were employed. Moreover, both theoretical and lateral reproduction were used in the deductive phase. Various factors, variables and measures have been explored and then compared with those in the literature. Then, the relationships between factors were established. Later, based on the analysis, a model was developed based on all the factors and variables that emerged from each interview. This model was then compared with the initial model that was derived from the literature review in order to arrive at a comprehensive research model. This model demonstrates the 'complete' relationship between Knowledge Management and the Effectiveness of IDSS in Iranian banks. In the next chapter (Chapter 5), hypotheses will be developed from this comprehensive model which will be further assessed using quantitative data (Chapter 6).

CHAPTER 5

HYPOTHESIS AND QUESTIONNAIRE DEVELOPMENT

5.1 INTRODUCTION

A detailed description of the development of the research hypotheses and questionnaire, which reflect the final comprehensive model, is provided in this chapter. The final comprehensive model was proposed in Chapter 4 by combining the tentative research model and the results of the field study. This chapter first presents the hypotheses development. The section that follows describes the design of the research instrument and presents a table of the measurement items with their respective references. The processes of back translation and pre-test are depicted next. Finally, the operation and results of the empirical pilot study are presented, and the final questionnaire for the main survey is thus obtained.

5.2 HYPOTHESES DEVELOPMENT

5.2.1 Hypotheses Related to Knowledge Management (KM)

5.2.1.1. Knowledge Management and Decision Support System

It has been acknowledged that Knowledge Management plays a very important role in decision-making research and as it does in decision quality (Spangler, and Peters 2001, 123; Bolloju, Khalifa, and Turban 2002, 166). Literature on Decision Support Systems found that organizational decisions may include economic, environmental, and social concerns, and be much more, complex and interconnected than those of the past (Courtney 2001, 17). Firms and their decision support systems must implement procedures and utilize tools that can deal with this complexity; one of these tools is knowledge management. Knowledge Management helps a decision support system to provide a good decision-making process allowing the best decisions to be made (Liebowitz 2001, 4). Similarly, the field study also indicated that a

decision support system is generally influenced by Knowledge Management. As found from the literature and field study, one of the significant roles of knowledge management regarding the decision support system is capturing tacit knowledge and then converting it to explicit knowledge (Liebowitz 2001, 1; Nemati et al. 2002, 145). It is clear that if valuable tacit knowledge is not converted to explicit knowledge and then distributed, this knowledge cannot be fully utilized for the decision making process that leads to firms making the best decisions in order to achieve their business goals (Bolloju, Khalifa, and Turban 2002, 166). Another important point that is supported by Huang et al (2010, 60) and the field study, is that by managing knowledge effectively, companies can enhance the decision support system why providing accurate, up-to-date and complete information for decision-makers to help them to make the best decisions. Hence, Knowledge Management acts as an independent variable and makes a significant impact on the Decision Support System (DSS) that is considered a dependent variable in this relationship. It means that any kind of change in the KM in a firm produces changes to the decision-making process and decision support system (Holsapple and Joshi 2001, 50; Shim et al. 2002, 121; Zack 2007, 1666; Hensman and Sadler-Smith 2011, 57). For example, Courtney (2001, 29) focused on the critical role of better and reliable information that was provided by KM in solving s firm's problem within the better decision-making support and system. Moreover, by making better use of data resources through KM, employers can obtain an overall picture of their firm and then make better informed decisions (Zack 2007, 1668). All previous researches and studies have focused on the "direct and positive" impact of KM on DSS which means that positive changes in KM produce improvement and positive changes in DSS. Therefore, based on this information and according to the previous discussions, the hypothesis related to Knowledge Management and the Decision Support System is proposed as follows:

H$_1$: Knowledge Management (KM) has a direct and positive influence on a Decision Support System (DSS)

5.2.1.2. Knowledge Management and Intelligence

According to the literature, knowledge management deals with how best to deliver value to the decision makers, users and customers (Huang et al. 2010, 60). Moreover, Liebowitz (2001, 1) believed that knowledge management combined different concepts such as human resource management, information technology and intelligence when managing knowledge. Therefore, based on the literature and findings from the field study, companies are using intelligent tools for knowledge management in order to achieve their goals Turban et.al 2011, 533). According to Nemati et al. (2002, 146) and the findings from the field study, knowledge management encourages firms to use intelligent tools especially for converting tacit knowledge to explicit knowledge (Bolloju, Khalifa, and Turban 2002, 166). As this conversion provides much better information for decision-making and creating new knowledge in organizations(Tabrizi, Ebrahimi, and Delpisheh 2011, 692), then it is critical that intelligent tools be included in knowledge management in order to perform this conversion in the best way possible. Hence, it can be concluded that knowledge management acts as an independent variable and has a significant impact on intelligence, the dependent variable in this relationship. It means that any sort of change such as the improvement or deterioration in KM in a company results in similar changes being made in terms of intelligent tools and then intelligence itself in the firm (Liebowitz 2001, 2& 4; Shim et al. 2002, 112; Turban, Aronson, and Liang 2005, 540; Turban et al. 2011, 533). For example, according to Kahraman, Kaya, and Cevikcan (2011, 360), sensitiveness, accuracy and flexibility of intelligent techniques which can be used to take advantage of the decision process of organization information system, were increased by an efficient knowledge management system in the company. In addition, Turban, Aronson, and Liang (2005, 558) listed numerous intelligence abilities that can be affected by KM, some of which include: recognizing the relative importance of different elements in a situation, understanding and inferring in ordinary rational ways, using reasoning and logic for solving problems and directing effectively, responding quickly and successfully to a new situation, making sense out of ambiguous or contradictory messages, learning or understanding from experience, and applying knowledge to manipulate the environment. All of those discussions in the literature and past studies concentrated on the "direct and positive" impact of KM on intelligence

which shows that positive changes in knowledge management caused improved and positive changes in intelligence. Therefore, in this study, the relationship between knowledge management and intelligence is very important. Hence, the following hypothesis is suggested for this relationship:

H_2: Knowledge Management (KM) has a direct and positive influence on intelligence

5.2.1.3. Knowledge Management and Decision Quality

It is clear that the decision maker's knowledge can play a strategic role in making high quality decisions (Raghunathan 1999, 275). According to Barr and Sharda (1997, 134), by having knowledge of similar experiences in the past (tacit knowledge), decision-makers can make more informed decisions. If the decision-maker makes maximum use of available knowledge, this improves the quality of decision-making as well as the quality of decisions (Barr and Sharda 1997, 134). Moreover, with knowledge management providing adequate knowledge about internal and external factors, it becomes a strong tool for improving the quality of decisions, achieving organizations' goals, and increasing companies' profits (Shim et al. 2002, 111). In addition, Kopeikina (2005, 10) and Raghunathan (1999, 276) explained that the quality of decisions would be improved by increasing the accuracy of information made possible by a firm's efficient knowledge management system. All of these points as well as the field study's findings focus on the important effect of knowledge management on decision quality. Put simply, by managing the available knowledge, decision-makers have the opportunity to access experts whose knowledge is related to the problem at hand (Carmeli and Schaubroeck 2006, 443). Moreover, all of the field study respondents stated that the knowledge management in their firms has improved the quality of decisions and their organization has benefited from their high quality decisions. This can be related to the high quality information that was provided and managed by KM (Shim et al. 2002, 111). The data that was collected from the interviews were in line with the findings in the literature that confirm the important role of knowledge management in improving the quality of decisions. Therefore, it can be concluded that knowledge management works as an independent variable and has significant impacts on the decision quality as the dependent variable in this

study. Then, any changes in KM lead to changes in the quality of decisions made by the company (direct and positive impact of KM on Decision Quality).Hence; this hypothesis is proposed to reflect this impact:

H_3: Knowledge Management (KM) has a direct and positive influence on decision quality

5.2.2 Hypothesis Related to DSS

As it discussed in the literature, IDSS is an intelligent version of DSS; therefore, it stands to reason that there is a strong and direct relationship between DSS and IDSS (Phillips-Wren et al. 2009, 643).Moreover, the main reasons for designing the Intelligent DSSs (IDSSs) are:to help the decision-making process through domain expertise recommendations, and to provide services to users to satisfy their requirements through communication, collaboration, and negotiation (Gao et al. 2007, 64). Therefore, in both the literature and the field study to better understand and evaluate the effectiveness of IDSS, a DSS can be considered as a type of IS and the IS is the evaluating model developed by DeLone and Mclean (DeLone and Mclean 2003, 10). Hence, since IDSS results from DSS therefore, the effectiveness of IDSS is strongly affected by DSS (Phillips-Wren et al. 2009, 643). Therefore, the DSS is an independent variable and impacts significantly on IDSS which is the dependent variable in this research. This means that any kind of change in the DSS in a firm causes some changes in the effectiveness of the IDSS (Sharda 1997, 134; Courtney 2001, 27; and Moreau 2006, 595). Most of the respondents in this research mentioned that DSS in some ways can provide high quality decisions, user satisfaction and then increase the effectiveness of IDSS by: providing quick access to the required information (Moreau 2006, 596), facilitating the communication between decision makers and firm (Courtney 2001, 28) and increasing the flexibility (Turban, Aronson, and Liang 2005, 540). In addition, according to Blair, Debenham and Edwards (1997, 277), an effective IDSS can be defined as "the ability of the Intelligent Decision Support system to gain its goals, principally to provide information described of its credibility and convenience that help firm decision makers to achieve their objectives". Therefore, as the DSS can increase or decrease this ability based on its status as

an independent variable, its direct impact on the effectiveness of IDSS has been recognized(Wang 1997, 326;Gao et al. 2007, 65).Therefore, based on discussions in the literature and past studies, as well as the findings from this research, it can be postulated that:

H₄: A Decision Support System (DSS) has a direct and positive influence on the effectiveness of IDSS

5.2.3 Hypothesis Related to Intelligence

Decision-making involves activities that comprise intelligence gathering, establishing guidelines, discovering alternatives, choosing a series of actions, and execution (Nutt 2007, 604). Intelligent techniques which can be used to take advantage of the decision process of organization information system, increase sensitiveness, accuracy and flexibility of this information system (Kahraman, Kaya, and Cevikcan 2011, 360).In addition, as IDSS is the result of combining DSS and Intelligence, it can be influenced by Intelligence as well as the DSS (Turban, Aronson, and Liang 2005, 558). Findings from the field study, which were confirmed in the literature, indicated that most of the research respondents believed that Intelligent tools which facilitate learning and understanding, better analysis of information (Turban etal2011, 533), improved information sharing in a virtual environment (Turban, Aronson, and Liang 2005, 540) and time saving (Moreau 2006, 595), can increase the effectiveness of IDSS by improving the decision making process and the decision quality. Hence, Intelligence is an independent variable in this research and impacts significantly on the Effectiveness of Intelligent Decision Support System (IDSS) that is the dependent variable in this study. Hence, any changes such as enhancement or diminishing in the intelligence tools or techniques in an organization results in changes to the effectiveness of IDSS in the firm (Liebowitz 2001, 2& 4; Shim et al. 2002, 112; Papamichail and French 2005, 95). Moreover, based on the definition of effective IDSS that was provided by Blair, Debenham and Edwards (1997, 277) which is "the ability of the Intelligent Decision Support system to gain its goals, principally to provide information described of its credibility and convenience that help firm decision makers to achieve their objectives", Intelligence tools play a significant role regarding the increase or decrease of this ability and then the

effectiveness of IDSS (Liebowitz 2001, 4; Turban etal2011, 534; Shim et al. 2002, 113;Moreau 2006, 596). It confirms that in this study, Intelligence acts as an independent variable and has a direct impact on the effectiveness of IDSS as a dependent variable. Hence, the following hypothesis is proposed regarding the relationship between Intelligence and effectiveness of IDSS:

H $_5$: Intelligence has a direct and positive influence on the effectiveness of IDSS

5.2.4 Hypothesis Related to Effectiveness of IDSS

As explained earlier, the Effectiveness of IDSS is a very important factor in this research because of its impact on the decision quality. Literature suggests that decision-making improves with the support of KM and IDSS (Holsapple and Joshi 2001, 52). Based on the literature, the Effectiveness of IDSS is evaluated using DeLone and McLean model (Delone and Mclean 2003, 10). In this model, effectiveness of IDSS is evaluated through its effect on user satisfaction (Moreau 2006, 594). As user satisfaction can result in high quality decisions made by IDSS users, then by increasing the user satisfaction, the quality of decisions will improve (Raghunathan 1999, 275). Then, the effectiveness of IDSS significantly influences the quality of decisions since it impacts on the decision makers who are the main users of the system (Papamichail and French 2005, 94). Hence, in the relationship between the effectiveness of IDSS and decision quality in this research the Effectiveness of IDSS is an independent variable and has an important impact on the Decision Quality, which is a dependent variable. It means that any kind of change in the effectiveness of IDSS in a firm results in changes to the decision quality (Raghunathan 1999, 275; Courtney 2001, 27; Papamichail and French 2005, 96). For example, Phillips-Wren et al. (2009 , 643) believed that an effective IDSS helps companies to direct users in some part of the decision-making process and enables them to make more qualified decisions (Phillips-Wren et al. 2009 , 643). In addition, the definition of effective IDSS as a means of "providing the credibility and convenience information to help firm decision makers to achieve their objectives" is another valuable sign of the critical effects of effective IDSS on increasing or decreasing the decision quality in a company (Blair, Debenham and Edwards 1997, 277).Following the discussion on

the effectiveness of IDSS, user satisfaction and decision quality, the following hypothesis is developed:

H_6: Effectiveness of IDSS has a direct and positive influence on Decision Quality

Table 5.1: Summary of hypotheses statements

Construct	Link	H#	Hypothesis Statement
Knowledge Management(KM)	KM➝DSS	H_1	Knowledge Management (KM) has a direct and positive influence on a Decision Support System (DSS)
	KM→ Intelligence	H_2	Knowledge Management (KM) has a direct and positive influence on Intelligence
	KM→ Decision Quality	H_3	Knowledge Management (KM) has a direct and positive influence on Decision Quality
Decision Support System(DSS)	DSS→ Effectiveness of IDSS	H_4	Decision Support System (DSS) has a direct and positive influence on the Effectiveness of IDSS
Intelligence	Intelligence →Effectiveness of IDSS	H_5	Intelligence has a direct and positive influence on the Effectiveness of IDSS
Effectiveness of IDSS	Effectiveness of IDSS → Decision Quality	H_6	Effectiveness of IDSS has a direct and positive influence on Decision Quality

5.3 SUMMARY OF HYPOTHESES

Based on the comprehensive research model, six main hypotheses were developed and are presented in Table 5.1 Figure 5.1 depicts these hypotheses on the comprehensive research model which was derived from both the literature and field study.
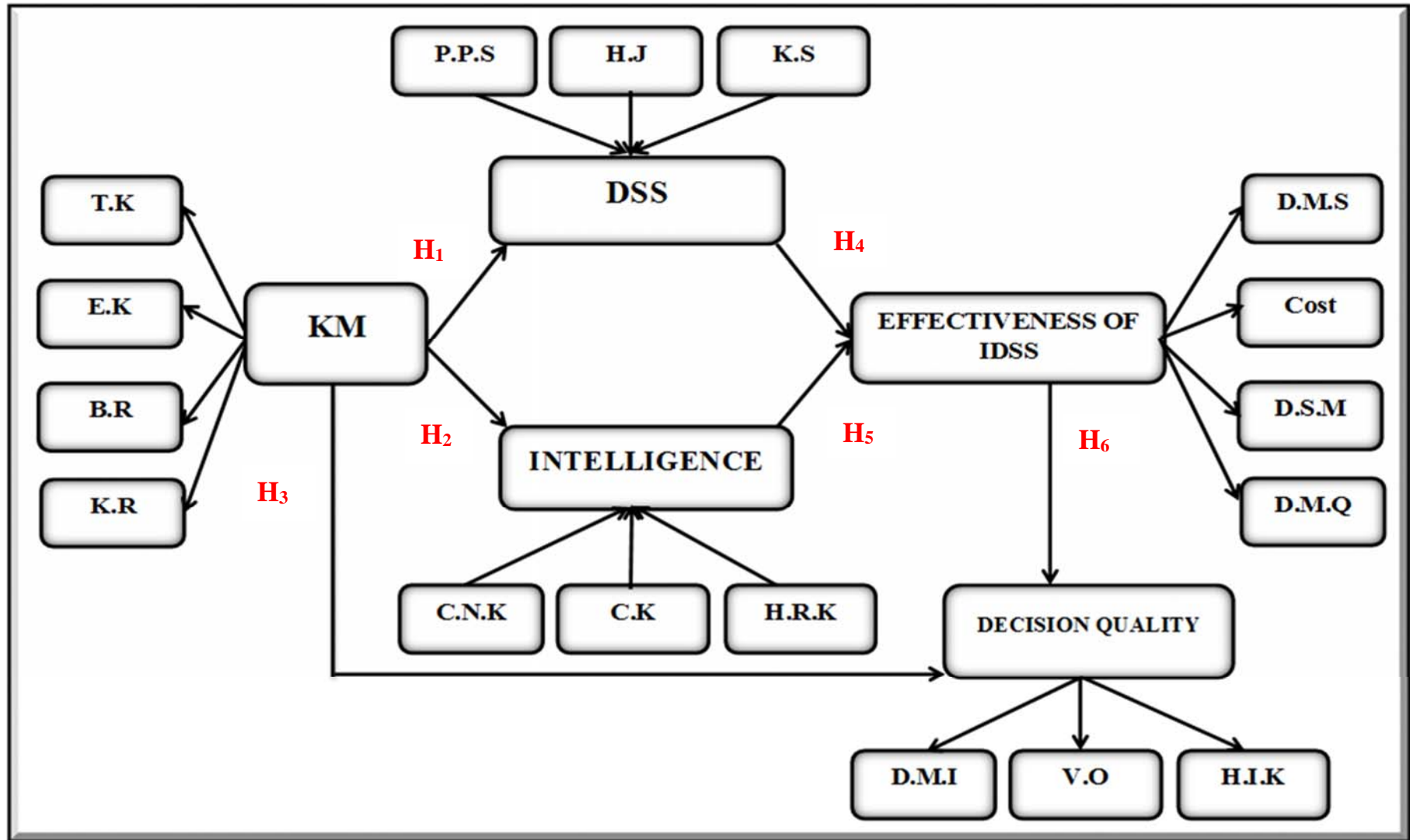
Figure 5.1: The hypothesized research model

5.4 QESTIONNAIRE DEVELOPMENT

In order to test the hypotheses, a set of questions were developed. The following section explains the development of the questionnaire.

5.4.1 Overview of the Questionnaire

Based on the field study and the existing literature, a questionnaire was developed to conduct the survey for this research. The questionnaire was designed to check the research hypotheses according to the comprehensive model as shown in Figure 5.1. The questionnaire that has been used for this research survey contained 102 questions. The questionnaire was divided into six main sections: demographic variables, KM factors, DSS factors, Intelligence factors, Effectiveness of IDSS factors, and Decision Quality factors. The first section obtained information about the demographic background of the respondents, whereas the other section(s) explored the respondents' opinions.

5.4.2 Development of Measurement Instrument
5.4.2.1 Questionnaire Section A: Demographic

The aim of this section was to acquire demographic information about the research participants. The demographic details included the respondent's details (gender, education, his/her length of employment in this company, field of his/her work, and his/ her position at the bank) and the bank's details (size, number of employees and the ownership status). Table 5.2 displays the demographic items used and the related references.

Table 5.2: Demographic Items

Item	Variable	Measure	Reference
D1	Gender	Nominate gender	Moores and Chang 2004
D2	Age	Nominate age	Morris and Venkatesh 2000
D3	Length of employment	Nominate the Tenure of employee in firm	Weeks et al. 2004
D4	Education	Nominate the highest level of education	Robinson and Sexton 1994
D5	Number of employees	Define the number of people engaged in bank	Field study (bank A-F)
D6	Ownership status	Nominate the bank ownership	Field study (bank A-F)
D7	Field of work	Nominate the field of work in bank	Field study (bank A-F)
D8	Position	Nominate the position at bank	Field study (bank A-F)

Four questions in the demographic section (D1, D6, D7 and D8) used nominal scales (categories with no implied order); another four (D2, D3, D4 and D5) used ordinal scales (categories in an order). Moreover, one of the items (D7) offered participants the opportunity to give open-ended responses. For example, the *field of the work* offered 12 choices. The respondent was also invited to write down his/her response in "Others" category mentioning his/her field of work if none of the provided choices was appropriate.

5.4.2.2 Questionnaire Section B: KM factors

The aim of the second section of the questionnaire was to identify and measure the influence of knowledge management factors on a Decision Support System, Intelligence and Decision Quality. Hence, the questions in section B measured the influence of the construct of KM on DSS, Intelligence and DQ (decision quality). The main sub-factors of KM that were evaluated in this part are:

- Managing tacit knowledge (TK)
- Managing explicit knowledge (EK)
- Contributing to achievement of business results (BR)
- Managing Knowledge Repository (KR)

Each of these sub-factors contains several dimensions as shown in Table 5.3. In this part of the questionnaire, the five-point Likert scale was used to determine the extent to which participants agreed or disagreed with each statement. The five-point Likert scale provides a complete picture of the research as it enables respondents to easily indicate the level of their agreement or disagreement with a variety of statements related to the phenomenon (Aaker, Kumar and Day 2004, 313).

Table 5.3: Measurement items related to Knowledge Management (KM)

	Item	Dimension	Statement	Source
Managing tacit knowledge	KM 1	Capturing tacit knowledge	Knowledge management helps to capture tacit knowledge in our unit.	Bolloju, Khalifa, and Turban 2002, 164;Guo and Sheffield 2008, 674; field study
	KM 2	Enriching tacit knowledge	By managing knowledge, tacit knowledge can be enriched.	Nemati et al. 2002, 145; Venters 2010, 162; field study
	KM 3	Sorting tacit knowledge	Sorting the tacit knowledge in organization is facilitated with KM.	Nemati et al. 2002, 145; Bolloju, Khalifa, and Turban 2002, 164; field study.
	KM 4	Converting tacit to explicit knowledge	Managing knowledge can convert tacit knowledge to explicit knowledge.	Liebowitz 2001, 1; Nemati et al. 2002, 145; Venters 2010, 162; field study
Managing explicit knowledge	KM 5	Retrieving explicit knowledge	By managing knowledge, explicit knowledge can be retrieved.	Bolloju, Khalifa, and Turban 2002, 166; Guo and Sheffield 2008, 674; field study
	KM 6	Filtering explicit knowledge	Knowledge management helps to filter explicit knowledge in my department.	Nemati et al. 2002, 145; field study
	KM 7	Storing explicit knowledge	By managing knowledge, I can store explicit knowledge in my department.	Valenzuela et al. 2008, 322; Venters 2010, 161; field study
	KM 8	Disseminating explicit knowledge	Knowledge management helps to disseminate explicit knowledge in our unit.	Spangler, and Peters 2001, 103&123;Venters 2010, 163
	KM 9	Creating new knowledge	By managing the knowledge, we can create new knowledge.	Nemati et al. 2002, 148; Valenzuela et al. 2008, 322; Venters 2010, 161; Tabrizi, Ebrahimi, and Delpisheh 2011, 692; field study
	KM 10	Testing new knowledge	We can test new knowledge by using KM in our department.	Spangler, and Peters 2001, 118; Huang et al. 2010, 63; field study
	KM 11	Facilitate Sharing the knowledge	Sharing the knowledge in organization is facilitated with KM.	Guo and Sheffield 2008, 674; Venters 2010, 162; field study
	KM 12	Transforming knowledge	Knowledge management can transform knowledge in my department.	Liebowitz 2001, 4;Guo and Sheffield 2008, 674; field study

Contribute in achieving the business results	KM 13	Improving company performance	By managing knowledge we can improve our performance.	Valenzuela et al 2008, 322; Huang et al. 2010, 63; Bolloju, Khalifa, and Turban 2002, 164; field study
	KM 14	Enhanced customer handling	By managing the knowledge, customer handling was enhanced.	Tabrizi, Ebrahimi, and Delpisheh 2011, 692; field study
	KM 15	Better employee skills	We have got better employee skills in our department with knowledge management.	Liebowitz 2001, 4;Tabrizi, Ebrahimi, and Delpisheh 2011, 692; field study
	KM 16	Reduced expenses	Knowledge management reduced expenses in our bank.	Bolloju, Khalifa, and Turban 2002, 16; Venters 2010, 162; field study
	KM 17	Increased profits	Increased earning/profits is one of the KM results in our bank.	Valenzuela et.al 2008, 323;Tabrizi, Ebrahimi, and Delpisheh 2011, 692; field study
	KM 18	Further business opportunities	Further business opportunities can be generated by knowledge management in our department.	Tabrizi, Ebrahimi, and Delpisheh 2011, 692; Kebede 2010, 420; field study
	KM 19	Delivering more value to customers	Knowledge management can help us to deliver more value to our customers.	Nemati et al. 2002, 148; Valenzuela etal. 2008, 325; Huang et al. 2010, 60
	KM 20	Delegating more authority to employees	By managing the knowledge, we can delegate more authority to employees.	Tabrizi, Ebrahimi, and Delpisheh 2011, 692; field study
Managing knowledge repository	KM 21	Sending knowledge internally	Knowledge management leads us to sending knowledge internally.	Valenzuela et al 2008, 326; Bolloju, Khalifa, and Turban 2002, 164; field study
	KM 22	Sending knowledge externally	Knowledge management leads us to sending knowledge externally.	Valenzuela et al 2008, 326; Bolloju, Khalifa, and Turban 2002, 164; field study
	KM 23	Availability of the right information in the right form	By managing the knowledge, we can be sure that right information is available in the right form.	Holsapple and Joshi 2001, 40; Chen and Chen 2011, 3862; field study
	KM 24	Availability of the right information in the right time	By managing the knowledge, we can be sure that right information is available at the right time.	Holsapple and Joshi 2001, 40; Chen and Chen 2011, 3862; field study

5.4.2.3 Questionnaire Section C: DSS factors

The next part of the questionnaire identified and measured the influence of the Decision Support System (DSS) factors on the effectiveness of IDSS. Hence, the questions measured the influence of the DSS construct on the effectiveness of IDSS. All of the DSS factors have been adapted from the existing literature and were confirmed by the field study. The main sub-factors of DSS that were evaluated in this part are:

- Problem Processing System (PPS)
- Human Judgment (HJ)
- Knowledge System (KS)

Each of these sub-factors includes several dimensions in which are presented in Table 5.4. In this section of the questionnaire similar to the second part, the five-point Likert scale was used to determine the extent to which participants agreed or disagreed with each statement. Aaker, Kumar and Day (2004, 313) defined these five points as: Strongly disagree, Disagree, Neutral, Agree, Strongly agree.

5.4.2.4 Questionnaire Section D: Intelligence factors

Section D of the questionnaire measured and identified the influence of the Intelligence factors on the effectiveness of IDSS. It means that the questions measured the impacts of the construct of Intelligence on the effectiveness of the IDSS. All of the Intelligence factors have been adapted from the existing literature and were confirmed by the field study. The main sub-factors of Intelligence that were evaluated in this part are:

- Creation of new knowledge (CNK),
- Codification of the knowledge in the knowledge management systems (CK)
- Assistance with the search for and retrieval of knowledge (HRK)

Each of these sub-factors includes several dimensions as shown in table 5.5. This section of the questionnaire is the same as sections A and B in that the five-point Likert scale (Strongly disagree, Disagree, Neutral, Agree, Strongly agree) was used to determine the extent to which participants agreed or disagreed with each statement.

Table 5.4: Measurement items related to the Decision Support System (DSS) factors

	Item	Dimension	Statement	Source
Problem processing system	DSS1	Gaining more and better information	This company's DSS helps to obtain more and better information	Holsapple and Joshi 2001, 39; Burstein and Widemeyer 2007, 1648; field study
	DSS 2	Increased the number of decision-making alternatives	Using of DSS in this organizations Increased the number of alternatives that examined for decision making	Courtney 2001, 29; field study
	DSS 3	Improved communication	DSS helps to improve communication in our organization.	Courtney 2001, 20; field study
	DSS 4	Greater flexibility	DSS provides great flexibility in our department	Holsapple and Joshi 2001, 40; Zack 2007, 1666
	DSS 5	Cost-saving	I think cost savings is one of the most important results of DSS.	Courtney 2001, 20; Holsapple and Joshi 2001, 40; Field study
	DSS 6	Time-saving	Another important result of DSS is time saving	Holsapple and Joshi 2001, 50; Moreau 2006, 595; Field study
	DSS 7	Better control	By using of DSS we have better control in our department.	Holsapple and Joshi 2001, 39; Hensman and Sadler-Smith 2011, 57
Human Judgment	DSS 8	More effective team work	I feel DSS helps to create more effective team work in organization	Holsapple and Joshi 2001, 40; field study
	DSS 9	Fast response to unexpected situations	In our bank fast response to unexpected situations was provided through DSS.	Shim et al. 2002, 123; field study.
	DSS 10	Better understanding of the business	I believe that better understanding of the business is one of the best results of DSS.	Shim et al. 2002, 121; field study
	DSS 11	Better and qualified decisions	I believe that DSS provides better and qualified decisions.	Holsapple and Joshi 2001, 39; Zack 2007, 1664; field study
	DSS 12	New insights and learning	I believe that DSS provides new insights and learning.	Zack 2007, 1668; field study
Knowledge system	DSS 13	Better use of data resource	DSS helps to make better use of data resources in organization.	Holsapple and Joshi 2001, 50; Shim etal. 2002, 121; field study
	DSS 14	Interactive use of the system	I think DSS provide Interactive use of the system by the decision maker.	Holsapple and Joshi 2001, 50; Moreau 2006, 594; field study
	DSS 15	Enhance the tacit to explicit knowledge conversion	DSS enhances the conversion of tacit to explicit knowledge.	Nemati et al. 2002, 145 Bolloju, Khalifa, and Trban 2002, 166.
	DSS 16	Assists with internalizing explicit knowledge	DSS assists with internalizing explicit knowledge	Holsapple and Joshi 2001, 41; Nemati et al. 2002, 145; field study

Table 5.5: Measurement items related to the Intelligence factors

	Item	Dimension	Statement	Source
Creating new Knowledge	INT 1	Facilitates Learning and understanding	Intelligence facilitates learning and understanding from experience	Liebowitz 2001, 2& 4; Turban et al. 2011, 533; field study
	INT 2	Better analysing of information	By using of Intelligent tools, this company had better analysing of its information.	Liebowitz 2001, 4; Turban et al. 2011, 533; field study
	INT 3	Improved information-sharing in virtual environment	I believe that Intelligence improved information-sharing in a virtual environment	Liebowitz 2001, 4; Turban, Aronson, and Liang 2005, 540
Codify the knowledge in the knowledge management systems	INT 4	Applying knowledge to managing the environment	Intelligent tools enable knowledge to be applied in order to manage the environment	Liebowitz 2001, 5; field study
	INT 5	Identifies system response to different situations	Intelligence identifies system response at different situation	Turban2005, 540; field study
	INT 6	Recognizing the relative importance of different elements in a situation	Intelligent tools recognize the relative importance of different elements in a situation.	Field study
	INT 7	Solving problems effectively	Using reasons in solving problems and directing conduct effectively, is one result of Intelligent tools.	Liebowitz 2001, 4; Turban et al. 2011, 534; field study
Help to the search and retrieval of knowledge	INT 8	Successfully respond to a new situation	I think Intelligent tools help to respond quickly and successfully to a new situation.	Turban, Aronson, and Liang 2005, 540; field study
	INT 9	Better communication between managers	I feel that intelligence helps with better communication between managers.	Liebowitz 2001, 4
	INT 10	Improved flexibility	I believe that Intelligence improves flexibility in organization.	Liebowitz 2001, 4; Turban, Aronson, and Liang 2005, 540; field study
	INT 11	Better decision-making	Intelligence provides better decision-making in our bank.	Shim et al. 2002, 112; field study
	INT 12	Time savings	I am sure that Intelligent tools lead company to time savings	Moreau 2006, 595; field study

5.4.2.5 Questionnaire Section E: Effectiveness of IDSS factors

Section E (Part 5) of the questionnaire focused on the effectiveness of IDSS. The impacts of the effectiveness of IDSS factors on decision quality was measured and identified in this section of the questionnaire. In a simple word, the questions of section E measured the effects of the construct of effectiveness of IDSS on decision quality. Similar to the previous parts of the questionnaire, all of the factors for the effectiveness of IDSS have been selected from the existing literature and were confirmed by the field study. The main sub-factors relating to the effectiveness of IDSS that were considered in this part of the research are:

- Decision-maker satisfaction
- Cost
- Decision-making speed
- Decision-making quality

Each of these sub-factors includes several dimensions which are presented in Table 5.6. The five-point Likert scale was used in this section of the questionnaire as it was in sections A, B, C and D to determine the extent to which the participants agreed or disagreed with each statement.

Table 5.6: Measurement items related to the Effectiveness of IDSS factors

	Item	Dimension	Statement	Source
Decision-maker satisfaction	E-IDSS 1	Quick access to the required information	With an effective IDSS we have easily and quickly access to the required information.	Moreau 2006, 595;field study
	E-IDSS 2	Facilitating the communication between decision-makers and firm	Effective IDSS can provide interactive use of the system by the decision-maker.	Courtney 2001, 27;field study
	E-IDSS 3	Recognizing the influenced variables for decision-making	I feel that I have the chance to recognize the influencing variables for decision-making with effective IDSS	Barr and Sharda 1997, 134; Moreau 2006, 595;field study
	E-IDSS 4	Facilitate decision-making process	I know that Effective IDSS facilitates decision-making in an organization.	Barr and Sharda 1997, 145;field study
	E-IDSS 5	Improving the decision-making quality	By using effective IDSS, decision-making was improved	Moreau 2006, 595;field Study

133

	E-IDSS 6	Increased customer satisfaction	Effective IDSS increased customer satisfaction in our company.	Moreau 2006, 595;field study
Cost	E-IDSS 7	Better use of information	Effective IDSS provides better use of data and information	Field study
	E-IDSS 8	Decreased decision-making cost	I believe that effective IDSS helps to decrease decision-making costs.	Moreau 2006, 595; field study
	E-IDSS 9	Decreasing the organizational cost	I believe that effective IDSS helps to decrease organizational costs.	Moreau 2006, 595; field study
	E-IDSS 10	Facilitating financial services	Effectiveness of IDSS can be measure according to its positive impact on the financial services	Moreau 2006, 602
	E-IDSS 11	Increasing the organizational profits	Effective IDSS helps to increase organizational profits	Papamichail and French 2005, 95; field study
	E-IDSS 12	Increase organization's Market share	Effective IDSS can increase organization's market share with using of intelligent tools	Moreau 2006, 595; field study
Decision making speed	E-IDSS 13	Provides accurate information at the right time	I believe that effective IDSS Provides accurate information at the right time.	Papamichail and French 2005, 94; field study
	E-IDSS 14	Time-saving	I feel that effectiveness of IDSS can be measured through the time saving that such improved decisions would create	Moreau 2006, 595; field study
	E-IDSS 15	Increased productivity	By using effective IDSS, productivity was increased in our bank	Papamichail and French 2005, 94
	E-IDSS 16	Quicker decision-making	I believe that effective IDSS helps to do decision-making, more quickly.	Moreau 2006, 595; Field study
Decision making quality	E-IDSS 17	Increased decision-making quality	I feel that effective IDSS improves decision-making quality.	Raghunathan 1999, 275; field study
	E-IDSS 18	Prevent intuitive decision-making	Effective IDSS prevents intuitive decision-making.	Hensman and Sadler-Smith 2011, 54; field study
	E-IDSS 19	Provide better results	I feel that effective IDSS provides better results in our department.	Barr and Sharda 1997, 134; field study
	E-IDSS 20	Increase flexibility	Increased flexibility is one of the most important results of effective IDSS.	Turban, Aronson, and Liang 2005, 540; field study
	E-IDSS 21	Achieve organization goals	I think the effectiveness of IDSS can be measured according to its impact on achieving organization goals.	Papamichail and French 2005, 95
	E-IDSS 22	Increase the rate of growth of an organization	Effectiveness of IDSS is measured via its impact on the rate of growth in each department that was use of this information system.	Gao et al. 2007, 63; field study

5.4.2.6 Questionnaire Section F: Decision Quality factors

The final section of the questionnaire is related to the Decision Quality. Section F of the questionnaire measured and identified different dimensions of Decision Quality that was affected by KM, DSS and Intelligence. Similar to all other parts of the questionnaire (except part A), all of the Decision Quality factors were selected from the existing literature and were confirmed by the field study. The main sub-factors of Decision Quality that were considering in this part of the research are:

•   Decision maker's information

•   Higher information quality

•   Viability of the organization

Each of these sub-factors includes some dimensions as well those shown in Table 5.7.The five-point Likert scale was used in this section of the questionnaire as in sections A, B, C, D and E to determine the extent to which the participants agreed or disagreed with each statement.

Table 5.7: Measurement items related to the Decision Quality factors

	Item	Dimension	Statement	Source
Decision maker's information	DQ 1	Team works with relevant and different expertise	Team works with relevant and different expertise create high quality decisions	Raghunathan 1999, 275; Carmeli and Schaubroeck 2006, 443; field study
	DQ 2	Knowledge of past similar experiences	Knowledge of past similar experiences helps to increasing decision quality.	Barr and Sharda 1997, 134; field study
	DQ 3	Reducing the number of constraints and limitations.	By reducing the amount of constraint and limitation and molesting directive, the quality of decision has been increased	Kopeikina 2005, 176; Djamasbi 2007, 1708; field study
	DQ 4	Consulting with people who are involved in this problem	I believe that consulting with all or most of the people who are involved in this problem can help decision-makers to make high quality decisions.	Shim et al. 2002, 122; Kopeikina 2005, 100; field study
	DQ 5	Adequate knowledge about internal organizational factors and activities	I believe that adequate knowledge about internal organizational factors and activities provide high quality decisions.	Shim et al. 2002, 111
	DQ 6	Adequate knowledge about external organizational factors	I feel that adequate knowledge about external organizational factors can increase decision quality.	Shim et al. 2002, 111; field study
Higher information quality	DQ 7	Decision-maker's quality	I feel that the qualifications of the decision-makers have a positive impact on decision quality.	Raghunathan 1999, 279; Kopeikina 2005, 231; field study
	DQ 8	Suitable and well-defined information system	Suitable and well-defined information system can provide qualified information for decision makers, increase decision quality.	Shim et.al. 2002, 12; field study
	DQ 9	Modelling the possible result of our decisions	By modelling the possible result of our decisions, we can make decisions that have high quality.	Courtney 2001, 18; Kopeikina 2005, 112; field study
	DQ 10	Highly accurate information	Highly accurate information can result in high quality decisions.	Kopeikina 2005, 10; Raghunathan 1999, 276; field study
	DQ 11	Considering all aspects of the decision-making topic	I feel that the quality of decisions has been increased by considering all aspects of the topic.	Courtney 2001, 19; field study

	DQ 12	Attention to the organization's goals at all phases of decision-making process	I think attention to the organization goals at all phases of the decision-making process, can provide high quality decisions.	Kopeikina 2005, 191; Field study
	DQ 13	Do not decision making based on the sense and feeling	I think that the quality of decisions has been increased when decision-making is not based on the sense and feeling.	Holsapple 2001, 2; field study
	DQ 14	Good understanding of the problem	I believe that a good understanding of the problem can result in making high quality decisions.	Courtney 2001, 19; Kopeikina 2005, 100; field study
Viability of the organization	DQ 15	On-time decision making	Timeliness of making decision is very important to making high quality decisions(late decisions are bad decisions)	Kopeikina 2005, 20; Davern, Mantena, and Stohr 2008, 127
	DQ 16	Alignment with the organizational goals	I think alignment with the organizational goals and objectives can help us to make qualified decisions.	Courtney 2001, 26; Kopeikina 2005, 214; field study
	DQ 17	Distributing authority	I believe that the quality of decisions has been increased with spending authority.	Courtney 2001, 27; field study
	DQ 18	Be familiar with the organization s culture and rules	Being familiar with the organization's culture and rules is very important to make decisions with high quality.	Kopeikina 2005, 99; Hensman and Sadler-Smith 2011, 58; field study
	DQ 19	Having enough authority and responsibility	Having enough authority and responsibility about the decisions can result in making high quality decisions.	Courtney 2001, 27; field study

5.5 QUESTIONNAIRE TRANSLATION

As discussed in previous chapters, the main aim of this study was to investigate the relationship between KM and the effectiveness of IDSS and then decision quality in Iranian banks context. The managers, decision-makers and analysts from six selected Iranian banks were the subjects of the study: they were comfortable with and used to communication and exchanges in the Iranian language - Farsi. Thus, the English version questionnaire was translated into Farsi before the survey was conducted to achieve better results and convenience. A complete English version of the questionnaire is presented in Appendix C. A back-translation method (Marin & Marin, 1991) was employed to create an accurate Farsi-version questionnaire and ensure the similarity of the two versions. The back-translation process involved a set of translations, check–recheck and modifications. The researcher first translated the original English questionnaire, which had been approved by the university's Human Research Ethics Committee, into Farsi. The first version of the Farsi questionnaire was thoroughly checked by an Iranian university academic in Australia. After that, the translated questionnaire was further reviewed by two university academics from Iran. The final version of the Farsi questionnaire was again translated back into English. This back-translated version of the questionnaire provided the chance to check whether the translated version of the questions project a similar meaning and approach to the original version. Although some words were found to be different, all items in both versions of the questionnaire were observed to be similar in their meaning which ensured that the two versions of the questionnaire were similar. A complete Farsi-translated version of the survey questionnaire is provided in Appendix D.

5.6 EMPRICAL PILOT STUDY

After the questionnaire was translated, and in order to test its validity, the questionnaire was distributed to potential respondents as well as researchers, as suggested by Frazer and Lawley (2000, 34), in order to determine whether any modifications needed to be made. Ten questionnaires were distributed to a group of researchers from multi-disciplinary areas. The

researchers were selected on the basis that "they understand the study's purpose and they have similar training as the researcher" (Frazer and Lawley 2000, 34) so that their feedback could improve the quality of the questionnaire to meet the research objective. Fifty questionnaires were distributed to the potential respondents who included randomly selected managers, analysts and decision makers in Iranian banks to ensure the questions were applicable and relevant to the research topic. The main purpose was to test the validity and suitability of the questions. The researcher explained the aim to all selected participants and then asked them to check the discussed issue in the questionnaire. Moreover, the length of time required to complete the questionnaire was determined by the pilot test. The participants in the pilot study believed that all questions were relevant and appropriate and they had no problems in understanding the meaning of the questions or seeing their relevance to the research topic. As the questions were clear and unambiguous, the estimated time needed to answer them closely approximated the time taken during the pilot study. Finally, the pilot study indicated that all the questions in the questionnaire were appropriate and clearly understood in the research context.

5.7 SUMMARY

This chapter presented the hypotheses developed that were derived from the comprehensive research model, developed in Chapter 4. Overall, six hypotheses were developed to describe the relationships among the variables as suggested in the comprehensive research model (Figure 4.3). Also, the justification and rationale of the hypotheses were presented. Finally, it presented the development method and measurement items for the questionnaire used in this research. To test the developed hypotheses, the questionnaire was developed based on the findings from the field study and literature. In total, one hundred and two items were derived for this questionnaire. To test the validity of the questionnaire, a pilot study was carried out and then the final version was distributed for a national survey, which is discussed in the next chapter.

CHAPTER 6

ADMINISTRATION AND ANALYSIS OF SURVEY

6.1 INTRODUCTION

The primary tool for collecting data in the main survey was the questionnaire as proposed in Chapter 5. The research questionnaire was distributed to the managers, decision-makers and analysts in Iranian banks. The first section in this chapter details the approaches used in operating the main survey. This is followed by a presentation of the demographic information about the respondents. The next sections describe the step-wise procedures of Smart Partial Least Squares in analyzing the survey data. The assessments of the Smart PLS model consist of the evaluation of the measurement model and the appraisal of the structural model. The results of the main survey are discussed in detail according to the standard for each assessment, which has been outlined in Chapter 3. This chapter concludes with the findings of the survey by presenting the outcomes of testing the proposed hypotheses.

6.2 OVERVIEW OF THE SURVEY
6.2.1 Sample Selection and Data Collection

The survey was administered to 420 subjects within different departments and sections of six banks in Iran, all of which were local. There are currently thirty-four local banks in Iran. Using the approach of cross-sectional studies, various segments of the Iran banking industry were sampled at a single point in time and the selected companies varied in terms of history, size and location (Zikmund 2003, 254). The participating banks were approached via phone to obtain their approval and identify the contact persons. The contact persons were then given the information regarding the purpose of the study, the instructions, and the target sample before they distributed the questionnaires through their companies' internal mailing systems. They were requested to distribute the questionnaires randomly across departments and divisions and the research subjects were the managers, decision-makers and analysts,

who worked full-time and were involved in acquiring, analyzing and utilizing information for decision-making activities. The packages of research instruments contained survey cover letters (see Appendix D), general instructions, pre-paid and self-addressed envelopes and the questionnaire. As in the pilot study, participation was voluntary and all individual responses were treated as confidential and anonymous.

6.2.2 Response Rate

Because it is important to have a high response rate for a research survey (Cui 2003), the researcher attempted to ensure a very high response rate for this study by increasing the interest and awareness of respondents regarding the research, thereby encouraging them to take part. Hence, the questionnaire was designed using non-technical general statements and avoiding technical jargon in line with the Total Design Method (TDM) which is a questionnaire-designing method (Heberlein and Baumgartner 1978, 460; Dillman 1991, 234). Therefore, the questionnaire for the current study was examined by two expert academics specializing in KM, IDSS and Decision Quality research. A personalized cover letter was attached to each questionnaire that explained the benefits and importance of taking part in the survey. To increase the credibility, the letters included the letterhead of Curtin University.

Respondents were ensured that their identity would not be revealed, thus ensuring the privacy and anonymity. Therefore, the survey did not include any special code or sign, which also made it impossible for the researcher to identify specific responses and compare them. For the convenience of the respondents, a stamped and addressed reply-envelope was provided. Respondents were given three weeks to complete and return the questionnaires. After the three weeks had elapsed, phone calls were made to the contact persons in the respective companies to encourage the return of more completed questionnaires. The packages, consisting of follow-up letters (see Appendix E), copies of questionnaire and reply-paid envelops, were provided to improve the response rate. A copy of the final Iranian version of the research questionnaire is presented in Appendix G. From the 420 questionnaires distributed, a total of 300 valid responses were collected, resulting in a 71.4%

effective response rate. It was found that, in the originally returned 316 questionnaires, 16 responses were incomplete and so were discarded.

6.2.3 Data Organization

Respondents having more than 6% missing values were excluded from the analysis. The data were examined to find out errors in the form of invalid data including missing values or a blank questionnaire. This process was carried out to provide clean data for the research analysis. Upon examination, 16 questionnaires were found to be incomplete and thus were excluded to avoid false results in the analysis. According to Barclay, Higgins and Thomson (1995, 292) the minimum requirement number of samples in the research should be 10 times the number of items in the most complex formative construct or the largest number of antecedent constructs leading to an endogenous construct in the research model which is the satisfied number. Based on this criterion, the minimum sample size for this study was 160 samples. The final number of usable responses was 300.

6.2.4 Pilot Test

A pre-analysis test using Smart PLS was conducted on these usable responses. Fifty responses were considered for the pre-analysis test. The main goal of the pre-analysis test was to obtain an overview of the applicability of the data in this research, not to assess the structural or measurement model. After the pilot test, some typing and texting corrections were made to improve readability.

6.2.5 Sampling Errors and Non-Response Bias

Only a small number of Iranian banks were surveyed; therefore, the statistics derived from these banks are likely to be different from those that would have been obtained if information had been collected from all Iranian banks. Any such differences are termed 'sampling errors'. Generally, the larger the sample size, the lower the sampling error is likely to be.

However, the data collected from each bank were considered as representative of all banks, which has been verified by the non-response bias test.

Non-response bias

It is imperative to test whether the responses from a survey represent the larger population. Non-response-bias tests check whether there is any difference in opinion of the respondents with the non-respondents who could have participated in the survey. Therefore, the rationale for this test is that late respondents were likely to have similar characteristics to non-respondents (Thong 1999, 199).

As mentioned earlier, this research was conducted through the traditional mail survey. The participants in the survey were split into early and late respondents. Therefore, the responses were grouped into group 1 and group 2 samples. Group 1 includes 170 responses and the remaining 130 were in group 2. The Independent Sample Mann-Whitney U Test was performed to test the significant differences between demographic and behavioral attitudes toward KM, and variables related to Effectiveness of IDSS and Decision Quality.

Table 6.1: Mann-Whitney U test for group 1 and group 2 samples of survey

Item	Z Value
Gender	0.683
Age	0.793
Education	0.598
By managing knowledge, we can improve our performance	0.811
I believe that DSS provides better and qualified decisions.	0.632
Intelligence provides better decision-making in our bank.	0.357
I know that effective IDSS facilitates decision-making in my organization.	0.759
By modeling the possible result of our decisions, we can make decisions that have high quality.	0.426

The test was executed in terms of gender, age, education, and one KM-related, one DSS-related, one Intelligence-related, one Effectiveness of IDSS-related and one Decision Quality related characteristics. The results founded that z-values are not significant at 0.05 levels.

Therefore, all items passed the non-response bias test which means that there are no significant differences between these two groups (group 1 & 2). Therefore, it can be concluded that this study does not have non-response bias.

6.2.6 Justification of Reflective and Formative measures

The appropriate and differentiation use of reflective and formative constructs in studies has been a new advancement of structural equation modeling (SEM). At first, IS researchers modeled most of the constructs as reflective due to many reasons. One of these reasons was the availability of the software that was supportive for estimates of these kinds of constructs (Chin, 1998a, xiii; Gefen, Straub, and Boudreau 2000, 25). Another reason was the conceptual criteria for determining whether constructs should be specified as reflective or formative (Diamantopoulos and Winklhofer, 2001, 271; Edwards and Bagozzi, 2000, 162). Lack of required knowledge for the subsequent estimates (Jarvis, Mackenzie, and Podsakoff, 2003, 202) and lack of a coherent standard for evaluating psychometric properties of measures (Bagozzi, 1981, 611; Bollen, 1989, 132) were other reasons for selecting the formative format for constructs by IS researchers. The introduction of PLS-based structural equation modeling (SEM) has provided the analytical tools suitable for modeling reflective and formative constructs. The development of software for component-based SEM has provided ample opportunities for researchers who are involved in modeling formative and reflective constructs. However, it is difficult to predict the nature of an indicator, that is, whether it is formative or reflective. Researchers in this study have initially judged the nature of a latent variable by applying the definitions of formative and reflective indicators as defined below.

Reflective items are highly related as they reflect or demonstrate a construct. Hence, deviation in a construct leads to deviation in its indicators (Bollen, 1989, 141). For example, any changes in the latent Decision Quality construct result in corresponding changes in each manifest indicator of Decision Quality. Thus, Decision Quality has been identified as a reflective construct.

On the other hand, formative indicators are entirely the opposite of reflective indicators. The formative items show direct causal relationships from the item to the latent variable; that is, the items cause the latent variable (Diamantopoulos and Winklhofer 2001, 273). Therefore, the formative constructs are formed by their respective measurement items. Thus, the items are not correlated and measure different underlying dimensions of the latent variable (Chin, 1998b, 301). For example, a Decision Support System (DSS) is measured by a problem processing system, human judgment, and a knowledge system. The measurement indicators are not correlated and the deviation in the latent construct does not lead to deviation in its indicators. More clearly, an individual's favorable assessment about a Decision Support System (DSS) does not necessarily mean that all of its indicators are favorable for this SMEs' model. Thus, the Decision Support System (DSS) construct has been identified as a formative construct. Modeling formative or reflective constructs requires theoretical justification (Jarvis, Mackenzie, and Podsakoff, 2003, 204; Diamantopoulos and Siguaw 2006. 268; Coltman et al., 2008, 1255). However, it may be difficult to investigate the theoretical interpretation of a construct, formative versus reflective. Jarvis, Mackenzie, and Podsakoff, (2003, 205) developed a set of conceptual criteria which are used as a guideline for justifying the nature of variables, formative or reflective, modeled to measure a phenomenon. More clearly, a variable is modeled as formative when the following decision rules hold; otherwise, it is reflective:

(i) The direction of causality is from indicators to constructs

(ii) The indicators need not be interchangeable

(iii) Co variation among indicators is not necessary, and

(iv) The nomological net of indicators can differ (Jarvis, Mackenzie, and Podsakoff 2003, 205; Rai, Patnayakuni, and Seth 2006, 228; Petter, Straub, and Rai 2007, 632).

The screening process, which applied the above conceptualizations and decision rules (see Appendix H for the decision rules in detail), resulted in the identification of 11 reflective items and 6 formative items for 3 reflective and 2 formative constructs.

6.3 DESCRIPTIVE ANALYSIS OF THE SAMPLE

The participants in this study were from the Iranian banking industry. They were managers, decision-makers and analysts. As mentioned earlier, the usable sample was 300. To understand the respondent's demographic background, descriptive analysis using SPSS was conducted in this study. The following sections explain the characteristics of the respondents.

6.3.1 Gender

Of the survey participants, 75% of the respondents were male whereas 25% of the respondents were female. The gender analysis clearly shows that more males than females completed the questionnaire. Therefore, the dominance of male in this survey is normal which proves one more time that males are still predominant in banking positions in Iran. Table 6.2 present the details.

Table 6.2: Participants in Survey by Gender

Gender	Frequency	Percentage
Male	225	75%
Female	75	25%

6.3.2 Age

The participants were asked to select an age-range rather than giving a numeric number. The age group was divided into five categories. Table 6.3 displays that just 2% of the respondents were younger than 25 years. In addition, 76% of the respondents were over 35 years old. Another significant finding is that around 85% of the respondents were middle-aged ($35 - 55$ years old). This result showed that most of the managers, decision-makers and analysts in Iranian banks were middle aged which can be significant when analyzing the research data and in future decision-making or planning regarding this group of employees in the Iranian banking industry.

Table 6.3: Participants in Survey by Age

Age	Frequency	Percentage
Under 25 years old	6	2%
25 – 35 years old	68	23%
35 – 45 years old	116	39%
45 – 55 years old	71	24%
Over 55 years old	39	13%

6.3.3 Highest Level of Education

Table 6.4 shows the participant's highest level of education. More than 73.7% of the respondents had tertiary education, completing a college degree or a university degree. The remaining participants (26.3%) completed high school education and had a diploma. This indicates that in Iranian banks, most of the managers, decision-makers and analysts who were involved in knowledge management and decision-making had tertiary education.

Table 6.4: Participants in Survey by Education

Education	Frequency	Percentage
Diploma	79	26.3%
Bachelor degree	167	55.7%
Master degree	45	15%
Doctor of Philosophy (PhD)	9	3%

6.3.4 Length of employment in the Bank

Participants were asked to select a year-range rather than giving a numeric number for length of their employment in their bank. The length of employment was divided into five

categories. Table 6.5 shows that 18.7% of the respondents had worked for their bank for less than 5 years. Moreover, over 17.7% of the respondents had worked for the same bank for over 30 years. Another significant finding is that 63.6% of the respondents were in other three groups (5-10; 10-20; 20-30 years). As shown in Table 6.5, there is not a huge difference between the numbers of people in these five groups. This indicates that managers, decision-makers and analysts in Iranian banks were selected from different people with different periods of employment. This is a significant point, indicating that qualified employees had the opportunity to be selected for these kinds of jobs regardless of the length of time that they had been with the bank.

Table 6.5: Participants in Survey by Length of employment

Length of employment in this company	Frequency	Percentage
Less than 5 years	56	18.7%
5 – 10 years	69	23%
10 - 20	63	21%
20 – 30	59	19.6%
Over 30 years	53	17.7%

6.3.5 Position at Bank

Table 6.6 shows each participant's role or position in the bank. As the main categories in this study were managers, decision-makers and analysts, the table comprises these three main groups. As shown in the table, 43.3 % of the participants were analysts. Decision-makers and managers comprised 56.7% of the respondents. As the number of decision-makers is just 15, then in order to compare the results, the researcher decided to include managers and decision-makers in one group and then compare their answers with the analysts' answers to the questionnaire when analyzing the data and arriving at the final research findings.

Table 6.6: Participants in Survey by position at bank

Position at Bank	Position at Bank	Frequency	Percentage	Frequency	Percentage
Decision Maker	Senior Director	6	2%	15	5%
	Director	5	1.7%		
	Executive	4	1.3%		
Manager	Department Manager	72	24%	155	51.7%
	Section Manager	69	23%		
	Branch Manager	14	4.7%		
Analyst	Department Analyst	67	22.3%	130	43.3%
	Department expert	63	21%		

6.4 DATA ANALYSIS

Figure 6.1 shows the research model of Figure 4.2 in the Smart PLS environment. It is noted that Figure 6.1 shows all the constructs of the 2nd order level and also all the corresponding sub-constructs of the first order level along with their items. This study involved five higher (2nd) order constructs, as Knowledge Management (KM), Decision Support System (DSS), Intelligence, Effectiveness of IDSS (EIDSS) and Decision Quality (DQ). Each of these 2nd order constructs included several 1st order sub-constructs. These 1st order sub- constructs included several measurable items.
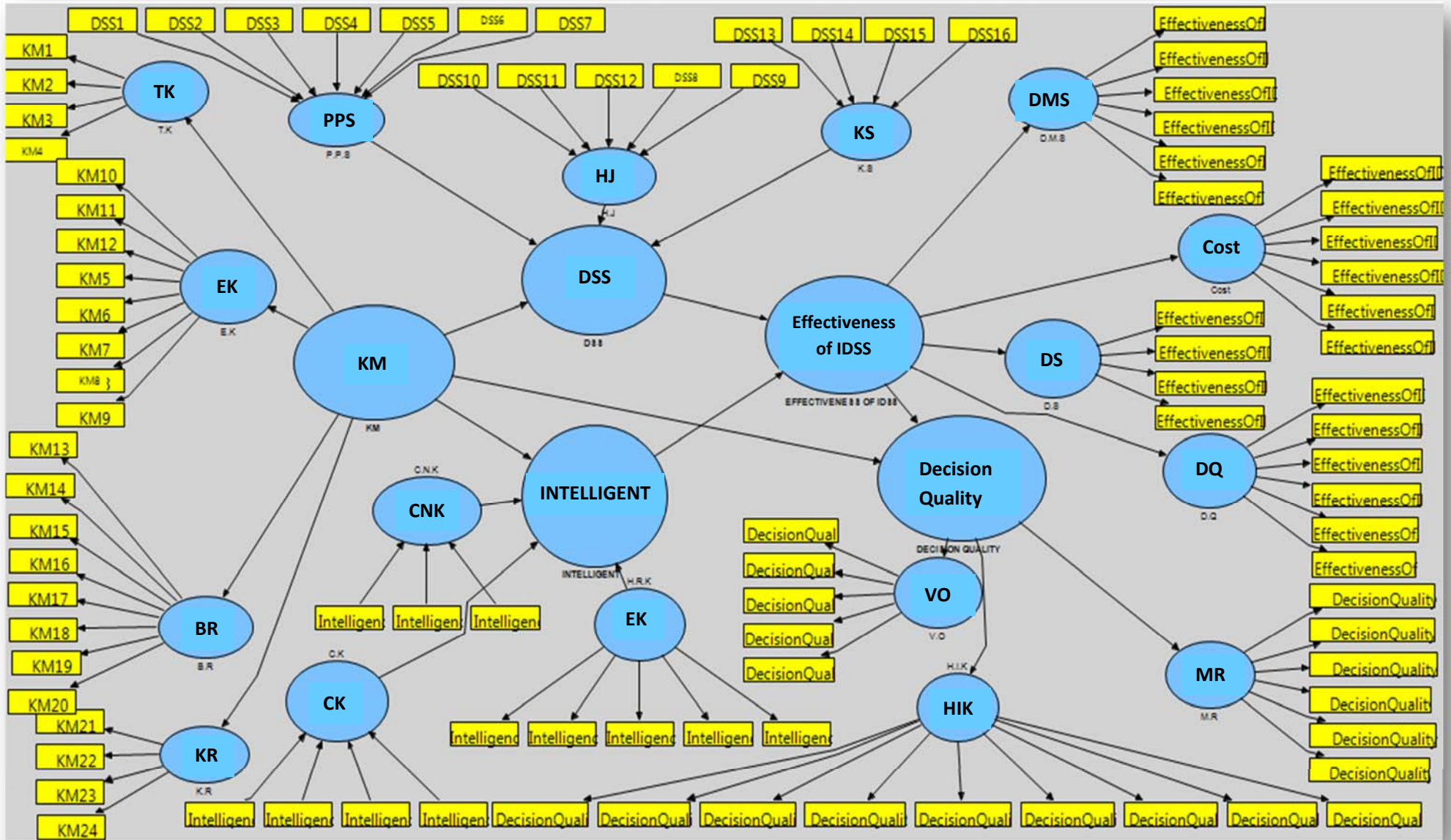
Figure 6.1: The First order Model in Smart PLS Environment

150

For example, KM as a 2nd order construct comprises four 1st order sub-constructs which are managing tacit knowledge (TK), managing explicit knowledge (EK), contribute to achieving business results (BR), and managing knowledge repository (KR). Each of these 1st order sub-constructs includes several measurable items. However, we perform the data analyses at the 2nd order level directly. To do this 1st order sub-constructs are converted into composite elements corresponding to the relevant 2nd order construct.

6.4.1 Second Order Model

As explained previously, the data analysis in this study has been done at the 2nd order level. Table 6.7 shows the 2nd order constructs and their association with the corresponding 1st order sub- constructs and measurable items.

Table 6.7: 2nd order constructs and the corresponding 1st order sub- constructs and items

2nd Order Construct	1st Order sub - Construct	Measurable Items
KM	TK	4
	EK	8
	BR	8
	KR	4
DSS	PPS	7
	HJ	5
	KS	4
Intelligence	CNK	3
	CK	4
	RHK	5

| Effectiveness of IDSS	DMS	6
	Cost	6
	DSM	4
	DMQ	6
Decision Quality	MR	6
	HIK	8
	VO	5

6.4.1.1 Knowledge Management (KM)

For describing the process of converting the 1st order model to the 2nd order model, each construct is discussed separately. The first 2nd order construct KM comprises four 1st order sub- constructs which are managing tacit knowledge (TK), managing explicit knowledge (EK), contribute in achieving the business results (BR), managing knowledge repository (KR). Table 6.8 displays all details of KM as a 2nd order construct, its related 1st order sub – construct and its related measurable items.

Table 6.8: 2nd order level construct (KM), the corresponding 1st order sub- constructs and measurable items

2nd Order level Constructs	2nd Order level Sub- constructs	1st order level corresponding Sub- constructs	Measurable items
KM	TK	**Managing tacit knowledge (TK)**	Capturing tacit knowledge
			Enriching tacit knowledge
			Sorting tacit knowledge
			Converting tacit knowledge to explicit knowledge
	EK	**Managing explicit knowledge (EK)**	Retrieving explicit knowledge
			Filtering explicit knowledge
			Storing explicit knowledge

			Disseminating explicit knowledge
			Creating new knowledge
			Testing new knowledge
			Facilitate sharing the knowledge
			Transforming knowledge
	BR	**Contribute in achieving the business results (BR)**	Improving company performance
			Enhanced customer handling
			Better employee skills
			Reduced expenses
			Increased profits
			Further business opportunities
			Delivering more value to customers
			Delegate more authority to employees.
	KR	**Managing knowledge repository (KR)**	Sending knowledge internally
			Sending knowledge externally
			Availability of the right information in the right form
			Availability of the right information at the right time

This table clearly shows which items and sub-constructs are related to Knowledge Management (KM) as a second order construct. All of the 1st order sub- constructs are reflective. Figure 6.2 shows the process of converting the 1st order sub- constructs of KM into corresponding items for the KM 2nd order construct. To do this, four new composite elements for KM with the same name as the 1st order sub-constructs are developed using the latent variables scores from SMART PLS (see figure 6.2).
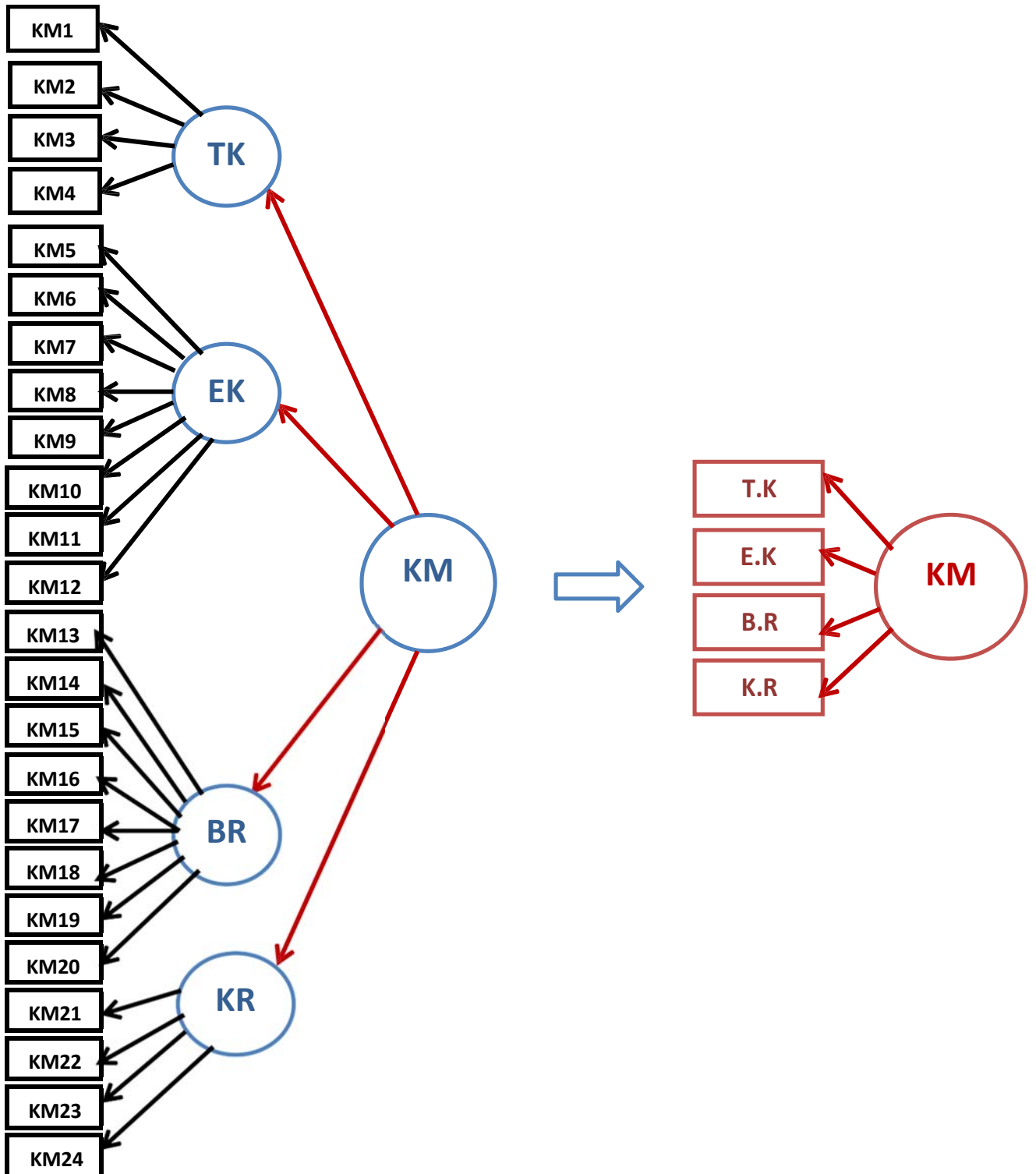
Figure 6.2: The process of converting the first order sub-constructs of KM into corresponding items for KM second order construct

6.4.1.2 Decision Support System (DSS)

Decision Support System (DSS) is a 2nd order construct comprising three 1st order sub-constructs which are Problem Processing System (PPS), Human Judgment (HJ), and Knowledge System (KS). Table 6.9 displays all details of DSS as a 2nd order construct, its related 1st order sub -construct and the measurable items.

Table 6.9: 2nd order level construct (DSS), the corresponding 1st order sub- constructs and measurable items

2nd Order level Constructs	2nd Order level Sub- constructs	1st order level corresponding Sub- constructs	Measurable items
DSS	PPS	Problem Processing System (PPS)	Gaining more and better information.
			Increased the number of decision-making alternatives
			Improved communication
			Great flexibility
			Cost savings
			time saving
			Better control
	HJ	Human Judgment (HJ)	More effective team work
			Fast response to unexpected situations
			Better understanding of the business
			Better and qualified decisions
			New insights and learning
	KS	Knowledge System (KS)	Better use of data resource
			Interactive use of the system
			Enhances the tacit to explicit knowledge conversion
			Assists in internalizing explicit knowledge
			Acquired more and better information.
			Increases the number of decision-making alternatives
			Improved communication
			Great flexibility
			Cost savings

Table 6.9 shows which items and sub-construct are related to Decision Support System (DSS) as a 2nd order construct. All of the 1st order sub-constructs are formative. Figure 6.3 shows the process of converting the first order sub-constructs of DSS into corresponding items for the DSS 2nd order construct using the same procedure discussed earlier.
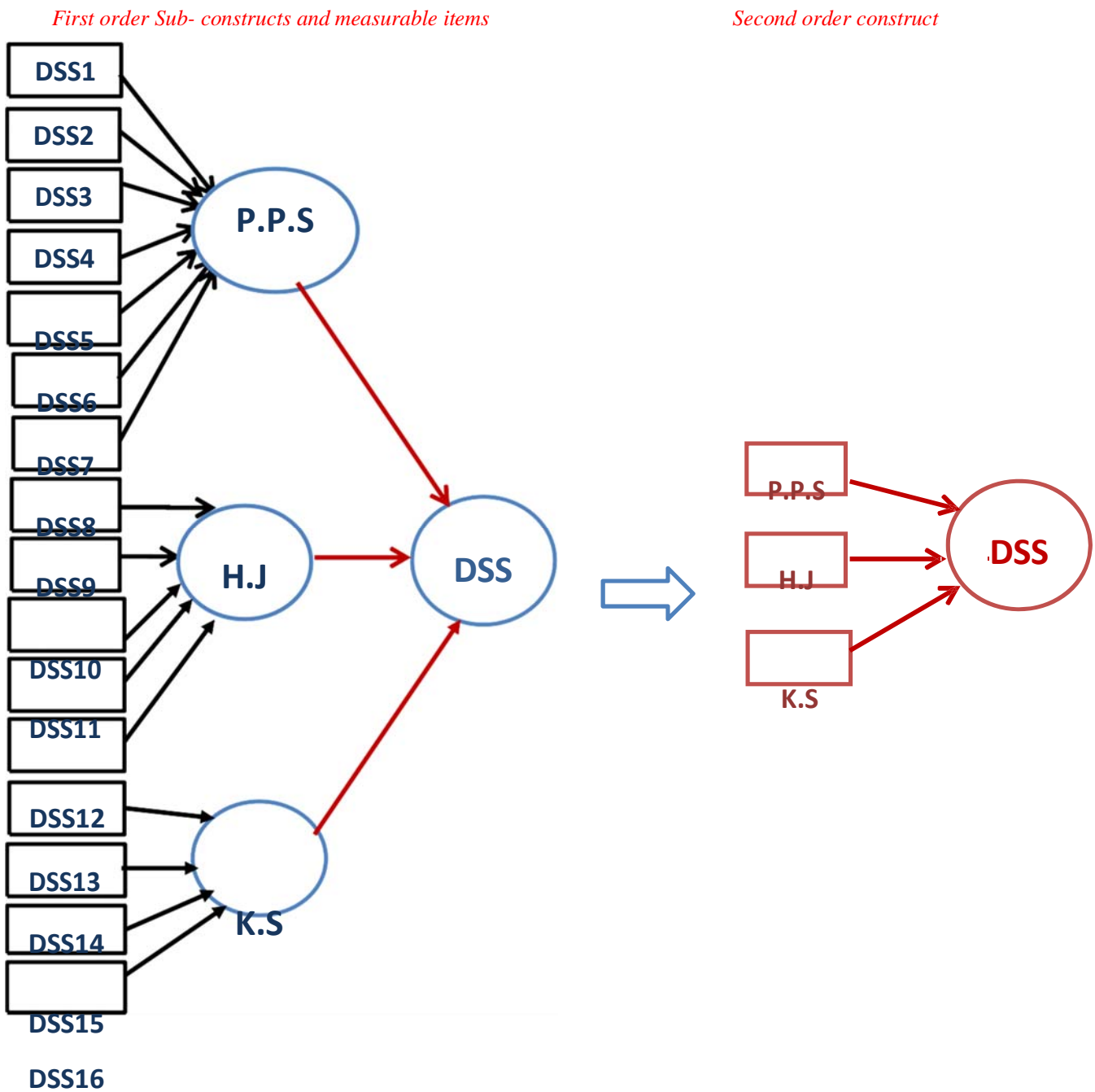
Figure 6.3: The process of converting the first order sub-constructs of DSS into corresponding items for DSS 2nd order construct

This process has been followed for all other 2nd order constructs that are Intelligence, Effectiveness of IDSS and Decision Quality. Figure 6.4 shows the final 2nd order model in the Smart PLS environment. The main data analysis for evaluating these research hypotheses was undertaken based on this model.
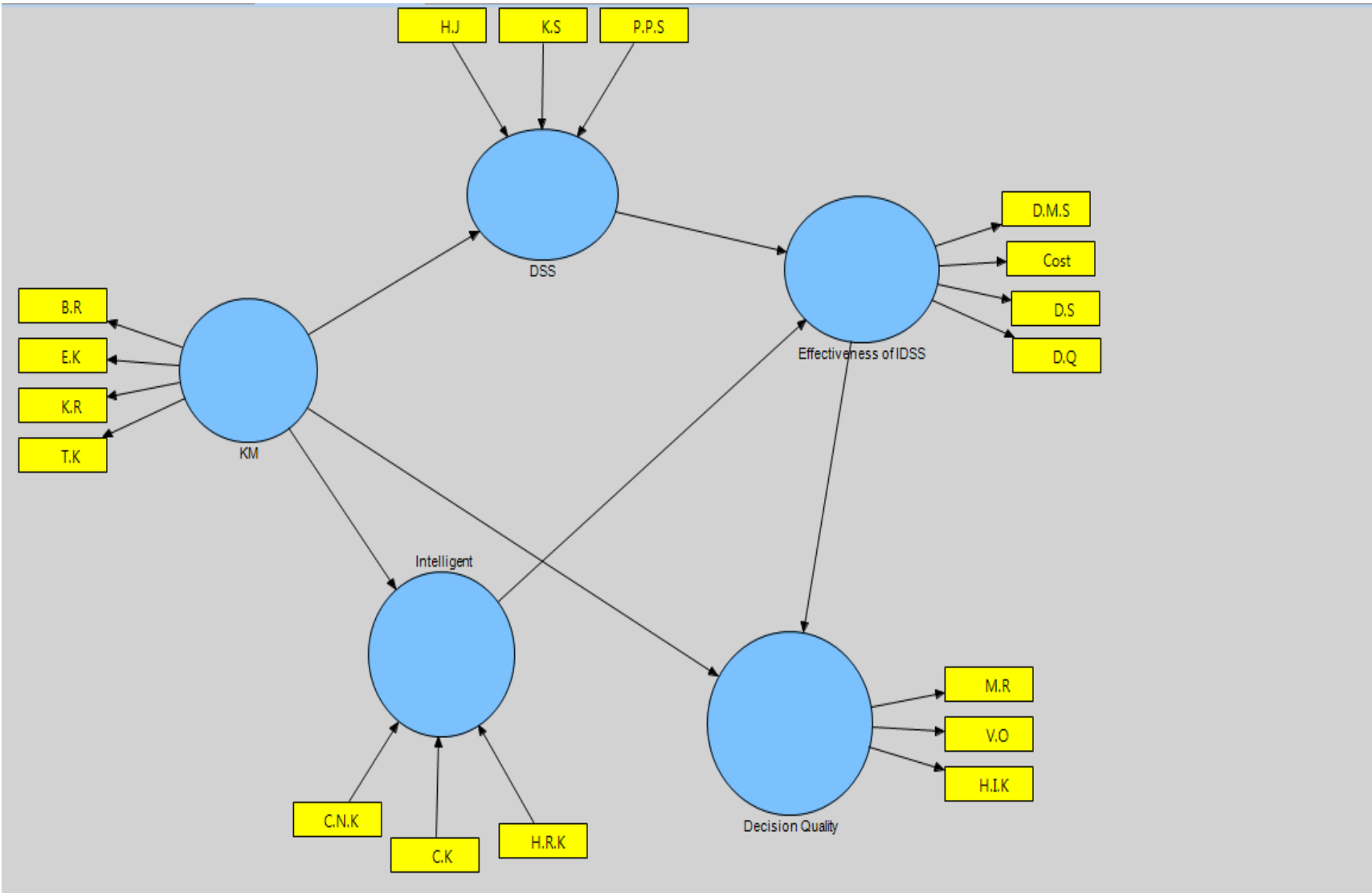
Figure 6.4: The Second order Model in Smart PLS Environment

6.4.2 Assessment of the Measurement Model

The main procedures in PLS frameworks for assessing the measurement model are: examining individual item-reliability, internal consistency, and discriminant validity to evaluate the suitability of the measurement model (Barclay, Higgins, and Thomson 1995, 297; Hulland 1999, 201; Santosa, Wei, and Chan 2005, 365).

Item reliability

As discussed in Chapter 3 (3.6.6.1-a), in order to meet the required convergent validity 0.7 was determined as the minimum value for Internal Consistency. Table 6.8 shows the item loadings for reflective constructs in research model, all of the items meet this criterion. This result confirms that this research model was suitable for this study as all items satisfy the requirement needed to represent their respective construct.

Table 6.10: Item loading for Reflective constructs in research model

Construct	Items	loading
KM	TK	0.780
	EK	0.766
	BR	0.723
	KR	0.828
Effectiveness of IDSS	DMS	0.709
	Cost	0.760
	DS	0.697
	DQ	0.802
Decision Quality	MR	0.787
	HIK	0.788
	VO	0.731

As mentioned earlier, the item reliability of formative items is not examined with item loading but with the weight scores. According to Hair, Ringle and Sarstedt (2011) when weight is not significant for a formative item it can be discarded. Thus "H.R.K" is removed from the model (see Table 6.11)

Table 6.11: Item loading for Formative constructs in research model

Construct	Items	t-values of the Weights
DSS	PPS	5.394
	HJ	2.022
	KS	3.615
Intelligent	CNK	2.853
	CK	7.465
	HRK	1.186

Internal Consistency

According to Fornell & Larcker (1981, 42) Internal consistency was measured by calculating composite reliability. As composite reliability is not affected by the number of indicators, it can be considered more appropriate than traditional measures of consistency such as Cronbach's alpha (Hanlon 2001, 33). Igbaria, Guimaraes, and Davis (1997, 110) and Barclay, Higgins, and Thomson (1995, 297) suggested that constructs with a coefficient value of 0.70 and over in the estimates of composite reliability were considered reliable for further analysis. Table 6.12 shows that the composite reliability for all constructs was over 0.7. This finding shows that internal consistency in this research model is satisfied. Because "DSS" and "Intelligence" are formative constructs, the Internal Consistency (Composite Reliability) for them is not discussed.

Table 6.12: Internal Consistency for research model constructs

Construct	Composite Reliability
KM	0.7869
Effectiveness of IDSS	0.7329
Decision Quality	0.7147

160

Average Variance Extracted (*AVE*)

Average variance extracted (AVE) should be at least 0.5 in order to satisfy the convergent validity (Fornell and Larcker 1981, 46). As Table 6.13 shows, the Average Variance Extracted (AVE) for all reflective constructs was over, 0.5 which confirms the discriminate validity at the construct level in the research model. Similar to Internal Consistency, the value of AVE for formative constructs which are "DSS" and "Intelligence", are not calculated

Table 6.13: Average Variance Extracted (AVE)

Construct	AVE
KM	0.5816
Effectiveness of IDSS	0.6733
Decision Quality	0.5643

Discriminant validity

Discriminant validity is the third measure of assessment of the model. Barclay, Higgins, and Thomson (1995, 295) stated that discriminant validity refers to the degree to which constructs differ from others in the same model. The square root of the AVE is compared to the inter-construct correlations to find the discriminate validity. According to Fornel and Larcker (1981, 49), when the AVE for one construct is greater than their shared variance, discriminate validity is adequate. Table 6.14 presents the results of the discriminant validity test. The square root of AVE is shown as the main diagonal elements. The off-diagonal elements represent the correlations among the latent variables. The discriminant validity test has been done for reflective constructs only.

Table 6.14: Correlation of Latent Variables & Square Root of AVE for Reflective constructs

	Decision Quality	Effectiveness of IDSS	KM
Decision Quality	0.75119		
Effectiveness of IDSS	0.6101	0.82054	
KM	0.3096	0.6235	0.76262

Table 6.14 explains that the square root of AVE is greater than the off-diagonal elements across the rows and down the columns, indicating that these results are satisfactory. Moreover, the second discriminant validity criterion states that no item should load higher on another construct than the construct it is supposed to measure (Chin 1998a, xiii; 1998b, 305). In this analysis for discriminant validity, cross loadings for each item were explored and compared across all constructs. Table 6.15 shows the matrix of loading and cross loading. The results indicate that most items demonstrate higher loadings in their respective constructs in comparison to their cross loadings in other constructs. Therefore, it confirms that the measurement model has strong discriminant validity at the items level.

Table 6.15: Cross-loading matrix for research model

	KM	DSS	Intelligent	Effectiveness of IDSS	Decision Quality
T.K	0.7802	0.684	0.1743	0.39	0.2071
E.K	0.7656	0.1365	0.7859	0.3789	0.1689
B.R	0.7230	0.4021	0.7291	0.3593	0.2873
K.R	0.8226	0.5489	0.2991	0.6593	0.1804
P.P.S	0.3847	0.7753	0.2995	0.5677	0.3384
H.J	0.394	0.677	0.0807	0.4386	0.2212

K.S	0.5604	0.7308	0.1869	0.3407	0.2832
C.N.K	0.5831	0.1054	0.7192	0.3091	0.164
C.K	0.6495	0.3396	0.9046	0.5146	0.3577
R.H.K	0.4671	0.0546	0.5068	0.1335	0.1798
D.M.S	0.6616	0.6041	0.3332	0.7091	0.2748
Cost	0.3994	0.4505	0.3856	0.7597	0.3654
D.S	0.1173	0.1693	0.2841	0.6971	0.2346
D.Q	0.2641	0.216	0.306	0.8027	0.1337
M.R	0.1132	0.2863	0.0638	0.216	0.7875
H.I.K	0.2256	0.2535	0.2937	0.3217	0.7881
V.O	0.2714	0.2934	0.3024	0.2904	0.7308

6.4.3 Assessment of the Structural Model

The structural model includes the hypothesized relationships between latent constructs in the research model (Santosa, Wei, and Chan 2005, 367). The assessment process involves appraising the descriptive power of the independent variables (R^2), checks the direction of path coefficient and the value of t-statistics (Barclay, Higgins, and Thomson 1995, 299; Santosa, Wei, and Chan 2005, 366).

6.4.3.1 Path coefficient (β) and statistical significance of t-value

The best test for assessing the relationship between constructs as hypothesized in this research is path coefficient (β) and the t-value. More specifically, the statistical analysis is examined by assessing the path coefficient (β) and the t-value. The β and the t-values were extracted from the bootstrapping procedures (Gefen, Straub, and Boudreau 2000, 18). Bootstrapping is a non-parametric test of significance that produces t-statistics to evaluate the

significance of the structural paths. As the 'bootstrap' method produces both a t-value and an R² value, it is commonly used within the *PLS* framework. The technique which bootstrapping employs for calculating the *t*-statistic is similar to the traditional *t*-test that is also used to interpret the significance of the paths between study constructs (Barclay, Higgins, and Thomson 1995, 295). Interpreted in a similar way in multiple regression analysis, the R² value is also used to indicate the explanatory power of variables within a model. In other words, this value estimates the variance associated with constructs; thus, the proposed overall model could be evaluated. It is important to note that PLS had some advantages as it was ideal for assessing the path loadings and structural relationships between the study constructs which could handle both formative and reflective constructs (Chin and Newsted 1999, 315; Hanlon 2001, 34). This method also did not require the normal distribution of the data. Table 6.16 illustrates the result of the path coefficient (β) and the t-value. The results indicate that all path loadings are significant.

Table 6.16: The result of Structural Model: Path coefficient (β) and the T-value

Link	Path Coefficient (Loading)	T value
KM ——→ DSS	0.6997	7.4347
KM ——→ Intelligence	0.760	14.1595
KM ——→ Decision Quality	0.738	8.9215
DSS ——→ Effectiveness of IDSS	0.7171	7.4642
Intelligence ——→ Effectiveness of IDSS	0.7029	4.6712
Effectiveness of IDSS ——→ Decision Quality	0.7552	8.6083

6.4.3.2 Amount of variance explained or R square (R²)

According to Barclay, Higgins, and Thomson (1995, 299) and confirmed by Santosa, Wei, and Chan (2005, 366), the predictive power of the proposed research model can be ascertained by obtaining the R² values. The well accepted value of R² is 0.1 or above (Teo, Wei, and Benbasat 2003, 32). As shown in Table 6.15, the results of the structural equation modeling (SEM) estimation employing a bootstrapping procedure indicated that all the R^2 values were above the minimum cut-off value proposed by Teo, Wei, and Benbasat (2003, 32) which, in turn, ensured the explanatory validity of the model.

Table 6.17: The explanatory power of Endogenous (Dependent) Constructs

Endogenous (dependent) Construct	R²
DSS	0.3718
Intelligence	0.5772
Effectiveness of IDSS	0.5010
Decision Quality	0.3930

6.5 TEST OF HYPOTHESES

As shown in Tables 6.16 and 6.18 (see also Figure 6.8), the results depicted significant effects of *Knowledge Management (KM)* on the *Decision Support System (DSS)* by SMEs. Thus, Hypothesis H_1 was supported.

H_1: **Knowledge Management (KM) has direct and positive influence on Decision Support System (DSS).** ($\gamma = 0.6997$, t= 7.4347, R² = 0.3718).

Hypothesis H_2 was developed to assess the influence of *Knowledge Management (KM)* on *Intelligence*. The model estimation described a significant effect of Knowledge Management (KM) on Intelligence. Thus, Hypothesis H_2 was supported.

H_2: Knowledge Management (KM) has direct and positive influence on Intelligence.
$$(\gamma = 0.760, \text{t}= 14.1595, \text{R}^2 = 0.5772)$$

The hypothesized relationship between *Knowledge Management (KM)* and *Decision Quality* were postulated in hypothesis H_3. Knowledge Management (KM) was found to have significant effects on Decision Quality. Thus, Hypothesis H_3 was accepted.

H_3: Knowledge Management (KM) has direct and positive influence on Decision Quality.
$(\gamma = 0.738, \text{t}= 8.9215, \text{R}^2 = 0.3930)$

The effect of *Decision Support System (DSS)* on *Effectiveness of Intelligent Decision Support System (IDSS)* was stated in Hypothesis H_4. The structural equation modelling (SEM) results presented a significant association between Decision Support System (DSS) and Effectiveness of Intelligent Decision Support System (IDSS). Thus, Hypothesis H_4 was accepted.

H_4: Decision Support System (DSS) has direct and positive influence on Effectiveness of Intelligent Decision Support System (IDSS). $(\gamma = 0.7171, \text{t}= 7.4642, \text{R}^2 = 0.5010)$

As postulated in Hypothesis **H_5** the study results supported the association between *Intelligence* and *Effectiveness of Intelligent Decision Support System (IDSS)*. Thus, Hypothesis **H_5** was supported.

H_5: **Intelligence has direct and positive influence on Effectiveness of Intelligent Decision Support System (IDSS).** ($\gamma = 0.7029$, t= 4.6712, R² = 0.5010)

The hypothesized relationship between *Effectiveness of Intelligent Decision Support System (IDSS)* and *Decision Quality* were postulated in hypothesis H_6. Effectiveness of Intelligent Decision Support System (IDSS) was found to have significant effects on Decision Quality. Thus, Hypothesis H_6 was accepted.

H_6: **Effectiveness of Intelligent Decision Support System (IDSS) has direct and positive influence on Decision Quality.** ($\gamma = 0.7552$, t = 8.6083, R² = 0.3930)

Table 6.18 shows the result of the research hypotheses in the research model. As this table shows, all hypotheses were supported by the comprehensive research model. It means that there is a positive relationship between KM and Decision Quality.

Table 6.18: The Result of Hypotheses Test

| Hypotheses	Comments
H_1: Knowledge Management (KM) has a direct and positive influence on Decision Support System (DSS).	Supported
H_2: Knowledge Management (KM) has a direct and positive influence on Intelligence.	Supported
H_3: Knowledge Management (KM) has a direct and positive influence on Decision Quality.	Supported
H_4: Decision Support System (DSS) has a direct and positive influence on Effectiveness of Intelligent Decision Support System (IDSS).	Supported
H_5: Intelligence has a direct and positive influence on Effectiveness of Intelligent Decision Support System (IDSS).	Supported
H_6: Effectiveness of Intelligent Decision Support System (IDSS) has a direct and positive influence on Decision Quality.	Supported
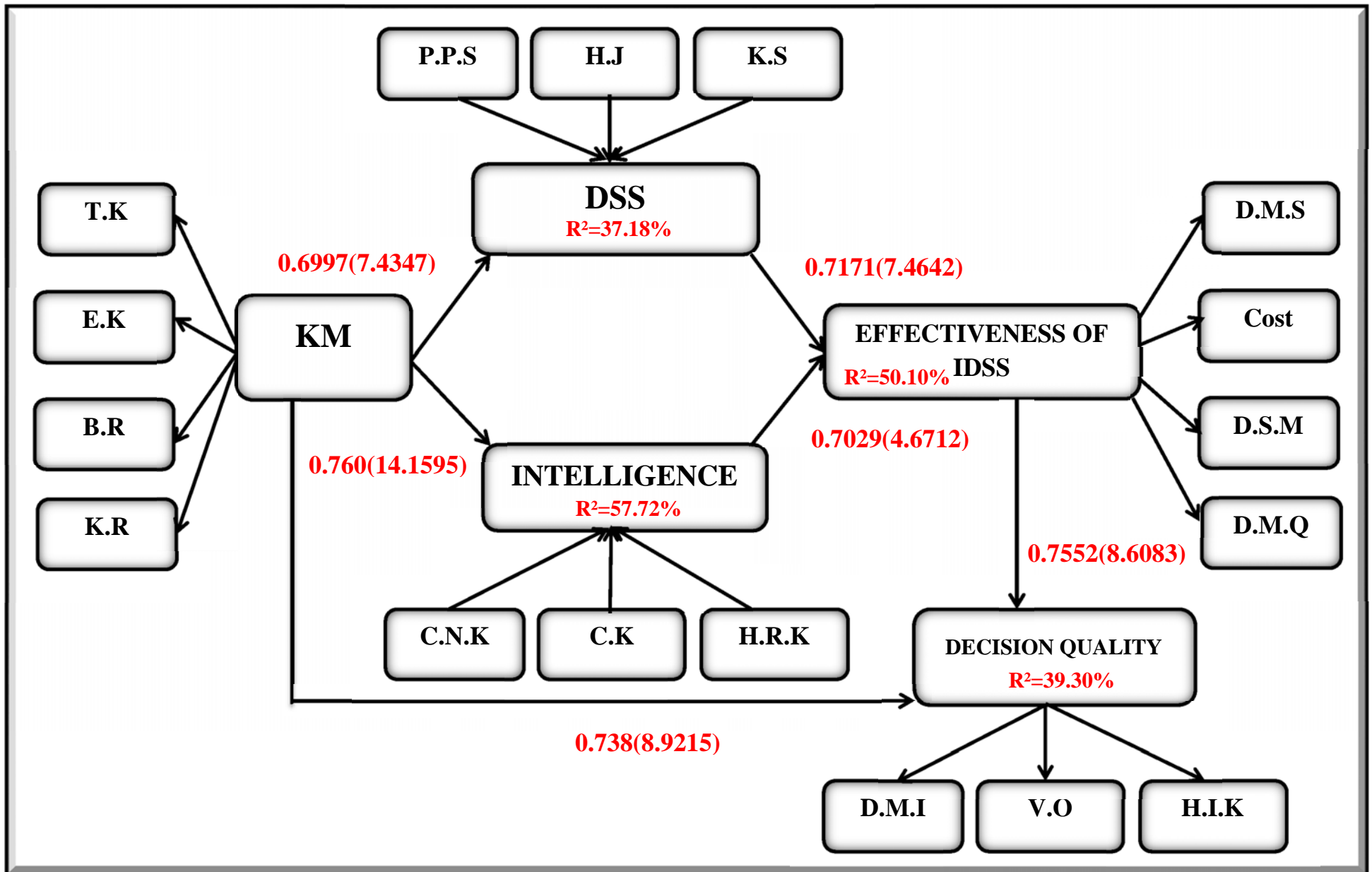
Figure 6.5: The Comprehensive Model estimates

6.6 Summary

This chapter presented the findings of the quantitative analysis of the survey conducted among managers, decision-makers and analyst in Iranian banking industry. In order to analyse the relationship between KM and the Effectiveness of IDSS and Decision Quality the researcher used factors from the responses of 300 participants from six selected Iranian banks. Data analysis using the component-based Smart PLS technique has been adopted for this study. This technique has been considered because of the nature of data (reflective as well as formative items), smaller sample-size, and the nature of the study (exploratory study). For the collected data, the data analysis was performed in two stages: assessment of the measurement model and assessment of structural model. To assess the structural model, convergent validity and discriminant validity were performed. The convergent validity was achieved by determining the item loadings of the reflective indicators and weights of the formative indicators. Reflective items having an item loading less than 0.5 were discarded. Moreover, composite reliability and AVE (average variance extracted) were tested. Discriminate validity was achieved by (i) examining the square root if AVE to the inter-construct correlations, and (ii) developing and analyzing item-loading matrix. To assess the structural model, (i) $R2$ (amount of variance explained) value for each predicted variables, (ii) path coefficient (β), and (iii) significance of t-values were examined. The data analysis found that 37.18% of the variance in *DSS* was accounted for by *KM*. The statistics also indicated that 57.72% of variance in *Intelligence* was accounted for by *KM*. *DSS* and *Intelligence* also affected *Effectiveness of IDSS* with an $R2$ value of 50.10%. This means that 50.10% of *Effectiveness of IDSS* was accounted for by the *DSS* and *Intelligence*. The model finally indicated 39.30% % of variance in *Decision Quality* accounted for *KM* and *Effectiveness of IDSS*. Based on the results from measurement model and structural model, the hypotheses which were developed in Chapter 6 were tested and evaluated. The implications of these results and outcomes are discussed in Chapter 7.

CHAPTER 7

DISCUSSIONS AND IMPLICATIONS

7.1 **INTRODUCTION**

This chapter presents and discusses the findings obtained from the survey (quantitative data analysis) that was conducted to examine the relationship between KM with Effectiveness of IDSS and Decision Quality in the Iranian banking industry (Chapter 6). The estimated results, by applying Smart PLS-based structural equation modeling (SEM), showed the degree and significance of the relationships between the constructs under study. The discussion of the results and their interpretations was executed based on the anticipated hypotheses and statistical estimations. The hypotheses of the research and test results were shown respectively in Chapters 5 and 6. This chapter discusses the results in light of the respective hypotheses.

7.2 INTERPRETATION AND DISCUSSION OF DATA ANALYSIS RESULTS

7.2.1 Hypothesis related to the KM

7.2.1 .1Hypothesis H1

It was anticipated that knowledge managementwould have direct and significant effects on decision support systems. As discussed in the literature, knowledge management plays a significant role in assisting the decision support system to provide a good decision-making process and to make the best decisions (Liebowitz 2001, 4). Moreover, it is clear that without transforming valuable tacit knowledge to explicit knowledge and then distributing it, this knowledge cannot support the decision-making process and to making the best decisions for achieving the company's goals (Bolloju, Khalifa, and Turban 2002, 166). Another important point that is supported by Huang et al. (2010, 60) and the findings from the field study, is that by managing knowledge, a company can assist the decision support system to provide

accurate, up-to-date and perfect information for decision-makers and help them to make the best decisions. Therefore, all of this information focused on this point that knowledge management (KM) heavily influenced the decision support system (DSS). Therefore, based on the survey findings and the previous studies, it was anticipated that *Knowledge Management (KM)* would have a direct and positive influence on *Decision Support System (DSS)* (Liebowitz 2001, 1; Nemati et al. 2002, 145; Bolloju, Khalifa, and Turban 2002, 166; Huang et.al 2010, 60). The findings of the study revealed that *Knowledge Management* ($\gamma = 0.6997$, $t = 7.4347$, $R^2 = 0.3718$) was directly related to *Decision Support System (DSS).* This finding was consistent with those of past studies (Liebowitz 2001, 1; Huang et.al 2010, 60) and field study.

With its strong positive and significant influence on decision support system, knowledge management played an important role on decision quality in Iranian banking industry. The result explained that knowledge management, created positive expectation regarding the use or implementation of the DSS. From the model, it was observed that the construct *Knowledge Management (KM)* was a 2nd order latent variable constructed by the reflections of four components and *Decision Support System (DSS)* was a 2nd order latent variable constructed by the reflections of three components. This result has some implications for existing and potential users of KM and DSS as well as for decision-makers and managers. For example, Iranian decision-makers and managers in the banking industry can focus on the critical role of better-informed information that was provided by KM in order to address their bank's problems within a better decision-making support system. Moreover, they learn from this study that with better use of data resources through KM, their employers can have an overall picture of their bank and then they can make better-informed decisions. In addition, decision-makers may be interested to know how KM evaluation could be developed in a positive way to improve DSSs in Iranian banks.

7.2.1.2 Hypotheses H$_2$

The estimates showed a significant positive association between Knowledge Management (KM) and Intelligence. According to Huang et al. (2010, 60), knowledge management focused on delivering best value to the decision-makers, users and customers. In addition, knowledge management combined different concepts such as human resource management, information technology and intelligence to managing the firm's knowledge (Liebowitz 2001, 1). Therefore, based on the literature and finding from this research knowledge management concentrated to use intelligent tools in companies to achieving firm s goals (Turban et al. 2011, 533). It means that according to the Nemati et al. (2002, 146) and findings from this study , knowledge management encourage firms to use of Intelligent tools especially for converting tacit to explicit knowledge (Bolloju, Khalifa, and Turban 2002, 166). As this transformation is very significant to providing perfect information for decision-making and creating new knowledge in organization, (Tabrizi, Ebrahimi, and Delpisheh 2011, 692) then the impact of knowledge management to use of intelligent tools for doing this converting is so critical. Therefore, based on the survey findings and the previous studies, it was anticipated that *Knowledge Management (KM)* would have a direct and positive impacts on *Intelligence (*Nemati et al. 2002, 146; Bolloju, Khalifa, and Turban 2002, 166; Tabrizi, Ebrahimi, and Delpisheh 2011, 692; Kahraman, Kaya, and Cevikcan 2011, 360).

The findings from this research confirm the aforementioned information and indicate that Knowledge Management or KM improves the using of intelligence tools in Iranian banks ($\gamma = 0.760$, $t = 14.1595$, $R^2 = 0.5772$). This means that Knowledge Management (KM) has a direct and positive influence on Intelligence within the Iranian banks. Hence, any sort of change such as improvement or deterioration in the KM in these companies produces the same changes to the use of intelligence tools and the knowledge they produce.

From the model, it was observed that the construct *Knowledge Management (KM)* was a 2nd orde latent composite of *Managing Tacit Knowledge, Managing Explicit Knowledge, Contribution to achieving business results and Managing Knowledge Repository*. This finding is consistent with past studies such as those of Nemati et al. (2002, 146); Bolloju,

Khalifa, and Turban (2002, 166); Tabrizi, Ebrahimi, and Delpisheh (2011, 692) as well as the field study. This result has some significant implications for policy makers, managers, decision-makers and analysts in the Iranian banking system that are involved in KM, intelligence and decision-making activities. Managers, decision-makers and analysts in the Iranian banking system considered that sensitiveness, accuracy and flexibility of intelligent techniques which can be used to take advantage of the decision process of organization information system, was increased in their bank by having an efficient knowledge management system. In addition, they strongly expressed that many aspects of intelligence can be affected by KM in their banks and that they must focus on them; these included: recognizing the relative importance of different elements in a situation; understanding and inferring in ordinary rational ways; using logic when solving problems and directing effectively; responding quickly and successfully to a new situation; learning or understanding from experience; applying knowledge to manipulate the environment. Private companies that are working in the intelligence tools market in Iran and are interested in the findings that pertain to the Iranian banking industry can also make use of these implications.

7.2.1.3 Hypotheses H₃

The statistics revealed a significant association between Knowledge Management (KM) and Decision Quality. Prior studies supported the view that the decision-makers' knowledge can play a strategic role in high quality decision-making (Raghunathan 1999, 275). It means that by having knowledge of similar experiences in the past (tacit knowledge) and by providing adequate knowledge about internal and external factors, decision-makers can make more informed decisions, achieve organization goals, and raise the company s profit (Barr and Sharda 1997, 134; Shim et al. 2002, 111). In addition, Kopeikina (2005, 10) and Raghunathan (1999, 276) explained that the quality of decisions would be improved by increasing the accuracy of information that can be achieved by an efficient knowledge management system. All of these points as well as the field study's findings demonstrate the important effect of knowledge management on decision quality. This relates to H3 which concerned with the direct and positive effects of KM on decision quality.

The structural model estimations confirm the hypothesis regarding the relationship between KM and decision quality and showed a direct significant association between *Knowledge Management and Decision Quality* within the Iranian Banks ($\gamma = 0.738$, $t = 8.9215$, $R^2 = 0.3930$) which was consistent with field study and previous studies (Raghunathan 1999, 275; Barr and Sharda 1997, 134; Carmeli and Schaubroeck 2006, 443; Shim et.al. 2002, 111). Thus, this finding indicated the direct and positive impact of *Knowledge Management* on *Decision Quality.* Another point that must be considered in this part is related to the indirect effect of *KM* through *Effectiveness of Intelligent Decision Support System (E-IDSS)* on *Decision Quality* in the Iranian banks. This means that *KM* has impacts on the *Decision Support System (DSS)* and *Intelligence.* These effects transfer to the *Intelligent Decision Support System (IDSS)* and its effectiveness and finally pass on to the *Decision Quality.* Therefore, *KM* is a very important factor regarding the *quality of decisions* in Iranian banks.

Decision Quality was measured by applying higher-order hierarchical modeling where *decision maker's information, higher information quality* and *viability of the organization* were the manifest variables. This result was logical as KM was provided and managed the high quality information that resulted in high quality decisions (Shim et al. 2002, 111). The quality of decisions is vital in all working environments, especially in the financial market sector where each decision has critical implications for business. Therefore, this result has some significant implications for policy makers, managers, decision-makers and analyst in Iranian banking system that involved in decision-making activities. This information shows the importance of managing knowledge to making the high quality decisions in the banking environment. It means that executives, policy makers and even the Iranian government should establish a suitable strategy to support knowledge management system within the Iranian banks to increase the quality of decisions that were made in these banks. Moreover, as decision maker's information was one of the manifest variables regarding the decision quality, managers in the Iranian banks specially in the HR department must focus on the employee s training to keep their knowledge up to date and efficient for making qualified decisions. This valuable fact can even use in other kind of companies in Iran or in other banks in different countries.

7.2.2 Hypothesis related to the DSS

7.2.2.1 Hypotheses H$_4$

Based mainly on the field study findings, it was anticipated that *Decision Support System (DSS)* would have a significant effect on *Effectiveness of Intelligent Decision Support System (E-IDSS)* (Hypothesis *H4*). The results of the structural model disclosed a positive and significant effect of *Decision Support System (DSS)*($\gamma = 0.7171$, t = 7.4642, R² = 0.5010) on *Effectiveness of Intelligent Decision Support System (E-IDSS)* which was consistent with field study and the past studies (Phillips-Wren et al. 2009, 643;Gao et al. 2007, 64; DeLone and Mclean 2003, 10; Moreau 2006, 595; Courtney 2001, 27;Turban, Aronson, and Liang 2005, 540). This result indicated that to better understand and evaluate the effectiveness of IDSS, the main focus must be DSS. This means that any kind of change in the DSS in firm caused some changes in the effectiveness of IDSS (Sharda 1997, 134; Courtney 2001, 27; and Moreau 2006, 595).

Decision Support System (DSS) was measured as a composite of *Problem Processing System* (Courtney 2001, 20; Moreau 2006, 595; Burstein and Widemeyer 2007, 1648; Gao et al.2007, 65); *Human Judgment* (Holsapple and Joshi 2001, 40; Shim et.al. 2002, 123; Zack 2007, 1668); and *Knowledge System* (Nemati et al. 2002, 145; Bolloju, Khalifa, and Turban 2002, 166). This finding indicated that *Decision Support System (DSS)* helps in many ways such as providing quick access to the required information (Moreau 2006, 596), facilitating the communication between decision-makers and firm (Courtney 2001, 28) and increasing the flexibility (Turban, Aronson, and Liang 2005, 540). It shows that DSS can provide high quality decisions, user's satisfaction and then increase the *Effectiveness of Intelligent Decision Support System (E-IDSS)*. Moreover, this research confirm the Blair, Debenham and Edwards (1997, 277) findings that defined an effective IDSS as "the ability of the Intelligent Decision Support system to gain its goals, principally to provide information described of its credibility and convenience that help firm decision-makers to achieve their objectives". Therefore, in this study, it was found that DSS can increase or decrease this ability to have a direct impact on the effectiveness of IDSS.

This finding has some valuable implications for analysts, decision-makers and mangers in Iranian banking as well as the private IS companies that interested to working with Iranian banks. According to this result, decision-makers in Iranian banks must focus to improve their DSSs to increase the effectiveness of the IDSS in their firm. It is critical for them to keep their knowledge up-to-date by participating in training course or getting help of IS companied to have perfect Decision Support System in the competitive Iranian financial market. This ability resulted to have an effective IDSS and high quality decisions which led them to be more effective banks in Iran. It means that executives and high level managers in the Iranian banks could play critical role to achieving their firm s goals with concentrate on the efficient DSS and Effective Intelligent DSS. They must spend enough money (budget) and time on this part of their banks and hire IS and IT experts to provide appropriate working environment in their company that is resulted to the perfect decisions, satisfied employees and customers and huge market share in the Iranian financial market. This valuable information about the relationship between DSS and E-IDSS and the impact of this relation on the decision quality can even use in other banks in different countries or in other kind of Iranian firms.

7.2.3 Hypothesis related to the Intelligence
7.2.3.1 Hypotheses H_5

The estimates showed a significant positive association between *Intelligence* ($\gamma = 0.7029$, t = 4.6712, R² = 0.5010) and *Effectiveness of Intelligent Decision Support System (E-IDSS).* Traditionally, the literature has suggested that as IDSS is the result of combining DSS and Intelligence, therefore it can be influenced by intelligence as well as the DSS (Turban, Aronson, and Liang 2005, 558). Moreover, finding of the study also confirms that that Intelligent tools which facilitates learning and understanding, better analyzing of information (Turban et al. 2011, 533), improved information sharing in virtual environment (Turban, Aronson, and Liang 2005, 540) and time saving (Moreau 2006, 595) can increase the effectiveness of IDSS by improving the decision-making quality and decision quality. This means that according to the research findings, any changes such as enhancing or diminishing

the intelligence tools or techniques in an organization produces the same changes to the effectiveness of IDSS in the firm. The result indicated that Intelligence has direct and positive influence on Effectiveness of IDSS and hypothesis H5 was confirmed.

It shows that the findings of the structural model estimation was in line with the field study and was also consistent with the basic assumptions in the previous studies (Turban, Aronson, and Liang 2005, 558; Turban, Aronson, and Liang 2005, 540; Moreau 2006, 595; Nutt 2007, 604; Kahraman, Kaya, and Cevikcan 2011, 360; Turban et al. 2011, 533).

Intelligence was measured by applying higher-order hierarchical modelling where *creating new knowledge*, *codify the knowledge in the knowledge management systems* and *help in the search and retrieval of knowledge* were the manifest variables. This result was reasonable as intelligence techniques can be used to take advantage of the decision process of organization information system, increase sensitiveness, accuracy and flexibility of this information system (Kahraman, Kaya, and Cevikcan 2011, 360). Therefore, this tool can help to produce effective IDSS in the Iranian banking environment. In addition, as the quality of decisions in the financial market has a significant impact on all parts of the society, the results of this research can be very useful for decision-makers in the banking industry. Moreover, the findings of this study has some significant implications for managers, decision-makers, policy makers and analyst in Iranian banking system that involved in decision-making activities. This information shows the important role of intelligence tools in providing an effective IDSS in Iranian banks. It means that executives, policy makers and even the Iranian government should establish a suitable strategy to support intelligence techniques, especially regarding information systems within the Iranian banks to increase the quality of decisions that were made in these banks. For example, managers in Iranian banks, especially in the HR department, must focus on employee training in order to improve their knowledge about the intelligence techniques and tools, specifically in relation to the decision support system or hiring new employees with enough experience and knowledge in this area. All of this innovation confirmed the importance of intelligence tools for achieving firm's goal in connection with IDSS and its effectiveness.

7.2.4 Hypothesis related to the Effectiveness of Intelligent Decision Support System

      7.2.4.1 Hypotheses H$_6$

Based on the field study findings, *Effectiveness of Intelligent Decision Support System (E-IDSS)* was anticipated to have a significant influence on *Decision Quality* (Hypothesis H6). The structural model estimation revealed a strong significant positive association between *Effectiveness of Intelligent Decision Support System (E-IDSS)* ($\gamma = 0.7552$, t = 8.6083, R² = 0.3930) and *Decision Quality*. This result was consistent with the field study and findings of past researchers which explained that firms can improve their decision quality by increasing the effectiveness of IDSS (Raghunathan 1999, 275; Holsapple and Joshi 2001, 52; DeLone and Mclean 2003, 10; Papamichail and French 2005, 94; Moreau 2006, 594).

As it explained earlier Effectiveness of IDSS is very important factor in this research because of its impact on the decision quality. Based on the literature, the Effectiveness of IDSS is evaluated using the DeLone and Mclean model (DeLone and Mclean 2003, 10). In this model, the effectiveness of IDSS is evaluated through its effect on user satisfaction (Moreau 2006, 594). As user satisfaction can result in high quality decisions being made by IDSS users, better user satisfaction will improve the quality of decisions (Raghunathan 1999, 275). Therefore, the effectiveness of IDSS strongly influences the quality of decision-making as it impacts on decision-makers' satisfaction, the main users of this system, (Papamichail and French 2005, 94). All of this information was confirmed by the findings of this research. For example, this result explained that an effective IDSS helps Iranian banks to direct their users in some part of the decision-making process and provides new capabilities for them that result in better-informed decisions which were made by these users. The decision-makers in the different departments or branches of Iranian banks believed that an effective IDSS in their firm can provide the necessary, relevant information for them to make the best decisions and then to achieve their goals. This issue is very significant especially when loan decisions need to be made based on customers' information. If they do not have access to such information, they cannot make the best decisions and then the bank's goals could not be achieved. Following these findings regarding the effectiveness of IDSS, user satisfaction and

decision quality in the Iranian banks, Hypothesis H6 is accepted. This valuable information about the relationship between E-IDSS and decision quality can be used by other banks in different countries or in other Iranian industries.

7.3 ADDESSING THE RESEARCH QUESTIONS:

Following these discussions and evaluation of the hypotheses, it is necessary to consider the answers to the three research questions.

7.3.1 Research Question 1

How does knowledge Management affect the effectiveness of Intelligence Decision Support System (IDSS) in Iranian Banks?

The research findings demonstrate that knowledge management has positive impacts on the effectiveness of IDSS within the Iranian banks. According to this result, managers and decision-makers in Iranian banks must focus on improving knowledge management systems and processes to increase the effectiveness of the IDSS in their organization. It is critical that they maintain up-to-date knowledge by participating in training course or engaging IS consultants in order to have a highly efficient decision support system in the competitive Iranian financial market. This ability results in an effective IDSS and high quality decisions which will establish them as successful banks in Iran. Therefore, executives and high level managers in the Iranian banks play a critical role in achieving their firm's goals by focusing on the implementation of excellent knowledge management systems.

In addition, according to the findings of this research, the analysts and knowledge experts in the Iranian banks recognized that by managing their banks' most valuable asset, *the tacit and explicit knowledge* and *knowledge repository*, they can provide high quality decisions, especially financial decisions, according to the high quality of the information. All of these processes produce an effective IDSS in the bank which leads to well-informed decision-making. *Decision maker's satisfaction*, *decision-making speed*, *decision-making*

179

quality and *cost* are four factors that must be considered by analysts, managers and executives in order to have an effective IDSS as all of them are affected by knowledge management. This valuable information shows the significant impact of knowledge management on the effectiveness of IDSS in Iranian banks which can play an important role when making decisions about the knowledge management issues in the company.

7.3.2 Research Question 2

How Intelligence and DSS integrate to develop an effective IDSS in Iranian Banks?

Regarding the important role of DSS and intelligence in developing an effective IDSS in Iranian banks, this research provide some valuable information for analysts, decision-makers and managers in these companies. According to the findings, managers in Iranian banks should focus on improving their DSSs by using intelligence tools to increase the effectiveness of the IDSS in their banks. Using of intelligence tools to improve all kind of systems is a necessary function for all companies that have an IS system. In other words, it is critical for Iranian bank managers in the competitive Iranian financial market to keep their Decision Support Systems (DSS) up-to-date and efficient by using intelligence tools. This combination of DSSs and Intelligent tools produces an Intelligent Decision Support System that can provide high quality decisions and then help these Iranian banks to function more competitively.

Hence, executives and high level managers in the Iranian banks play a critical role regarding their firm's goals achievement by combining DSS and intelligence tools. They should invest money, time and effort in consulting with or hiring IT and IS experts in order to provide an appropriate working environment in their company that results in an effective IDSS, high quality decisions, satisfied employees and customers, and bigger market share in the Iranian financial market. All of this valuable information about the importance of combining DSS and intelligence to provide an effective IDSS and subsequent high quality

decisions may encourage all managers in Iran or even in different countries to invest in the process of integrating DSS and intelligence in order to achieve better results.

7.3.3 Research Question 3

How does the effectiveness of IDSS improve decision quality within the Iranian Banks?

This research finding explained that the effectiveness of IDSS is a very important factor because of its impact on the decision quality. In this study, the effectiveness of IDSS is evaluated by examining its effect on user satisfaction. This study shows that user satisfaction can result in high quality decisions that were made by these IDSS users; by increasing the user satisfaction, the quality of decisions will improve. Therefore, the effectiveness of IDSS has strong effects on decision quality by its impact on decision maker s satisfaction. Moreover, these research findings indicated that an effective IDSS helps Iranian banks to direct their users in some part of the decision-making process and provided new capabilities for them that produced better informed decisions. The decision-makers in Iranian banks explained that an effective IDSS in their firm can provide the relevant information that they require in order to make the best decisions and then to achieve their goals. This issue is very significant in terms of the loan decisions that they must make based on the customers' information. If they do not have access to the necessary, relevant and up-to-date information in this area, they cannot make high quality decisions and then the bank's goals cannot be achieved. Hence, it is evident that an effective IDSS can improve the quality of decisions in Iranian Banks.

7.4 SUMMARY

This chapter has provided a discussion of the structural equation modeling (SEM) estimates presented in Chapter 6. The interpretations of the findings have been carried out to support the hypotheses. This chapter has discussed the effects of the antecedent factors of KM, DSS, Intelligence, Effectiveness of IDSS, and Decision Quality in Iranian Banks. In analyzing the relationship between KM with Effectiveness of IDSS and Decision Quality in Iranian banks, it was found that KM has a direct and an indirect (through DSS and Intelligence) impact on Decision Quality. The discussion in this chapter has indicated that Iranian banks generally use KM to improve the quality of their decisions given its impact on the effectiveness of IDSS. The final chapter presents the conclusion and directions for future research.

CHAPTER 8

CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH

8.1 INTRODUCTION

In Chapter 2, the researcher developed a conceptual model to conduct this research which assesses the relationship between Knowledge Management and the Effectiveness of IDSS in Iranian banks. To refine the initial research-model, a field study was conducted (Chapter 4). The field study was employed to contextualize the factors and indicators in the current setting while developing new indicators where existing literature could not assist. Based on the findings of the field study, a comprehensive research-model was developed. The formal relationships were drawn from the model in Chapter 5. The hypotheses were tested using the quantitative data that were obtained from a survey in Iran. The results of the quantitative analysis were presented in Chapter 6. All six hypotheses were accepted. Chapter 7 presented the discussion of the findings. This final chapter provides the summary and conclusion of this research. Based on the research questions and objectives, the next section presents a summary of the research. In addition, the research theme, methodology, analysis, results and interpretation of this research are discussed. This chapter also explains how the research findings contribute to existing knowledge in terms of methodological, theoretical and practical aspects. Furthermore, the implications of this research are also identified, followed by the limitations of the research. In the final section, directions for future research are outlined in order to suggest potential areas that could be valuable in the context of the area of this research.

8.2 SUMMARY OF RESEARCH FINDINGS

This research project was initiated to study the impact of the Knowledge Management on the Effectiveness of IDSS with special attention given to the Decision Quality. Previous studies have reported different impacts of knowledge management on decision support systems in

organizations in the context of different countries. Although numerous research initiatives have focused on the effects of KM on decision support systems (Holsapple and Joshi 2001, 50; Courtney 2001, 29; Shim et.al. 2002, 121; Zack 2007, 1666; Hensman and Sadler-Smith 2011, 57) and intelligence tools (Liebowitz 2001, 2& 4; Bolloju, Khalifa, and Turban 2002, 166; Nemati et al. 2002, 146; Tabrizi, Ebrahimi, and Delpisheh 2011, 692; Kahraman, Kaya, and Cevikcan 2011, 360) the question of whether KM impacts on the effectiveness of IDSS, decision quality and a banking company's performance has not been clearly answered. Furthermore, previous studies on knowledge management have focused on developed countries rather than on developing countries (Spangler, and Peters 2001, 123; Nemati et al. 2002, 145). To examine the effects of knowledge management on the effectiveness of IDSS, this study firstly developed a comprehensive theoretical model and then examined the research model using the survey data collected from various banks in Iran. The theoretical framework of the research (described in Chapter 2) was developed based on the DeLone and McLean's information system success model (Delone and Mclean 2003, 10).The initial research model was refined and contextualized by the field study and a comprehensive research model was developed. The hypotheses for the research were formulated from the comprehensive model.

As previously discussed in the section on methodology (described in Chapter 3), this study has employed a mixed-method research approach, combining qualitative and quantitative methods of data collection and analysis to attain the research objectives. The qualitative phase of the study extended and contextualized the initial model. It is not unlikely that, due to contextual differences, this study may produce different results from, and may be beyond the scope of, the existing literature. Furthermore, the new model developed by synthesizing different models needed to be contextualized. A field study was conducted by interviewing ten managers, decision-makers and analysts from six selected Iranian banks (as discussed in Chapter 4). Content analysis was performed to analyze the data. The findings, in general, (construct and linkage) supported the initial model. However, some adjustments were also made to the initial model in order to construct a comprehensive and integrated research model (Figure 4.2). The final, comprehensive model comprised *Knowledge*

Management, Decision Support System, Intelligence, Effectiveness of Intelligent Decision Support System, and Decision Quality as the main variable that is involved in this relationship. Based on the comprehensive research model, six hypotheses were formulated under four groups (as explained in Chapter 5).

The second phase of the research employed a quantitative approach to test these hypotheses. Since this study stands under the positivist research paradigm, the main and most voluminous work was associated with this phase (the quantitative research) of the study. The quantitative research study involved the development of the survey instrument, questionnaire pre-testing, survey design, data collection, data coding, recording and manipulation, and model estimation (as described in Chapter 6). The questionnaire was finalized after pre-testing. Next, a pilot study was conducted with 50 respondents. Based on the feedback, some modifications were made and the final questionnaires were distributed to six banks in Iran seeking their responses. In total, 300 responses were gathered. A Smart partial least squares (PLS)-based structural equation modelling (SEM) technique was employed to analyze the quantitative data using Smart PLS software.

The analysis revealed that the quality of decisions in Iranian banks was largely influenced by *the decision-maker's satisfaction, decision-making speed, decision-making quality* and *cost* that comprised the *Effectiveness of IDSS* factors as well as the *Knowledge Management* factors which are *managing tacit knowledge, managing explicit knowledge, and managing knowledge repository perfectly.* Iranian banks were interested in using KM concepts and techniques to increase the effectiveness of their firm's IDSS and then improved the quality of this firm's decisions that resulted in better organizational performance. The analysis revealed that the use of KM both directly and indirectly (through its impact on DSS and Intelligence that was transferred to IDSS and its effectiveness) had a strong impact on the quality of decisions that were made in the firms and also had a critical impact on organizational performance. This result suggests that all firms might not attain effective IDSS or high quality decisions by implementing KM in their companies if it is not integrated with different functional areas such as a decision support system as well as intelligence tools, and utilized properly.

8.3 CONTRIBUTIONS OF THE RESEARCH

8.3.1 Theoretical Contributions

As Knowledge Management and Effectiveness of IDSS and their impacts on Decision Quality research is still in its infancy, recent studies in this area (KM and Effectiveness of IDSS) have attempted to discover the significant factors that make this a successful relationship in order to make better decisions. However, these studies are predominantly in Knowledge Management or Decision Support System areas. Therefore, understanding and incorporating the distinctive factors in the relationship between KM and Effectiveness of IDSS and its impacts on Decision Quality in the banking industry demands more effort. To address this issue, this research proposed a model for this relationship. This model, which is developed based on an extensive literature review and the previous discussions, is very significant and unique. As discussed previously, this model was based on the DeLone and McLean's information system success model (Delone and Mclean 2003, 10).DeLone and McLean's is a framework and model for measuring the complex, dependent variables in IS research. This model claims that the use of the system and its information products affects the individual user's performance, and these individual efforts impact in a collective manner resulting in organizational impacts (DeLone and Mclean 2003, 12). In other words, according to DeLone and McLean's model, better system quality is expected to lead to better user satisfaction and use, leading to positive impacts on individual productivity, resulting in improved organizational productivity. The purpose of combining the success taxonomy with the success model was to aid in the understanding of the possible causal interrelationships among the dimensions of success and to provide a more concise exposition of the relationships. Therefore, the success of IS can be measured by examining its impact on user satisfaction and finally its impact on an organization as a whole. Therefore, in this unique model, for evaluating the effectiveness of IDSS (specific kind of IS), its effects on the decision quality as a very important organizational impact was measured. Put simply, based on the DeLone and McLean model, the success of IS can be measured through its impact on user satisfaction and finally on organizational impact. Therefore, the researcher evaluated the effectiveness of IDSS within the Iranian banks by assessing its impacts on the quality of

decisions that were made in different departments and branches in these companies. Hence, this impact showed the extent of the effectiveness of Intelligent Decision Support Systems that were affected by Knowledge Management in Iranian banks. Moreover, in this model for estimating the relationship between KM and effectiveness of IDSS, the focus was on determining the factors that influence the relationship between KM and DSS, KM and Intelligence, DSS and Intelligence with IDSS, the Effectiveness of IDSS and Decision Quality and KM and Decision Quality. Another valuable aspect of this research is determining the results of these relationships and impacts including relative advantage, individual and organizational impacts that have previously been mentioned. Therefore, according to this explanation about the specific features of this model, the applicability of this research which can be used in similar studies in Iran or other countries in the future is increased. For researchers, the model suggests the types of variables that need to be included in future empirical tests of the relationship between KM and the effectiveness of Intelligence Decision Support System (IDSS). Consequently, the model extends our understanding of what is becoming increasingly important –the effect on the effectiveness of IDSS of the integration of Intelligence and DSS.

Furthermore, the variables which are found to be significant such as "Better employee skills", "Further business opportunities", "Disseminating explicit knowledge" would be in general applicable across different industries and countries. However, the research model needs to be contextualized via field studies to explicate new variables (if any).It means that to explore the relationship between KM and the effectiveness of IDSS in a different business environment such as manufacturing sector, or in the banking environment in different countries such as Australian context the research model needs to be contextualized via field studies to explicate new variables.

8.3.2 Practical Contributions

From the practical perspective, this study has provided a clear picture of how KM factors affect the effectiveness of IDSS and decision quality in the context of Iranian banks. In addition, it was revealed that Knowledge Management has positive and direct effects on Decision Support System, Intelligence (elements of IDSS) and even on Decision Quality in these Iranian firms. All of these valuable results help decision-makers, knowledge experts, analysts, managers and even IDSS users within Iranian banks to have better understanding of

the mentioned concepts and try to make better use of them in order to achieving the banks' goals. For example, knowledge experts and system analysts in different departments of the Iranian banks recognized that in order to have the perfect analysis of the *Decision Support System* in their banks, they must improve *their judgment* as well as the firm *knowledge system* and the *Problem Processing system*. Any kind of progress in those three areas produced better and more efficient DSS in these banks.

In addition, according to the findings of this research, the analysts and knowledge experts in the Iranian banks recognized that *tacit knowledge* is a very valuable asset that must be *managed* carefully and *converted to explicit knowledge*. The senior experts in the various departments and branches have extremely valuable knowledge; this study demonstrated that the recognition, management, conversion and distribution of this knowledge lead to improved productivity. *Managing the knowledge repository* in these banks based on scientific methods allows the decision-makers to make well-informed decisions, especially financial decisions, as they are guided by the high quality information that was provided by the knowledge repository.

Moreover, knowledge experts and system analysts in these Iranian banks must consult with IT experts regarding the use of suitable intelligence tools in order to have an effective IDSS in the firm which facilitates better decision-making. *Decision maker's satisfaction*, *decision making speed*, *decision making quality* and *cost* are four factors that must be considered by analysts, managers and executives in order to create an effective IDSS. As the banking industry operates in a very competitive environment, this knowledge is extremely valuable for banks and will be highly advantageous.

This research makes another significant practical contribution in the financial Iranian market because of the impact on the *quality of decisions* that were made by Iranian banks. According to this research's findings, by increasing the *quality of information provided to decision makers* by IDSS in these banks with the help of KM, and by increasing the *firm's viability,* the quality of decisions would be improved as well. All of these factors help Iranian banks to achieve their goals and extend their market share as a result of well-informed decisions. Hence, each decision made by a bank will play an important role in its success or failure. This importance is even more evident in the financial markets that deal with money

credit and profit. Consequently, this study's findings revealed the critical factors related to the quality of decisions and knowledge management in the context of Iranian banks.

The Iranian government could make use of the findings from this research by applying them to different working areas in this country as well as in other Iranian financial markets. As this country is one of the most important countries in the Middle East, it is necessary for the Iranian government to have a strong financial market with excellent performance, and in which the Iranian banks play a crucial role. Therefore, if the quality of decisions made by Iranian banks is improved, then subsequently the banks' performance and productivity is also likely to improve.

In summary, practitioners especially KM and IDSS applications developers and users such as managers, business analysts and decision makers can also use this model to refine their thinking about KM and IDSS; this will have a significant effect on their decision-making and then on the quality of decisions made by their firms. By recognizing the relationship between KM and IDSS with decision quality, the decision-makers, analyst and managers can focus on the main items in this area and make the best decision that they can. These kinds of decisions are resulted to the more organization's success. Moreover, not only in the banking industry, but for any organization, these findings are very valuable and useful. For example, other countries may consider the findings from this study to plan their future strategies and policies. They may compare their own perceptions and/or experiences with the findings of this study.

8.4 RESEARCH LIMITATIONS

Despite this study's substantial contribution by studying the relationship between KM, Effectiveness of IDSS and Decision Quality (from a developing country perspective) and its analysis of the effects of a range of KM, DSS, and intelligence variables on this relationship and its consequences for organizational performance, it has some limitations. In essence, this study has analyzed the accumulated effects of knowledge management variables on the effectiveness of IDSS and has explored how these affect the aggregated decision quality and subsequently a firm's performance. The results have implications for the banking industry as well as for Iran generally.

Firstly, while the sample size is acceptable, further studies should analyze the factors with a greater sample size. Schmitt and Michahelles (2009) mentioned that at least 200 completed responses are required for an SEM methodology. In addition, this study has focused on the banking industry sector in Iran. Therefore, the relationship between knowledge management, effectiveness of IDSS and Decision Quality has been analyzed mainly in the context of this industry. However, six Iranian banks participate in this study all of them were not mentioned in this research. More importantly, the homogenous distribution of the respondents from each Iranian bank was not guaranteed in this survey. Future research could conduct the study in all Iranian banks, taking the number of responses on the basis of bank-population which would not suffer from any 'firm's bias', because it is very important to note that all Iranian banks have different knowledge management and decision-making policies. Without undermining the contributions of this study, it should be considered that the practical environment within an organization is much more complex than what can be indicated by an opinion survey. The results of this study provide a generic picture of the Iranian banking industry which may not reflect the factors of a particular bank, but provide an overall picture of the industry.

Secondly, as there is no foreign bank in Iran, this issue can be seen as a limitation of this study. In this research, six banks were selected among the thirty-four local banks. Therefore, the relationship between knowledge management, effectiveness of intelligent decision support and decision quality was considered only in the context of the local banks. The opinions and ideas of employees could be very different in foreign banks that operate within the Iranian financial market regarding this relationship and the effects of KM factors on decision quality. Hence, without considering these ideas and opinions, the findings of this study may have limited application. Therefore, the developed model and the interpretations are local-specific, and apply in particular to the Iranian banking industry; hence, the results of this study might not explain the same problem in a different context, or even the same banking industry in a different country.

Finally, after the field study no new construct or link emerged. Therefore, the main constructs and the links between them are the same in the comprehensive and initial model. Although respondents and participants in this study mentioned all significant points and

items in this area, the researcher also used information from the literature review and previous studies. It is possible that in future research in this area, other researchers may find other constructs regarding this model and relationship. Therefore, this issue is another limitation of this study that must be considered in future research.

8.5 FUTURE DIRECTIONS

The limitations of this study may provide directions for new research investigating the relationship between knowledge management and the effectiveness of IDSS in Iranian banks. Analysis of the direct effects of the various dimensions of a higher-order composite, with these used as manifest variables, may provide a clearer understanding of the phenomena. The effects of various dimensions of knowledge management and decision support systems, intelligent, and the effectiveness of intelligent decision support systems as well as decision quality factors may help in developing policy and strategies for more efficient KM and IDSS utilization. Future research could compare the aggregated results with the specific outcomes of different dimensions of effectiveness of IDSS such as decision-maker's satisfaction, decision making speed, decision-making quality and cost.

The changes in knowledge management usage and the effects of various antecedent factors could be examined by the analysis of data collected from the same or different panels of all Iranian banks at different time. The inclusion of diversified industries in the sample would enhance the validity of the predictions. Future studies could include different industries such as services industry, manufacturing industry, educational industry, insurance industry, and even food industry to produce more comprehensive and representative results. Therefore, future research could examine the relationship between intelligent decision support systems with decision quality within all Iranian banks to obtain more comprehensive results or in other Iranian industries. Moreover, research could be undertaken in the banking industry in other countries guided by this research model and its findings.

In addition, as foreign banks are nominated that they will open their branches in Iran in the next year, it can be a great chance for future researcher to check this model and hypotheses in the context of the foreign banks that are working in Iran. A comparison

between the local and foreign banks in this area provides a valuable opportunity for future researchers to discover useful information and concepts regarding to the knowledge management, decision support systems, intelligence, the effectiveness of IDSS and decision quality.

Furthermore, as knowledge management and decision-making is multi-faceted, future researchers could focus on other aspects of these concepts in the mentioned industry. Therefore, it is possible that new constructs or linkages will be investigated by future research in this area and new valuable concepts and facts regarding the KM, IDSS, and decision quality and the relationship between them may emerge. Finally, while a model developed for a particular industry in a particular country may not be suitable for application in another country, it nevertheless provides a stepping stone and the model for such a study. Utilizing the findings of this research, a more country-specific model could be developed for an interested country and would help to generalize the problem structure.

8.6 CONCLUSION

This study confirmed the significance of the relationship posited by the DeLone and McLean model, in which any improvement in knowledge management translated into a positive change or improvement in the DSS and Intelligence, which in turn influence the effectiveness of IDSS in conducting decision-making activities. The results also supported the notion that the management of tacit knowledge and explicit knowledge contribute to achieving business goals. Managing the knowledge repository, which involved KM factors, had significant influences on the effects of knowledge management via the DSS and Intelligence toward effectiveness of IDSS. To extend the existing theories, this study identified KM factors, DSS actors, Intelligence actors, Effectiveness of IDSS factors, and Decision quality factors, as the factors that affected the relationship between knowledge management, effectiveness of IDSS, and decision quality.

The role of these factors regarding the knowledge management, effectiveness of IDSS factors, and decision quality produced the following mixed results:

- Knowledge management factors were found to have positive influences on Decision Support System, Intelligence and Decision Quality.

- Decision Support System and Intelligence factors were also shown to have significant positive effects on Effectiveness of Intelligent Decision Support System.

- Moreover, the positive influences of Effectiveness of Intelligent Decision Support System on Decision quality were accepted statistically in this study.

These results implied that the banking firms could manage tacit and explicit knowledge perfectly, contribute to achieving the firm goals, and create an efficient knowledge repository to improve the level of effectiveness of IDSS and decision quality in their organization. Overall, given that some difficulties might arise in the decision-making processes, when the managers and decision makers try to use of Decision support system and intelligent tools together for making the best decisions. Therefore, they would tend to consult with knowledge experts and information system analysts regarding the use of KM techniques to improve their firms' chance to have an effective intelligent decision support system that can help them to make highly informed decisions. Hence, they recognized that their banks' performance would improve via knowledge management mechanisms and their impact on the decision quality.

In terms of the limitations of this study, there were several weaknesses in the research methodology issues and in generalizing the results of the current study to other industry sectors or geographical contexts. Although the cross-sectional approach was employed in the main survey to select the participant companies that would reflect various segments of Iran's banking industry, there was a risk that the samples were not truly representative of the Iranian banking industry. Another concern was the lack of foreign banks in Iran. It could be different ideas in the foreign banks within the Iranian financial market regarding the relationship between KM factors and decision quality. It means that, without considering these ideas, the result of this study has got limitation. Finally, after the field study, no new construct or link emerged. Therefore, the main constructs and the links between them are the same in both the comprehensive and the initial model. Therefore, this issue is another limitation of this study that must be considered in future researches. Moreover, since the

setting of this study was the banking industry in Iran, some adjustments should be made to generalize the findings of this research to other industrial and geographical contexts.

The study provides future research with several directions. It is suggested that parts of the comprehensive research model can be extracted and further investigated. Future research could compare the aggregated results with the specific outcomes of different dimensions of the effectiveness of IDSS such as decision-maker's satisfaction; decision making speed, decision making quality and cost. Future studies could include all Iranian banks or different Iranian industries such as the services industry, manufacturing industry, educational industry, insurance industry, and even the food industry in order to produce more comprehensive and representative results. Moreover, it can be done in the banking industry in other countries based on this research model. A comparison between the local and foreign banks in this area could be another option for future researchers in order to discover useful information and concepts regarding knowledge management, decision support system, intelligence, effectiveness of IDSS and decision quality. Furthermore, as KM and decision-making have different aspects, it is possible that new constructs or linkages will be investigated in future research in the same or a different industry. Above all, while there were some research limitations as described above, this study makes a significant contribution to both theory and practice. This study offers a comprehensive research model for future knowledge management studies, as well as IDSS and decision quality implications for banking enterprises, particularly those embarking on knowledge management in Iran. This study also provides a better understanding of the determinant factors in the relationship between knowledge management and effectiveness of IDSS and the guidelines to successfully implement knowledge management and IDSS.

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Appendix

Appendix A: Interview Information Sheet

INFORMATION SHEET

Project Title:

RELATIONSHIP BETWEEN KNOWLEDGE MANAGEMENT AND EFFECTIVENESS OF INTELLIGENCE DECISION SUPPORT SYSTEM (IDSS) IN IRANIAN BANKS

Principal Researcher:

Shaghayegh Sahraei

Introduction:

This research aims to assess the role of KM in achieving organization goals and improving the decision quality. In doing so this research will also investigate the relationship between knowledge management (KM) and effectiveness of Intelligence Decision Support System(IDSS) with in organizations. Taking the Banking industry in Iran as a field study, the research will particularly focus on the influencing perceptions that are held by banking business managers, analysts and executives on knowledge management factors that impact the effectiveness of IDSS in banking.Another important aim of this study is to determine the direct effect of KM on decision quality and banks' goals.

Procedures:

In this research, I will employ quantitative methodology. However, field study will be employed prior to quantitative study to enrich the research model. Thus a mixed method research will be followed. Field interview, that you will participate on it, will then be conducted with no more than 10 managers, business analysts and decision makers of the selected participating Banks in Iran. Potential key variables will be identified after field interview. The preliminary research model will be refined based on the findings from field interview. Necessary addition or elimination of the constructs will be done and a research model is then finalized. After this stage, the main data collection process will be conducted by distributing questionnaires to all business analysts and executives in selected Iranian Banks. The target sample would be employees of the firms who are involved in acquiring, analyzing and utilizing information for decision-making activities. It is anticipated that a sample of about 300 responses will be gathered at this stage

Possible benefits:

I wish after this research I can find important KM factors that can affect Intelligence decision making in Iranian banks and improve decision quality in this area and therefore improve my society with improving banks performance. I think this improve is good for you as both of a bank manager and a people of Iranian society.

Possible risks:

I would like to promise you that there is not any risk associated with you as an interviewee.

Participation is voluntary:

I would like to assure you that your participation is voluntary and you can withdraw any time.

Results:

At the end of research, I will send a brief summary (report) of this research s result for you.

Privacy, confidentiality and disclosure of information:

I would like to assure you that your information confidentiality will be maintained at all time as per Curtin University Guide to Ethical Practice. All data collected including interview scripts and questionnaires will be retained securely with the Curtin Graduate School of Business (GSB) for a period of 5 years following the date of publication. Furthermore, no individuals will be identified in any report of the results.

Ethical guidelines:

This research has been approved by the Curtin university Human research Ethics Committee and the approval number is ....If you have any question about the Ethics issue you can contact with this committee (secretary-phone +61 8 9266 2784 or hrec@curtin.edu.au or in writing C/- office of research and development, Curtin university of technology, GPO Box U1987, Perth WA 6845).

Contacts:

If you have any queries or would like further information about this study, please email me at s.sahraei@postgrad.curtin.edu.au or call me at 09125045754.

Thank you.

Yours faithfully,

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Appendix B: Interview Questions

Knowledge Management and Intelligent Decision Support System Interview question

Q1: What is your perception on managing knowledge in your organization?

Possible Probes:

• **How is knowledge managed in your organization?**

• **Are specific tools (software or model) used to manage knowledge in your organization?**

• **What part of your organization is involved with knowledge management activities?**

Q2: How are decisions made in your organization?

Possible Probes:

• **Do you use of IT/ IS for decision making?**

• **Do you use of special model for decision making?**

• **What is the decision making process in your organization?**

Q3: In what way does KM help in decision making in your organization?

Possible Probes:

• **How is KM used to help decision making?**

• **Describe a situation where KM was used to help with a decision.**

Q4: What is your view of intelligence decision making?

Possible Probes:

• **Do you use intelligence aids (AI/ES) in helping you to make decisions?**

- **If yes, give an example of how it was used.**

- **Do you think that intelligence decision making can give you better result than normal decision making? Why?**

- **Does this organization use an Intelligent Decision Support System?**

Q5: Do you think Knowledge gathered from your organization can boost the use of intelligence tools in Decision making?

Possible Probes:

- **Can you explain some example of how intelligent tools are used in your organization? For instance using ES to providing customer history system? Or making customer loan repayment pattern with using intelligent tools.**

- **Do you think intelligent tools can affect the quality of decisions?**

Q6: Do you measure the usefulness of technology (IDSS, IS/IT) in Decision making activities?

Possible Probes:

- **How do you measure the use of technology tools in organizational decision making activities?**

- **Why / Why?**

- **How would you, if you had the opportunity, measure the effectiveness of IDSS in your organization?**

Q7: What is your perception of quality of the decision you make?

Possible Probes:

- **What factors do you think would increase the quality of decisions?**

- **Do you think that good and effective IDSS is necessary for Decision making? Why?**

- **Do you think the quality of decision can be improved by Knowledge management?**

Appendix C: Interview Transcript for Participant from Bank A

Possible Probes:

- <u>How is knowledge managed in your organization?</u>

As you know, Knowledge Management is very deep and wide that various definitions have been proposed for it. In summarize, The Knowledge Management is the process of identifying, acquiring, organizing, and processing information to create knowledge and innovation in organizations. But, in my organization KM has not this scientific process and managers in each department attend to it according on their taste.

- <u>Are specific tools (software or model) used to manage knowledge in your organization?</u>

There is not a comprehensive software or model to manage knowledge in our organization. However, there are some lateral soft wares such as suggestion system, department portal and bank website which are used to manage knowledge. It is necessary that these soft wares merge together to provide a comprehensive managing knowledge software and system.

- <u>What part of your organization is involved with knowledge management activities?</u>

As mentioned before, different departments doing these activities according to their preferences. For example in the bank branches, concepts generally get and transfer through teacher – student and man to man methods. Moreover, department of education holds Practical courses on banking affairs for bank staff every year.

Q2: How are decisions made in your organization?

Possible Probes:

- <u>Do you use of IT/ IS for decision making?</u>

Yes we use of IS in our organization. In our bank, each department has separate information system that has been used for decision making. These Information systems are improved based

on its requirements during last years. As these Information systems are separated of each other and therefore, there is not a comprehensive Information systems then access to the information is just limited to the own manager and analyst of each department and this access is difficult for managers and analysts from other department. Credit system, foreign exchange system, personnel training system, compensation and benefits system, welfare system, employment system and accounting system are some examples of these information systems. Moreover, during last two years we have used specific software that is made base on the DEA method for ranking the branches.

<u>Do you use of special model for decision making?</u>

In different department of our bank decisions are made based on the proficiencies .In addition, using of scientific models for decision making was considered based on managers ^s knowledge or lack of knowledge about those model. In some cases the managers just used of data convert to information or intuitive judgment to make decisions.

- <u>What is the decision making process in your organization?</u>

We have got some stages for decision making in our organization. Firstly, the experts who are working in specialized department of bank collect data and change them to information. Then experts provide report according to this information for head manager of organization. It means that in our organization, decisions are provide in specialized departments and then final decision was made with head managers. These final decisions send to the departments and units with different format such as instructions, notices, circulars, and so on. Moreover, some decisions directly were made at higher level of organization (management) and then declare to units and departments. Therefore, in our organization decision according to the subject was made in both two shapes: down to up, up to down.

Q3: In what way does KM help in decision making in your organization?

Possible Probes:

- <u>How is KM used to help decision making?</u>

As I said in question 1, if knowledge is managing good and systematic it can help to making best decision for every subject. In other words, as KM translates implicit knowledge to explicit

knowledge it can provide enough, suitable and useful information about each subject which help managers to make best decisions in difficult situations.

- <u>Describe a situation where KM was used to help with a decision.</u>

As an example I can mention the performance of the foreign exchange department ^s manager in deal with the international sanction about Iranian banks. At this difficult and unstable situation that transfer and exchange foreign money with foreign banks is unavailable for Iranian banks, this manager can use of KM to finding several solution for this problem.

Q4: What is your view of intelligence decision making?

Possible Probes:

- <u>Do you use intelligence aids (AI/ES) in helping you to make decisions?</u>

No we do not use of AI/ES in our organization yet, but we have got a project for using of ES to provide a model for transfusion money to ATM machines. This project is in progress now and hopefully during next two or three months we can use of it.

- <u>If yes, give an example of how it was used.</u>

- <u>Do you think that intelligence decision making can give you better result than normal decision making? Why?</u>

Yes .I thinks that using of intelligent systems to identify system response at different situation can provide more accurate results. These results can help to determine available and correct future goals in the varied conditions and turbulent competitive environment. Also, as the most important issue regarding the use of intelligent decision making system is the system input data, then if we can design, provide and develop the suitable database and knowledge base, it can helps to decision making in our organization.

- <u>Does this organization use an Intelligent Decision Support System?</u>

Yes. We start to use an IDSS in our organization, but we are in the first steps.

Q5: Do you think Knowledge gathered from your organization can boost the use of intelligence tools in Decision making?

Possible Probes:

- Can you explain some example of how intelligent tools are used in your organization? For instance using ES to providing customer history system? Or making customer loan repayment pattern with using intelligent tools.

AS I said before we have got a project for using of ES to provide a model for transfusion money to ATM machines. This project is in progress now and hopefully during next two or three months we can use of it. In this project we use of ES to design a system that transfusion money to ATM machine automatically when this machine has a predetermined amount of money.

- Do you think intelligent tools can affect the quality of decisions?

Yes it can do it. I think intelligent tools can help decision makers to make qualified decisions. They can do it through good information processing and make decisions with greater confidence that result to optimum decisions and outcome.

Q6: Do you measure the usefulness of technology (IDSS, IS/IT) in Decision making activities?

Possible Probes:

- How do you measure the use of technology tools in organizational decision making activities?

We do not measure the use of technology tools in scientific method. We just compare the quality of decision that made with using of these tools with the decisions that made without these tools. It can help us to measure the impact of these tools on decision making and therefore we can measure the amount of using of these tools for next decision making according to the necessity to these tools.

 Why / Why not?

I explain the reason for these measuring in the previous question. Moreover, this measuring is very important for recognizing the impact of these tools on the quality of decisions and therefore on organization prosperity. Then, we can consider the use of technology tools for our future projects and plans.

- How would you, if you had the opportunity, measure the effectiveness of IDSS in your organization?

To measure the effectiveness of any system, it is necessary to define the objectives and expectations of the system. Then these objects and expectations can be used to measure system performance or effectiveness. Scientific approaches and methods can be used for doing these measurement according to the system s philosophy, application and functional areas.

Q7: What is your perception of quality of the decision you make?

Possible Probes:

- What factors do you think would increase the quality of decisions?

The optimal decision factors can include:

- Developed information and support systems to collect and process related on time data.

- Knowledge of past similar experiences.

- Relevant scientific methods and techniques.

- To providing team works with relevant and different expertise.

- To provide adequate knowledge about internal and external factors which are affecting organization.

- Do you think that good and effective IDSS is necessary for Decision making? Why?

Yes, of course. This kind of system (good and effectiveness IDSS) is help decision makers to prevent of the making decisions that is purely intuitive. Moreover, managers and experts can access to the relevant and up to date information for decision making with using of these systems. Therefore, organization^ goals can be achieved.

- Do you think the quality of decision can be improved by Knowledge management?

Yes, Knowledge management can improved the quality of decision. It can help managers to get better result from their decisions as their decisions was made on the base of the refine, accurate, valid and on time data. It means that KM can provide the qualified data for the decision makers in the organization that cause to making high quality decisions.

Curtin University

INFORMATION SHEET

Project Title:

RELATIONSHIP BETWEEN KNOWLEDGE MANAGEMENT AND EFFECTIVENESS OF INTELLIGENCE DECISION SUPPORT SYSTEM (IDSS) IN IRANIAN BANKS

Principal Researcher:
Shaghayegh Sahraei

Introduction:
This research aims to assess the role of KM in achieving organization goals and improving the decision quality. In doing so this research will also investigate the relationship between knowledge management (KM) and effectiveness of Intelligence Decision Support System (IDSS) within organizations. Taking the Banking industry in Iran as a field study, the research will particularly focus on the influencing perceptions that are held by banking business managers, analysts and executives on knowledge management factors that impact the effectiveness of IDSS in banking. Another important aim of this study is to determine the direct effect of KM on decision quality and banks' goals.

Procedures:
In this research, I will employ quantitative methodology. However, field study will be employed prior to quantitative study to enrich the research model. Thus a mixed method research will be followed. Field interview, that I have done it before, was conducted with no more than 10 managers, business analysts and decision makers of the selected participating Banks in Iran. Potential key variables identified after field interview. The preliminary research model refined based on the findings from field interview. Necessary addition or elimination of the constructs was done and research model was finalized. Now at this stage, that you will participate on it, the main data collection process will be conducted by distributing questionnaires to all business analysts and executives in selected Iranian Banks. The target sample would be employees of the firms who are involved in acquiring, analyzing and utilizing information for decision-making activities. It is anticipated that a sample of about 300 responses will be gathered at this stage.

Possible benefits:
I hope after this research I can find important KM factors that can affect Intelligence decision making in Iranian banks and improve decision quality in this area and therefore improve the society with improving banks performance.

Possible risks:
I would like to promise you that there is no risk associated with you as an interviewee.

Participation is voluntary:

I would like to assure you that your participation is voluntary and you can withdraw any time.

Results:
At the end of research, I will send a brief summary (report) of this research result to you.

Privacy, confidentiality and disclosure of information:
I would like to assure you that your information confidentiality will be maintained at all time as per Curtin University Guide lines to Ethical Practice. All data collected including interview scripts and questionnaires will be retained securely with the Curtin Graduate School of Business (GSB) for a period of 5 years following the date of data collection. Furthermore, no individuals will be identified in any report of the results (However, because of sanction about Iran I have to write your full name in the separate list to check that no body of the sanctioned people or entities are participate in this research. After this checking that list was destroyed and do not use of it in other part of my study).

Ethical guidelines:
This research has been approved by the Curtin university Human research Ethics Committee and the approval number is ....If you have any question about the Ethics issue you can contact this committee (secretary- phone +61 8 9266 2784 or hrec@curtin.edu.au or in writing C/- office of research and development, Curtin university of technology, GPO Box U1987, Perth WA 6845).

Contacts:
If you have any queries or would like further information about this study, please email me at s.sahraei@postgrad.curtin.edu.au or call me at 09125045754.
Thank you.
Yours faithfully,

Yours faithfully,

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Appendix E: Survey Follow-up Letter

Date:
Department:
Bank:
Address:

Dear Mr/Mrs:

My name is Shaghayegh Sahraei, a Ph.D. candidate of Curtin University of Technology in Australia. Under the supervision of Professor Quaddus, I am presently conducting academic research into knowledge management and effectiveness of intelligent decision support system in the banking industry in Iran. I sent the questionnaires which I would like to administer to the managers, decision makers and analyst to you three weeks ago. If you have received and kindly distributed them, please accept our heartily thanks for your time and help.

The questionnaires were attached with self-addressed and stamped envelopes. If there are some questionnaires which have not been returned, I would be very grateful if you would allow your colleagues to complete the questionnaire and send back to us as soon as possible. For your convenience, I attach some other copies of the questionnaire and paid envelopes in this letter.

This research questionnaire has been approved by the School Research Ethics Committee. All responses will be kept confidential and the anonymity of the respondents will be respected and protected. Thank you very much for your kind assistance. Should you have any further queries, please feel free to contact me at 09127682532 or email to s,sahraei @ postgrad.curtin.edu.au. If you would like to know the results of this survey, please leave your correspondences on the last page of questionnaire. The summarized results will be sent to you after the study is finished. Any additional comments will be highly appreciated.

Sincerely yours,
Shaghayegh Sahraei
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The Research Ethics Committee (Secretary)
Curtin University of Technology
78 Murray Street, Perth 6000, Western Australia

Appendix F: Questionnaire

QUESTIONNAIRE

Definition

The following definitions have been used operationally in this study.
- *Knowledge Management (KM)*

Knowledge Management (KM) is an approach to adding or creating value by more actively leveraging the know-how, experience, and judgment resident within and, in many cases, outside of an organization.

- *Decision Support Systems (DSS)*

Are interactive, computer- based systems intended to provide support to the decision makers engaged in solving various semi- to ill-structured problems involving multiple attributes, objectives and goals.

- *Intelligence*

Refers to artificial intelligent tools that can mimic human actions. These tools can increase sensitiveness, flexibility and accuracy of information and decision management systems.

- *An Intelligent Decision Support System (IDSS)*

Is an interactive system, flexible, adaptable and specifically developed to support the solution of a non-structured management problem for improved decision – making. It uses data, provides easy user interface, and can incorporate the decision makers own insights.

- *Effectiveness*

Refers to how good a DSS is in solving organizational problems. The effectiveness of a DSS is predicted to interact with a user's motivation to perform a task to enhance actual DSS use

SECTION A: DEMOGRAPHIC CHARACTERISTICS

The following questions deals with the basic characteristics of your business and some information about yourself.

1.1   Gender
___Male   ___Female

1.2   Age

___Under 25 years old   ___25 – 35 years old   ___35 – 45 years old

       ___45 – 55 years old   ___more than 55 years old

1.3   Length of employment in this company.

___Less than 5 years   ___5-10 years____10-15 years____15-20 years   ___20-25 years

1.4   Education
------ Diploma   ------Bachelor   ------Master   --------PhD

1.5   Number of employees in your company/organization is:

___Less than 1000 employees   ___10001 – 25000 employees

___1001 – 5000 employees   ___25001 – 50000 employees

___5001 – 10000 employees   ___Greater than 50000 employees

1.6   The status ownership of your company/organization is:

___public   ___private

1.7   In what field (*function*) do you work?
___Finance   ___Accounting

___Human Resource   ___Information Technology

___Legal   ___Planning

___Customer Service   ___Foreign Exchange

___Internal Branches   ___External Branches

___Research & Development   ___Communication

___Others   --------------

Others (Please Specify): _____

1.8   Your position in your company/organization is:
___Senior Director   ___Section Manager

___Director   ___Branch Manager

___ Department Manager   ___ Executive

___ Department Analyst   ___ Department expert

How to complete the questionnaire?

Please answer the statements overleaf by placing a circle around the number which most closely matches your opinion or to the best of your knowledge.

Example of how to use the rating scales:

Every human being has five senses.

Strongly Disagree ←			→ Strongly Agree	
1	2	3	4	5
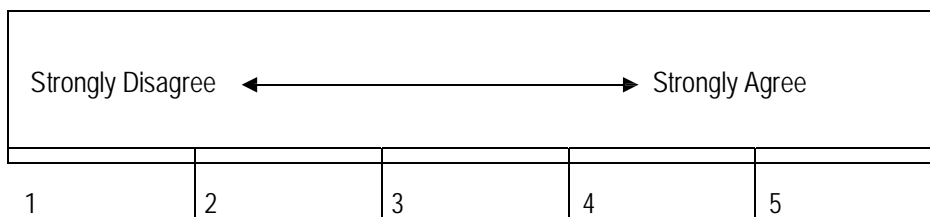
By circling the rating 5, therefore you would be saying that you are strongly agreed with the given statement.

SECTION B: KNOWLEDGE MANAGEMENT (KM)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.1. Knowledge Management helps to Capturing tacit knowledge in our unit.	1	2	3	4	5
2.2 With managing knowledge tacit knowledge can be Enriched	1	2	3	4	5
2.3 Sorting the tacit knowledge in organization is facilitated with KM.	1	2	3	4	5
2. 4 Managing Knowledge can Convert tacit knowledge to explicit knowledge.	1	2	3	4	5
2.5 With managing knowledge explicit knowledge can be Retrieved.	1	2	3	4	5
2.6 Knowledge Management helps to Filtering explicit knowledge in my department.	1	2	3	4	5
2.7 With managing knowledge, I can Store explicit knowledge in my department.	1	2	3	4	5
2.8 Knowledge Management helps to Disseminating explicit knowledge in our unit.	1	2	3	4	5
2.9 With Managing the knowledge, we can Create new knowledge.	1	2	3	4	5

228

2.10 We can test new knowledge with using of KM in our department.	1	2	3	4	5
2.11 Sharing the knowledge in organization is facilitated with KM	1	2	3	4	5
2.12 Knowledge Management can transform knowledge to my department.	1	2	3	4	5
2.13.With managing knowledge we can Improve our performance	1	2	3	4	5
2.14. With Managing the knowledge, customer handling was Enhanced	1	2	3	4	5
2.15. We have got Better employee skills in our department with Knowledge Management	1	2	3	4	5
2.16. Knowledge Management Reduced expenses in our bank.	1	2	3	4	5
2.17. Increased earning/profits is one of the KM results in our bank.	1	2	3	4	5
2.18 Further business opportunities can be generated with Knowledge Management in our department.	1	2	3	4	5
2.19 Knowledge Management can help us to Delivering more value to our customers.	1	2	3	4	5
2.20 With Managing the knowledge, we can Delegate more authority to employees.	1	2	3	4	5
2.21 Knowledge Management leads us to Sending knowledge internally	1	2	3	4	5
2.22 Knowledge Management leads us to Sending knowledge externally	1	2	3	4	5
2.23 With Managing the knowledge, we can be sure that Right information is available in the right form.	1	2	3	4	5
2.24 With Managing the knowledge, we can be sure that Right information is available at the right time.	1	2	3	4	5

SECTION C: DECISION SUPPORT SYSTEM (DSS)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.1 This company's DSS help to gaining more and better information.	1	2	3	4	5

3.2 Using of DSS in this organizations Increased the number of alternatives that examined for decision making	1	2	3	4	5
3.3 DSS helps to Improved communication in our organization.	1	2	3	4	5
3.4 DSS provide great flexibility in our department.	1	2	3	4	5
3.5 I think Cost savings is one of the most important results of DSS.	1	2	3	4	5
3.6 Another important result of DSS is time saving	1	2	3	4	5
3.7 With using of DSS we have Better Control in our department.	1	2	3	4	5
3.8 I feel DSS helps to More effective team work in organization.	1	2	3	4	5
3.9 In our bank Fast response to unexpected situations was provided through DSS.	1	2	3	4	5
3.10 I believe that better understanding of the business is one of the best results of DSS.	1	2	3	4	5
3.11 I believe that DSS provide Better and qualified decisions.	1	2	3	4	5
3.12 I believe that DSS cause New insights and learning.	1	2	3	4	5
3.13 DSS helps to Better use of data resource in organization.	1	2	3	4	5
3.14 I think DSS provide Interactive use of the system by the decision maker.	1	2	3	4	5
3.15 DSS Enhance the tacit to explicit knowledge conversion.	1	2	3	4	5
3.16 DSS Assists to internalizing explicit knowledge	1	2	3	4	5

SECTION D: INTELLIGENCE

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.1 Intelligence facilitates Learning and understanding from experience.	1	2	3	4	5
4.2 With using of Intelligent tools, this company had better analyzing of its information.	1	2	3	4	5
4.3 I believe that Intelligence Improved information sharing in virtual environment.	1	2	3	4	5

230

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.4 Applying knowledge to manipulate the environment is provided by Intelligent tools.	1	2	3	4	5
4.5 Intelligence identifies system response at different situation.	1	2	3	4	5
4.6 Intelligent tools recognizing the relative importance of different elements in a situation.	1	2	3	4	5
4.7 Using reasons in solving problems and directing conduct effectively is one result of Intelligent tools.	1	2	3	4	5
4.8 I think Intelligent tools helps to responding quickly to a new situation.	1	2	3	4	5
4.9 I feel that Intelligence helps to better communication between managers.	1	2	3	4	5
4.10 I believe that Intelligence Improved flexibility in organization.	1	2	3	4	5
4.11 Intelligence provides better decision making in our bank.	1	2	3	4	5
4.12 I am sure that Intelligent tools lead company to time savings.	1	2	3	4	5

SECTION E: EFFECTIVENESS OF IDSS

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.1 With an Effective IDSS we have quickly access to the required information.	1	2	3	4	5
5.2 With an Effective IDSS we have easily access to the required information.	1	2	3	4	5
5.3 Effective IDSS can provide interactive use of the system by the decision maker.					
5.4 I feel that I have chances to recognize the influencing variables for decision making with Effective IDSS.	1	2	3	4	5
5.5 I know that Effective IDSS Facilitate decision making in organization.	1	2	3	4	5
5.6 Effective IDSS Increase customer satisfaction in our company.	1	2	3	4	5
5.7 Effective IDSS provide better use of data and information	1	2	3	4	5

5.8 I believe that Effective IDSS helps to decrease decision making cost.	1	2	3	4	5
5.9 I believe that Effective IDSS helps to decrease organizational cost.	1	2	3	4	5
5.10 Effective IDSS helps to Increase organizational profits.	1	2	3	4	5
5.11 Effectiveness of IDSS can be measure according to its positive impact on the financial services.	1	2	3	4	5
5.12 Effective IDSS can increase organization s Market share with using of intelligent tools.	1	2	3	4	5
5.13 I believe that Effective IDSS Provides accurate information at the right time.	1	2	3	4	5
5.14 I feel that effectiveness of IDSS can be measure through the time saving that such improved decision would create.	1	2	3	4	5
5.15 I believe that Effective IDSS helps to do decision making, more quickly.	1	2	3	4	5
5.16 With using of Effective IDSS productivity was increased in our bank.	1	2	3	4	5
5.17 I feel that Effective IDSS Increase decision making quality.	1	2	3	4	5
5.18 Effective IDSS Prevent of intuitive decision making.	1	2	3	4	5
5.19 I feel that Effective IDSS Provide better result in our department.	1	2	3	4	5
5.20 Increase flexibility is one of the most important results of Effective IDSS.	1	2	3	4	5
5.21 I think effectiveness of IDSS can be measured according its impact on achieving organization goals.	1	2	3	4	5
5.22 Effectiveness of IDSS is measuredvia its impact on the rate of growth in each department that was use of this information system.	1	2	3	4	5

SECTION F: DECISION QUALITY

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.1 Team works with relevant and different expertise create high quality decisions	1	2	3	4	5

6.2 With reducing the amount of constraint and limitation and molesting directive, the quality of decision has been increased.	1	2	3	4	5
6.3 Knowledge of past similar experiences helps to increasing decision quality.	1	2	3	4	5
6.4 I believe that consulting with all or most of the people who involved in this problem can help decision makers to make high quality decisions.	1	2	3	4	5
6.5 I believe that adequate knowledge about internal organizational factors and activities provide high quality decisions.	1	2	3	4	5
6.6 I feel that adequate knowledge about external organizational factors can increase decision quality.	1	2	3	4	5
6.7 I feel that the qualifications of the decision makers have positive impact on decision quality.	1	2	3	4	5
6.8 Suitable and well define information system that can provide qualified information for decision makers, increase decision quality.	1	2	3	4	5
6.9 With modeling the possible result of our decisions, we can make decisions that have high quality.	1	2	3	4	5
6.10 High accurate information can result to high quality decisions.	1	2	3	4	5
6.11 I think attention to the organization goals at all phases of decision making process, can provide high quality decisions.	1	2	3	4	5
6.12 I feel that the quality of decisions has been increased with considering to all aspect of the topic.	1	2	3	4	5
6.13 I think that the quality of decisions has been increased with do not decision making based on the sense and feeling.	1	2	3	4	5
6.14 I believe that good understanding of the problem can result to making high quality decisions.	1	2	3	4	5
6.15 Timeliness of making decision is very important to making high quality decisions(late decisions are bad decisions),	1	2	3	4	5
6.16 I think alignment with the organizational goals and objectives can help us to make qualified decisions.	1	2	3	4	5
6.17 I believe that the quality of decisions has been increased with spending authority.	1	2	3	4	5

6.18 Be familiar with the organization s culture and rules is very important to make decisions with high quality.	1	2	3	4	5
6.19 Having enough authority and responsibility about the decisions can cause to making high quality decisions.	1	2	3	4	5

Appendix G: Farsi version Survey Questionnaire

Curtin University

پرسشنامه

تعریف واژگان:

در زیر تعریف مفاهیم و واژه های کلیدی مورد استفاده در این تحقیق جهت آگاهی بیشتر ارائه شده است:

مدیریت دانش : مدیریت دانش یک نگرش خاص است در مورد ایجاد یا افزایش ارزش از طریق بکار گیری موثرتر تجارب ، دانسته ها و قضاوتهای موجود در درون و در بسیاری از موارد در خارج از سازمان.

سیستمهای پشتیبانی تصمیم : سیستمهای کامپیوتری تعاملی هستند که جهت پشتیبانی تصمیم گیرندگانی که درگیر حل مسائل نیمه ساختار یافته یا بدون ساختار با ویژگیها و اهداف متعدد ،هستند استفاده می شوند .

هوش: اشاره به ابزارهای هوش مصنوعی دارد که می توانند فعالیتهای انسان را تقلید کنند. این سیستمها می توانند حساسیت ، انعطاف پذیری و صحت را در مورد اطلاعات وسیستمهای مدیریت تصمیم گیری افزایش دهند .

سیستمهای هوشمند پشتیبانی تصمیم: سیستمهای انعطاف پذیر، تعاملی و انطباق پذیرهستند که به صورت ویژه جهت پشتیبانی و کمک به ارائه راه حل جهت مشکلات بدون ساختار مدیریتی و در راستای افزایش کیفیت تصمیم گیری مورد استفاده قرار می گیرند.

اثربخشی: اشاره دارد به اینکه یک سیستم پشتیبانی تصمیم به چه میزان توانسته است یک مشکل سازمانی را خوب حل نماید. پیش بینی شده است که اثربخشی یک سیستم پشتیبانی تصمیم با میزان برانگیخته شدن کاربر درانجام فعالیتهایی که میزان استفاده واقعی از این سیستم را افزایش می دهد ارتباط و تعامل دارد.

بخش اول: اطلاعات فردی

سوالات این بخش در ارتباط با ویژگیهای فردی شخص شما و نیز ویژگیهای سازمانی است که در آن مشغول به کار هستید:

۱-۱ جنسیت:

□مرد   □زن

۲-۱ مدت زمان استخدام شما در این سازمان:

□کمتر از ۵ سال   □۵-۱۰ سال   □۱۰-۱۵سال   □۲۰-۱۵ سال   □۲۰-۲۵ سال

۱-۳اندازه سازمانی که در آن مشغول به کار هستید:

□کوچک   □متوسط   □بزرگ

۱- ۴تعداد کارکنانی که در سازمان شما مشغول به کار هستند:

□کمتر از ۱۰۰۰ نفر   □۱۰۰۱-۵۰۰۰ نفر   □۵۰۰۱-۱۰۰۰۰نفر

□۱۰۰۱-۲۰۰۰۰نفر   □۲۰۰۰۱-۴۰۰۰۰نفر   □بیشتر از ۴۰۰۰۰نفر

۱-۵وضعیت مالکیت سازمانی که در آن مشغول به کار هستید:

□دولتی   □خصوصی

۱-۶ شما در چه زمینه ای فعالیت می کنید:

□مالی   □منابع انسانی   □حقوقی   □خدمات مشتری   □شعب داخلی   □تحقیق و توسعه □حسابداری

□فناوری اطلاعات   □برنامه ریزی   □تبادلات ارزی   □شعب خارجی   □ارتباطات   □سایر

۱-۷ سمت شما در سازمانی که مشغول به کار هستید:

□مدیر ارشد   □مدیر   □مسئول واحد   □تحلیلگر واحد

□مدیربخش   □مدیر شعبه   □مدیر اجرایی   □متخصص واحد

راهنمای تکمیل پرسشنامه:

لطفا پس از مطالعه سوالات پاسخ خود را با انتخاب کردن یکی از گزینه های موجود(دایره کشیدن دور عدد مورد نظر) که با نظر یا اطلاعات شما مطابقت بیشتری دارد بیان کنید.

یک مثال از نحوه استفاده کردن از این مقیاس درجه بندی شده :

" همه انسانها ۵ حس دارند."

کاملا موافقم				کاملا مخالفم
۵	۴	۳	۲	۱

با توجه به جدول فوق در صورت انتخاب گزینه ۵ ، شما بیان می کنید که با عبارت ذکر شده کاملا موافق هستید.

بخش الف- مدیریت دانش

کاملا موافقم	موافقم	نظری ندارم	مخالفم	کاملا مخالفم	سوالات
٥	٤	٣	٢	١	٢-١ مدیریت دانش به گردآوری دانش ضمنی موجود در واحد کمک می کند.
٥	٤	٣	٢	١	٢-٢با مدیریت دانش می توان دانش ضمنی سازمان را تقویت کرد.
٥	٤	٣	٢	١	٢- ٣ منظم کردن دانش ضمنی در سازمان با مدیریت دانش تسهیل می شود.
٥	٤	٣	٢	١	٢-٤ با مدیریت کردن دانش می توان دانش ضمنی را به دانش آشکار تبدیل کرد.
٥	٤	٣	٢	١	٢-٥ با مدیریت کردن دانش می توان دانش آشکار را بازیابی کرد.
٥	٤	٣	٢	١	٢-٦ مدیریت دانش به تصفیه کردن دانش آشکار موجود در اداره کمک می کند.
٥	٤	٣	٢	١	٢-٧ بامدیریت دانش می توان دانش را در سازمان ذخیره کرد.
٥	٤	٣	٢	١	٢-٨مدیریت دانش به منتشرکردن دانش درسازمان کمک می کند.
٥	٤	٣	٢	١	٢-٩ با مدیریت کردن دانش می توان دانش جدید خلق کرد.
٥	٤	٣	٢	١	٢-١٠ می توان دانش جدید سازمان را با استفاده از مدیریت دانش تست کرد.
٥	٤	٣	٢	١	٢-١١ با استفاده ازمدیریت دانش ،به اشتراک گذاشتن دانش درسازمان تسهیل می شود.
٥	٤	٣	٢	١	٢-١٢ مدیریت دانش می تواند دانش را به واحدهای مختلف منتقل کند.
٥	٤	٣	٢	١	٢-١٣ مدیریت دانش منجر به بهبود عملکرد خواهد شد.
٥	٤	٣	٢	١	٢-١٤ با مدیریت دانش اداره مشتریان بهبود خواهد یافت .
٥	٤	٣	٢	١	٢-١٥ مهارتهای کارکنان واحد با مدیریت دانش بهبود خواهد یافت .
٥	٤	٣	٢	١	٢-١٦ هزینه های واحد با مدیریت دانش کاهش خواهد یافت .
٥	٤	٣	٢	١	٢-١٧افزایش سود یا درآمد یکی از نتایج مدیریت دانش می باشد.
٥	٤	٣	٢	١	٢-١٨ مدیریت دانش فرصتهای تجاری جدیدی را درسازمان ایجاد می کند.
٥	٤	٣	٢	١	٢-١٩ مدیریت دانش به ارائه ارزشهای بیشتر به مشتریان کمک می کند .
٥	٤	٣	٢	١	٢-٢٠ با مدیریت دانش امکان واگذاری اختیارات بیشتر به کارکنان فراهم خواهد شد.
٥	٤	٣	٢	١	٢-٢١ مدیریت دانش ما را نسبت به ارسال دانش به داخل سازمان هدایت می کند.
٥	٤	٣	٢	١	٢-٢٢ مدیریت دانش ما را نسبت به ارسال دانش به خارج از سازمان هدایت می کند.
٥	٤	٣	٢	١	٢-٢٣ با مدیریت دانش ما مطمئن خواهیم بود که اطلاعات درست به شکل درست در دسترس خواهد بود.
٥	٤	٣	٢	١	٢-٢٤ با مدیریت دانش ما مطمئن خواهیم بود که اطلاعات درست در زمان درست در دسترس خواهد بود.

بخش ب- سیستمهای پشتیبانی تصمیم

سوالات	کاملا مخالفم	مخالفم	نظری ندارم	موافقم	کاملا موافقم
۳-۱ سیستمهای پشتیبانی تصمیم منجر به بدست آوردن اطلاعات بیشتر و بهتر می شوند.	۱	۲	۳	٤	٥
۳-۲ سیستمهای پشتیبانی تصمیم تعداد گزینه های مورد ارزیابی برای تصمیم گیری را افزایش می دهد .	۱	۲	۳	٤	٥
۳-۳ سیستمهای پشتیبانی تصمیم ارتباطات را در سازمان بهبود می بخشد.	۱	۲	۳	٤	٥
۳-٤ سیستمهای پشتیبانی تصمیم انعطاف پذیری بالایی در سازمان ایجاد می کند.	۱	۲	۳	٤	٥
۳-٥ صرفه جویی در هزینه ها یکی از نتایج اصلی سیستمهای پشتیبانی تصمیم است.	۱	۲	۳	٤	٥
۳-٦ صرفه جویی در زمان یکی دیگر از نتایج سیستمهای پشتیبانی تصمیم است .	۱	۲	۳	٤	٥
۳-۷ سیستمهای پشتیبانی تصمیم موجب کنترل بهتر در واحد می شود.	۱	۲	۳	٤	٥
۳-۸ سیستمهای پشتیبانی تصمیم منجر به کار گروهی موثرتر در سازمان خواهد شد.	۱	۲	۳	٤	٥
۳-۹ سیستمهای پشتیبانی تصمیم پاسخگویی سریع در موارد پیش بینی نشده را ممکن می کند.	۱	۲	۳	٤	٥
۳-۱۰ درک بهتر از کار و تجارت یکی از نتایج سیستمهای پشتیبانی تصمیم می باشد.	۱	۲	۳	٤	٥
۳-۱۱ سیستمهای پشتیبانی تصمیم منجر به تصمیمات بهترو با کیفیت تر می شود.	۱	۲	۳	٤	٥
۳-۱۲ سیستمهای پشتیبانی تصمیم منجربه بینش و آموخته های جدید خواهد شد.	۱	۲	۳	٤	٥
۳-۱۳ سیستمهای پشتیبانی تصمیم موجب استفاده بهتر ازمنابع اطلاعات سازمان می شود.	۱	۲	۳	٤	٥
۳-۱٤ سیستمهای پشتیبانی تصمیم استفاده موثر از سیستم را توسط تصمیم گیرندگان فراهم می کند.	۱	۲	۳	٤	٥
۳-۱٥ سیستمهای پشتیبانی تصمیم تبدیل دانش ضمنی به دانش آشکار را بهبود می بخشد.	۱	۲	۳	٤	٥
۳-۱٦ سیستمهای پشتیبانی تصمیم درونی سازی دانش آشکار را تسهیل می بخشد.	۱	۲	۳	٤	٥

بخش پ- هوش (سیستمهای هوشمند)

سوالات	کاملا مخالفم	مخالفم	نظری ندارم	موافقم	کاملا موافقم
٤-۱ هوش یادگیری و آموزش از طریق تجربه را تسهیل می کند .	۱	۲	۳	٤	٥
٤-۲ استفاده از ابزار های هوشمند سبب تحلیل بهتر اطلاعات خواهد شد .	۱	۲	۳	٤	٥
٤-۳ ابزار های هوشمند اشتراک اطلاعات در محیطهای مجازی را بهبود می بخشند.	۱	۲	۳	٤	٥
٤-٤ ابزار های هوشمند استفاده از دانش در اداره کردن محیط را فراهم می کند .	۱	۲	۳	٤	٥

٥	٤	٣	٢	١	٥-٤ ابزارهای هوشمند نوع پاسخ سیستم به موقعیتهای گوناگون را تعیین می کند .
٥	٤	٣	٢	١	٦-٤ ابزارهای هوشمند ارزش نسبی اجزا گوناگون یک موقعیت را تشخیص می دهد.
٥	٤	٣	٢	١	٧-٤ استفاده از منطق در حل مسایل و هدایت موثر محصولات از نتایج استفاده از ابزارهای هوشمند است .
٥	٤	٣	٢	١	٨-٤ استفاده از ابزارهای هوشمند سبب پاسخگویی سریع در موقعیتهای جدید خواهد شد
٥	٤	٣	٢	١	٩-٤ ابزارهای هوشمند موجب برقراری ارتباط موثر میان مدیران خواهد شد .
٥	٤	٣	٢	١	١٠-٤ ابزارهای هوشمند انعطاف پذیری سازمان را افزایش می دهد.
٥	٤	٣	٢	١	١١-٤ ابزارهای هوشمند موجب تصمیم گیری بهتر در سازمان خواهند شد.
٥	٤	٣	٢	١	١٢-٤ ابزارهای هوشمند سبب صرفه جویی در زمان خواهد شد.

بخش ت – اثربخشی سیستمهای هوشمند پشتیبانی تصمیم گیری

کاملا موافقم	موافقم	نظری ندارم	مخالفم	کاملا مخالفم	سوالات
٥	٤	٣	٢	١	١-٥ بوسیله سیستم هوشمند پشتیبانی تصمیم اثربخش دسترسی سریع به اطلاعات مورد نیاز فراهم خواهد شد.
٥	٤	٣	٢	١	٢-٥ بوسیله سیستم هوشمند پشتیبانی تصمیم اثربخش دسترسی آسان به اطلاعات مورد نیاز فراهم خواهد شد.
٥	٤	٣	٢	١	٣-٥ یک سیستم هوشمند پشتیبانی تصمیم اثربخش استفاده بهینه از سیستم توسط تصمیم گیرندگان را فراهم می کند.
٥	٤	٣	٢	١	٤-٥ یک سیستم هوشمند پشتیبانی تصمیم اثربخش متغیرهای موثر در تصمیم گیری را شناسایی می کند.
٥	٤	٣	٢	١	٥-٥ یک سیستم هوشمند پشتیبانی تصمیم اثربخش تصمیم گیری را در سازمان تسهیل میکند
٥	٤	٣	٢	١	٦-٥ یک سیستم هوشمند پشتیبانی تصمیم اثربخش رضایت مشتریان را افزایش می دهد.
٥	٤	٣	٢	١	٧-٥ یک سیستم هوشمند پشتیبانی تصمیم اثربخش استفاده بهتر از داده های سازمان را فراهم می کند.
٥	٤	٣	٢	١	٨-٥ یک سیستم هوشمند پشتیبانی تصمیم اثربخش هزینه تصمیم گیری راکاهش می دهد.
٥	٤	٣	٢	١	٩-٥ یک سیستم هوشمند پشتیبانی تصمیم اثربخش هزینه سازمان را کاهش می دهد.
٥	٤	٣	٢	١	١٠-٥ یک سیستم هوشمند پشتیبانی تصمیم اثربخش سود سازمان را افزایش می دهد.
٥	٤	٣	٢	١	١١-٥اثربخشی یک سیستم هوشمند پشتیبانی تصمیم از طریق میزان تاثیر مثبت آن برروی خدمات مالی موسسه قابل اندازه گیری است .

كاملا موافقم	موافقم	نظری ندارم	مخالفم	كاملا مخالفم	
٥	٤	٣	٢	١	٥-١٢ یک سیستم هوشمند پشتیبانی تصمیم اثربخش با استفاده از ابزارهای هوشمند سهم بازار موسسه را افزایش می دهد.
٥	٤	٣	٢	١	٥-١٣ یک سیستم هوشمند پشتیبانی تصمیم اثربخش اطلاعات صحیح را در زمان مناسب فراهم می کند .
٥	٤	٣	٢	١	٥-١٤ اثربخشی یک سیستم هوشمند پشتیبانی تصمیم از طریق میزان صرفه جویی در زمان ناشی از تصمیمات بهبود یافته اندازه گیری می شود.
٥	٤	٣	٢	١	٥-١٥ یک سیستم هوشمند پشتیبانی تصمیم اثربخش سرعت تصمیم گیری را افزایش می دهد.
٥	٤	٣	٢	١	٥-١٦ با استفاده از یک سیستم هوشمند پشتیبانی تصمیم اثربخش درسازمان میزان بهره وری سازمان افزایش خواهد یافت .
٥	٤	٣	٢	١	٥-١٧ یک سیستم هوشمند پشتیبانی تصمیم اثربخش کیفیت تصمیم گیری را افزایش می دهد.
٥	٤	٣	٢	١	٥-١٨ یک سیستم هوشمند پشتیبانی تصمیم اثربخش مانع از تصمیم گیری احساسی می شود.
٥	٤	٣	٢	١	٥-١٩ یک سیستم هوشمند پشتیبانی تصمیم اثربخش نتایج بهتر سازمانی را به همراه خواهد داشت .
٥	٤	٣	٢	١	٥-٢٠ افزایش انعطاف پذیری سازمان یکی از نتایج مهم سیستم هوشمند پشتیبانی تصمیم اثربخش می باشد.
٥	٤	٣	٢	١	٥-٢١ اثربخشی یک سیستم هوشمند پشتیبانی تصمیم از طریق میزان تاثیر آن بر تحقق اهداف سازمان اندازه گیری می شود.
٥	٤	٣	٢	١	٥-٢٢ اثربخشی یک سیستم هوشمند پشتیبانی تصمیم از طریق میزان تاثیر آن بر روی نرخ رشد واحدهای سازمانی که از آن سیستم استفاده کرده اند اندازه گیری می شود.

بخش ث – کیفیت تصمیم

کاملا موافقم	موافقم	نظری ندارم	مخالفم	کاملا مخالفم	سوالات
٥	٤	٣	٢	١	٦-١ کارتیمی با حضورمتخصصان مختلف سبب افزایش کیفیت تصمیمات می شود.
٥	٤	٣	٢	١	٦-٢ با کاهش میزان محدودیتها کیفیت تصمیمات افزایش خواهد یافت.
٥	٤	٣	٢	١	٦-٣ دانش ناشی از تجربیات مشابه گذشته سبب افزایش کیفیت تصمیمات خواهد شد .
٥	٤	٣	٢	١	٦-٤ مشورت و همفکری با افرادی که با موضوع مورد تصمیم گیری در گیر هستند سبب افزایش کیفیت تصمیمات خواهد شد.
٥	٤	٣	٢	١	٦-٥ دانش کافی در خصوص عوامل داخلی سازمان سبب اتخاذ تصمیمات با کیفیت خواهد شد .
٥	٤	٣	٢	١	٦-٦ دانش کافی در خصوص عوامل خارج از سازمان سبب اتخاذ تصمیمات با کیفیت خواهد شد.

240

٥	٤	٣	٢	١	٦-٧ تحصیلات تصمیم گیرندگان تاثیر مثبتی بر روی کیفیت تصمیمات خواهد داشت.
٥	٤	٣	٢	١	٦-٨ سیستم اطلاعاتی مناسب که اطلاعات با کیفیت را برای تصمیم گیرندگان فراهم می کند سبب افزایش کیفیت تصمیمات خواهد شد .
٥	٤	٣	٢	١	٦-٩ از طریق مدلسازی نتایج ممکنه حاصل از تصمیمات ، کیفیت تصمیمات افزایش خواهد یافت .
٥	٤	٣	٢	١	٦-١٠ اطلاعات با صحت بالا سبب اتخاذ تصمیمات با کیفیت بالا خواهند شد.
٥	٤	٣	٢	١	٦-١١ توجه به اهداف اصلی سازمان در تمامی مراحل تصمیم گیری سبب افزایش کیفیت تصمیمات خواهد شد .
٥	٤	٣	٢	١	٦-١٢ توجه به تمامی ابعاد موضوع مورد تصمیم گیری سبب افزایش کیفیت تصمیمات متخذه خواهد شد.
٥	٤	٣	٢	١	٦-١٣ تصمیم گیری غیراحساسی سبب افزایش کیفیت تصمیمات متخذه خواهد شد .
٥	٤	٣	٢	١	٦-١٤ درک درست از موضوع سبب اتخاذ تصمیمات با کیفیت خواهد شد.
٥	٤	٣	٢	١	٦-١٥ تصمیم گیری در بازه زمانی صحیح سبب افزایش کیفیت تصمیمات خواهد شد.
٥	٤	٣	٢	١	٦-١٦ همراستایی با اهداف سازمان سبب افزایش کیفیت تصمیمات خواهدشد.
٥	٤	٣	٢	١	٦-١٧ با تفویض اختیارات به شکلی درست ،کیفیت تصمیمات افزایش می یابد.
٥	٤	٣	٢	١	٦-١٨ آشنایی با فرهنگ و قوانین سازمان سبب اتخاذ تصمیمات با کیفیت می شود.
٥	٤	٣	٢	١	٦-١٩ داشتن اختیارات و مسولیتهای کافی درخصوص تصمیم گیری سبب اتخاذ تصمیمات با کیفیت خواهد شد .

Appendix H: Decision Rules for Formative or Reflective Measurements

	Formative Model	**Reflective Model**
1. Direction of causality from construct to measure implied by the conceptual definition	**Direction of causality is from items to construct**	**Direction of causality is from construct to items**
Are the indicators (items) (a) defining characteristics or (b) manifestations of the construct?	Indicators are defining characteristics of the construct	Indicators are manifestations of the construct
Would changes in theindicators/items cause changes in the construct or not?	Changes in the indicators should cause changes in the construct	Changes in the indicator should not cause changes in the construct
Would changes in the construct cause changes in the indicators?	Changes in the construct donot cause changes in theindicators	Changes in the construct do cause changes in theindicators
2. Interchangeability of theindicators /items	**Indicators need not be interchangeable**	**Indicators should be interchangeable**
Should the indicators have the same or similar content?	Indicators need not have the same or similar content	Indicators should have the same or similar content theme
Do the indicators share a common theme?	Indicators need not share acommon theme	Indicators should share acommon theme
Would dropping one of theconstruct indicators alter the conceptual domain of the construct?	Dropping an indicator may alter the conceptual domainof the construct	Dropping an indicator shouldnot alter the conceptualdomain of theconstruct
3. Covariation among the indicators	Not necessary for indicatorsto covariate with each other	Indicators are expected tocovariate with each other
Should a change in one of the indicators be associated with changes in the other Indicators?	Not necessarily	Yes
4. Nomological net of the construct indicators	Nomological net for the indicators may differ	Nomological net for theindicators should not differ
Are the indicators/items expected to have the same antecedents and consequences?	Indicators are not required tohave the same antecedentsand consequences	Indicators are required tohave the same antecedentsand consequences

Source: Jarvis,

241