Islamic University Gaza
Faculty of Commerce
Business Administration Department
MBA Program

Evaluation of Managerial Requirements Toward Utilization Of Decision Support System (DSS) In Palestinian Ministries (PM) In The Gaza Strip

Prepared by
Mohammad B. Arafat

Supervisor
Dr. Rushdy Wady

Master Thesis
Business Administration Department
Islamic University Gaza

2007 – 1428

بسم الله الرحمن الرحيم

(وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ وَسَتُرَدُّونَ إِلَى عَالِمِ الْغَيْبِ وَالشَّهَادَةِ فَيُنَبِّئُكُمْ بِمَا كُنْتُمْ تَعْمَلُونَ) (التوبة:105)

صدق الله العظيم

Dedications

- I would like to dedicate this research to spirit of my dearest father; God mercy him.
- I would like to dedicate this research to my earliest teacher in life my dearest mother God bless her.
- I would like to dedicate this research to my wife; her constant encouragement and patience were extremely helpful for me to complete the master as whole.
- I would like to dedicate this research to my brother and sisters.
- I would like to dedicate this research to my three sons; they have exposed mature understanding for my full involvements in the last tough three years.
- I would like to dedicate this research to my brother and sisters.
- I would like to dedicate this research to Mr. Farouk Afranji Chairman of GPIC ; I will never forgotten his support by encouraging me to return back to academic again.
- I would like to dedicate this research to all colleagues ; in GPIC ; do hope that this dissertation may help them to trigger real plan toward utilization of DSS.

Acknowledgement

- I deem myself to be very fortunate to have Dr. Rushdy Wady as my advisor. I am really impressed by his intuition, and quick comprehension capabilities. I am obliged to Dr.Wady for guiding me in picking a very interesting and fruitful research direction. He was never demanding yet always encouraging natural growth.

- I am also obliged to all Islamic University Professors; special thanks to (Prof. Yosuef Ashour , Dr. Esam Behesy , Dr.Salem Hillis , Dr. Fares Abu Momer, Dr. Samir Safi ,Dr. Mhaer El-Holuy,Dr. Majed Fara , Dr. Sami Abu El-Ros and Dr. Mohammad Madhoun) , it was really wealthy, interesting and precious 36 academic months.

- Finally, I am proud to be one of the Islamic University alumnae

Table of Contents

List of Tables

List of Figures

Abstract

The main objective of this study is to evaluate the managerial requirements toward the utilization of DSS in Palestinian Ministries; the practice has been applied in two ministries (ministry of education and ministry of health) Gaza.

This study uses the descriptive and data analysis approach to verify the validity – invalidity of the predefined hypothesis. As result of the analysis the following main conclusions were obtained:

1. There is proper awareness of DSS importance in PM management levels that facilitate utilization of DSS.
2. There is a need for awareness enhancements for utilized DSS in PM main management domains (Human Resource, Organization Structure, Business Process, Control of Change and Conduct &Commitment domains).
3. The Human Resource System in PM is poor which is hampering the utilization of DSS.
4. The Organization Structure at PM is moderate in terms of facilitating utilization of DSS.
5. The Business Process at PM is moderate in terms of facilitating utilization of DSS.
6. The Change Control System is moderate at PM in terms of facilitating utilization of DSS.
7. The Conduct and Commitments are moderate at PM in terms of facilitating utilization of DSS.
8. There are significant statistical differences at trends of managers in respect to managerial requirements of DSS due to the age in years, experience and education level at significant level $\alpha = 0.05$.

As result of the data analysis and serious literature review of the major managerial factors that affect the utilization of DSS; group of recommendations have been underlined within this study.

ملخص الدراسة

تهدف هذه الدراسة الى تقييم المتطلبات الادارية نحو الاستخدام الامثل لنظم دعم القرار فى وزارات السلطة الفلسطينية – غزة ،من وجهة نظر المديرين ، وقد اعتمد الباحث أسلوب الاحصاء الوصفى التحليلى عل مجتمع الدراسة والمكون من وزارتين من أكبر الوزارات العاملة فى قطاع غزة (وزارة التربية والتعليم ووزارة الصحة) ، وقد تمحورت الدراسة بتقييم المديرين فى مجتمع الدراسة للمحاور التالية فى المساعدة على الاستخدام الامثل لنظم دعم القرار (مدى ادراك المديرين باهمية نظم دعم القرار ، مدى الحاجة لتعزيز الادراك باهمية نظم دعم القرار بالمجالات الادارية الرئيسية ، نظام الموارد البشرية ، الهيكل التنظيمى ، نظام ادارة العمليات الخاصة بالعمل ، نظام التحكم بالتغيير ، مجال الانضباط والالتزام) وقد كانت أهم النتائج على النحو التالى :

1. هناك دلالة احصائية عند مستوى دلالة على ان هناك **مستوى جيد** من الادراك لاهمية نظم دعم القرار فى مؤسسات القطاع الحكومى فى قطاع غزة .
2. هناك دلالة احصائية عند مستوى دلالة على ان هناك حاجة لتحسين الادراك فيما يتعلق بالمجالات الادارية الرئيسية فى مؤسسات القطاع الحكومى فى قطاع غزة (الموارد البشرية – الهيكل التنظيمى والادارى – ادارة العمليات المتعلقة بالعمل – السيطرة على التغيير – الانضباط).
3. هناك دلالة احصائية عند مستوى دلالة على عدم ملاءمة نظام الموارد البشرية فى مؤسسات القطاع الحكومى فى قطاع غزه فيما يتعلق بتسهيل الاستخدام الامثل لنظام دعم القرار .
4. هناك دلالة احصائية عند مستوى دلالة على ان الهيكل الادارى والتنظيمى فى مؤسسات القطاع الحكومى ملائم بشكل مقبول فيما يتعلق بتسهيل الاستخدام الامثل لنظم دعم القرار .
5. هناك دلالة احصائية عند مستوى دلالة على ان نظام ادارة العمليات الخاصة بالعمل فى مؤسسات القطاع الحكومى ملائم بشكل مقبول فيما يتعلق بتسهيل الاستخدام الامثل لنظم دعم القرار .
6. هناك دلالة احصائية عند مستوى دلالة على ان نظام السيطرة على التغيير فى مؤسسات القطاع الحكومى ملائم بشكل مقبول فيما يتعلق بتسهيل الاستخدام الامثل لنظم دعم القرار .
7. هناك دلالة احصائية عند مستوى دلالة على ان الانضباط فى مؤسسات القطاع الحكومى ملائم بشكل مقبول فيما يتعلق بتسهيل الاستخدام الامثل لنظم دعم القرار .
8. هناك دلالة احصائية عند مستوى دلالة على ان هناك فروق فى اتجاهات المديرين نحو تقييم المتطلبات الادارية نحو الاستخدام الامثل لنظم دعم القرار فيما يتعلق بالعمر و الخبرة و المؤهل .

بناء على التحليل ونتائجه ، وكذا المراجعة النظرية لمحاور تسهيل الاستخدام الامثل لنظم دعم القرار فان مجموعة من التوصيات تم طرحها فى اطار هذه الدراسة.

List of Abbreviations

AI	Artificial Intelligence
AIS	Association of Information Systems
AMCIS	American Conference Information Systems
ANN	Artificial Neural Networks
AIS	Association of Information Systems
AMCIS	American Conference Information Systems
BI	Business Intelligence
BP	Business Process
BPR	Business Process Reengineering
BPS	Business Process System
CaC	Conduct and Commitment
CBIS	Computer-based Information Systems
CC	Change Control
CMM	Capability Maturity Model
CPA	Critical Path Analysis
CSFs	Critical Success Factors
DA	Decision Analysis
DBMS	Data Base Management System
DGMS	Dialogue Generation and Management System
DSS	Decision Support System
DW	Data Warehousing
ECTL	Extract, Correct, Transform and Load
FSE	Fuzzy Search engine
GDSS	Group Decision Support System
GPIC	General Pension Insurance Corporation
HCI	Human-Computer Interface
HRS	Human Resource System
ICT	Information & Communications Technology
IDSS	Intelligent Decision Support Systems
ISD	Information Systems Development
ISR	Information Systems Research
IT	Information Technology
ISR	Information Systems Research
JAIS	Journal of the Association of Information Systems
KBDSS	knowledge-based decision support system
KM	Knowledge Management
LDC	Least Developed Countries
MBMS	Model-Base Management System
MIS	Management Information System

MISQ	Management Information Systems Quarterly
MOE	Ministry Of Education
MOH	Ministry of Health
OLAP	Online Application Processing
OLTP	Online Transactions Processing
OS	Organization Structure
PDM	Portfolio Decision Making
PGI	Palestinian Government Institutions
QA	Quantitative Analysis
RDBMS	Relational Data Base Management System
RM	Risk Management
SBAs	Support Building Activities
SCOR	Supply Chain Operations Reference-model
SEI	Software Engineering Institute
SPADE	(Supporting Platform for Airport Decisionmaking)
SPSS	Statistical Package for the Social Sciences
STSs	Socio Technical Systems
SN	Social Networks
SC	Soft Computing
TAM	Technology Accepted Model
PR	Probabilistic reasoning
DGMS	Dialog Generation and Management System

Key Terms

Aggregate	"Aggregates are stored summaries built primarily to improve query performance" (Kimball, 2004).
Content Analysis	Content analysis. "Content analysis is a research tool used to determine the presence of certain words or concepts within texts or sets of texts" (CSU Writing Lab, 2005)
Corporate Data Warehouse	Subject-oriented corporate database which addresses the problem of having multiple data models implemented on multiple platforms and architectures in the enterprise" (Kelly, 1995).
Data	"The individual facts with a specific meaning at a point in time or for a period of time" (Brackett, 2000).
Data Cleansing	"Data cleansing is the process of finding errors in data and either automatically or manually correcting the errors" (Loshin, 2003).
Data Processing Improvements	The tracking of data through an operational process and making adjustments to processes for higher data quality (Redman, 2001).
Data Profiling	"[Data profiling] employs analytical methods for looking at data for the purpose of developing a thorough understanding of the content, structure, and quality of the data" (Olson, 2003).
Data Quality	"The degree to which data meets the specific needs of specific customers" (Redman, 2001). The dimensions of data quality are "accuracy, currency, completeness, and consistency" (Redman, 1996).
Data Quality Program	An enterprise-level data quality initiative with "clear business direction, objectives, and goals management infrastructure that properly assigns responsibilities for data an operational plan for improvement and program administration" (Redman, 1996).
Data Warehouse	A database of snapshots and aggregations of data throughout an enterprise to be used for querying and decision-making (Kimball, et al., 2004)
Metadata	"Data about the data. They include names, definitions, logical and physical data structure, data integrity, data accuracy, and other data about the organization's data resource" (Brackett, 1994, p. 451).
Snapshot	A static view of data representing a period of time (Kimball, et al., 1998).
Strategic decision-making	Long-term decisions that affect the health of the enterprise or its important organization over the long term" (Redman, 1996).

Chapter 1 – Research Framework

1.1 Introduction

Everyone in an organization makes decisions, particularly those in the supervisory, managerial or leadership positions face a unique challenge when making decisions. Researchers have known that decision makers on their own are incapable of making the best decisions when the problem is complex. Socrates; one of the most influential philosophers in ancient Greece argued that not all men are capable of seeking the truth knowledge or dealing with problems without the help from others (Scott, 2002).

DSS Concept and Definitions

Drawing on various definitions that have been suggested (Alter 1980), Bonczek (1980) Keen and Scott-Morton (1978) and Sprague and Carlson (1982) a DSS can be described as a computer-based interactive human–computer decision-making system that: supports decision makers rather than replaces them. This feature distinguishes a DSS from other IS. Some IS replace decision makers in well structured, routine and recurring decisions; others are used to verify record or extract data.

Because of the continuously growing number of different types of computer-based systems it is important to distinguish among them and position DSSs within the family of information systems used by decision makers. Little (1970), in one of the earliest works on computer-based decision support, proposed that a DSS be "a model-based set of procedures for processing data and judgments to assist a manager in his decision making". Keen and Scott-Morton (1978) note that DSS play a different role and propose the following definition:" Decision support systems couple the intellectual resources of individuals with the capabilities of computers to improve the quality of decisions. It is computer-based support for management decision makers who deal with semi-structured problems." Moore and Chang (1980), define a DSS in terms of its features and use. They view a DSS as a system that is extendable, capable of supporting ad hoc analysis and decision modeling, oriented towards future planning, and of being used at irregular, unplanned intervals. Bonczek, Holsapple and Whinston (1980), define DSS in terms of its components. A generic DSS consists of a language system for communication between the user and the DSS, a knowledge system containing problem domain knowledge consisting of data and procedures, and a problem processing system consisting of programs capable of solving decision problems.

The difficulties with defining DSSs were recognized already at the early stage of their introduction. Sprague and Carlson (1982) note that some definitions are so restrictive that only

a few existing systems satisfy them, while other definitions are broad so that they include almost all computer systems. Systems for extracting, summarizing and displaying data are also viewed as DSSs (McNurlin and Sprague, 1993). This led Naylor (1982) to observe that "... it seems that virtually every computer hardware and software firm in the industry refers to its products as DSS". This statement is even more justified today as DSSs have gained much popularity and software companies use it as a marketing attribution that indicates their product's innovative character and ability to solve complex managerial problems.

DSS Theory Developments

In the mid- to late 1970s, both practice and theory issues related to DSS were discussed at academic conferences including the American Institute for Decision Sciences meetings and the Conference on Decision Support Systems in San Jose, CA in January 1977 (the proceeding were included in the journal database). The first International Conference on Decision Support Systems was held in Atlanta, Georgia in 1981. Academic conferences provided forums for idea sharing, theory discussions and information exchange.

At about this same time, Keen and Scott Morton's (1978) provided the first broad behavioral orientation to decision support system analysis, design, implementation, evaluation and development. This influential text provided a framework for teaching DSS in business schools. McCosh and Scott-Morton's (1978) DSS book was more influential in Europe.

In 1980, Steven Alter published his doctoral dissertation results in an influential book. Alter's research and papers (1975; 1977) expanded the framework for thinking about business and management DSS. Also, his case studies provided a firm descriptive foundation of decision support system examples. A number of other dissertations completed in the late 1970s also dealt with issues related to using models for decision support.

Alter concluded from his research (1980) that decision support systems could be categorized in terms of the generic operations that can be performed by such systems. These generic operations extend along a single dimension, ranging from extremely data-oriented to extremely model-oriented.

Donovan and Madnick (1977) classified DSS as institutional or ad hoc. Institutional DSS support decisions that are recurring. An ad hoc DSS supports querying data for one time requests. Hackathorn and Keen (1981) identified DSS in three distinct yet interrelated categories: Personal DSS, Group DSS and Organizational DSS.

The first commercial tool for building model-driven DSS using financial and quantitative models was called IFPS, an acronym for Interactive Financial Planning System. It was developed in the late 1970's by Gerald R. Wagner and his students at the University of Texas. Wagner's company, EXECUCOM Systems, marketed IFPS until the mid 1990s. Gray's Guide to IFPS (1983) promoted the use of the system in business schools. Another DSS generator for building specific systems based upon the Analytic Hierarchy Process (Saaty, 1982), called Expert Choice, was released in 1983. Expert Choice supports personal or group decision making. Ernest Forman worked closely with Thomas Saaty to design Expert Choice.

So early DSS like the first Atari games still have some interest; however the capabilities of modern DSS are much advanced. The features of the specific categories of DSS have been reviewed. The discussions on communications-driven DSS (Power, 2007a), data-driven DSS (Power, 2007b), document-driven DSS (Power, 2007c), knowledge-driven DSS (Power, 2007d), and model-driven DSS (Power, 2007e). The defining characteristics of DSS have not changed. DSS remain characterized by facilitation, interaction, ancillary, repeated use, task oriented, identifiable and decision impact (cf., Power, 2003).

The following is a list of attributes that are becoming increasingly common in new and updated decision support systems. Not all modern DSS have these attributes, but some do! Some attributes are more closely associated with one category of DSS than another, but complex DSS often have multiple subsystems that fit in different categories. So for example, a complex, modern DSS may have a well-defined data-driven subsystem and a model-driven decision support subsystem. Major attributes of modern DSS include:

1. Broad domain of applications with diverse functionality -- which uses a DSS and for what purpose has expanded. We are identifying many use cases for DSS and we are beginning to capture each specific use in use case models.
2. Faster access to data stored in very large data sets -- data access refers to software and activities related to retrieving or acting upon data in a database or other repository. Data-driven DSS can have almost unlimited historical data stores.
3. Faster deployment -- software deployment is all of the activities that make a new DSS available for use. Faster deployment is partly due to the use of Web technologies, but better prototyping, templates, and vertical market applications also speed deployment of DSS.
4. Faster response -- how quickly an interactive system responds to user input has improved

significantly. In a distributed computing environment, the lagg with video, voice, data retrieval or transmitting model results is now negligible.

5. Integrated DSS with Transactions Processing System (TPS), multiple decision support subsystems -- enterprise-wide decision support applications are increasingly common. A standardized interface and single sign-on security helps create an integrated and unified decision support/transaction processing environment. The days of standalone DSS are numbered and few.

6. Multi-user and collaborative interaction -- DSS is increasingly collaborative and shared decision making environments.

7. Real-time data, DSS use and system response-- the classical conception is an immediate real-time system that is used while action is occurring. That vision is increasingly possible and sometimes very useful. See the Ask Dan! columns on real-time DSS (Power, 2002a, 2002b).

8. Ubiqitous -- DSS are available and seem to be usable everywhere. DSS for a particular function can go with the targeted user.

9. User friendly and a better user experience -- Usability denotes the ease of using a particular tool. All DSS are much easier to use, but we can do more to improve usability and reduce information load.

10. Visualization, graphics intensive, visual applications -- visualization involves creating images, diagrams, or animations to communicate a message. Modern DSS increasingly include capabilities to see and manipulate visualizations.

DSS vs. Other ISs.

It is clear that DSSs are used to support decision processes as do Management Information Systems (MIS), Database Management Systems (DBMS), On-line Analytic Processing (OLAP), and also some Knowledge-Based Systems (KBS). All these systems may support decision makers on-line and in an interactive mode so that this feature does not distinguish DSS from other systems. The main difference between DSS and other information systems lies in the model component: formal quantitative models are an integral part of a DSS (Emery 1987; Bell 1992). These models, for example, statistical, simulation, logic and optimization models are used to represent the decision problem; their solutions are decision alternatives.

However, the model need not be defined a priori but may be constructed during the decision making process.

Beulens and Van Nunen (1988) reiterate that a DSS enables managers to use data and models related to an entity (object) of interest to solve semi-structured and unstructured problems with which they are faced. This view allows us to incorporate some of the functions of DBMS and MIS in a DSS. It also emphasizes that a DBMS is an important component of a DSS which also needs reporting capabilities. This is because data used to determine the parameters of a decision model needs to be analyzed and verified. A decision maker requires facilities to extract and view data describing an entity or an object to be able to verify and possibly modify the parameters. While DBMS and MIS are used to provide information about past and present, a DSS is used to determine decisions that will be implemented and will produce outcomes in the future. Thus, the decision maker may need to use models to extrapolate data and obtain a description of the future state of an entity or of an object of interest. The main goal of this research is to explore the managerial requirements that facilitate DSS utilization in PM . The researcher believes that this will eventually assist the Palestinian Government in reforming the governmental sector by enhancing the transparency and governance for all management levels in PM s.

1.2 Research Problem

Abu Sabat (2005) has recommended for further research dedicated for the role of Information Systems in the decision-making process in the Palestinian Governmental Sector. Shantaf(2000) has concluded that Human Resource at commercial banks in Gaza is not competent toward utilization of modern information technologies.

Among the desire of PM to formulate real reform in the managerial level in order to enhance the effectiveness and transparency of the general activities in order to provide the Palestinian public with best service . One of the most critical areas that need assessment is the managerial requirements status toward utilization of DSS. The following question can summarizes the research problem as follows:

What are the managerial requirements that facilitate utilization of DSS in the Palestinean Ministries management levels?

For better understanding of the research problem; the following questions have been derived:

1. Is there awareness of the importance of utilized DSS in PM management levels?

2. Is there a need for utilized DSS awareness enhancements in the main PM management domains?
3. Is there proper Human Resource System in PM that facilitates utilization of DSS?
4. Is Organization Structure in PM facilitating utilization of DSS?
5. Is there proper Business Process System in PM that facilitates utilization of DSS?
6. Is there proper Change Control System in PM management that facilitates utilization of DSS?
7. Is there Conduct and Commitment that facilitate utilization of DSS in PM?
8. Are there differences at trends of managers in respect to managerial requirements of DSS due to the age in years, education level, experience and gender?

1.3 Research Hypothesis

H1 There is significant statistical relation between poor DSS utilization and the extent of awareness of DSS importance in PM management levels at significant level $\alpha = 0.05$.

H2 There is statistically evident that there is a need for awareness enhancements for utilized DSS in PM main management domains (Human Resource domain, Organization Structure domain, Business Process domain, Control of Change domain and Conduct &Commitment domain) at significant level $\alpha = 0.05$.

H3 There is significant statistical relation between of poor DSS utilization and availability of proper Human Resource System in PM at significant level $\alpha = 0.05$.

H4 There is significant statistical relation between poor DSS utilization and the availability of proper Organization Structure in PM at significant level $\alpha = 0.05$.

H5 There is significant statistical relation between poor DSS utilization and availability of proper Business Process System at significant level $\alpha = 0.05$.

H6 There is significant statistical relation between poor DSS utilization and availability of proper Change Control System in PM at significant level $\alpha = 0.05$.

H7 There is significant statistical relation between poor DSS utilization and availability of proper Conduct and Commitment in PM management levels at significant level $\alpha = 0.05$.

H8 There are no significant statistical differences at trends of managers in respect to managerial requirements of DSS due to the age in years, experience and education level.

1.4 Research Objectives

1. Evaluate the awareness of the importance of DSS in Palestinian governmental sector management levels.
2. Explore if there is a need for DSS in Palestinian governmental sector management levels.
3. Evaluate the Human Resource competency requirements that facilitate utilization of DSS in the Palestinian governmental management levels
4. Assess the Organization Structure that facilitates the utilization of DSS in Palestinian governmental management levels.
5. Evaluate the internal business process characteristics that facilitate the utilization of DSS in Palestinian governmental management levels.
6. Evaluate the internal control of change system that facilitates the utilization of DSS in Palestinian governmental management levels.
7. Evaluate the Conduct & Commitments that facilitates the utilization of DSS in Palestinian governmental management levels.

1.5 Importance of the Research

1. Up to the researcher; this is the first academic study that examines the management status toward utilization of DSS in PM.
2. The research provides a clear insight to the appropriate management that facilitate utilization of DSS; which will lead to identify the areas that should be enhanced.
3. The research will include suggestions of capacity building in the PM management levels.
4. Upon successful completion, this research can be the bases of other applied researches.

1.6 Research Structure

Chapter 1 Introduction; the researcher in this chapter presents the conceptual frame of the study which includes the study importance , research problem , thesis statement , research questions , the hypothesis , research objectives , research scope , research limitations and key terms.

Chapter 2: Theoretical framework; the researcher build up this framework in away it addresses the major aspects of the study. The concept of the researcher was to identify major six categories that are close to the core of the research; a- DSS overview b- DSS role in management decision-making c- Human-Computer Interface that facilitate DSS utilization e-Organization Structure models revisions that smooth the process of DSS utilization f- Business Process Management review and models that support the DSS utilization and finally.

Chapter 3: Previous Studies in this chapter the researcher identified findings of the most relevant studies that related to managerial factors affecting DSS utilizations and developments, some practices have been underlined and other milestones have been presented.

Chapter 4: Research Methodology; this chapter discusses the research methodology including explanation about survey, sampling and instrument development that applied in this study research.

Chapter 5: Data Analysis and Discussions; this chapter explains and discusses about the analysis of the data collected, analysis results, hypothesis testing and finally confirmation / disconfirmation of the hypothesis including interpretation of results with linkage with relevant previous studies.

Chapter 6: Conclusions and Recommendations; in this chapter the researcher has summarized the main conclusions drawn as result of the empirical part of the thesis study then presents some sort of recommendations appropriated to the core of the thesis including future suggestions .

Chapter 2 - Theory Framework

2.1 Introduction

This chapter briefly reviews the principles underlying the core of the study; the first section presents overview about DSS in terms of definition and phlesophy, origin of DSS, taxonomies, architecture, characteristics & capabilities and finally the future trends of DSS developments particularly in the areas of (1- Expert system 2-Fuzzy logic 3-Artificial Neural Network) including the advancements in software & hardware.

The second section focuses on role of DSS in management decisions; basically reviewing the management cycle with linkage and integration to the management pyramid.

Section four in this chapter underlines the importance of Human-Computer Interface (HCI) to the DSS utilizations; the chapter approaches the concept of HCI, importance of HCI, research framework of HCI and finally the chapter presents recommended model for training and organization learning. Section five presents relevant key organization structures including at the end of the section brief details about four levels organization model by Gachet (2004) which is essential to be adapted to have such flexible organization structure that facilitate utilization of DSS. Section six underlines the concept of business process management and certain attributes that related to optimize the DSS in general within the organization.

2.2 DSS Overview

2.2.1 DSS Definitions and Phlesophy

The concept of a Decision Support System DSS is extremely broad and its definitions vary depending on the author's point of view (Druzdzel and Flynn, 1999). It can take many different forms and can be used in many different ways (Alter, 1980). On the one hand, Finlay (1994) and others define a DSS broadly as "a computer-based system that aids the process of decision making".

In a more precise way, Turban (1995) defines it as "an interactive, flexible, and adaptable computer-based information system, especially developed for supporting the solution of a non-structured management problem for improved decision making. It utilizes data, provides an easy-to-use interface, and allows for the decision maker's own insights." Other definitions fill the gap between these two extremes. For Keen and Scott Morton (1978), DSS couple the intellectual resources of individuals with the capabilities of the computer to improve the quality of decisions. "DSS are computer-based support for management decision makers who are dealing with semi-

structured problems." For Sprague and Carlson (1982), DSS are "interactive computer-based systems that help decision makers utilize data and models to solve unstructured problems."

On the other hand, Schroff (1998) quotes Keen (1980) ("there can be no definition of Decision Support Systems, only of Decision Support") to claim that it is impossible to give a precise definition including all the facets of the DSS. Nevertheless, according to Power (1997), the term Decision Support System remains a useful and inclusive term for many types of information systems that support decision making. He humorously adds that every time a computerized system is not an on-line transaction processing system (OLTP), someone will be tempted to call it a DSS.

So early DSS like the first Atari games still have some interest; however the capabilities of modern DSS are much advanced. The features of the specific categories of DSS have been reviewed. The discussions on communications-driven DSS (Power, 2007a), data-driven DSS (Power, 2007b), document-driven DSS (Power, 2007c), knowledge-driven DSS (Power, 2007d), and model-driven DSS (Power, 2007e). The defining characteristics of DSS have not changed. DSS remain characterized by facilitation, interaction, ancillary, repeated use, task oriented, identifiable and decision impact (cf., Power, 2003).

The following is a list of attributes that are becoming increasingly common in new and updated decision support systems. Not all modern DSS have these attributes, but some do! Some attributes are more closely associated with one category of DSS than another, but complex DSS often have multiple subsystems that fit in different categories. So for example, a complex, modern DSS may have a well-defined data-driven subsystem and a model-driven decision support subsystem. Major attributes of modern DSS include:

1. Broad domain of applications with diverse functionality -- which uses a DSS and for what purpose has expanded. We are identifying many use cases for DSS and we are beginning to capture each specific use in use case models.
2. Faster access to data stored in very large data sets -- data access refers to software and activities related to retrieving or acting upon data in a database or other repository. Data-driven DSS can have almost unlimited historical data stores.
3. Faster deployment -- software deployment is all of the activities that make a new DSS available for use. Faster deployment is partly due to the use of Web technologies, but better

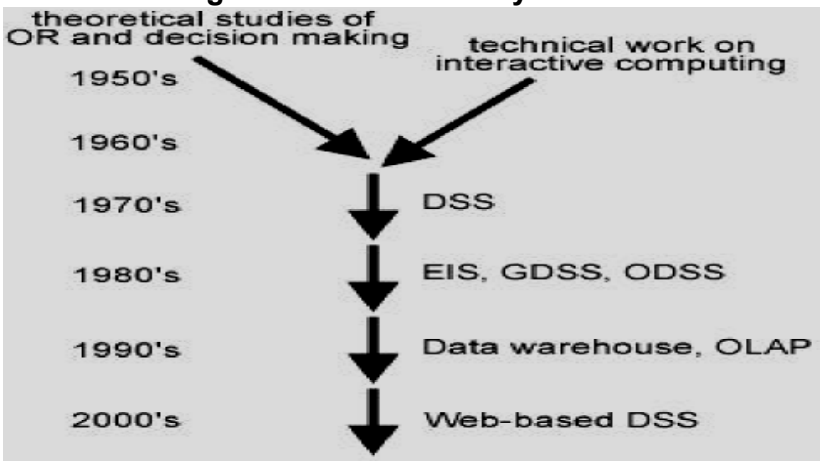
prototyping, templates, and vertical market applications also speed deployment of DSS.

4. Faster response -- how quickly an interactive system responds to user input has improved significantly. In a distributed computing environment, the lagg with video, voice, data retrieval or transmitting model results is now negligible.
5. Integrated DSS with Transactions Processing System (TPS), multiple decision support subsystems -- enterprise-wide decision support applications are increasingly common. A standardized interface and single sign-on security helps create an integrated and unified decision support/transaction processing environment. The days of standalone DSS are numbered and few.
6. Multi-user and collaborative interaction -- DSS is increasingly collaborative and shared decision making environments.
7. Real-time data, DSS use and system response-- the classical conception is an immediate real-time system that is used while action is occurring. That vision is increasingly possible and sometimes very useful. See the Ask Dan! columns on real-time DSS (cf., Power, 2002a, 2002b).
8. Ubiqitous -- DSS are available and seem to be usable everywhere. DSS for a particular function can go with the targeted user.
9. User friendly and a better user experience -- Usability denotes the ease of using a particular tool. All DSS are much easier to use, but we can do more to improve usability and reduce information load.
10. Visualization, graphics intensive, visual applications -- visualization involves creating images, diagrams, or animations to communicate a message. Modern DSS increasingly include capabilities to see and manipulate visualizations.

2.2.2 DSS Origin

According to Keen and Scott Morton (1978), the concept of decision support has evolved from two main areas of research: the theoretical studies of organizational decision making done at the Carnegie Institute of Technology during the late 1950s and early 1960s, and the technical work on interactive computer systems, mainly carried out at the Massachusetts Institute of Technology in the 1960s.

Figure 2.1 a brief history of DSS



Source (Power, 2002)

It is considered that the concept of DSS became an area of research of its own in the middle of the 1970s, before gaining in intensity during the 1980s (Haettenschwiler, 1999). In the middle and late 1980s, Executive Information Systems (EIS), Group Decision Support Systems (GDSS), and Organizational Decision Support Systems (ODSS) evolved from the single user and model-oriented DSS. Beginning in about 1990, data warehousing and On-Line Analytical Processing (OLAP) began broadening the realm of DSS. As the millennium approached, new Web-based analytical applications were introduced. It is clear that DSS belong to an environment with multidisciplinary foundations, including (but not exclusively) database research, artificial intelligence, human-computer interaction, simulation methods, software engineering, and telecommunications.

In a technology field as diverse as DSS, chronicling history is neither neat nor linear. Different people perceive the field of Decision Support Systems from various vantage points and report different accounts of what happened and what was important (cf., Arnott & Pervan, 2005; McCosh & Correa-Perez, 2006; Power, 2003; Power, 2004a). As technology evolved new computerized decision support applications were developed and studied. Researchers used multiple frameworks to help build and understand these systems. Today one can organize the history of DSS into the five broad DSS categories explained in Power (2001; 2002; 2004b), including: communications-driven, data-driven, document driven, knowledge-driven and model-driven decision support systems.

2.2.3 DSS Taxonomies

As with the definition, there is no universally accepted taxonomy of DSS either. Different authors propose different classifications. Using the relationship with the user as the criterion, Haettenschwiler (1999) differentiates passive, active, and cooperative DSS. A passive DSS is a system that aids the process of decision making, but that cannot bring out explicit decision suggestions or solutions. An active DSS can bring out such decision suggestions or solutions. A cooperative DSS allows the decision maker (or its advisor) to modify, complete, or refine the decision suggestions provided by the system, before sending them back to the system for validation. The system again improves, completes, and refines the suggestions of the decision maker and sends them back for validation. The whole process then starts again, until a consolidated solution is generated. Using the model of assistance as the criterion, Power (2002) differentiates communication-driven DSS, data-driven DSS, document-driven DSS, knowledge-driven DSS, and model-driven DSS.

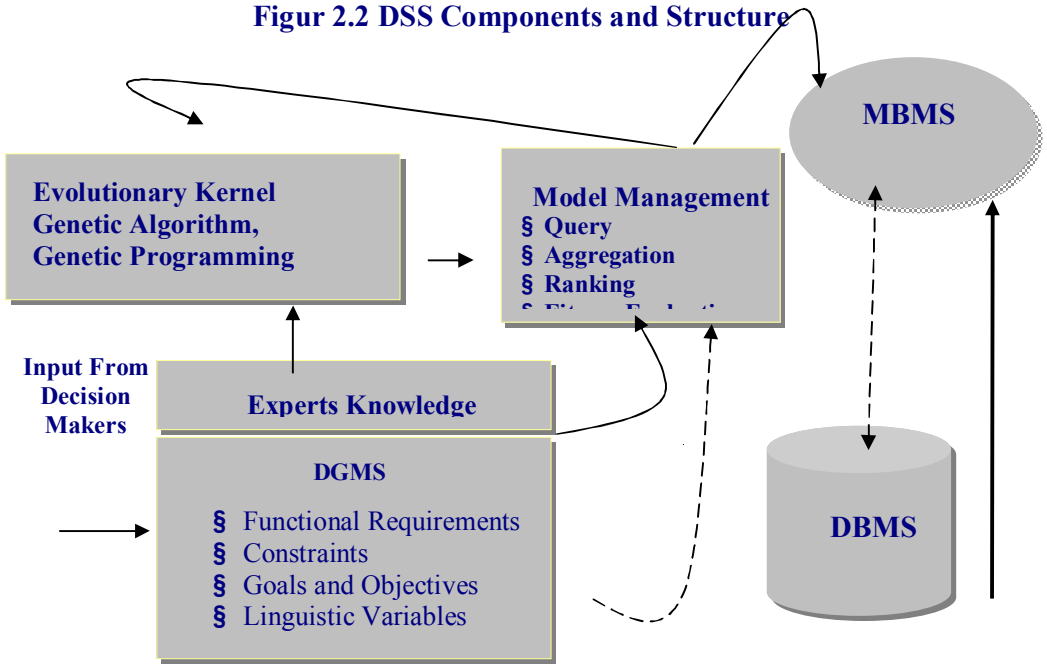
1. A model-driven DSS emphasizes access to and manipulation of a statistical, financial, optimization, or simulation model. Model-driven DSS use data and parameters provided by users to assist decision makers in analyzing a situation; they are not necessarily data intensive. Dicodess is an example of an open source model-driven DSS generator (Gachet, 2004).
2. A data-driven DSS or data-oriented DSS emphasizes access to and manipulation of a time series of internal company data and, sometimes, external data.
3. A document-driven DSS manages, retrieves and manipulates unstructured information in a variety of electronic formats.
4. A knowledge-driven DSS provides specialized problem solving expertise stored as facts, rules, procedures, or in similar structures (Power, 2002).
5. Using scope as the criterion, Power (1997) differentiates enterprise-wide DSS and desktop DSS. An enterprise-wide DSS is linked to large data warehouses and serves many managers in the company. A desktop, single-user DSS is a small system that runs on an individual manager's PC.

2.2.4 DSS Architecture

Once again, different authors identify different components in a DSS. Sprague and Carlson (1982) identify three fundamental components of DSS: (a) the database management system (DBMS),

(b) the model-base management system (MBMS), and (c) the dialog generation and management system (DGMS).

Figur 2.2 DSS Components and Structure



Source: Haag and others (2000)

Haag and others (2000) describe these three components in more detail: The Data Management Component stores information (which can be further subdivided into that derived from an organization's traditional data repositories, from external sources such as the Internet, or from the personal insights and experiences of individual users); the Model Management Component handles representations of events, facts, or situations (using various kinds of models, two examples being optimization models and goal-seeking models); and the User Interface Management Component is of course the component that allows a user to interact with the system. According to Power (2002), academics and practitioners have discussed building DSS in terms of four major components: (a) the user interface, (b) the database, (c) the model and analytical tools, and (d) the DSS architecture and network.

The Database; the database contains information about internal data and external data that will contribute to the decision making process. This data is in most cases more extensive than the Model Base; this module contains a set of algorithms that makes decisions based on the

information in the database. This information is then summarized and displayed as tables or graphs. The Interface; this is what the user will use to interact with the system. This is complimented with an interactive help and navigation screen. Framework DSS systems are not entirely different to other systems and require a structured approach. A framework was provided by Sprague and Watson (1993).

The framework has three main levels. 1. Technology levels 2. People involved 3. The developmental approach

1. Technology Levels; the same Sprague has suggested that there are three levels of hardware and software that have been proposed for DSS.
    a. Level 1 – Specific DSS; this is the actual application that will be used to by the user. This is the part of the application that allows the decision maker to make decisions in a particular problem area.
    b. Level 2 – DSS Generator; this level contains Hardware/software environment that allows people to easily develop specific DSS applications.
    c. Level 3 – DSS Tools Contains lower level hardware/software. DSS generators including special languages, function libraries and linking modules
2. People Involved; Sprague suggests there are 5 roles involved in a typical DSS development cycle.
    a. The end user.
    b. An intermediary.
    c. DSS developer
    d. Technical supporter
    e. Systems Expert
3. Developmental the developmental approach for a DSS system should be strongly iterative. This will allow for the application to be changed and redesigned at various intervals. The initial problem is used to design the system on and then tested and revised to ensure the desired outcome is achieved.

Hättenschwiler (1999) identifies five components of DSS: (a) users with different roles or functions in the decision making process (decision maker, advisors, domain experts, system experts, data collectors), (b) a specific and definable decision context, (c) a target system

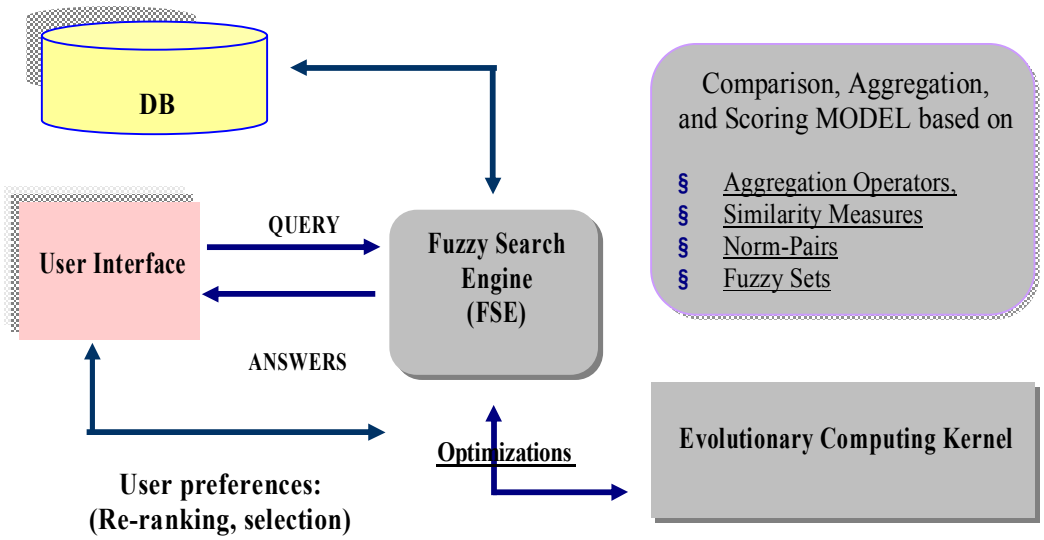
describing the majority of the preferences, (d) a knowledge base made of external data sources, knowledge databases, working databases, data warehouses and meta-databases, mathematical models and methods, procedures, inference and search engines, administrative programs, and reporting systems, and (e) a working environment for the preparation, analysis, and documentation of decision alternatives.

Building upon the various existing architectures, Marakas (1999) proposes a generalized architecture made of five distinct parts: (a) the data management system, (b) the model management system, (c) the knowledge engine, (d) the user interface, and (e) the user(s). Here are several ways to classify DSS applications. Not every DSS fits neatly into one category, but a mix of two or more architecture in one. Holsapple and Whinston (1996) classify DSS into the following six frameworks: Text-oriented DSS, Database-oriented DSS, Spreadsheet-oriented DSS, Solver-oriented DSS, Rule-oriented DSS, and Compound DSS. A compound DSS is the most popular classification for a DSS. It is a hybrid system that includes two or more of the five basic structures described by (Holsapple and Whinston ,1996).

The support given by DSS can be separated into three distinct, interrelated categories Holsapple and Whinston (1996) Personal Support, Group Support, and Organizational Support. Additionally, the build up of a DSS is also classified into a few characteristics. 1) Inputs: this is used so the DSS can have factors, numbers, and characteristics to analyze. 2) User knowledge and expertise: This allows the system to decide how much it is relied on, and exactly what inputs must be analyzed with or without the user. 3) Outputs: This is used so the user of the system can analyze the decisions that may be made and then potentially 4) make a decision: This decision making is made by the DSS; however, it is ultimately made by the user in order to decide on which criteria it should use. DSSs which perform selected cognitive decision-making functions and are based on artificial intelligence or intelligent agent's technologies are called Intelligent Decision Support Systems (IDSS). DSS are supporting the decision making process , considering the complexity of natural resource decision problems within multiple-purpose management with many site and stand attributes, neither intuitive nor schematic solutions are appropriate planning approaches. For such problems, a formal decision analysis is strongly recommended: (1) structuring the decision problem, (2) assessing the impacts of each possible solution, (3) determining the preferences of the decision maker and (4) comparing the decision alternatives. In this context DSSs provide support to solve ill-structured decision problems (Leung, 1997; Rauscher, 1999) by integrating database management systems with analytical and operational research models, graphic display, tabular reporting capabilities, and the expert knowledge of

scientists, managers, and decision makers to assist in solving specific problems (Fischer et al., 1996). DSSs have proved to be most useful for complex, strategic problems, that is, for problems that cannot be completely supported by algorithms and analytical solutions (Turban and Aronson, 2005).

Figure 2.3 DSS: Interaction and Optimization



Source: (Turban and Aronson,2005)

A good decision, in the sense of decision science (e.g., Keeney, 1982), builds on objective information as well as the preferences and expertise of stakeholders and decision makers. Without such tools, forest owners usually do not otherwise have access to quantitative information about future stand development and the consequences in terms of resource conditions and economic outcomes. Thus, the DSS approach has the potential to facilitate good decisions. A "good" decision is one that is made based on a thorough understanding and analysis of the problem (Holloway, 1979). The consequences of a "good" outcome are favorable with respect to the preferences of the decision maker. There is no guarantee that a good decision will always achieve a good outcome. A decision resulting in a bad outcome could still be considered a good decision as long as the decision-making process indicated the possibility of a bad outcome. Yet it puts emphasis on the improvement of the effectiveness of forest management by better representation of decision-making problems. Decision-making may take longer but decisions are better (Turban and Aronson, 2005).

2.2.5 DSS Characteristics and Capabilities

Because there is no exact definition of DSS, there is obviously no agreement on the standard characteristics and capabilities of DSS; the researcher will present the research of Alter (1980) and Turban (2005). Alter (1980) concluded from his research that decision support systems could be categorized in terms of the generic operations that can be performed by such systems. These generic operations extend along a single dimension, ranging from extremely data-oriented to extremely model-oriented. Alter conducted a field study of 56 DSS that has categorized into seven distinct types of DSS. His seven types include:

1. File drawer systems that provide access to data items.
2. Data analysis systems that support the manipulation of data by computerized tools tailored to a specific task and setting or by more general tools and operators.
3. Analysis information systems that provide access to a series of decision-oriented databases and small models.
4. Accounting and financial models that calculate the consequences of possible actions.
5. Representational models that estimate the consequences of actions on the basis of simulation models.
6. Optimization models that provide guidelines for action by generating an optimal solution consistent with a series of constraints.
7. Suggestion models that perform the logical processing leading to a specific suggested decision for a fairly structured or well-understood task.

Turban (2005) and others constitute an ideal set of characteristics and capabilities of DSS. The key DSS characteristics and capabilities are as follows:

1. Support for decision makers in semi structured and unstructured problems.
2. Support managers at all levels.
3. Support individuals and groups.
4. Support for interdependent or sequential decisions.
5. Support intelligence, design, choice, and implementation.
6. Support variety of decision processes and styles.
7. DSS should be adaptable and flexible.
8. DSS should be interactive and provide ease of use.

9. Effectiveness balanced with efficiency (benefit must exceed cost).
10. Complete control by decision-makers.
11. Ease of development by (modification to suit needs and changing environment) end users.
12. Support modeling and analysis.
13. Data access.
14. Standalone, integration and Web-based.

2.2.6 Future Trends of DSS

One of the most prevalent technologies today is the relational database system. With the appropriate data, relational database systems are able to predict the best potential future opportunities and threats for prospective line of business. Unfortunately, the appropriate data is not always available; therefore, relational database systems often lack the ability to predict the best future. More promising and relatively successful technologies are Expert Systems, Fuzzy Logic, and Artificial Neural Networks (ANN).

2.2.6.1 Expert Systems

Expert Systems are designed to store specific business knowledge from experts and to make that knowledge available for problem solving; they can play a role in support of decision making process (MaLec, 2002). The researcher will present three expert examples of

- STRATEX – Allows for market planning in the export trade of fish and fisheries products (MaLec, 2002). Indications are that this system was actually developed by Nokia.
- COMSTRAT – A prototype system for strategic management decisions with special emphasis on competitive positioning (MaLec, 2002). This system makes use of a multi-agent view of strategic planning using group support systems (Li, 2007).
- Woodstrat – A Management Decision Support System (MDSS) with expert capabilities for use with action program activities at the corporate, divisional, and business unit levels in Finnish forest and wood industries (MaLec, 2002).

2.2.6.2 Fuzzy Logic

Fuzzy Logic , aims at modeling the complex reasoning that plays an important role in the human ability to make rational decisions in an environment of uncertainty and imprecision. Only recently has this technology found its way into DSS (MaLec, 2002).

- AMOS – A probability-driven, customer-oriented DSS for target marketing of solo mailings (MaLec, 2002). AMOS enables the user to perform market research on how customer behavior impacts new products (AMOS, 2007).
- Fuzzy Team Decision Model – A conceptual framework for the design of new computer-based decisions systems and information systems that support decision processes for new product introduction (MaLec, 2002). One design problem that exists in this model is that the information cannot be accessed in a quantitative manner (Ullah, 2005).

2.2.6.3 Artificial Neural Network

Artificial Neural Networks: (ANN). Artificial Neural Networks are distributed information-processing systems that are important in modeling fuzzy and uncertain phenomena and in forecasting non-linear systems (MaLec, 2002).

- Market Segmentation – ANN technology enables the formation of models to analyze market segments. (MaLec, 2002).
- Neural Network Model for Predicting Market Responses – A data modeling tool that is able to learn and store knowledge, used for capturing markets though powerful input and output (MaLec, 2002).
- Neural Network Model for Decision Support – Neural networks used as a tool for analyzing market share using the PIMS (Profit Impact of Market Strategy) database (MaLec, 2002). With appropriate input, users are able to analyze the market and learn from past experiences with Neural Network Modeling.

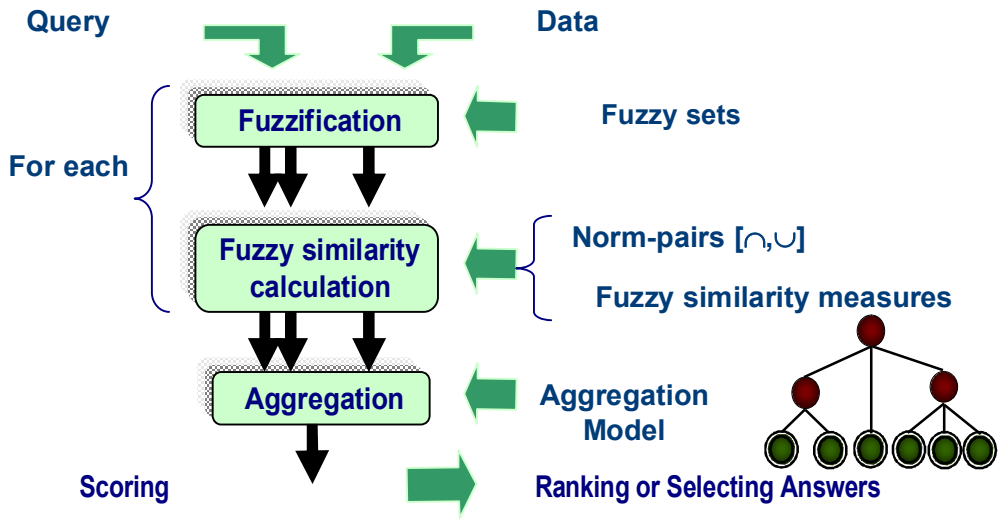
The most practical and prominent technologies in use, however, are simple database systems and spreadsheets. Databases like Microsoft Access are cheap and portable; spreadsheet designs with complex formulas are also easy to use and very portable. In some cases, people will link the two tools to create presentations that demonstrate creative market design models. These creative designs include large amounts of data to increase the accuracy of the presentation.

2.2.6.4 The outlook for DSS and AI

Future developments of DSSs will incorporate Artificial Intelligence (AI). The product will be a system unhindered by the problem of new products without comparable counterparts on the market. Systems will be able to analyze trends in the complex business environment and predict reliably product demographics. The best system will be reusable and will fit models in that it will be a framework that is reusable across multiple organizations / companies and it will fit the

before mentioned criteria of DSS (Power, 2003).Future DSS will include four criteria: robustness, ease of control, simplicity, and completeness of relevant detail.

Figure 2.4 Multi-Criteria Decision Model



Source: (MaLec, 2002)

Reusability will be accomplished through some type of software or hardware framework conforming to Alter's model, enabling institutions to take advantage of basic, generalized models common to a range of scenarios.

2.2.6.5 Software Advancements

Software expands the use of current technology to shape the design of future Decision Support Systems. According to AMOS (2007) The DSS software of the future must possess the following qualities:

1. Software must be reusable across companies and must be generic in nature.
2. Unlike the relational database systems of today, software developed in the future must not be dependent on large amounts of data entry. They must be able to predict information about products coming to market without the use of existing data.
3. Prediction models will need to be included. Businesses should be able to examine what will happen if they explore a certain market or expand a market.
4. The system must be affordable so that any size of business can take advantage of it.

2.2.6.6 Hardware Advancements

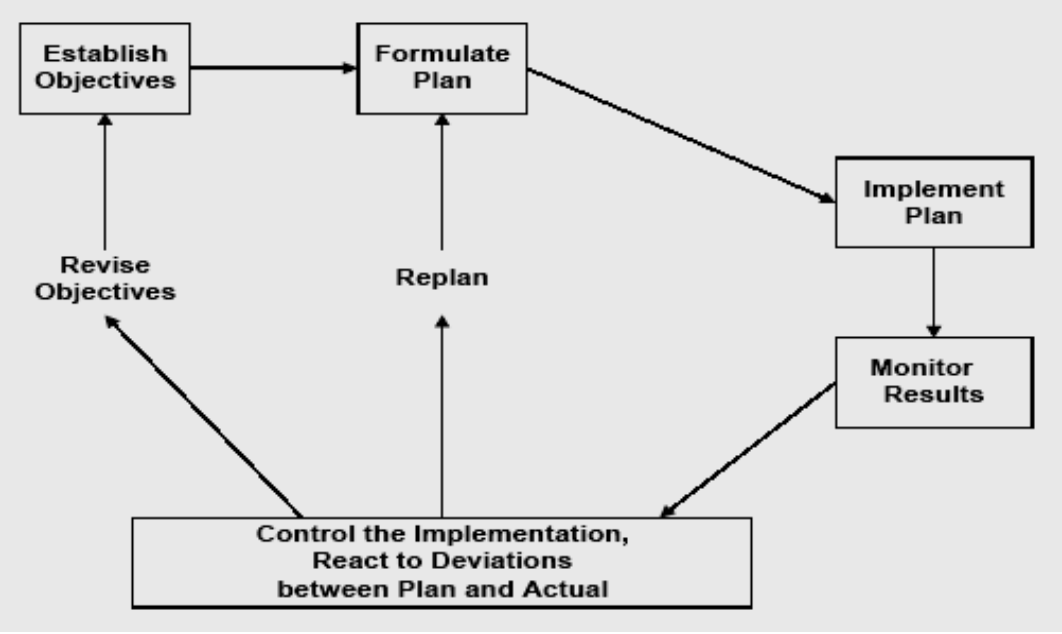
We are on the brink of new and faster hardware advancements limited only by the imaginations of their designers and the fundamental properties of physics. We hear almost daily of new technologies that are able to process information faster and faster. Obviously, similar computing hardware and software will make use of this increasing power. Many cars have more computing power than the very first DSS systems. Hardware growth is a double edged sword: new technology opens new avenues in DSS, but it also causes hardware to become obsolete very quickly.

2.3 DSS Role in the Management Decisions

2.3.1 DSS role in Management Cycle

In order to examine the role of DSS in the management cycle; a broad understanding of the basic functions of management should be reviewed. Mohan (2007) define management in terms of tasks that mangers perform and control as "; Implement the plan; Monitor performance; and, Control the implementation to ensure achievement of desired results."

Figure 2.5 The management life cycle - Mohan (2007)



Source: Mohan (2007)

Objectives have to be set and a plan has to be formulated to achieve these objectives. Once the plan is implemented, the control function takes over for assuring the accomplishment of the plan's objectives. This requires actual outcomes to be monitored and corrective action to be taken when actual deviate from planned objectives. The corrective action could encompass tactical changes to the plan, or even a revision in the original objectives. Deviations between actual and plan could be negative or positive. In the former case, it signals a problem that has to be dealt with. In the latter, it reveals an opportunity that should be exploited. The entire process, depicted in figure 2.2 is cyclical in the sense that the control function loops back into the planning function, and the cycle repeats itself.

2.3.2 DSS for Planning and Control

Again, Mohan (2007) highlights three complicated factors that affect the process of underlying the choice from (perhaps many choices) as following:

1. The Large Number of Alternatives The right choice is totally dependent on the variety of alternatives evaluated. The problem is how to evaluate this large number in a cost-effective manner within the limited time available.
2. Uncertainty about the outcomes in virtually all real-world planning situations, outcomes are not known for sure. This is true even when the number of alternatives is very limited.
3. Multiple Criteria; there is no single yardstick or criterion for measuring many outcomes. Example in pension environment where the researcher is currently working the outcome of the pensioner's future benefits determination based on many parameters of outcome; economic, demographic and social.

A DSS to support the planning process is hence not easy to design. A pragmatic approach is contained in the concept of a "satisfying" solution to a decision problem rather than an "optimum" solution.

2.3.3 Monitoring

The monitoring function supplies the data for exercising control to ensure that the objectives of the plan are achieved. Hence, the control function can only be as effective as the monitoring of actual performance. Several questions have to be addressed here: What should be monitored? What "readings" of actual performance should be taken? How should the monitoring be done? Where should the "meters" for taking the "readings" be placed? How often should the "meters"

be read? How Current? How quickly should the readings be transmitted to management for action to be taken? How Accurate?

In regards to the information consistent to Control; the data generated by the monitoring will eventually converted to information to support the control function or deviations between actual and plan, have to be determined and linked to their root causes. The pinpointing of the root causes is critical for the appropriate corrective action to be taken.

All the above is a simple enough statement, but it encapsulates several prerequisites on the information needed for effective control. Before discussing these requirements, we note that the control function is not driven only by variances between plans and actual. Other differences, such as the difference between actual for this year and last year, or between two divisions of the organization, or between "us" and "them" (the competition), can also bring problems and opportunities to the surface. Pounds (1996) observed that looking at differences or changes in situations is a manager's principal means of problem-finding. According to Mohan (2007); the following are some generalizations on the information required to establish control:

1. Summary reports that are generated by existing MIS systems as a means of reducing the data overload are not enough since they can hide problems.
2. To reduce the data overload, exception reports that spotlight data which have strayed from benchmarks or expected levels are mandatory.
3. A drill-down capability is essential for accessing detailed data to trace a problem to the root cause.
4. Graphics capability is a must, since comparisons can be made in seconds as opposed to several minutes to absorb the same information from a tabular report. For example, the cumulative expenditures graph.
5. It is not sufficient to know just "what happened." There should be a minimal analysis capability to evaluate the consequences of performance to date.

2.3.4 The management pyramid and management functions

Having outlined the nature of the information required to support the planning and control functions, the turn now to the question of who performs those functions in an organization. According to Mohan (2007); the user (or user group) should be the owner and driver of a DSS system for the simple reason that the whole purpose of the system is to support that particular

user (or group). The starting point for designing a DSS is, hence, the user and the specific task of that user which the DSS aims to support. In this context, the level of the user in the organization has an important bearing, since it defines the scope of the tasks that the user is responsible for. In fact, the particular type of DSS that has been labeled Executive Information Systems was developed in response to the needs of top management for information to support them in their sphere of responsibility.

Anthony Robert N. (1965) has provided a useful framework for viewing the management functions in relation to the three broad tiers of an organization was provided by in a classic treatise on planning and control systems. According to Anthony, top management should be concerned with strategic planning, middle management with management control, and lower management with operational control, which he defined as follows

- Strategic Planning: the process of deciding on objectives, on the resources used to attain these objectives, and on the policies that are to govern the acquisition, use, and disposition of these resources.
- Management Control: the process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of the organization's objectives.
- Operational Control: the process of assuring that specific tasks are carried out effectively and efficiently.

Anthony (1965) goes on to clarify that while strategic planning is concerned with the "big picture, management control is concerned with the continual administration of the organization, and takes place within the objectives defined in the strategic planning process. Thus, management control is concerned with both the planning and execution of unspecified activities, whereas operational control deals with the execution of specified tasks. In a nutshell, the function of top management is, to a large extent, planning; that of middle management involves less planning and more control; and, as we go down to the bottom of the pyramid, the control function becomes more and more important.

Radford, K.J. (1990) has categorized the tree management tiers in terms of information requirements and managers interest as in table 2.1. What are the implications on the information support for each tier of the management pyramid? The following observations by Mohan (2007); can be made about the attributes of the information required:

1. The scope of the information is narrow and well-defined at the lowest tier and becomes wider and fuzzier as one move up the pyramid.

2. The sources of the data required at the top management level is largely external - involving competition, customers, trends in the economic environment, social trends, etc. On the other hand, most of the data required for operational control at the lower levels of the organization is internal, with one notable exception - the sales function. The very nature of that function requires external data on customers and competitors to be available all the way down to the front-line salespeople.

3. The time horizon of the information required is mostly historical at the lower level as against mostly about the future at the top level.

4. The level of detail in the information required at the different levels is not as straightforward as the previous attributes. The operational control function requires detailed data on specific tasks. Since the scope of the responsibility at the lower level is narrow, this detail can be absorbed by the users and acted upon. Moving up the pyramid, the scope of responsibility and, hence, the information required gets wider. Conventional wisdom suggests that, as you go up the pyramid, the information presented to management should be more and more summarized and compact.

Table 2.1
Outline of Managers information requirements. Radford, K.J. (1990)

Management Level	Information Use	Information Requirements
Top Management	§ Goal setting § Long-range plans Strategy	§ External Information, e.g. competitor actions, government regulation, economic factors, resource availability. § Internal Information e.g. financial reports, key exception reports, etc. § Long term trends. § Conjoint analysis ("what if" analysis)
Middle Management	§ Definition of objectives § Medium range plans § Tactical decisions	§ Internal information § Short term trends § Some conjoint analysis
Lower Management	§ Attainment of objectives § Short range plans § Supervision	§ Internal information e.g. recent historical information, detailed operational reports, appropriate exception reports

Source: Radford, K.J. (1990)

2.3.4 The Role of DSS in the Decision Process

Decision support systems (DSS) disciplines deal with the use of information technology, to support human decision-making processes. It is a computer-based support system for management decision-makers who deal with semi-structured problems (Keen and Scott, 1978).

This consequently triggers the questions; who is the decision-maker? What kinds of data serve as inputs to the decision-making process? What does the decision-making process itself look like? What kinds of risks and constraints are associated with the decision-making process? How is the output of the decision-making process – a decision – evaluated, implemented and tracked?

2.3.4.1 The Decision Process

Simon (1960) suggested that the manner in which human beings solve problems, regardless of their position within an organization, can be broken down into three phases:

1. **Phase I** Intelligence
2. **Phase II** Design
3. **Phase III** Choice

In calling the first phase "intelligence," Simon borrowed the military meaning, and noted that the first phase in the decision-making process is "searching the environment for conditions calling for decision." In other words, the problem (or opportunity) has to be first identified. Next, the possible courses of action have to be developed - the "design" phase.

Finally, the "choice" phase involves the selection of a course of action from the available alternatives. Simon cautions that each of these phases could itself be a decision-making process. For example, the design phase may require new intelligence. Or, a problem could be comprised of sub-problems which have their own intelligence, design, and choice phases. Yet, Simon concludes that: The three large phases are closely related to the stages in problem solving first described by 1John Dewey: "What is the problem? What are the alternatives? Which is best? Drawing on Simon's model, the decision process can be viewed as consisting of two major stages: problem finding and problem solving.

Again Herbert Simon (1960) concluded that managers often look at differences of many different sorts in order to find problems. Problem solving requires, first, design of what actions might be taken, then, making a choice and, finally, a review of the results. This could, in turn, lead to finding a new problem (or opportunity).

2.3.4.2 Role of DSS in Decision-Making Process

DSS systems, if properly designed, can make a significant contribution at the problem finding stage to determine the real problem underlying an observed symptom. DSS systems can be quite helpful in the review or postfacto evaluation of the results of past actions to get a better insight

into "what happened" and further, "why did it happen?" In contrast, the design of alternative courses of action to address the problem at hand is essentially a creative task. A DSS can support this task through an analysis of relevant historical date, if available, to show what worked and what did not work. The decision maker can benefit from these lessons of history when thinking up alternative solutions to the current problem.

Table 2.2 Role of DSS in the Decision-Process

Problem Finding	Ability to trace root causes to enable the proper corrective action.
Problem-Solving	Finding suitable courses of action
Design:	Analysis of historical data. Expert Systems that deliver knowledge.
Choice	Selection among Optimization Models, Heuristic models and Simulation models.
Review	Ability to determine "what happened" and "why it happened."

An exciting development is the emergence of expert systems that deliver knowledge to support this process. For example, the concept of an electronic marketing advisor to support a product management team planning its promotional program for the coming year is an offshoot of this technological development. (Little, 1990). We turn now to the "choice" stage. DSS systems can provide support in one of the following ways:

1. Identifying the best action, through an optimizing model; like linear programming. The caveat here; concerns the applicability of the assumptions of the model to the problem in question.
2. Determining a satisfying solution using heuristics.
3. Performing a "what if" analysis of a finite set of alternatives using simulation model.

2.3.4.3 Structured vs. Unstructured Decisions

Herbert Simon (1981) to further consider the nature of management decisions; he examined how humans solve problems, regardless of their position in the organization, and distinguished between programmed and non-programmed decisions: Decisions are programmed to the extent that they are repetitive and routine, or to the extent that a definite procedure has been worked out for handling them so that they don't have to be treated de novo each time they occur. Decisions are non-programmed to the extent that they are novel, unstructured, and consequential. There is no cut-and-dried method for handling the problem because it hasn't arisen before, or because it's precise nature and structure are elusive or complex, or because it is so important that it deserves a

custom-tailored treatment. Simon (1981). The terms structured and unstructured were suggested by Anthony Gorry and Michael Scott Morton in place of programmed and non-programmed because they relate more directly to the basic nature of the decision task Gorry (1971). A structured decision is one where a decision rule can be specified and even automated, such as applying the Economic Order Quantity or Economic Lot Size formula to inventory reordering decisions. Conversely, unstructured decisions are largely made on the basis of judgment and intuition. An example would be the choice of a person to head an organization. In between the two extremes is the category of semi-structured decisions which Keen and Scott Morton defines as follows: "decisions where managerial judgment alone will not be adequate, perhaps because of the size of the problem or the computational complexity and precision needed to solve it. On the other hand, the model or data alone are also inadequate because the solution involves some judgment and subjective analysis. Under these conditions, the manager plus the system can provide a more effective solution than either alone. (Keen and Scott, 1987).

2.3.5 The Management style (Perception, Conduct and Commitment)

Having outlined the nature of the information required to support the planning and control functions, we turn now to the question of who performs those functions in an organization. That the user (or user group) should be the owner and driver of a DSS system for the simple reason that the whole purpose of the system is to support that particular user (or group).

A DSS must be compatible with the user's "style" of management for it to be used. Of course, if the DSS system is not used, it is useless. What is management style? Consider the following observation of McKenney (1976) and others, who distinguishes between systematic thinkers and intuitive thinkers: Systematic thinkers tend to approach a problem by structuring it in terms of some method which, if followed through, leads to a likely solution. Intuitive thinkers usually avoid committing themselves in this way; their strategy is more one of hypothesis-testing and trial-and-error. They are much more willing to jump from one method to another, to discard information. According to McKenney (1976);if some users are more systematic thinkers than others, this will obviously have an effect on their decision-making and, hence, the information that he or she favors or rejects Mason and Mitroff put it well: What is information for one type will definitely not be information for another. Thus, as developers of MIS, our job is not to get (or force) all types to conform to one, but to give each type the kind of information he or she is psychologically attuned to and will use most effectively Mason and Mitroff (1973). This is sound, albeit not easy-to-follow, advice for DSS system developers. All too often, we do not give

due consideration to the users' style(s) and run the significant risk of having the system rejected because it is not “useful,” or “appropriate.” Watch for code words like these from users - they may signal a misfit with their decision-making style and be a presumption of a “useless” DSS.

2.3.5.1 How do managers use models?

Mohan (2007), albeit anecdotal, of how managers actually use models. The operations research department of a major oil company recently did a survey on the use of mathematical programming in production scheduling at their refineries. Refinery scheduling was a pioneer application of mathematical programming and has been an active research area for 10-15 years. At one refinery the dialog between the interviewer and the local OR analyst went somewhat as follows: Interviewer: “Do you make regular mathematical programming runs for scheduling the refinery?” Analyst: “Oh yes.” Interviewer: “Do you implement the results?” Analyst: “Oh no!” , Interviewer: “Well, that seems odd. If you don't implement the results, perhaps you should stop making the runs?” Analyst: “No. No. We wouldn't want to do that!” Interviewer: “Why not?” Analyst: “Well, what happens is something like this: I make several computer runs and take them to the plant manager. He is responsible for this whole multi-million dollar plumber's paradise.” “The plant manager looks at the runs, thinks about them for a while and then sends me back to make a few more with conditions changed in various ways. I do this and bring them in. He looks at them and probably sends me back to make more runs. And so forth.” Interviewer: “How long does this keep up?” Analyst: “I would say it continues until, finally, the plant manager screws up enough courage to make a decision.”

What is the plant manager doing here? Before speculating on this, let me recount some experiences with people using MEDIAC, a media planning model developed by L. M. Lodish and Mohan (2007) .The first step in using the model is preparing the input data. This requires a fair amount of reflection about the problem at hand, a certain effort spent digging out numbers, and usually subjective estimates of several quantities. Thereafter, the model is run and a schedule is generated.

The user looks at the schedule and immediately starts to consider whether it makes sense to him or not. Is it about what he expected? Sometimes it is and, if so, usually that is that. Oftentimes, however, the schedule does not quite agree with his intuition. It may even differ substantially. Then he wants to know why. A process starts of finding out what it was about the inputs that made the outputs come out as they did. This usually can be discovered without too much difficulty by a combination of inspection, consideration of how the model works, and various

sensitivity analyses. Having done this, the user decides whether he is willing to go along with the results as they came out. If not, he can, for example, change the problem formulation in various ways or possibly change his subjective estimates. Sometimes he finds outright errors in the input data. Most of the time, however, if he has been careful in his data preparation, he will agree with the reasons for the answers coming out as they did and he has, in fact, learned something new about his problem. The whole process might be described as an updating of his intuition. The model has served the function of interrelating a number of factors and, in this case, not all the implications of the interrelations were evident to him when he started. Notice, incidentally, that he has by no means turned over his decision making to the computer. He remains the boss and demands explanations from his electronic helper.

I believe the same type of process is going on with the plant manager in the earlier example. He is involved in an analysis-education-decision process built around man model-machine interaction in which the man does not lose responsibility or control and instead of understanding less, understands more.

2.3.5.2 How a Manager-Model Interaction Improve the Decision?

The researcher again will present lesson learned by Mohan (2007) to help clarify the differences between structured and unstructured decisions - and the cost of not recognizing them. In the late 1950s, business schools in United States of America provided advanced seminars on the use of the new technique of linear programming for obtaining optimal answers to business problems. This state-of-the-art methodology seemed like magic; the student who was armed with optimal solutions would, of course, rise to the top of the organization, inevitably and rapidly. During one such seminar, the author in question was required to write a term paper illustrating the application of linear programming to a real situation. He and a friend rushed to the treasurer of a major American corporation, with whom he had some connections.

The treasurer felt he had no problems for which linear programming could be at all useful, but admitted that his staff members might. Further discussion with these personnel revealed that one of the treasurer's main jobs was to manage cash balances. His department was linked by Teletype to the company's primary bank, which was in turn linked to 250 bank branch locations in which the company maintained checking accounts. The treasurer examined the balances in these accounts each Friday and decided how to invest this idle cash over the weekend. This was an operational control decision that generated $8 million in interest income. It involved a talented senior executive who saw it as an unstructured task. The students examined this situation and

concluded that linear programming was the obvious solution. This was clearly a structured task. They built a model and tested it using six months of historical data on actual cash balances. The LP solutions would have generated $1,750,000 of additional interest. The students presented their conclusions and generously asked for only 30 percent of the savings. The treasurer asked several questions and said he could not use the model. After the students delicately pointed out that he was old-fashioned, reactionary, narrow minded, and perhaps a little stupid, he asked what the model would do if interest rates in London suddenly rose. The LP formulation would, of course, result in all the company's spare cash being "optimally" shipped to London for the weekend. Since the rising rates might reflect expectations of devaluation and a consequent attempt by the London money market to prevent funds from suddenly being withdrawn, this would be a foolish and obvious mistake. The LP model would lose in a weekend more than the company made in interest over several years. The students accepted the point and rushed off to "fix" the model. The treasurer raised a second set of questions, and a third, and then a fourth. The model grew larger and more cumbersome, no real progress was made, and the students stopped their work. The final outcome was a compromise; the treasurer got the original system and the students got no money. He had realized that the model made better decisions than he could for most weeks but that it also occasionally made very bad ones. He found it helpful to run the model and review its recommendations. If he found no obvious problem or felt there was no special factor to take into account, he would implement the LP's decision. Otherwise, he used his unaided judgment.

The treasurer recognized one of the main points underlying the DSS approach. The system alone or the manager alone was far less effective than the two combined. This semi structured problem could be best solved by delegating to the system routine computations and resolution of interactions too complex for the manager to perform, while leaving the judgments that the algorithm could neither make, nor recognize were needed, to the human. The students learned that there is a middle ground between the analyst's perception that problems are structured and the manager's general assumption that his or her own job is special and cannot be handled by a computer routine.

2.4 Human-Computer Interaction

2.4.1 Introduction

The definition of Human-Computer Interaction (HCI) depends on the situational context and the referent discipline being considered. To begin a coherent argument for the inclusion of HCI in the DSS utilization, we first define HCI within the IS context. A previous article by Zhang (2002) provides a useful starting point for understanding HCI in IS. In the Information Systems field, HCI issues are explored from a distinctive perspective: MIS researchers and educators take managerial and/or organizational issues into consideration. Human factors in Information Systems; is the scientific study of the interaction between people, computers, and the work environment. The knowledge gained from this study is used to create information systems and work environments which help to make people more productive and more satisfied with their work life." (Beard & Peterson, 1988)

Human Computer Interaction studies in MIS are concerned with the ways humans interact with information, technologies, and tasks, especially in business, managerial, organizational, and cultural contexts. Zhang (2002) examined three IS journals including Management Information Systems Quarterly (MISQ), Information Systems Research (ISR), and the Journal of the Association of Information Systems (JAIS) found that in 2000-2001, the percent of total articles that could be classified as having an HCI focus was around 33%. This data shows a tremendous interest in HCI research by MIS scholars.

2.4.1 What is Human-Computer Interface

HCI is more than just the user interface. From a user's perspective, the computer user interface is what a user sees of the system. Thus many times, the user interface and a computer system mean the same thing. From developers or IT project managers' perspectives; however, there is a big difference between the user interface and a computer system. To avoid any confusion, the researcher takes the position of treating the user interface as the representation of the entire system to the users. The researcher again considers HCI to be broad, including any interactions humans (developers and users) may have with the systems during their entire lifecycle.

2.4.2 The Importance of HCI

In his American Conference Information Systems (AMCIS 2003) keynote speech entitled "The Future of the Internet," Patrick, J. (2003) stressed the significance and importance of HCI considerations for business applications. He provided surprising number of examples of Internet

interfaces that were poorly designed, incomplete, and frustrating to the user. He concluded that businesses must pay attention to the functionality and usability of Internet-based tasks, because the young consumers of tomorrow's markets will insist on doing business on the Internet and will be intolerant of dysfunctional and unusable systems.

Patrick's call for an emphasis on the usefulness and usability of information systems from the perspective of the user is just the most recent in a long line of such suggestions. As early as the first volume of MIS Quarterly, Bostrom and Heinen(1977) suggested that information systems failures could be attributed to "faulty design choices" resulting from the lack of emphasis on the human/social aspects of system use. Carey (1991) argued that software designers need to expand their focus beyond functional requirements to include behavioral needs of the users. Perhaps the problem is one of inexperience on the part of designers and on the part of an ever-expanding set of users (Galletta, 2003); highly experienced designers could reasonably be expected to know that they should pay closer attention to usability and users' needs. Results of the many studies on technology acceptance demonstrate the importance of both the perceived usefulness and the perceived ease of use for user acceptance of IS (Venkatesh, 2003.)

Much of the impetus for integrating HCI into IS comes from industry. The role of the IS professional in industry has changed and indicates a need for understanding human-computer interaction. Programmers in the early days of computing were isolated from the rest of the organization and spent most of their time interacting with the computer rather than other members of the organization or even with other programmers. They were focused on developing well-defined, transaction-based systems, rather than on systems analysis and information requirements determination. Programmer/analysts could begin the coding task after a minimal analysis was performed. They did not need to spend hours and hours of their time in determining what the current system did and how to design a replacement system because all the systems were new. According to Jane Carey (2004) Modern systems development is quite different because the IS function and staff members serve an interactive role in the business organization.

1. Programmers and analysts now spend much more time interacting with users and with each other.
2. The systems being developed today are more complex, forcing IS staff to spend a great deal of time interacting with users to determine what informational and decision-making needs exist.
3. Development approaches such as prototyping are based on iterative feedback from users on

the functionality and usability of the systems as they are being developed.

4. Information is seen as an important asset by top management.
5. Information Systems are seen, in many (but not all)1 firms, as being strategic rather than just having an operational role in the organization.
6. The computer, itself, is now an integral part of the job of all white-collar workers, both office-support staff and knowledge workers.

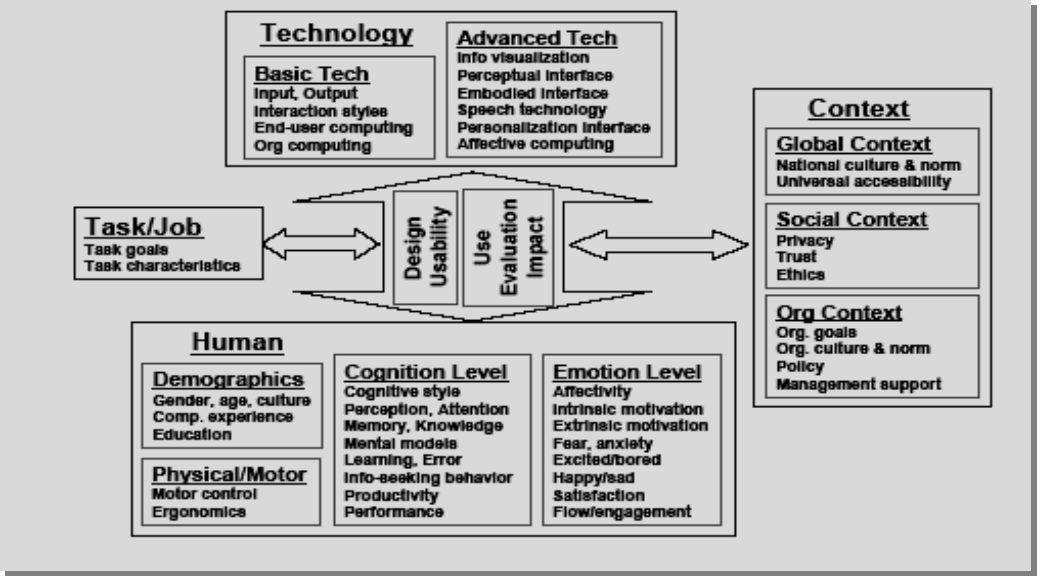
2.4.3 HCI Research Framework Zhang and Li (2004)

Zhang and Li (2004) present a research framework, shown in Figure 2.5 that captures broad HCI issues and concerns. In a nutshell, the framework considers five components and the interplay among them: Human, Technology, Interaction, Task, and Context. There can be different ways of understanding humans in general and their specific characteristics pertinent to their interaction with IT. One way of examining humans is as shown in Figure 2.6 Technology can be broadly defined including hardware, software, applications, data, information, knowledge, and supporting personnel and procedures. Figure 2.6 indicates one way of examining technological issues when studying HCI. All the topics under Human and Technology in the same Figure are meant to be illustrative, rather than exhaustive.

The thick vertical Interaction arrow (the "I" arrow) between Human and Technology represents the "I" in HCI. It is the core of all the actions and can be further divided into two stages: issues that occur during the development of a computer artifact, and issues that occur during the use and impact of the artifact in real contexts. Ideally, concerns about humans and technology should influence interaction.

Thus the labeling is meant to be bi-directional. These two classes of emphases are represented by the box "Design / Usability" on the left side inside and the "Use/ Evaluation /Impact" box on the right side of the Interaction component respectively. Zhang and Li (2004) list the specific research topics for each of these two emphases, which are incidentally dominated by CHI and MIS studies respectively.

Figure 2.6 a Broad Overview of HCI



Source: (Zhang & Li, 2004)

The picture with Human, Technology, and Interaction alone is incomplete. The interaction experience is relevant and important only when humans use technologies to support their primary tasks within certain contexts, being organizational, social or societal. Normally, humans use technologies not for the sake of technologies but for supporting their primary tasks, whether job related or entertainment-oriented. In addition, tasks are carried out in a certain setting or context that imposes constraints or significance for doing and completing the tasks. Three contexts are identified: organizational context, social context, and global context. The task and context boxes add the dynamic and essential meanings to the interaction experience the human has with technology.

In this sense, studies on interaction are moderated by tasks and contexts. The two horizontal arrows connecting with Task and Contexts represent this fact (Zhang and Li, 2004).

2.4.4 Strategies for incorporating HCI into IS CURRICULA Model

As noted by the curricula committee, the model curricula are recommendations, rather than requirements. MIS educators use the model curricula to establish their own IS programs. The researcher hopes that the strategies suggested here are helpful for incorporating HCI into PM Information Systems programs!!

2.4.5 The AIS CURRICULA

With the advent of The Association of Information Systems (AIS), a model curriculum for undergraduate MIS programs was created in 1997 (jointly with ACM and the Association for Information Technology Professionals) (Davis et al, 1997) and is updated periodically. The most recent version of the MIS model curriculum for the undergraduate level (Gorgone et al., 2002) includes the core courses listed in figure 2.8. The model curriculum for the MS level (Gorgone et al., 2002) includes the core courses listed in figure 2.7

Figure 2.7 Core Courses in the Model Curriculum

1. Personal Productivity with IS Technology*	7. Analysis and Logical Design
2. Fundamentals of Information Systems	8. Networks and Telecommunication
3. Information Systems Theory and Practice	9. Physical Design and Implementation with DBMS
4. E-Business Strategy, Architecture, and Design	10. Physical Design and Implementation in Emerging Environments
5. IT Hardware and System Software	11. Project Management and Practice
6. Programming, Data, File, and Object Structures	

*Required for all business majors

Source: (Gorgone et al., 2002)

Figure 2.8 Core Courses in the Model Curriculum (Gorgone et al., 2002)

1. Data Management
2. Analysis, Modeling and Design
3. Data Communications and Networking
4. Project and Change Management
5. IS Policy and Strategy
6. Integration (choose 1 of these 3) • Integrating the Enterprise • Integrating the IS Function • Integrating the Technology

Source :(Gorgone et al., 2002)

In addition, the MSIS 2000 model curriculum requires that students take a sequence of 4 courses in a career track. Individual universities can choose which career tracks to offer, based on their student population, their faculty capabilities, and the needs of local industry. Examples are given of tracks in academia, consulting, data management and data warehousing, decision making,

electronic commerce, enterprise resource planning, global IT management, human factors, knowledge management, managing the IS function, new ways of working, project management, systems analysis and design, technology management, or telecommunications. It is expected that each school would offer a subset of these tracks or invent some of their own. A particular student would choose one career track to pursue.

Next we offer several suggestions for incorporating HCI into the current MIS curricula. We acknowledge the great difficulty that accompanies core curricular changes at both the graduate and undergraduate levels and the restriction on the total number of core credits each program can have. Curricula may be seen as zero-sum games to the extent that the total number of course credit hours at both the graduate and undergraduate levels is often fixed. Introduction of new requirements must necessarily be accompanied by eliminating existing requirements.

Graduate curricula may be even more constrained by a cap on the number of credits in the program and fewer elective options available for substitution. That leaves us with the knotty problem of trying to identify courses in the current core that might be eliminated or targets for a reduction in credit hours. We might think of more creative ways to package one- or two-credit course components, but many universities have trouble scheduling courses that do not fit the standard 3-credit format. With these restrictions in mind, we present specific strategies and examples of how to do so.

2.4.6 The Strategies for Integration HCI into IS CURRICULA

How should an IS department proceed to integrate HCI into its graduate and undergraduate IS curricula? Change is difficult. It is unrealistic to attempt to move from no coverage of HCI directly to some ideal coverage of HCI. It is more realistic to follow a phased or evolutionary approach to the integration of HCI into the IS curricula. The following steps are recommended by Jane Carey (2004):

1. Ensure coverage of HCI considerations within each required and elective course. Some courses lend themselves more readily to integration than do others. Courses such as management information systems (MIS) already contain many human and managerial components. These introductory courses are likely candidates for beginning an HCI focus.
2. Initiate a separate course dedicated to HCI. Although such change might be difficult, a realistic first step would be to offer a graduate seminar, elective course in HCI. In Section V we offer a HCI course outline derived from the various courses that we teach in our institutions.

3. When the graduate course becomes a permanent part of the graduate curriculum, the next step is to initiate a separate course at the undergraduate level. One way to make the transition into this course is to offer a course that is cross-listed with a senior level prefix and a graduate level prefix. Once this course is in place and is being offered on a continuing basis, it is advisable to teach separate courses at the graduate and undergraduate levels. Such separation. Also would depend on demand.

4. Implement the optional HCI track at both the graduate and undergraduate levels. Acceptance of such track will be determined by the previous success of the HCI courses at the university, the faculty orientation towards HCI, and what happens at the national level. Most universities are reluctant to introduce new requirements without outside support. Outside influences such as accrediting bodies and professional associations influence curricular decisions. University culture and climate may also dictate the relative likelihood for change.

5. Offer multiple elective courses in HCI. While most schools will not have the opportunity to offer an HCI program or even an emphasis in HCI, some schools may decide to emphasize HCI as the focus of their MIS curriculum. In such a case, multiple courses on HCI topics may be offered. We present two examples from our experience that may be adapted for use in business schools in the U.S. At Yonsei University in South

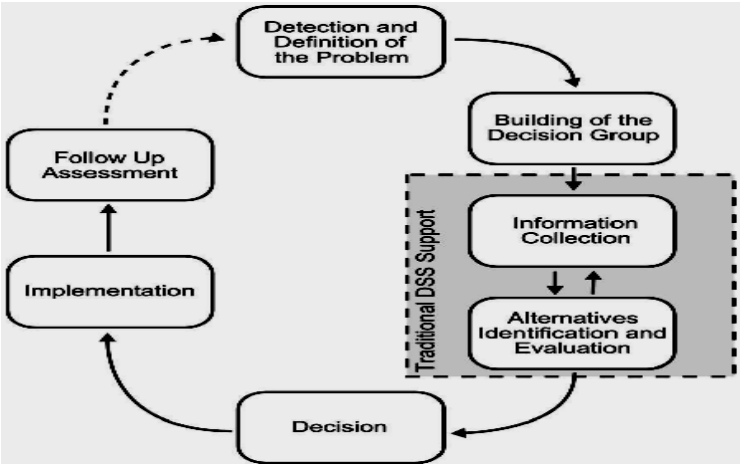
2.5 Organization Structure and DSS

2.5.1 Introduction

Inspired by Simon's original decision-making process (intelligence – design – choice) (Simon 1965), researchers and practitioners in the decision support community gradually extended and detailed the process to reach the general model depicted in Figure 2.8 (Power 2002). Interestingly enough, most of the existing decision support systems (DSS) only support a small subset of these seven steps, namely the collection of information and the identification and evaluation of alternatives.

Figure 2.9

Decision-Making Process (General Model) by Power (2002)



Source: Power (2002)

For example, data-driven DSS such as data warehouses and OLAP tools are very good at collecting, slicing and dicing large collections of data to turn them into meaningful information (step 3). Knowledge-driven and model-driven DSS are especially good at performing what-if analysis, identifying and evaluating alternatives (step 4). Group DSS and other communication-driven DSS support group decision during these two stages, but they do not actually support the structured building and assembling of the group itself. In this section, the researcher will present the four-level model that has been introduced by Brézillon and Marquois (2004) ; which can be used to explain how one institution moves from an organizational structure to another when its context changes during a decision making process. One purpose of this model is to show that

traditional decision processes underplay the dynamics of the decision group and its influence on both the problem definition and the information collection phases of the global process.

2.5.2 Key Organizational Structures

Gachet and Brézillon (2004) in their review of the various structures found ; organizational structures such as Social Networks (SN), enterprises, Communities of Practice (CoP), and Task Forces (TF). It focuses more on the structuring, building, and assembling processes of the different entities rather than on the resulting entities themselves. The researcher purpose of this review is not to present an exhaustive list of all the existing organizational structures, but rather to highlight and compare representative examples in different categories. As the multi-level model that will be discussed in the next section; which will emphasizes the role of contextual knowledge during a decision making process, its important to briefly present different organizational structures as following:

2.5.2.1 Social Networks Structure

Many authors agree on the fact that a social network is comprised of individuals and ties (Wellman and Carrington, 1988; Hanneman ,2001). Individuals mostly socialize around their own individual goals, not around a shared, federating goal. The main characteristics of a social network are its flexible structure, a lack of hierarchy, and weak importance of the emotional dimension (Foucault, 2002). A good metaphor is the rhizome metaphor, which is a conceptual framework for the generative possibilities of non-hierarchical networks of all kinds on the Internet. To be brief and precise; this type of structure is not the one that meet sophisticated management. The commitment of individuals is superficial, limited to the reasons of the local interaction (Foucault, 2002). As a consequence, ties are "socially-oriented" in many real life situations. Trust does not play an important part, and individuals generally belong to several social networks where they do not play crucial roles.

2.5.2.2 Enterprise

Successful enterprises are organized around shared visions. “IBM had 'service'; Polaroid had instant photography; Ford had public transportation for the masses and Apple had computing power for the masses” (Senge, 1990). It naturally follows that an enterprise can be seen as a hierarchy of roles, each of which is provided with a set of one or several tasks to fulfill.

2.5.2.3 Communities of Practice

Communities of practice (CoP) are semi-structured groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis (Wenger, 2002). Examples of CoP include engineers who design a certain kind of electronic circuit and find it useful to compare designs regularly and discuss the intricacies of their specialty; academic researchers attending conferences to share the results of their research on a common topic.

2.5.2.4 Task Force

It is important to understand that the mission is more central to drive the task force than the leader role that can be formally endorsed by a member. The entire task force is oriented towards its expected results. With regard to time-critical missions, task forces can be assembled and dissolved very quickly.

The mission is shared by all the employees and is responsible for the coordination of their actions. It acts such as an internal engine to impulse the task force. Because the task force is conditioned by expected results, employees in such case have a strong motivation in the realization of the mission

2.5.3 Comparison

In order to make it more consent; the following paragraph will compares the various organization structures that presented. The main difference between a social network and an enterprise is that the enterprise is “about” something. Whereas a social network is defined by a loose discriminating factor that does not even imply a shared goal, an enterprise is clearly organized around its vision.

It follows that the level of organization is higher in an enterprise than in a social network. Nevertheless, information management in any kind of organization presupposes the sharing of a common background context. This shared context contains general information in a social network (allowing individuals to behave in a socially acceptable way) and domain-specific information in an enterprise (allowing the employees to enrich their own individual contexts from the shared context). Enterprises and communities of practice mostly differ in the scope of their goals. Whereas the enterprise follows a vision that is often easier to “feel inside” than to describe, and that can take many years to attain (Senge ,1990) notes that “the Japanese believe building a great organization is like growing a tree; it takes twenty-five to fifty years”), CoP

members explicitly share domain interest and aim at keeping their domain expertise. This is why a CoP often develops a shared language, which an enterprise as a whole usually does not. The main difference between a CoP and a task force is that the latter is put together by an external, unpredictable event, rather than by a shared concern. The expressions mission and focus of interest are used to differentiate task forces from CoP.

Whereas the focus of interest of a CoP refers to the domain of knowledge shared by all, giving the CoP an identity, a cohesiveness and an intentionality going beyond the interpersonal nature of informal social networks, the mission of a task force refers to an external, unpredictable, and short-lived event acting as a glue force on the heterogeneous population of actors. Focuses of interest and missions do not act at the same level on their respective structures. On the one hand, the mission mobilizes all the actors directly impacted by the unexpected event in their activities.

The mission is the organizing factor of the task force. On the other hand, the focus of interest acts at a Meta level on the CoP. It does neither organize the CoP itself, nor impact the individuals in a direct way. It simply defines a shared concern. It is up to the actors to exchange information in order to keep the CoP alive. An immediate consequence is that actors in a task force have to satisfy a collective need at the organization level and are endowed with decision power, whereas the actors of a CoP share a same concern to satisfy individual needs (mostly in the form of exchanges of experience).

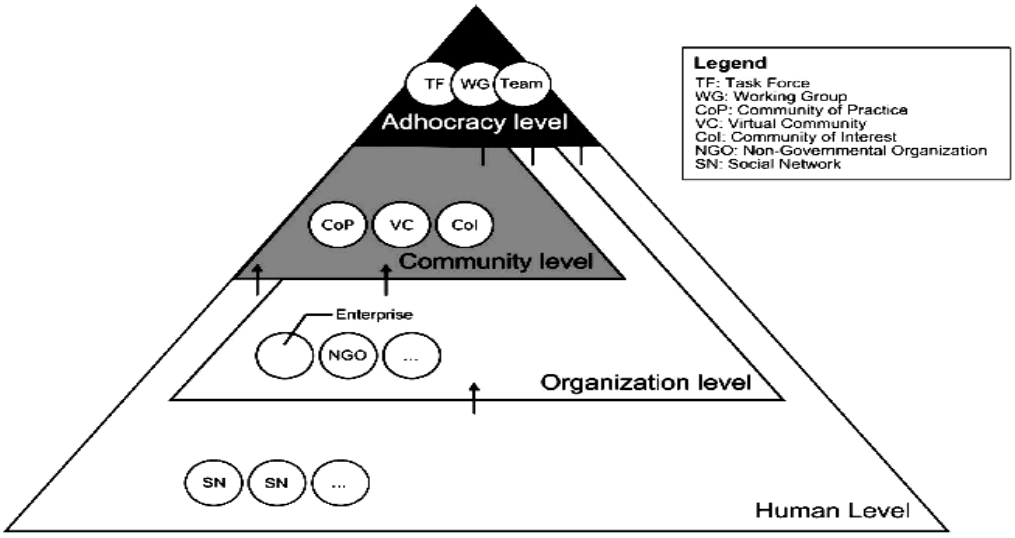
Another difference between the focus of interest of a CoP and the mission of a task force is that the focus of interest will most likely cross an organization horizontally, whereas the mission will cross it vertically or diagonally. Because the mission in a task force acts more as a glue force on actors than the focus of interest in a CoP or the discriminating factor in a social network, ties in a task force are stronger than ties in a CoP or a social network. This mission imposes a structure on the task force because all actors are strongly connected together through a dynamic organization of roles and tasks (Brezillon and Marquois, 2004). Thus, the level of organization of a task force is higher than the level of a CoP, which in turn is higher than the level of a social network. Finally, CoP and task forces have a shared language to speed up interaction and collaboration, which social networks don't.

2.5.4 A Four-Level Model of Organizations

Gachet and Brézillon (2004) have introduced this Multi-model organization structure in order to enable traditional hierarchical organizational charts to overcome the dynamic environment challenges. Figure 2.9 presents an integrative view of the social networks, enterprises, and

communities of practice, task forces, and other related organizational structures. Communities (such as CoP and virtual communities) are generated from social networks or from within enterprises, when a focus of interest appears. They represent semi-permanent structures grouping actors with convergent, long-lasting goals.

Figure 2.10 Four Level Organization Model Gachet and Brézillon (2004)



Source: Gachet and Brézillon (2004)

Short-lived, unpredictable events trigger missions that bring together actors of various communities, enterprises, and social networks in a task force whose lifetime is relative to the time necessary to solve the problem. Once the problem is solved, the mission dies out and the members of the task force slip back into their respective structures, enriching them with chunks of knowledge acquired during the problem-solving process. Figure 2.9 also outlines the boundaries of the model. The purpose of this model is to show that a decision group can be seen as a task force built and assembled on top of communities (groupings of decision-makers or available employees able to fulfill required tasks), organizations (for example, in the case of an audit), and/or external individuals (for example, when external experts are called to help solving a very specific problem). It is worth to highlight the four proposed levels of the model: human level, organization level, community level, and adhocracy level.

2.5.4.1 Human Level

The human level is represented at the bottom of the model. This level plays a double function: it supports and covers the other levels at the same time. As shown in Figure 2.9, it supports the other levels because individuals are the elementary constituents of the entire model. In other words, the three upper levels are made up of individuals inevitably coming from social networks belonging to this human level. This level supports the dynamic building of upper level structures that help information flow more rapidly and easily among individuals. In a metaphorical way, one can see the shared vision, the focus of attention, or the mission of the resulting structure acting like a magnet on iron filings, attracting only the individuals deemed appropriate for the purpose of the structure.

2.5.4.2Organization Level

As this model focuses on the enterprise, it encompasses a technical and economic perspective, as well as a social perspective. In the first case, an organization is described as "a network of production systems each trying to adapt its output to the demand for that output" (van Aken 1982). In the second case, an organization is described as a network of social groups, each trying to reach its own goal as well as possible, protecting its interests against outside interferences.

The meaning of the organization adopted in this context r remains closely related to social perspectives. The organization level is closely related to bureaucracy concepts. In sociological theories, bureaucracy is an organizational structure characterized by regularized procedure, division of responsibility, hierarchy, and impersonal relationships. According to Weber (1947), the attributes of modern bureaucracy include impersonality and the implementation of a system of authority that is practically indestructible. Toffler (1970) sees it as a network of roles fulfilled by individuals (in opposition to a network of individuals, such as a social network). Bureaucratic organizations usually deal with routine operations. Information flows bottom-up along a hierarchical path, before coming down again along a different hierarchy.

2.5.4.3 Community Level

A community structure emerges when a focus on a specific domain arises among the individuals of an existing social network and/or organization. This shared concern gives the community a collective context and individuals organize as employees with roles. Instances of the community level include communities of practice, virtual communities, communities of interest, and other forms of communities. It should be mentioned that all the instances at a given level do not necessarily have the exact same position on the bureaucracy-adhocracy continuum. For example,

virtual communities – which are typically depicted as groups of individuals having regular contact with one another in cyberspace, with shared interests, problems or ideas, independent of space and time – have a community structure tending towards the organization level, whereas communities of practice tend more towards the adhocracy level.

2.5.4.4 Adhocracy Level

The term adhocracy was first coined by Bennis and Slater (1968) to describe a structural configuration that "is able to use experts drawn from different disciplines into smoothly functioning ad hoc project teams. An adhocracy represents any form of organization capturing opportunities, solving problems, and getting results (Waterman, 1992). Beairsto (1997) defines it as "the term used to describe the flexible structure of multidisciplinary teams which is best suited for complex tasks in a dynamic and unpredictable environment." It can be characterized by shared values across various splinter groups, cultures, and individuals. It relaxes hierarchical ties and promotes lateral relations (Orlikowski ,1991). An adhocracy is not organized around formal rules or regulations, and it does not provide standardized procedures for dealing with routine problems. It is instead a response to environmental pressure (Mintzberg and Quinn 1996), meant to cope with exceptional situations and adapt quickly to changes within its environment.

In the context of the enterprise, an adhocracy allows teams to make decisions without approval from higher-level members of the organizational chart. Adhocracies are traditionally at work in high risk organizations or in emerging industries. The lifetime of an adhocracy is usually limited. Mintzberg and Quinn (1996) distinguish between two forms of adhocracies: (a) the operating adhocracy, which works on behalf of its clients, and (b) the administrative adhocracy, which serves itself. The term adhocracy is often used by opposition with the term bureaucracy. Both structures can cohabit in a same organization. For example, hospitals and universities, which are professional bureaucracies in their routine clinical and teaching work, adopt an adhocratic form in their research functions.

2.2.4 Organizational Structures and DSS

Based on all of the above, including the four-level model that has been developed by introduced by Gachet and Brézillon (2004) ; obviously ; the challenge of all organizations is how they move from an organizational structure to another when its context changes during a decision making process. The most critical is how to infer a framework of support technologies adapted to the different organizational structures. The researcher highly believes that each level of the proposed model can benefit from a different kind of support technology (for example, decision support

systems (DSS) at the adhocracy level, computer supported collaborative work (CSCW) at the community level, management information systems at the organization level, and office automation tools at the human level). Bringing these different categories of systems into a coherent framework could be a valuable contribution to the field of systems integration.

2.6 Business Process Management

2.6.1 Introduction

In 1985, when Michael Porter first defined the Value Chain, he divided the processes that make up the value chain into two broad groups: (1) core processes that add value to the product or service the company produced, and (2) support processes that were necessary to enable the core processes. In the early Nineties, this distinction was popular with most of those engaged in Business Process Reengineering (BPR). At the same time, however, there was an alternative approach that emphasized a third kind of process - management processes. Software Engineering Institute (SEI) emphasized the need to change management processes to move from one Capability Maturity Model (CMM) level to the next. And, later, in the Nineties, when the Supply Chain council created their SCOR6 model, it described the world with core, enabling, and planning processes. Today, most analysts discriminate between core, support, and management processes. In this section, the researcher will present and discuss dedicated model developed by Gebauer and Schober (2005) in order to support decisions regarding Information Systems flexibility ; the model relates to business process characteristics (uncertainty , variability and time –criticality) with two basic types of information system flexibility (flexibility to use the information system and flexibility to change the information system).

2.6.2 Business Process and Information System

Information systems are used to support business processes. To perform a business process, a number of individual activities need to be performed, such providing certain service to beneficiary. Since our focus is on the information system flexibility with the objective to improve business process performance, we need to (1) operationalize business process performance; and (2) operationalize the characteristics of business processes to be included into the analysis as being impacted by information system flexibility. Researchers have identified many factors to determine the performance of business processes, including: efficiency, effectiveness, customer satisfaction, bottom line impact, and shareholder value (Hammer and Champy, 1993). In order to avoid over-complication of our model from dynamically changing processes, we focus our attention on a given process, for example purchasing, and measure performance as process efficiency over time.

We consequently want to assume the target process outcome to remain steady in terms of quality and processing time.

The assumption of a fixed process outcome does not necessarily preclude intermittent changes of the underlying process structure. Yet the process structure as such is not at the focus of attention and effectively treated a “black box” in the current paper. In cases where a process cannot be performed in time and where the quality of outcome is not adequate, we assume additional operational costs as a penalty for late and for poor performance.

To operationalize business process characteristics, we now turn to earlier research studies on managerial processes that have been performed in research areas, such as organization and management. We focus on three process characteristics: uncertainty, variability, and time-criticality

2.6.1 Uncertainty

The uncertainty associated with a business process refers to the difficulty to predict the tasks and resources required to perform the business process in a particular instance. Business process uncertainty results from a combination of environmental uncertainty, i.e., uncertainty of exogenous input variables, that determines what process tasks are required to perform a future business process, and structural uncertainty that determines to which extent a process task can be supported by a given information system. The concept of structural uncertainty is part of the discussion of task difficulty by scholars of organization and management, in particular managerial tasks structured ness (Simon 1960), and analyzability (Perrow 1967) of a task and with it the business process of which the task is a part. In general, higher level management tasks tend to be characterized by a higher level of uncertainty than lower level management and administrative tasks, making a prescription of specific activities problematic for higher level management tasks. The result of high structural uncertainty is a situation where even at the time of process occurrence a significant amount of individual judgment is required regarding the most appropriate measures to be taken. Both environmental and structural uncertainty, contribute to the overall difficulty of predicting system requirements. A business operating in a highly volatile environment (high environmental uncertainty) will find it difficult to predict system requirements even for processes and tasks that can be structured easily (low structural uncertainty), whereas a business operating in a relatively stable environment (low environmental uncertainty) will at times find it difficult to predict the specific system requirements for highly unstructured tasks and processes (high structural uncertainty).

2.6.3 Variability

As a second factor: to impact the requirements of an information system in support of a given business process. The variability of a business process over time can be operationalized with the concept of the Lorenz curve (Lorenz, 1905).

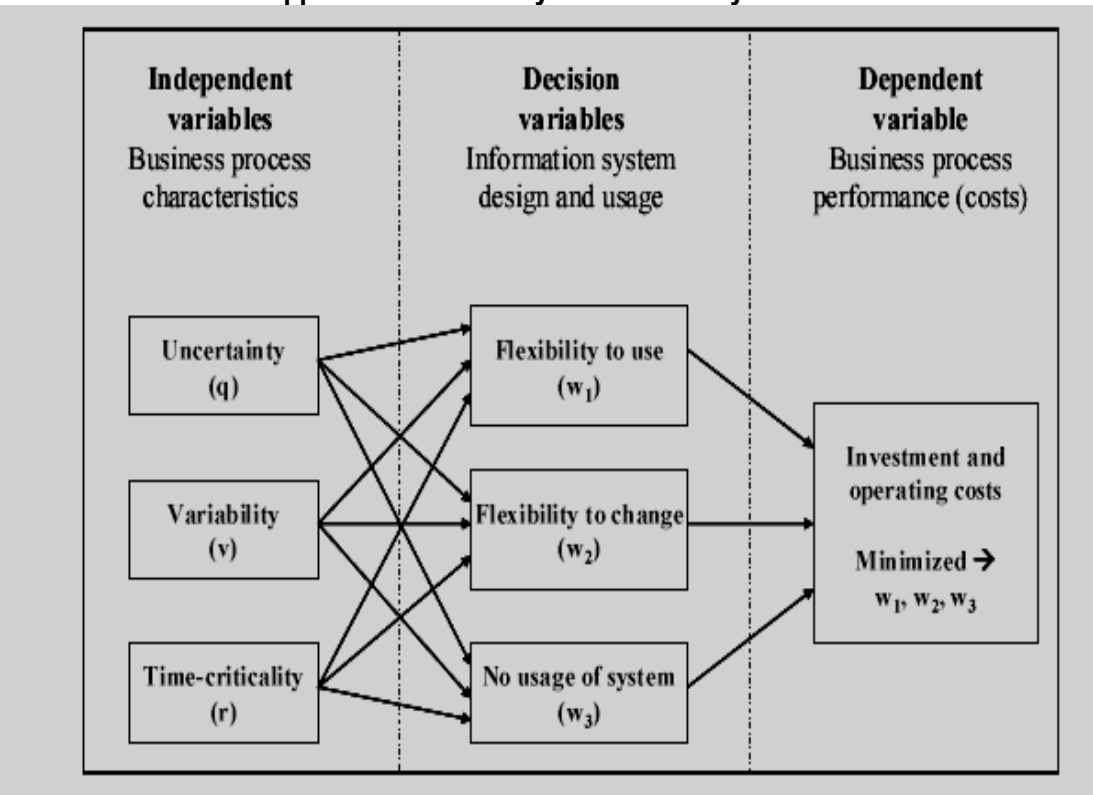
2.6.4 Time-Criticality

Time-criticality is included in the analysis as a third factor to characterize business processes, referring to the question of how urgent it is to perform a business process promptly. Although the concept of time-criticality has traditionally found relatively little attention in the research areas of management and organization, time-criticality has captured the attention of scholars of mobile information systems (Balasubramaniam, (Junglas and Watson 2003; Siau, Lim and Shen 2001).

2.6.5 A Model to Support Information System Flexibility Decisions

Gebauer and Schubert (2005) have introduced model contains the different decisions regarding the allocation of investments for the different types of information system flexibility and information system upgrades. Figure 2.9 depicts the general structure of the model showing business process characteristics as the combined independent variable independent variable, information system design and usage as the combined decision variable, and overall business process performance as the dependent variable.

Figure 2.10 Model Structure for Support Information System Flexibility Decisions



Source: Gebauer and Schober (2005)

More specifically, a business process is characterized by uncertainty, variability and time-criticality and each characteristic is measured by a specific parameter: q denotes the probability that a certain process occurrence is anticipated at the time of system specification, v denotes process variability and drives the Lorenz curve, and r denotes the share of time-critical process occurrences. In the model, the business process parameters influence the recommended investments in flexibility to use the information system and in flexibility to change the information system, as expressed by the shares w1 and w2 in Figure 2. The share w3 = 1 – w1 – w2 denotes the amount of process occurrences that are handled outside of the system by manual operations or by the use of older legacy systems (in the following we simply speak of "manual operations"). In the model, the shares w1, w2 and w3 are calculated such that the objective function, comprising the total investments and operating costs, is minimized over the lifetime of the considered information system.

2.6.6 Model Applicability and limitations

The objective of the model was to improve the management of information system flexibility in support of a given business process. We presented a decision model to guide the investment in two types of information system flexibility, namely flexibility to use, manifested for example in information system functionality, data base, user interface and processing capacity, and flexibility to change, manifested for example in technical staff, system integration and modularity, and for the subsequent operations, including the use and upgrade of the information system, and manual operations outside of the information system. We used as independent variables the business process characteristics of uncertainty, variability and time-criticality, while the minimization of the overall investment and operational costs of the information system throughout the system lifetime comprised the objective function, subject to decisions regarding investments in information system flexibility and regarding subsequent use.

2.6.7 The Model Outlook

The model presented provides a general way of thinking about flexibility of an information system to support a given business process, rather than a closed body of theory. A number of propositions have been derived as guidelines for the evaluation and management of information system flexibility. To validate and improve upon the general structure of the model it is necessary to address the question of whether critical aspects were omitted, such as time aspects and specific characteristics of business processes, and to analyze the implications of those omissions. In this context, empirical research work should seek to establish evidence for the validity of the propositions, addressing questions such as: How are managers actually addressing the question of flexibility to use versus flexibility to change? How are managers selecting (1) the components to be included in an information system (flexibility to use) and (2) the type of level of flexibility to change by offsetting setup and operational costs for the information system on the one hand, with additional investments in flexibility to change, change costs, and exception handling costs on the other hand? The identification and analysis of differences between actual managerial behavior and the recommendations provided in the current paper will help to strengthen the model, and help to improve information system management.

Chapter 3 - Previous Studies

3.1 Introduction

This chapter presents the previous studies that relate to my thesis core of research; the managerial factors that influence the utilization of DSS al over the world. The researcher has managed hard to find any relevant study in the local libraries; unfortunately; there were lack of references neither in Universities nor in public libraries. The main source of the attached literature review was electronic studies; the researcher has tried to focus on case studies on different countries with different cultures, UN publications, World Bank publications, International Mentoring Fund publications and relevant International Technical Conferences deliverables. The previous studies attached in this chapter will enable the researcher to make such sort of linkage and comparison, headed for confirmation/disconfirmation of thesis hypothesis, more ever, it will greatly assist the researcher in interpretation of the findings and infighting the results with Palestinian case.

3.2 Palestinian and Arabic Studies

1. Abu Sabat (2005) "Role of Computerized Management Information Systems in the decision making process at Universities of Gaza – Palestine "

The main objective of this study was to evaluate the applied Computerized Managerial Information Systems at Universities in Gaza – Palestine; by evaluating the main domains of infrastructure available, software, communication and relevant competent staff. The main findings of the study were; the infrastructure available at universities in Gaza is viable with positive distinctive to the Islamic University, managerial levels at universities in Gaza are a ware of the importance of Computerized Information Systems and relevant Human Resources are competent enough however there is need for enhancing the current applied systems specially for establishing and developing expert systems. One of the recommendations of this study was to conduct dedicated research for the role of Information Systems in the decision-making process in the governmental sector.

2. Goneem (2004) "Role of Computerized Information Systems in the decision making process at municipalities of Gaza - Palestine "

Goneem has deliberated to evaluate the applied Computerized Information Systems available at municipalities in Gaza – Palestine in respect to the decision making process in terms of ; relevant infrastructure, the factors that influence the Information Systems with respect to decision making process and eventually the thesis has highlighting that managers in Gaza municipalities are relying on Information System in the decision making process , Information Systems

infrastructure influence the decision making process and finally Information available is fulfilling the management need.

3. **Shanatf (2000) " Role of Computerized Management Information Systems in the decision making process at trade banks of Gaza - Palestine "**

This thesis has focused on weighing up Computerized Management Information Systems in the area of decision making process at commercial banks of Gaza and what are the areas that need enhancements; the main finding of Shanatf theses were; organization structure at trade banks in Gaza should be developed and enhanced in order to be consistent with IT developments, computerized management information systems should be adapted in the terms of modern software, communication and hardware and finally Shantaf has concluded that Human Resource at commercial banks in Gaza is not competent toward the modern IT.

4. **Amry (2000) "Factors Affecting the Decision Making Process in Police Sector – Saudia Arabia ".**

Amry in his thesis toward the fulfillment of Master degree requirements in Nief Arab University for security sience EL-reyad Saudia Arabia has made empirical assessment in order to evaluate the factors that affecting the Decision Making Process (DMP) in Saidy Police sector. Amry findings; both change control system and conduct & commitment show positive indicators however; organization structure, managers perceptions and human resource system do need real reform.

5. **El-Rashedy (2000) "The Factors that hampering usage of Computerized Systems in Decision Making Process ".**

El-Rashedy has used descriptive analytical survey approach in order to define the main factors hampering the usage of Computerized Systems in Decision Making Process. He investigate the perception and experiences of medium managerial levels of general security in El-Ryad in order to confirm / disconfirm his assumptions ; El-Rashedy has concluded the following main factors that hampering the usage of Computerized Systems in the decision making process : there is lack of Awareness & Perceptions of the importance Computerized Systems , lack of (conduct & commitment to adapt the new technologies and change control system) social & cultural factors negatively influence the usage of CS .

6. **Farhan and Tarwana (1995) "Effective Information & Control Systems in Jordanian Public and Private sector".**

The authors of this thesis have tried to explore to which extent the Information & Control Systems are available and effective and to which extent the institutions have benefited from such

systems. The authors have conceded the following findings: lack of availability and efficiency of Information Systems & control in Public sector lack of (change control system, human resource system and organization structure) while the Private sector has shown positive results.

3.3 International Studies

1. Arain (2006) "A framework for developing a knowledge –based DSS for management of variation orders for Institutional Building"

Professor Arain , department of building, school of design and environment, National University of Singapore has taken three years in this research in order to describe relevant framework for developing a knowledge-based decision support system (KBDSS) , in order to provide decision-makers more informed decisions for managing variation orders in institutional buildings. The KBDSS framework consists of two main components, i.e., a knowledge base and a decision support shell. Database will be developed through collecting data from source documents of 80 institutional projects, questionnaire survey, literature review and in-depth interview sessions with the professionals who were involved in these institutional projects. The knowledge base will be developed through initial sieving and organization of data from the database. The decision support shell would provide decision support through a structured process consisting of building the hierarchy between the main criteria and the suggested controls, rating the change control system, and analyzing the controls for selection through multiple analytical techniques.

2. Sabherwal(2006) " Information Systems Success: Dimensions and Determinants "

Rajiv Sabherwal ; Professor of Information Systems , College of Business Administration, University of Missouri has worked for this research for almost three years in order to introduce a model of Information System success and its determinants. Professor Sabherwal joins together with two Doctoral Candidates in Information Systems Anand Jeyaraj and Charles Chowa have presented and tested a comprehensive theoretical model. This model explains interrelationships among four constructs representing the success of a specific information system (user satisfaction, system use, perceived usefulness, system quality), and the relationships of these IS success constructs with four user-related constructs (user experience with ISs, user training in ISs, user attitude towards ISs, and user participation in the development of the specific IS) and two constructs representing the context (top-management support for ISs and facilitating conditions for ISs). To test the model, they first used meta-analysis to compute a correlation matrix for the constructs in the model based on 612 findings from 121 studies published between 1980 and 2004, and then used this correlation matrix as input of the model. Overall, the

researchers found excellent support for the theoretical model. The results underline the importance of user-related and contextual attributes in IS success and raise questions about some commonly believed relationships. Also the results underline the lack of (change control system and business process systems) as main reasons of failure Information Systems.

3. Kwakkel (2006) "DSS failure studied from an adaptive design perspective".

This study is written by Kawakkel for the master thesis project of the System Engineering Policy Analysis and Management master of the faculty TPM of the TU Delft Netherlands. It is the result of roughly nine months of research into; why and how decision support system fails frequently. The central problem in this research focuses on the lack of understanding of DSS Failure. Research framework for understanding DSS failure is developed and used for the analysis of two DSS development project.

As result of comprehension literature review including identifying dedicated framework for the failure reasons of DSS; the researcher has identified some precise and rich framework for the DSS failure. The brief outline of the results can be as following; ambiguous definitions of the success factors, ambiguous distinction between processes and environment and factors identical to elements that form the loops in adaptive design. Kawakkel has proceeded studying the DSS failure by highlighting the case of DSS failure: SPADE (Supporting Platform for Airport Decision-making) which an acronym for a failed European Union sponsored project that aimed at developing a decision support system for strategic planning at airports.

The results of SPADE study were; lacking in (Conceptualization of the development process, change control system, conduct & commitments) in addition to the improper business process system.

4. Cordier (2006) "Lessons Learned From the Model-Driven Architecture Applied to Critical Systems Reliability: A Case Study "

This Master thesis submitted to department of Computer and Systems Sciences Royal Institute of Technology / Stockholm University. As the Object Management Group; (OMG) developed in 2001 a new approach to software development: the Model Driven Architecture (MDA). This approach emphasizes the role of conceptual models in software development and aims at improving software portability, reusability and interoperability. To achieve these goals, the Object Management Group postulates that the clear distinction between functional requirements and technical implementation is the key to success.

As the aim of this master thesis, is to investigate this question. The methodology followed by this thesis is a case study. The case study focuses on a large software company which developed a decision support system intended for emergency services applying Model Driven Architecture. This application belongs to the category of safety critical systems where reliability is of specific concern. The thesis gives a thorough description of the implementation of Model Driven Architecture in this project and investigates the implications of Model Driven Architecture on software reliability. The following results were drawn from the case study: Model Driven Architecture seems to contribute to accurately define requirements in term of object models, and seems to lead to high compliance to requirements. Moreover, Model Driven Architecture introduces traceability throughout the development process; this practice may encourage learning process and contribute to prevent errors. Furthermore, Model Driven Architecture seems to provide interesting bases for model based testing. In this respect, Model Driven Architecture opens new perspective on an integrated process from specification to software testing. The more interesting result of the case study, was the highlight of lack of "well defined and précised business process system "and ineffectual change control system as critical factors to be reformed in order to implement the model driven architecture setup.

5. **Heilman and others (2005) " Working Smarter: Research and Decision Support Systems in Mexican Agriculture".**

Agricultural research institutions will face many challenges in the 21st century. The importance of producing food and fiber is recognized, and agriculture plays a critical role in rural employment and environmental management; this lead Hellmann and his colleagues to trigger this research as it mainly focused on exploring the importance and visibility of applying DSS in Mexican Agriculture. After long and hard revision of relevant literature review and many interviews with experts; the researchers have concluded the following findings as managerial factors that hampering utilization of DSS in Mexican Agriculture as following : Lack of (user perception of DSS, internal business process system, change control system and conduct & commitment).

6. **Imran (2005) "Strategies for ICT Use in the Public Sector in the Least Developed Countries: A Cross-Country Analysis".**

Imran as PhD Candidate School of Business and Information Management Australian National University has intended to investigate strategies to advance the use of ICT in the public sector in LDCs least developed countries, with the aim of improving services and outcomes for government and citizens. Imran has developed a multi-level framework for analysis with, consistent with a structuration-type theoretical approach. A meta-analysis of data gathered in a

UN study of e-government readiness was performed, focussing on the developing countries that have greatly improved their relative positions recently. In general, the findings support the multi-level approach. At the national level, a low level of economic development, poor infrastructure and political unrest are inhibitors of public sector ICT progress. At a base level, access by individuals and organizations to ICT tools and IT-related education is necessary for e-government to be feasible.

Overall, analysis identified a number of themes that were common in a number of the least developed countries LDCs. These themes were; Leadership and political willingness and awareness to initiate change within the government sector, was evident in the majority of countries with improved positions. Malaysia for example, has a Malaysian Administrative Modernization and Management Planning Unit that seeks to enhance the use of ICTs and has mandated that each government agency create an IT strategy to help facilitate greater communication between agencies and the public. An incremental step-by-step approach to development was also common across the majority of the LDCs with a step up in ranking. Examples include Pakistan (+15), Saudi Arabia (+15), China (+7), and Thailand (+6).

There was limited evidence of top down long-range planning approaches that worked. 'Leap frogging' is possible, it is not necessary to go through steps or stages in a fixed sequence. Mongolia is an illustration, advancing considerably although it bypassed a transactional stage.

Imran has finished his findings by highlighting the fact; that human resource systems as well as organization structure domain in LDCs in general should be critically adapted in order to meet the future requirements in the area of ICT.

7. Liew and Sundaram (2005) "Complex Decision Making Processes: their Modelling and Support"

Liw and Sundarman have worked together in this research paper which submitted to the University of Auckland, New Zealand, the main purpose of their research was to investigate conceptual decision-making and modeling processes and then develop a flexible object-oriented decision system framework and architecture to support the proposed processes. Some of the key concepts that they have been able to explore and implement are generic modelling ideas, such as data-model, model-solver, model-model, solver-visualisation, and data-visualisation independences. Specifically they have been able to explore the integration of models of different types, levels of complexity, depths of integration (aggregation, pipelining, and splicing) and orientations (satisfying as well as optimizing). The most interesting part of this study was that

one related to the continuous change and developments on the Business Process domain in order to apply utilized model-driven DSS.

8. Elbeltagi (2004) "Evaluating the Factors Affecting DSS Usage by Senior Managers in Local Authorities in Egypt "

This study has examined the utilization of a decision support system (DSS) in Egyptian local authorities using an adapted Technology Acceptance Model (TAM). The centrally-developed DSS had been rolled out to 27 Governorates in Egypt for use by Chief Executive Officers. The results demonstrated that TAM could be applied to a specific system within a developing country, top management support and organizational characteristics exerted the greatest effect ; which still consider not capable enough for sophisticated IS, environmental characteristics and task characteristics had a negative effect on DSS usage, DSS utilization requires users to have significant amount of perception which exist in Egypt , Kuait and to less degree in Jordan , the organizational structure of Egyptian government is hierarchical, with long chains of command and only the top level able to make decisions this adds more difficulties for future modifications on modern DSS in Egypt. In conjunction with interviews, the quantitative results suggest that the perceived usefulness of the DSS is reduced in an environment where there is a lack of autonomy, a command and control culture and little requirement for decision making in implementing centrally-made decisions. This study has clearly indicated the importance of taking into account reforming the business process domain and external factors when examining IT technology adoption globally. In particular, many aspects of culture, including the background and characteristics of the decision-maker will strongly influence the perception of management support systems.

9. Eom (2004), "The Changing Structure of Decision Support Systems Research: An Empirical Investigation through Author Cogitation Mapping"

This paper extends earlier benchmark study which examined the intellectual structure, major themes, and reference disciplines of decision support systems (DSS) over the last two decades (1960-1990). Factor analysis of an author cocitation matrix over the period of 1990 through 1999 extracted 10 factors, representing six major areas of DSS research: group support systems, DSS design, model management, implementation, and multiple criteria decision support systems and five contributing disciplines: cognitive science, computer supported cooperative work, multiple criteria decision making, organizational science, and social psychology. Several notable trends and developments in the DSS research areas over the 1990s have been highlighted.

10. Hussein and others (2004) " The impact of Organization Factors on Information Systems Success: an empirical investigation in the Malaysian electronic –government sector.

Hussein and his colleges have used perceptual measures in order to investigate the influence of organizational factors on IS success. Survey questionnaires were gathered from 201 users from four central agencies located at the central administration complex in Putrajaya. Six items were identified to influence IS success. They are top management support, decision-making structure, organization structure, managerial IT knowledge, goal alignment, and resources allocation. The study also identified four IS success dimensions; systems quality, control of change, perceived usefulness, and user satisfaction. The main findings that related to my thesis were; there is significant relationship between the organizational factors concerned and IS success dimensions evidently indicate the importance of these factors in ensuring successful information systems. The empirical evidence also support organizational factors as one of the important antecedent factors of IS success. The outcome suggests that the organization structure has significant impact on system success. The results however gave the indication that public sector organizations tend to adopt the traditional form of decision-making structure. Furthermore, the common practice in the Malaysian the public sector is that decisions are normally made at the strategic level of the organization. Well defined Business Process relates to a higher degree of satisfaction in system quality, information quality, system quality and overall user satisfaction. The results are consistent with other related studies. The outcome validates the assertion that top management plays a very important role in supporting IS and eventually facilitates success in an organization including public organization. More importantly, commitment from supportive top officials is most likely to encourage employees to use an IS. Any form of support from top management may help employees to become involved in any IS applications adoption, implementation or utilization. In the Malaysian context, during the electronic government project implementation, the top government officers are required to attend IT related courses. Thus, this scenario justifies the outcome of the results. The results also is implying higher level of goal alignment practice correlates to higher levels of perception towards the four dimensions of the IS success.

11. Khorshid(2004) "Model-Centered Government Decision Support Systems for Socioeconomic Development in the ArabWorld "

Khorshid , vice president of Graduate Studies and Research of Cairo University has sprinted this research paper on the International Conference on Input-Output and General Equilibrium: Data, Modeling and Policy analysis Brussels, Belgium. The paper developed descriptive analytical model in order to achieve the main objectives ; assess recent developments in model-centered

DSS technology, (ii) Identify the role of DSS in improving socioeconomic development policy-making and strategic planning in the government sector and (iii) Critically review the experience of the Arab countries in developing, implementing and institutionalizing government socioeconomic model-centered DSS, with the objective of identifying challenges and learned lessons. The following were the main findings and recommendations: With regards to a data-centered DSS, the main emphasis is on acquiring, filtering, testing, and consolidating data from external and internal sources with the objectives of generating appropriate indicators and reports for supporting strategic decisions. E-governance offers, then, a new way forward to improve government processes, establish appropriate linkages with citizens, build interactions with civil society, and finally, interact properly with the outside world. According to this concept, e-government uses the ICT to offer three basic change potentials for good governance in developing countries; Automation, Transformation and Informatisation DSS in Arab Countries; in many circumstances government senior officials or socioeconomic policy-analysts are faced with a specific problem that needs a quick decision. In this situation, the DSS group needs to concentrate only on developing a simple analytical database along with its particular quantitative decision support tool or model. Some cases from Arab countries have been presented ; Foreign Exchange Rate Policy in Egypt , Economy-Wide Loss from the Second Gulf War (Kuwait case), Development Planning Scenarios in Egypt , Fiscal Reform in Kuwait , External Debt Management System in Egypt , Customs Tariff Policy Formulation. The study recommends triggering effective and continuous DSS training to enhance the Human Resource capabilities. Based on the outcome of the review carried out on DSS applications in the Arab countries, the use of this second comprehensive type to support government socioeconomic decisions is very limited.

A direct reason for this situation is the considerable expenses associated with the development, maintenance and updating of these general-purpose DSS systems, fact that DSS understanding and perception by government senior managers and public sector policy- makers is still very limited and the lacking in (change control system, business process system and conduct & commitment). Finally, the small number of specialists of DSS in the Arab world contributes, also, to limiting its utilization in the region.

Two successful stories about DSS; two most representative and successful government DSS experiences in the Arab countries: the Development Planning Decision Support project [DPSS] of the Ministry of Planning in Kuwait and the Information and Decision Support Center [IDSC] of the government of Egypt. The Kuwaiti DSS represented a joint project carried out by the

Ministry of Planning [MOP], the Department of Economic and Social Affairs [DESA] of the United Nations, and the UNDP. The Cabinet of Ministers of the Egyptian government, however, initiated the second DSS. With respect to the use of analytical tools and models, the Kuwaiti case is more advanced. It integrates the data-centered and the model-centered DSS technologies into a unified computer-based support system. Nonetheless, IDSC provides many lessons about the institutional aspects of the DSS and its computing infrastructure.

12. Bohanec, (2004) " What is Decision Support System "

This research study has been presented by department of Intelligent Systems Jožef Stefan Institute Ljubljana, Slovenia. Bohaner has hardly tried to describe and clarify the meaning of the term Decision Support (DS). Based on, a survey of DS-related WWW documents. A classification of DS and related disciplines are presented. DS is put in the context of Decision Making, and some most important disciplines of DS are overviewed: Operations Research, Decision Analysis, Decision Support Systems, Data Warehousing and OLAP, and Group Decision Support. Finally the paper highlights the most factors that managers should a ware of in order to have such successful DSS as follows; mangers perception of DSS Importance, True Conduct & Commitment of DSS , Continues human-computer knowledge ,enhancing data warehouse and OLAP , enhancing the integration of DS with data mining , qualitative modeling ,Introduction of advanced technologies such as Artificial Intelligence and finally expert system.

13. List and others (2003) "Process-Oriented Requirement Analysis Supporting the Data Warehouse Design Process ".

List Beate and his colleagues are researchers in the Institute of Software Technology, Vienna University of Technology have presented in this paper the adaptation of use case and object models for modeling business requirements for data warehouse systems to support the data warehouse design process. Also the paper shows how data warehouse requirements are derived from business requirements and their organization context, the paper presents use case model is an excellent means of both expressing requirements with regard to the data warehouse and providing a comprehensive picture of proper business process system; the paper find that the current business process system is ideal for integrating data warehouse requirements with business requirements.

14. Ahmed and others(2003) " Scenario Driven Decision Systems: Concepts and implementation "

The main goal of this technical paper that has bee produced by Department of MSIS University of Auckland, Auckland, New Zealand is to define an integrated life cycle approach for scenario

driven flexible decision support by synthesizing ideas from scenario-based decision-making and DSS. The proposed processes help the decision maker with idea generation, scenario planning, development, organization, analysis, execution, and evaluation for Decision Support System. Also, dedicated modular framework has been developed in order to support the proposed scenario management process. Scenarios are introduced as a component that is comprised of a complex combination of other decision-support components. The framework and architecture have been validated through a prototype. Finally; is paper draw road map for better integration between both IT and business process domain.

15. English (2002) "Ten mistakes to avoid if your data warehouse is to deliver quality information".

Larry P. English the President and Principal of Information Impact International, Inc in his article tried to provide ; some sort of precise benchmarks regarding the mistakes that should mangers highly consider when designing proper data warehouse the ten mistakes are :

- Failing to understand the purpose of data warehousing and the types of business problems to be solved with data warehouse information
- Failing to understand who are the real "customers" of the data warehouse
- Assuming the source data is "OK" because the operational systems seem to work just fine
- Not developing enterprise-focused information architecture-even if only developing a departmental data mart
- Focusing on performance over information quality in data warehousing
- Not solving the information quality problems at the source
- Inappropriate "Ownership" of data correction/cleanup processes
- Not developing effective audit and control processes for the data Extract, Correct, Transform and Load (ECTL) processes
- Misuse of information quality software in the data warehousing processes
- Failing to exploit this opportunity to "correct" some of the wrongs created by the previous 40 years of bad habits

16. Newman and Plummer (2000) "Success and failure of decision support systems learning as we go ".

Newman from Cooperative Research Centre for the Cattle & Beef Industry and Plummer Central Queensland University, North Rockhampton, Queensland 4702 Australia have worked together in this case study , a DSS under development to evaluate crossbreeding systems in northern Australia. The main objectives of the case study were to identify issues involved in DSS development and use. Issues highlighted include industry consultation, managerial role, target audience focus, evaluation of DSS success, user participation, support and availability, and participatory learning processes. The case study provided evidence of a perceptible shift in the development process because greater emphasis was put on the learning process of breeding program design by end-users rather than emphasis on learning how to use the DSS itself. Effective change control system and greater end user involvement through participatory learning approaches.

17. Kersten and others (1999) "Decision Support Systems for Sustainable Development in Developing Countries ".

This study examines decision making and support from the following four perspectives: information processing, managerial activities, decision problems and human organizations. This broad framework allowed the researchers to identify different aspects and requirements of managerial support and led to a formulation of a set of decision support system design principles. The main findings and conclusion of this study are; managerial decisions are always made within an organization and context including the organization's own culture, routines and operating procedures. Support systems need to allow for the influence of cultural and other traits, and must fit the organizational structure. At the most general level problem solving and reasoning about decisions, including managerial decisions, can be articulated at three distinct levels; the level of need, the cognitive level and finally the tool & calculation level.

18. Kersten and Yeh (1999), "Decision Support Systems for Sustainable Development in Developing Countries "

This study examines decision making and support from the following four perspectives: information processing, managerial activities, decision problems and human organizations. This broad framework allowed the authors to identify different aspects and requirements of managerial support and led to a formulation of a set of decision support system design principles. This framework can be applied to position, study and develop a variety of systems for the domain of sustainable development in developing countries. The references clearly show that the DSS area is very active; plethora of systems has been developed in the nineties and used to support

almost every type of decision problem. As per the managerial requirements for successful DSS; the others have found the following; lack of control over the change process activities, improper conduct and commitments and lack of user perception of the importance of DSS.

19. Averweg and Erwin (1999) " Critical Success Factors for Implementation of Decision Support Systems in South Africa "

In this paper the authors have compare published findings of identified critical success factors (CSFs) for the implementation of Decision Support Systems (DSS) in developed countries with survey findings from a selection of organizations in South Africa. As no previously published literature exists, the authors seek to establish whether these same CSFs exist in South Africa. The authors identified from their survey several differences between the accepted DSS implementation norms prevalent in developed countries and those in South Africa. These include: user involvement, top management support, user training, information source, organization structure, change control system, organization structure.

The structured interviews resulted in some of the evidence items being strongly supported; mainly all managers agreed on the knowledge of importance and purpose of DSS, business process domain is integrated to IT, control of change is properly enforced, of all managers are committed to the success of the DSS in the other hand, the analyzed data show continuous need for effective training for users and organization structure adoption.

20. Rose and Straub(1998) " Predicting General IT Use: Applying Technology Accepted Model TAM to the Arabic World"

This study provides insight into information technology adoption and use outside of the technologically advanced world. As predicted, TAM transferred successfully to the Arab world. The effectiveness of TAM in predicting general computer technology adoption and use raises the question of whether other adoption and use models might not be applicable as well. For practitioners, successful transfer of TAM to less developed countries suggests certain implementation strategies. Approaches which are suitable for introducing IT in technologically advanced cultures may be applicable to a certain extent in less developed cultures. Stressing rational factors like usefulness of a new system in user training, true conduct, and effective change control system could lead to better implementation, for example. Caution must be used when interpreting these findings, however. The researchers know that social and cultural norms are also good predictors of technology use and, thus, it is possible that over emphasis of rational factors could lead to cultural backlash rather than cultural acceptance. Social and cultural beliefs may be very specific to certain cultures and need to be addressed in training and implementation

Managers should attempt to work with, rather than against the dominant culture. Top management buy-in and championship must be ensured before attempting to introduce new IT in a highly patriarchal, tribal, and communal society like the Arab culture, for example. In that face-to-face meetings are an essential part of Arab society, managers should probably not stress the efficiency of face-to-face replacement systems, such as an E-Mail or groupware.

21. KAMEL (1998) " Decision Support Systems and Strategic Public Sector Decision Making in Egypt "

Sherif Kamel has published this study by Institute for Development Policy and Management, University of Manchester, Precinct Centre, Manchester. This paper focuses on the application of decision support systems (DSS) to strategic public sector decision making for socio-economic development. It describes the experience of the Egyptian public sector in socio-economic decision making and the related emergence of an information-based support organization for government, the Information and Decision Support Centre (IDSC). The paper describes a set of decision support system cases, and an issue-based management approach in the design and delivery of these systems. Such cases fall within Egypt's comprehensive plan to introduce and rationalize the use of information technology in various key sectors in the economy. The paper also describes the challenges faced and lessons learned from the DSS cases which briefly categorized as ; Resistance to change, lack of timely, adequate information about user needs , lack of user involvement ,user language problems , lack of top management support , lack of continuous communication from users , difficulty of problem definition , lack of proper Business Process , Lack of precise definition , Lack of monitoring , Lack of performance measurements tools and finally improper organization structure.

22. Vetschera (1997) "Decision Support Systems in Networked Organizations "

Vetschera as Professor in University of Vienna, Austria focused in this study on revision of the effect of organization structure characteristics and the main role of DSS in traditional organizations. Also he presents the new paradigm of organization in more detail, analyzes how the traditional goals of DSS are influenced by this change and finally summarizes the main consequences and presents conclusions for both future research and practical DSS development. The main findings that related to my thesis are; the organizational structure has strong effects on the development and even the entire concept of DSS , organizations have undergone dramatic changes during the recent years ,traditional hierarchical organizations and bureaucracies are now viewed as outdated and inefficient forms of organization and finally flat hierarchies, process-

oriented designs, networked and even "virtual" organizations are advocated as more efficient ways to utilize sophisticated information system .

23. Bertucci(1995) "Government Information Systems a Guide to Effective use of Information Technology in the Public Sector of Developing Countries ".

This United Nation report is focusing on exploring the main difficulties hampering the success of Information Systems in governmental domain, the author is highlighting the management side rather than the technical side. Understanding what is government information system and how to develop it successfully is vital to government decision makers and senior managers responsible for this critical area. This critical issues include: appreciation and understanding of the advanced state of the art of information technology; awareness of the trends of modern information technologies and their impacts on development strategies of developing countries; knowledge on the roles of government policy in stimulating effective use of information technology; and cognizance of the management issues of government information infrastructure and information systems building. To summarize the findings; Berucci has concluded the following key problems in management level ; lack of management commitment, poor Business Process , unclear objectives and priorities , impractical strategies , user dissatisfaction , improper change control system and finally chaotic development programs.

Upon end of reviewing the previous related studies; the researcher would like to highlight that this study is distinguish in two main themes a)focus b) compile all managerial factors . With respect to the focus of the study; the researcher believes that its one of the unique studies that focuses on managerial dimension of DSS utilization , which is extremely important as most of the findings of the previous studies have mad it evident. Besides, the researcher believes that this study has such distinguish against others in combining together the most critical managerial factors that influence DSS utilizations.

.

Upon the end of literature review of the previous studies; the following section will present brief break down of the studies as whole and its relation with our study. Obviously, all the previous studies have one shared issue which is; the role of information systems in the decision-making process from various prospectives; meanwhile; the studies cover different cultures from various countries and different research directions.

With respect to the Palestinian studies; they focused on evaluating the Information Technologies tools role in the managerial decision-making process in the industry area of commercial banks in Gaza, Municipalities sector in Gaza and Palestinian universities in Gaza. All the three previous studies have not included DSS and also have not complied the managerial factors of successful DSS. This research study is focusing on this distinguish issue evaluating the managerial factors that utilize DSS.

With respect to the Arabic studies; all have measured the status of computer systems in terms of availability and define the obstacles that hamper the effectiveness of such systems; none of theses studies have compiled main managerial factors that affect the utilization of such systems together while this study is compiling theses managerial factors together.

With respect to international studies ; it cover evaluation of DSS in different industries within different countries but none of those studies have compiled major managerial factors that affect DSS utilization just like in our study . Part of the international studies were aimed to examined the status of Information Technologies (IT) in less developed countries which enrich this study with the required insight of the external as well as cultural influences on utilization of information systems as whole and DSS in particular .

Chapter 4 - Research Methodology

4.1 Introduction

This chapter describes the methodology that is used in this research study. The adopted methodology to accomplish this study uses the combination techniques of descriptive approach and information about the research design, population, sample size, research setting, questionnaire design, statistical data analysis, content validity, pilot study and ethical aspects of the research.

4.2 Research Methodology

A descriptive research methodology join together with statistical analysis were used for this study. A survey was conducted and distributed to stratified random sample of two mission critical PM; Ministry of Education and Ministry of Health.

The researcher chose a descriptive research methodology and then has designed a questionnaire survey instruments to assess the perceptions random sample of various levels of managers in the two big institutions, section 4.5.1 show the population descriptions.

4.3 Research Sample

After the supervisor approval; the researcher has defined the population of the study. The methodology for this study was a stratified random sample of both Ministry of Education and Ministry of Health

Table no (4.1) Population and sample

Institution	Total staff	Mangers	%0. 4	N
Ministry of education	10,543	2,268	90.72	90
Ministry of Health	7,445	1,503	60.12	60
Total	**17,988**	**3,771**		**150**

The researcher chose a 4% random sample of the population.

The respondents were full-time governmental employees working in the managerial levels from (head of departments, deputy managers, managers and managing directors or above). The sample was selected randomly from the managerial levels of the population (Ministry of education and Ministry of Health). A total of 150 questionnaires were distributed and 141 were returned this constitute response of %0.94 (refer table 4.2)

Table 4.2 Questionnaires distribution and response rates

Ser	Institution	Questionnaires Sent out	Questionnaires returned	Percent of total
1	Ministry of Education	90	84	60%
2	Ministry of Health	60	57	40%
	Total	**150**	**141**	**100%**

4.4 Data Collection

In this thesis a structure data collection approach was used to collect the data. This approach was selected because it allowing the quantification of respondents, and the statistical analysis therefore structured questionnaire was applied. The researcher requested managing directors to distribute it, in their respective departments; it was smooth process in general. The respondents have completed the questionnaires in their spare time. There was great sense of anonymity because each respondent was given his or her own questionnaire and the responses could not be linked to any particular person. Respondents were more likely to provide honest answers because each one could complete the questionnaire in private.

4.5 Questionnaire Content and Design

4.5.1 Questionnaire Content

All the information that could help in achieving the thesis objectives were collected, reviewed and formalized to be suitable for the study survey and after many stages of brain storming, and reviewing executed by the researcher with the supervisor, a questionnaire was developed with closed questions. The questionnaire was translated into Arabic language to make sure that contents for all respondents are clear and understandable. An English version was attached in (Annex 1). Unnecessary personal data, complex and duplicated questions were avoided. The questionnaire was provided with a covering letter which explained the purpose of the study, the

way of responding, the aim of the research and the security of the information in order to encourage high response. The questionnaire design was composed of four sections to accomplish the aims of the research, as follows:

1. Respondents Demographic Profile.
2. The Awareness of DSS importance in PM
3. Need of Enhancements in DSS Awareness
4. Managerial Requirements Evaluation that facilitate utilization of DSS in PM
   - Human Resource System evaluation.
   - Organization Structure evaluation.
   - Business Process System evaluation.
   - Change Control System evaluation.
   - Conduct and Commitment requirements evaluation.

4.5.2 Measurement Development

The measurement instrument (Questionnaire) and the measures of the construct were developed in several stages. A multi-option format and Likert scales technique have been selected in this questionnaire design. Cover letter in Arabic has been attached to the Questionnaire to guide the respondents and for better clarifications.

4.5.3 Pilot test

In this thesis; the pilot study was initially conducted by distributing the prepared questionnaire to panels of experts having experience in the same field of the research to have their remarks on the questionnaire. Ten expert representing two panels were contacted to assess the questionnaire validity. The first panel, which consisted of eight expert doctors in Islamic university (Appendix II) , was asked to verify the validity of the questionnaire topics and its relevance to the research objective. The second panel, which consisted of two experts in statistics, was asked to identify that the instrument used was valid statistically and that the questionnaire was designed well enough to provide relations and tests among variables. Expert comments and suggestions were collected and evaluated carefully. All the suggested comments and modifications were discussed with the study's supervisor before taking them into consideration. In addition pilot test has been implemented toward pilot population; the population for the pilot study possessed similar

characteristics to the research population. The research method was applied on limited scale. Twenty questionnaires were distributed and good response rate was obtained. At the end of this process, some minor changes, modifications and additions were introduced to the questions and the final questionnaire was constructed.

4.6 Demographics of Respondents

Six demographic and personal items were considered in the questionnaire which is age, gender, education, experience, profession, training in DSS attained.

4.6.1 Age in years

Table No. (4.3) show the distribution of the age in years of sample respondents as the maximum ratio was for those ages from 41 – 50 years (%34), while the minimum ratio was for the those ages older than 50 years (%16.3) meanwhile the ages from 25 - 30 years have (%28.4) ratio and the ages from 25 – 30 have the ratio of (%28.4). The previous findings seem to be reliable and reasonable which confirmed with oracle main database available in General Pension Insurance Corporation (GPIC) where the researcher is currently manager of the database there. Also the findings lead to conclude that the sample has diversity of managers ages and most majority of the respondents are young mangers (%82.7) of the sample are under 51 years old ; this extremely encourages the researcher that such young population will have the open mind and flexibility to adapt the finding and recommendations of this study

Table 4.3 Respondent's age

Age	Frequency	Percent
Less than 25 years	0	0.0
25 – less than 30 years	40	28.4
31 – Less than 40 years	30	21.3
41-50 years	48	34.0
Older than 50 years	23	16.3
Total	141	100.0

.

4.6.2 Gender

Table No. (3.4) Show that %85.1 from the sample are male, and %14.9 are female. These findings are confirmed with Oracle database that available at GPIC.

Table No (4.4) Gander

Gender	Frequency	Percent
Female	21	14.9
Male	120	85.1
Total	**141**	**100.0**

4.6.3 Education level

Table No. (4.5) show the respondents education levels distribution as the maximum ratio was for those who are holding Bachelor degree (%58.2) while the minimum ratio for those who are holding PHD (%2.1) meanwhile the ratio of respondents who are holding Master degree was (%33.3) and only %6.4 for the respondents that under graduate with diploma .

Table 4.5 Education Level

Education level	Frequency	Percent
High school or less	0	0.0
Diploma	9	6.4
Bachelor degree	82	58.2
Master degree	47	33.3
PHD	3	2.1
total	141	100.0

This was really a good sign for the researcher that sample was representing qualified mangers with almost (%94) are holding Bachelor or above degree and that lead to conclude that such qualified mangers will have the ability to deal and use DSS in their work.

4.6.4 Field of education background

Table No. (4.6) show the distributions of respondents according to their education specialization; the maximum ratio was for IT/MIS specialization (%31.9) and the minimum was for Business Administration (%12.1) , in the meanwhile those with specialization of Finance & Accounting have (%19.1) , Engineering with (%21.3) and finally others specialization with (%31.9).

Table 4.6 Field of education background

Specialization	Frequency	Percent
Business Administration	17	12.1
Finance & Accounting	27	19.1
Engineering	30	21.3
IT	22	31.9
Others	45	15.6
total	141	100.0

The above findings are encouraging the researcher that there are enough mangers that have proper knowledge of the fields IT and MIS which will be very helpful to the thesis study.

4.6.5 Profession

Table No.(4.7) show distributions of respondents according to their managerial position as 23.4% for head of department, 8.5% for Manager Deputy , 42.6% for Manager , 14.9% for Director Deputy, and finally 10.6% for General Director/above .

Table 4.7 Profession of respondents

Profession	Frequency	Percent
Head of Department	33	23.4
Manager Deputy	12	8.5
Manager	60	42.6
Director Deputy	21	14.9
General Director /above	15	10.6
total	141	100.0

This lead, to conclude; the sample was quite containing various management levels; which will enrich the thesis study in providing comprehension insight of all various management levels in Palestinian governmental sector·

4.6.6 Years of Experience

Table No. (3.7) show distributions of experience years of respondents as the maximum ratio was for those of experience from 11-15 years (%26.2) while the minimum ratio was for those experiences from 16-20 (%8.5) mean while the respondents with experiences less than 5 years was (%17), the experiences of respondents from 11-15 was (%26.2) and finally those respondents with more than 20 years experiences were representing (%24.8)

Table 4.8 Experience in years

Years of Experience	Frequency	Percent
Less than 5 years	24	17.0
5 – Less than 10 years	33	23.4
11 - 15 years	37	26.2
16 - 20 years	12	8.5
More than 20 years	35	24.8
total	141	100.0

This lead, to conclude, that vast numbers of respondents have long experience joining this results with the results from 3.81; vast numbers are young; which explain the sharp interesting and awareness of DSS.

4.6.7 Training in DSS

Table No. (4.9) show the respondents replying on the question of "how many course do you attend in the area of DSS?" ; the findings were quite confusing to the researcher as the majority of the respondents (%62.4) were divide between those who have never attain any training (%31.2) and those who only attend 1 course (%31.2) although great deal with respondents have agreed that there is awareness of DSS in the management level in the Palestinian governmental institutions. Mean while; (%14.2) of the respondents have attained two courses in the area of

DSS, (%2.1) of the respondents have attained 3 courses and finally %21.3 of the respondents have attained 4 courses.

Table 4.9 DSS training

DSS Courses	Frequency	Percent
None	44	31.2
One course	44	31.2
Two courses	20	14.2
Three courses	3	2.1
Four courses	30	21.3
Total	141	100.0

4.7 Research Validity

Validity refers to the degree to which an instrument measures what it is supposed to be measuring (Pilot and Hungler, 1985). Validity has a number of different aspects and assessment approaches. There area two ways to evaluate instrument validity: content validity and statistical validity, which include criterion-related validity and construct validity.

4.7.1 Content Validity of the Questionnaire

Content validity test was conducted by consulting two groups of experts. The first was requested to evaluate and identify whether the questions agreed with the scope of the items and the extent to which these items reflect the concept of the research problem. The other was requested to evaluate that the instrument used is valid statistically and that the questionnaire was designed well enough to provide relations and tests between variables. The two groups of experts did agree that the questionnaire was valid and suitable enough to measure the concept of interest with some amendments.

4.7.2 Statistical Validity of the Questionnaire

To insure the validity of the questionnaire, two statistical tests should be applied. The first test is Criterion-related validity test (person test) which measures the correlation coefficient between each item in the field and the whole field. The second test is structure validity test (person test) that used to test the validity of the questionnaire structure by testing the validity of each field and the validity of the whole questionnaire. It measures the correlation coefficient between one filed

and all the fields of the questionnaire that have the same level of similar scale with the size of a pilot sample equal 30.

4.7.3 Criterion Related Validity

4.7.3.1 Internal consistency

Internal consistency of the questionnaire is measured by a scouting sample, which consisted of thirty questionnaires, through measuring the correlation coefficients between each paragraph in one field and the whole filed. The tables (3.9, 3.10 and 3.11) below; show the correlation coefficient and p-value for each field items.

Table (4.10) – Awareness of DSS Importance
The correlation coefficient between each item in the field and the whole field

No.	Item	Person correlation coefficient	p-value
2.1.1	Define and analyze problems	0.455	0.012
2.1.2	Provide alternative scenarios to manage the defined problems	0.375	0.041
2.1.3	Take good decisions that maximize the benefits of the ministry.	0.409	0.025
2.1.4	Achieve the main objectives efficiency	0.625	0.000
2.1.5	Minimize efforts, time and cost	0.683	0.000
2.1.6	Assist in budgeting related decision	0.721	0.000
2.1.7	Assist in providing good public services	0.664	0.000
2.1.8	Assist in human resource management & developments	0.711	0.000
2.1.9	Assist in the control of change	0.795	0.000
2.1.1	Help management by discovering bottlenecks that hamper	0.401	0.028
2.1.1	Determine time constraints related to decisions taken	0.451	0.012
2.1.1	Trace the pros & cons of decision implementation	0.746	0.000
2.1.1	Reduce paper usage	0.393	0.031
2.1.1	Enhance Business Process Management	0.681	0.000
2.1.1	Enhance the Quality of Services	0.755	0.000
2.1.1	Achieve better Governance	0.778	0.000
2.1.1	Provide future sustainability and viability	0.775	0.000

As show in the table the p- Values are less than 0.05 or 0.01,so the correlation coefficients of this field are significant at $\alpha = 0.01$ or $\alpha = 0.05$, so it can be said that the paragraphs of this field are consistent and valid to be measure what it was set for.

Table (4.11) Need of Enhancements in DSS Awareness

The correlation coefficient between each item in the field and the whole field

Number	Item	Person correlation coefficient	p-value
3.2.1	Human Resource System	0.810	0.000
3.2.2	Organization Structure domain	0.874	0.000
3.2.3	Business Process System	0.888	0.000
3.2.4	Change Control	0.824	0.000
3.2.5	Conduct & Commitment domain	0.689	0.000

Table (4.12) - (Managerial requirements that facilitate utilization of DSS)

The correlation coefficient between each item in the field and the whole field

No.	Item	Person correlation coefficient	p-value
Human Resource System			
4.1.1.1	Existence of effective training program in the area of DSS.	0.653	0.000
4.1.1.2	Existence of a defined and clear plan for DSS building	0.791	0.000
4.1.1.3	Proper performance appraisal system is totally applied.	0.726	0.000
4.1.1.4	Proper safety & health system is applied.	0.827	0.000
4.1.1.5	Existence of an enhancing conduct programs.	0.578	0.001
4.1.1.6	Equipments needed are totally available for all relevant staff	0.588	0.001
4.1.1.7	Proper motivation policies are applied.	0.790	0.000
4.1.1.8	Regulations & rules are flexible enough to handle future	0.858	0.000
4.1.1.9	No existence of inter-departmental conflict	0.0590	0.001.
4.1.1.1	Staff satisfaction with pay & condition	0.720	0.000
Organization Structure			
4.2.2.1	OS is facilitating the decision-making process within the	0.859	0.000

4.2.2.2	OS is facilitating discipline and control over the business	0.868	0.000
4.2.2.3	Business Process activities are fully related to organization	0.847	0.000
4.2.2.4	Clear and precise responsibilities assigned to organization	0.778	0.000
4.2.2.5	OS is providing flexibility and responsiveness to the changing	0.834	0.000
4.2.2.6	OS is allowing information flow enormously	0.772	0.000
4.2.2.7	OS is providing easy communication among specialists	0.832	0.000
4.2.2.8	OS is providing learning abilities i.e. enhancement of	0.916	0.000
4.2.2.9	Organization Structure is facilitating performance evaluation	0.880	0.000
Internal Business Process System			
4.3.1.1	Business Processes are precisely defined	0.703	0.000
4.3.1.2	Business Process are well described including detailed	0.688	0.000
4.3.1.3	Business Processes activities are in accordance to laws and	0.767	0.000
4.3.1.4	There are precise measures for the quality of business	0.750	0.000
4.3.1.5	Business Process service level tasks are well monitored.	0.663	0.000
4.3.1.6	The flow of business process is well identifying both IT and	0.740	0.000
4.3.1.7	Business Processes have the predefined procedures that	0.803	0.000
4.3.1.8	Business Processes allow both business and IT to work	0.785	0.000
4.3.1.9	Translate IT service impacts into business impact information	0.703	0.000
Change Control System			
4.4.1.1	Change is integrated by DSS	0.811	0.000
4.4.1.2	Pre-defined mechanism of change is available	0.771	0.000
4.4.1.3	Pr-defined communication plan is applicable to manage	0.782	0.000
4.4.1.4	Change usually accelerate workflow by use of CPA (Critical	0.774	0.000
4.4.1.5	Change is positively affecting the correction of drawing or	0.729	0.000
4.4.1.6	Change is positively affecting usability, reliability or safety	0.743	0.000
4.4.1.7	Change always fixes a bug or procedure defect of the daily	0.903	0.000
4.4.1.8	Change is improving performance and/or functionality	0.856	0.000
4.4.1.9	Change is very helpful in incorporating new beneficiary	0.807	0.000
4.4.1.1	Change is helping to speed response to regulatory	0.829	0.000
4.4.1.1	Change is Streamlining data and document management	0.869	0.000
Conduct and Commitment			
5.3.1	Conduct to business rules is totally applied	0.861	0.000
5.3.2	Conduct to organization structure is totally applied	0.840	0.000

5.3.3	Full commitment to technical standards requirements	0.868	0.000
5.3.4	Full commitment to team work requirements	0.856	0.000
5.3.5	Full commitment to time constraints	0.842	0.000
5.3.6	Full commitment to cultural & social requirements	0.784	0.000

4.7.3.2 Structure Validity of the Questionnaire

Structure validity is the second statistical test that used to test the validity of the questionnaire structure by testing the validity of each field and the validity of the whole questionnaire. It measures the correlation coefficient between one filed and all the fields of the questionnaire that have the same level of liker scale. As shown in table No. (3.12), the significance values are less than 0.05 or 0.01, so the correlation coefficients of all the fields are significant at $\alpha = 0.01$ or $\alpha = 0.05$, so it can be said that the fields are valid to be measured what it was set for to achieve the main aim of the study

Table No. (4.13) Structure Validity of the Questionnaire

No		Section	Person correlation coefficient	p-value
1	Awareness of DSS Importance		0.448	0.013
2	Need of Enhancements in DSS Awareness		0.442	0.015
3	Managerial requirements that facilitate utilization of DSS	Human Resource System	0.795	0.000
		Organization Structure	0.760	0.000
		Internal Business Processes System	0.875	0.000
		Change Control System	0.773	0.000
		Conduct and Commitments	0.827	0.000
4	Managerial requirements that facilitate utilization of DSS		0.964	0.000

4.8 Reliability of the Research

The reliability of an instrument is the degree of consistency which measures the attribute; it is supposed to be measuring (Polit & Hunger, 1985). The less variation an instrument produces in repeated measurements of an attribute, the higher its reliability. Reliability can be equated with the stability, consistency, or dependability of a measuring tool. The test is repeated to the same sample of people on two occasions and then compares the scores obtained by computing a reliability coefficient (Polit & Hunger, 1985). It is difficult to return the scouting sample of the questionnaire-that is used to measure the questionnaire validity to the same respondents due to the different work conditions to this sample. Therefore two tests can be applied to the scouting sample in order to measure the consistency of the questionnaire. The first test is the Half Split Method and the second is Cronbach's Coefficient Alpha.

4.8.1 Half Split Method

This method depends on finding Pearson correlation coefficient between the means of odd rank questions and even rank questions of each field of the questionnaire. Then, correcting the Pearson correlation coefficients can be done by using Spearman Brown correlation coefficient of correction. The corrected correlation coefficient (consistency coefficient) is computed according to the following equation:

Table (4.14) Reliability (Split-Half Coefficient method)

No.	Section		Person correlation coefficient	Spearman-Brown Coefficient	p-value
1	Awareness of DSS Importance		.84390	0.915342	0.000
2	Need of Enhancements in DSS Awareness		.75570	0.860853	0.000
3	Managerial Requirements that facilitate utilization of DSS	Human Resource System	.64120	0.6412	0.000
		Organization Structure	.82580	0.8258	0.000
		Internal Business Processes System	.69870	0.6987	0.000
		Change Control System	.81860	0.8186	0.000

		Conduct and Commitments	.79470	0.7947	0.000
	Managerial requirements that facilitate utilization of DSS		0.7885	0.8817	0.000
Total			.75400	0.8597	0.000

Consistency coefficient = 2r/(r+1), where r is the Pearson correlation coefficient. The normal range of corrected correlation coefficient (2r/ r+1) is between 0.0 and + 1.0 As shown in Table No.(3.13), all the corrected correlation coefficients values are between 0.7889and 0.9029 and the significant (α) is less than 0.05 so all the corrected correlation coefficients are significance at α = 0.05. It can be said that according to the Half Split method, the dispute causes group are reliable.

4.8.2 Cronbach's Coefficient Alpha

This method is used to measure the reliability of the questionnaire between each field and the mean of the whole fields of the questionnaire. The normal range of Cronbach's coefficient alpha value between 0.0 and + 1.0, and the higher values reflects a higher degree of internal consistency. As shown in Table No. (3.14) The Cronbach's coefficient alpha was calculated for the first field of the causes of claims, the second field of common procedures and the third field of the Particular claims. The results were in the range from 0.7144and 0.8923, this range is considered high; the result ensures the reliability of the questionnaire.

Table (4.15) Reliability (Cronbach's Alpha)

No.	section		No. of Items	Cronbach's Alpha
2	Awareness of DSS Importance		**17**	.88490
3	Need of Enhancements in DSS Awareness		**5**	.87810
4	Managerial Requirements that facilitate utilization of DSS	Human Resource System	**10**	0.8870
		Organization Structure	**9**	.94800
		Internal Business Processes System	**12**	.90910
		Change Control System	**12**	.90910
		Conduct and Commitments	**11**	.94540

5	Managerial requirements that facilitate utilization of DSS	**48**	.96950
Total		**76**	**.95690**

4 .8.2.1 Statistical Manipulation:

To achieve the research goal, researcher used the statistical package for the Social Science (SPSS) for Manipulating and analyzing the data.

4.8.2.2 Statistical methods are as follows:

- Frequencies and Percentile
- Alpha- Cronbach Test for measuring reliability of the items of the questionnaires
- Person correlation coefficients for measuring validity of the items of the questionnaires.
- Spearman –Brown Coefficient
- One sample t test
- Independent samples t test
- One way ANOVA
- Scheffe test for comparison of the means of categories

4.9 Ethical Considerations

It is imperative that the researcher protects the rights of the participants of research study and those of the institution in which the study is conducted. The researcher also has ensured that the scientific integrity of the study is maintained.

4.10 Protecting the rights of the respondents

Prior to obtaining informed consent from the respondents, the researcher has explained the nature and purpose of the study. The procedure to be followed when completing the questionnaires was explained verbally. The respondents were assured that no harm would befall them. They were assured that the recommendations of the study might contribute towards management reform in their organizations.

4.11 Scientific Integrity

Scientific integrity refers to the degree to which a study is methodologically and conceptually sound, a major criterion for research utilization (Polit & Hungler, 1999). In this thesis, the researcher method and conceptual definitions were approved by the supervisor. Data was collected after supervisor approval of the instrument, and the instrument was tested for its validity and reliability. During data analysis appropriate tests were used and there was no manipulation of statistics or discussion of findings to support the researcher's opinions. A statistician assisted with data analysis. The researcher has ensured that the findings were supported by data.

Chapter 5 - Data Analysis and Discussion

5.1 Introduction

In this chapter, the data collected from the questionnaire survey are analyzed and discussed; the researcher was able to answer the thesis questions and verify validity / invalidity of the related hypothesis.

5.2 Parametric Test of the Data

Upon the guarantee of the tool reliability and validity; the next pace will identify and verify the collected data in terms of parametric / non parametric. As result of applying Kolmogorov-Smirnov Test the following results have been identified. Table (5.1), shows; the calculated p-value is greater than the significant level which equals 0.05 (p-value. > 0.05). This consequently led to indicate that data follows normal distribution, and so parametric tests will be used.

Table (5.1) One-Sample Kolmogorov-Smirnov Test

No	section		Kolmogorov-Smirnov Z	P-value
2	Awareness of the importance of DSS		0.702	0.708
3	Awareness Enhancements Needed		0.743	0.638
4	Managerial Requirements that facilitate utilization of DSS	Human Resource System	0.691	0.727
		Organization Structure	1.339	0.056
		Internal Business Process System	1.262	0.083
		Change Control System	0.730	0.661
		Conduct and Commitments	0.815	0.521
Managerial Requirements that facilitate utilization of DSS			0.697	0.729
Total			0.9120	0.3760

5.3 Discussion and interpretation of each section's items.

In order to verify the validity / in validity of the hypothesis; one sample t test will be applied. In line to test ; if the respondents opinion in respect to the content of the sentences are positive (weight mean greater than "60%" and the p-value less than 0.05) , if the respondents in the content of the sentences are neutral (p- value is greater than 0.05) or the opinion of the respondent in the content of the sentences are negative (weight mean less than "60%" and the p-value less than 0.05)

5.3.1 Section 1 Interpretations

5.3.1.1 Awareness of DSS importance

Table No. (5.2) shows ; how the respondents reply on the question "How would you evaluate awareness of DSS importance in the following areas " ; the respondents agree that " Minimize

efforts, time and cost " with weight mean equal " 88.65%" , "Define and analyze problems " with weight mean " 88.51%", " Enhance Business Process Management " with weight mean " 87.52%", " Take good decisions that maximize the benefits of the ministry " with weight mean " 87.23%", " Achieve the main objectives efficiency " with weight mean " 85.96%", " Assist in human resource management & developments " with weight mean " 85.94%", " Enhance the Quality of Services " with weight mean " 84.96%", " Provide alternative scenarios to manage the defined problems " with weight mean " 84.82%", " Provide future sustainability and viability " with weight mean " 84.68%", " Trace the pros & cons of decision implementation " with weight mean " 84.40%", " Assist in providing good public services " with weight mean " 84.26%", " Help management by discovering bottlenecks that hamper smooth daily activities " with weight mean " 83.97%", " Assist in the control of change " with weight mean " 82.84%", " Assist in budgeting related decision " with weight mean " 82.55%", " Achieve better Governance " with weight mean " 81.84%", " Determine time constraints related to decisions taken " with weight mean " 80.71%", . For general ; the results for all statements of the field show that the average mean equal 4.23, the weight mean equal 84.68% which is greater than " 60%" and the value of t test equal which is greater than the critical value which is equal 24.42 and the p- value equal 0.000 which is less than 0.05. Thus it is quite safe to conclude that there is proper awareness of the importance of utilized DSS in PM management levels. This belongs to the characteristics of PM Managers finding from chapter 3; as the demographic profile show; major part of managers are qualified and well experienced. This initially is encouraging; as vast of the respondents have such awareness extent of the DSS importance! Which is categorically an essential base toward the utilization of DSS, although this finding is improper with previous finding from chapter 3; table (3.9) regarding the DSS training attained by the same respondents!

5.3.1.2 Verification of Hypothesis #1 (H1)

As per verification of hypothesis H1; the finding from paragraph 5.3.1.1 lead to reject H1 to all its contents and consequently lead to make it evident that there is statistically significant proper to utilized DSS in terms of the awareness of DSS importance in PM management levels at significant level $\alpha = 0.05$. This finding agrees with Egyptian Local Authorities study by Elbeltagi(2004) ; as has approved that DSS managerial users have significant amount of perception of the importance of DSS ; which was extremely required to have such utilized DSS , also according to Imran (2005) conclusions ; leadership management has the required awareness of the important of ICT development with distinguish indicators in Malaysia . Averweg and Erwin (1999) found that all mangers in South Africa have agreed on the knowledge of

importance and purpose of DSS. However; Khorshid (2004) has found that the lack of awareness of the importance of Computerized Systems was one of the main factors that hampering the utilization of Computerized Systems in the Decision-making process in general security organization in Al-Reyad – Saudia Arabia.

Table no. (5.2) - Awareness of the importance of DSS

Serial	Category	Highly Agree	Agree	Don't know	Disagree	Highly disagree	mean	Weight mean	T test	P= value
2.1.1	Define and analyze problems	53.2	36.2	10.6	0.0	0.0	4.43	88.51	24.94	0.000
2.1.2	Provide alternative scenarios to manage the defined problems	36.9	56.7	2.1	2.1	2.1	4.24	84.82	18.83	0.000
2.1.3	Take good decisions that maximize the benefits of the ministry.	46.8	46.8	4.3	0.0	2.1	4.36	87.23	21.32	0.000
2.1.4	Achieve the main objectives efficiency	36.2	57.4	6.4	0.0	0.0	4.30	85.96	26.46	0.000
2.1.5	Minimize efforts, time and cost	56.0	35.5	4.3	4.3	0.0	4.43	88.65	22.15	0.000
2.1.6	Assist in budgeting related decision	27.7	59.6	10.6	2.1	0.0	4.13	82.55	19.85	0.000
2.1.7	Assist in providing good public services	45.4	39.0	9.2	4.3	2.1	4.21	84.26	15.45	0.000
2.1.8	Assist in human resource management & developments	39.9	52.2	5.8	2.2	0.0	4.30	85.94	22.50	0.000
2.1.9	Assist in the control of change	35.5	47.5	12.8	4.3	0.0	4.14	82.84	16.99	0.000
2.1.10	Help management by discovering bottlenecks that hamper smooth daily activities	38.3	43.3	18.4	0.0	0.0	4.20	83.97	19.52	0.000
2.1.11	Determine time constraints related to decisions taken	24.1	57.4	16.3	2.1	0.0	4.04	80.71	17.54	0.000
2.1.12	Trace the pros & cons of decision implementation	40.4	45.4	9.9	4.3	0.0	4.22	84.40	18.25	0.000
2.1.13	Reduce paper usage	34.8	39.7	10.6	10.6	4.3	3.90	78.01	9.52	0.000
2.1.14	Enhance Business Process Management	46.1	45.4	8.5	0.0	0.0	4.38	87.52	25.59	0.000
2.1.15	Enhance the Quality of Services	37.6	53.9	4.3	4.3	0.0	4.25	84.96	20.34	0.000
2.1.16	Achieve better Governance	36.2	45.4	9.9	8.5	0.0	4.09	81.84	14.51	0.000
2.1.17	Provide future sustainability and viability	31.9	61.7	4.3	2.1	0.0	4.23	84.68	23.32	0.000
Total							4.23	84.52	30.43	0.000

The critical value at degrees of freedom "120" and significant level $\alpha = 0.05$ equal 1.98

5.3.2 Section 2 Interpretations

5.3.2.1 Need of Enhancements in DSS Awareness

Table No. (5.3) shows the respondent's view in replying the question "How would you evaluate the awareness enhancements that needed in the following domains " ; they have agree that " Human Resource system domain " with weight mean equal " 88.09%" , " Organization Structure domain " with weight mean " 82.84%", and agree that " Business Process domain " with weight mean " 84.96%", " Change control domain " with weight mean " 83.26%", " Conduct & Commitment domain " with weight mean " 84.26%".For general , the results for all statements of the field show that the average mean equal 4.23 ,the weight mean equal 84.68% which is greater than " 60%" and the value of t test equal which is greater than the critical value which is equal 24.42 and the p- value equal 0.000 which is less than 0.05. Thus it's quite safe to conclude that there is a need for utilized DSS awareness enhancements in the PM management domains.

5.3.2.1 Verification of Hypothesis # 2 H2

With reference to the results from the above paragraph; it's quite convenient; to accept H2 to all its contents and components and wind up that there is statistically significant prove that there is a need for awareness enhancements for utilized DSS in PM main management domains (Human Resource domain, Organization Structure domain, Business Process domain, Control of Change domain and Conduct &Commitment domain) at significant level $\alpha = 0.05$. This finding agrees with Mamat(2004) and El-Rashedy (2004)

Table no. (5.3) Awareness Enhancements Needed

Serial	Category	Highly Agree	Agree	Don't know	Disagree	Highly disagree	mean	Weight mean	T test	P= value
3.2.1	Human Resource domain	48.9	44.7	4.3	2.1	0.0	4.40	88.09	24.67	0.000
3.2.2	Organization Structure domain	35.5	49.6	8.5	6.4	0.0	4.14	82.84	16.45	0.000
3.2.3	Business Process domain	39.7	49.6	6.4	4.3	0.0	4.25	84.96	19.57	0.000
3.2.4	Control of Change domain	31.2	58.2	6.4	4.3	0.0	4.16	83.26	19.09	0.000
3.2.5	Conduct and Commitment domain	29.8	63.8	4.3	2.1	0.0	4.21	84.26	23.27	0.000
Total							4.23	84.68	24.42	0.000

The critical value at degrees of freedom "120" and significant level $\alpha = 0.05$ equal 1.98

5.3.3 Section 3 Interpretations

5.3.3.1 Human Resources Requirements

Table No. (5.4) shows the respondents evaluation replying the question "How would you evaluate the following Human Resources components that facilitate utilization of DSS " ; they agree that " Existence of an enhancing conduct programs " with weight mean equal " 60.85%" , " Equipments needed are totally available for all relevant staff members " with weight mean " 60.85%", " Proper performance appraisal system is totally applied " with weight mean " 57.45%", " Proper safety & health system is applied " with weight mean " 56.45%", " Regulations & rules are flexible enough to handle future developments " with weight mean " 56.03%", " Existence of effective training program in the area of DSS " with weight mean " 53.76%", " Existence of a defined and clear plan for DSS building awareness " with weight mean " 52.77%", and agree that " Staff satisfaction with pay & condition " with weight mean " 52.48%", " No existence of inter-departmental conflict " with weight mean " 51.35%", and agree that " Proper motivation policies are applied " with weight mean " 51.06%".

For general the results for all statements of the field show that the average mean equal 2.77, the weight mean equal 55.30% which is less than " 60%" and the value of t test equal 3.84- which is less than the critical value which is equal -1.98 and the p- value equal 0.000 which is less than 0.05. Thus its quite fair, to conclude that there is no proper human resource system at PM that facilitate utilization of DSS.

The respondents were quite reasonable when they rated the human resource system available at PM ; the researcher considers this as one of the important managerial requirements that should be adapted in order to facilitate DSS utilization more, precise recommendation in chapter 6.

Verification of Hypothesis # 3 H3

According to Rose and Straub (1998) while predicting the applicability of Technology Accepted Model to the Arab world; highlight the issue of user training in terms of Technology utilization this confirmed with the finding of Newman and Plummer (2000) in the case of DSS utilization requirements in northern Australia. The researcher believes that continuous DSS effective training is extremely important in order to keep in track of technologies dynamic changes to tie up this issue we accept the hypothesis H3 and its quite evident that There is statistically significant poor to utilized DSS in the domain of Human Resource System that facilitate utilization of DSS in PM at significant level $\alpha = 0.05$.

With respect to sub item 5.4.5 the respondents have agreed" with weight mean equal "60.85%". Thus it is safe to claim that moderate respondents agree that there is such enhancing conduct program in their institution. Up to the researcher view; this belongs to respondent's demographic profile (vast of them are young and qualified) this agree with Abu Sabat(2005) although his study was on Gaza Universities !

With respect to sub item 5.4.6 the respondents have agreed" with weight mean "60.85%". Thus it is faire to claim that some PM have really such required equipments that totally available to all relevant staff. Based on the long previous experience of the researcher in PM ; the researcher confirmed that some donors especially in the years 1995 – 2003 have exclusively their denotations to be only equipments.

Table No. (5.4) Human Resources System

Serial	Category	Highly Agree	Agree	Don't know	Disagree	Highly disagree	mean	Weight mean	T test	P= value
5.4.1	Existence of effective training program in the area of DSS.	4.3	22.0	19.9	46.1	7.8	2.69	53.76	3.58-	0.000
5.4.2	Existence of a defined and clear plan for DSS building awareness.	1.4	27.0	15.6	46.1	9.9	2.64	52.77	4.17-	0.000
5.4.3	Proper performance appraisal system is totally applied.	2.1	34.0	22.7	31.2	9.9	2.87	57.45	1.43-	0.155
5.4.4	Proper safety & health system is applied.	1.4	34.0	16.3	41.8	6.4	2.82	56.45	2.06-	0.041
5.4.5	Existence of an enhancing conduct programs.	2.1	43.3	17.7	30.5	6.4	3.04	60.85	49.	0.628
5.4.6	Equipments needed are totally available for all relevant staff members	6.4	37.6	14.2	37.6	4.3	3.04	60.85	46.	0.643
5.4.7	Proper motivation policies are applied.	4.3	23.4	17.0	34.0	21.3	2.55	51.06	4.47-	0.000
5.4.8	Regulations & rules are flexible enough to handle future developments	1.4	31.9	16.3	46.1	4.3	2.80	56.03	2.39-	0.018
5.4.9	No existence of inter-departmental conflict	4.3	24.8	14.2	36.9	19.9	2.57	51.35	4.33-	0.000

5.4.10	Staff satisfaction with pay & condition	4.3	23.4	20.6	34.0	17.7	2.62	52.48	3.88-	0.000
Total							2.77	55.30	3.84-	0.000

The critical value at degrees of freedom "120" and significant level $\alpha = 0.05$ equal 1.98

5.3.3.2 Organization Structure (OS) Requirements

Table no. (5.5) shows; how respondents reply on the question "How would you evaluate the following Organization Structure characteristics that facilitate utilization of DSS?" The respondents agree that " OS is facilitating the decision-making process within the ministry " with weight mean equal " 73.62%" , " OS is facilitating discipline and control over the business processes activities " with weight mean " 70.78%", " Business Process activities are fully related to organization structure " with weight mean " 67.52%", " Clear and precise responsibilities assigned to organization structure " with weight mean " 67.38%", " OS is providing easy communication among specialists " with weight mean " 66.95%", " OS is providing learning abilities i.e. enhancement of individual and organizational performance " with weight mean " 64.68%", and agree that " OS is providing flexibility and responsiveness to the changing organizational environment " with weight mean " 63.69%", " Organization Structure is facilitating performance evaluation for supervisor " with weight mean " 63.69%", and finally have agreed that " OS is allowing information flow enormously " with weight mean " 63.55%",

For general the results for all statements of the field show that the average mean equal 3.34 and the weight mean equal 66.87% which is greater than " 60%" and the value of t test equal 4.64 which is greater than the critical value which is equal 1.98 and the p- value equal 0.000 which is less than 0.05. Thus it's safe to conclude that moderate number (66.87 %%) of respondents has agreed that Organization Structure available at PM is facilitating the utilization of DSS $\alpha = 0.05$.

The researcher believes that (66.87%) average weight of respondents that have agreed that current OS at PM is facilitating DSS utilization is not sufficient enough to claim that OS at PM doesn't need further enhancements and developments particularly in the revolutionary and dynamic developments in the area of technology and modeling.

Verification of Hypothesis # 4 (H4)

Averweg and Erwin (1999) found that there is real need for changes on the model of Organization Structure in South Africa public sector in order to maintain utilization of DSS , Kamel(1998) considered the organization structure that applied in Egypt is negatively

influencing the utilization of applying IS in decision-making process this also consistent with Farhan and Tarwana (1995) in the case of public sector in Jordan and Amry (2000) in the case of Police sector in Sauidia Arabia .It's obvious, that all related literature show need of Organization Structure development in order to make it ideal for facilitating utilization of DSS.

In ours study and based on the results from table 5.5 and the above paragraph ; its logic to reject hypothesis H4 and conclude that here is statistically significant moderate to utilized DSS in the domain of organization structure that facilitate utilization of DSS in PM at significant level $\alpha = 0.05$. With respect to sub item 5.5.6 (Organization Structure is allowing information flow enormously) with p-value equal 0.054 which is greater than 0.05. This consequently led to conclude, that respondents have not been able to conclude any form of clear opinion about "Organization Structure is allowing information flow enormously in PM ". Up to the researcher view ; This belongs to public sector decision making characteristics , as decisions usually are being made within limited senior managers , this reliable with Ramlah Hussein , Mohd Hasan Selamat ,and Ali Mamat (2004) and Ahmed Imran (2005).

With respect to the sub item 5.5.9; the p-value equal 0.050 which = 0.05. Thus it is safe to conclude that respondents have not been able to conclude any form of clear idea about (Organization Structure is providing learning abilities i.e. enhancement of individual and organizational) in PM .

Table no. (5.5) Organization Structure System

Serial	Category	Highly Agree	Agree	Don't know	Disagree	Highly disagree	Mean	Weight mean	T test	P= value
5.5.1	OS is facilitating the decision-making process within the ministry	18.4	50.4	16.3	10.6	4.3	3.68	73.62	7.85	0.000
5.5.2	OS is facilitating discipline and control over the business processes activities	16.3	46.8	15.6	17.0	4.3	3.54	70.78	5.89	0.000
5.5.3	Business Process activities are fully related to organization structure	14.2	44.7	12.1	22.7	6.4	3.38	67.52	3.82	0.000
5.5.4	Clear and precise responsibilities assigned to organization structure	6.4	53.9	14.2	21.3	4.3	3.37	67.38	4.28	0.000
5.5.5	OS is providing flexibility and responsiveness to the changing organizational environment	5.7	39.0	27.7	23.4	4.3	3.18	63.69	2.20	0.030

5.5.6	OS is allowing information flow enormously	6.4	45.4	12.1	31.9	4.3	3.18	63.55	1.94	0.054
5.5.7	OS is providing easy communication among specialists	5.7	48.9	22.0	21.3	2.1	3.35	66.95	4.35	0.000
5.5.8	OS is providing learning abilities i.e. enhancement of individual and organizational performance	5.7	41.8	24.8	25.5	2.1	3.23	64.68	2.87	0.005
5.5.9	Organization Structure is facilitating performance evaluation for supervisor	7.1	41.8	22.0	20.6	8.5	3.18	63.69	1.98	0.050
Total							3.34	66.87	**4.64**	**0.00**

The critical value at degrees of freedom "120" and significant level $\alpha = 0.05$ equal 1.98

5.3.3.3 Business Process Requirements

Table no. (5.6) shows; how the respondents evaluate the internal Business Process characteristics in PM that facilitate utilization of DSS as following : The respondents have agreed that " Business Processes activities are in accordance to laws and regulations " with weight mean equal " 70.64%" , " Business Process are well described including detailed procedures and tasks " with weight mean " 69.65%", " Business Processes are precisely defined " with weight mean " 66.24%", and agree that " Business Processes allow both business and IT to work together more effectively in solving mixed IT/business problems " with weight mean " 65.67%", " Translate IT service impacts into business impact information by linking business process steps to the IT services they run on " with weight mean " 62.55%", " The flow of business process is well identifying both IT and business performance problems at ministry overall " with weight mean " 61.84%", " Business Processes have the predefined procedures that capable of managing potential impact of problems " with weight mean " 60.14%", " Business Process service level tasks are well monitored " with weight mean " 59.15%", " There are precise measures for the quality of business processes " with weight mean " 59.01%", "There is proper hardware to run all the business processes " with weight mean " 60.14%", "There is proper Local Area Network to run all the business process " with weight mean " 65.67 %", "There is proper software tools to run all business processes " with weight mean " 62.55 %",

For general the results for all statements of the field show that the average mean equal 3.18 and the weight mean equal 63.65% which is greater than " 60%" and the value of t test equal 3.08 which is greater than the critical value which is equal 0.003 and the p- value equal 0.000 which is less than 0.05. Thus it is quite safe to conclude that moderate number of respondents [63.65%] has agreed that there is proper internal Business Process system in PM that facilitate utilization

of DSS. The researcher believes that [63.65%] is not sufficient enough to claim that Business Process system in PM is ideal and/or doesn't need serious reform toward utilization of DSS.

This finding agree with List and others (2003) however it disagree with findings from Egypt case for both Local Authorities Elbeltaji(2004) and Egyption public sector Kamel(1998) Also the result disagrees with Information Systems Success model in United States Sabherwal(2006) ; as he found that improper Business Process was the main failure reason of huge IS projects

Verification of Hypothesis # 5 (H5)

As to firm up this concern; it's opportune to reject hypothesis H5 and make it evident that There is statistically significant moderate to DSS in the domain of Business Process System that facilitate utilization of DSS in PM at significant level $\alpha = 0.05$.

With respect to sub item 5.7.4 with weight mean 59.01%, negative t-test value and the p-value is 0.552. Thus it is convenient to assume that respondents were not being able to wind up clear belief regarding the issue of "There are precise measures for the quality of business processes ". This neutral decree leads the researcher to conclude that there are no measures for quality of business processes in PM or such measures and/are not clear enough for respondents! With respect to sub item 5.7.5 with weight mean = "59.15%", t-test is negative and the p-vale = 0.552. Thus it is quite convenient to assume that respondents were not being able to draw clear opinion about "Business Processes service level tasks are well monitored" consequently; lead the researcher to suppose that there is lack monitoring in the domain of Business Process domain in PM . With respect to sub item 5.7.6 with weight mean "61.84%, t test 1.15 less than critical value and p-vale = 0.254. Thus it is safe to conclude that respondents were not being able to make any apparent view about "The flow of business process is well identifying both IT and business performance problem ". This feels right with the fact that the above issue requires special knowledge in both business performance and IT performance, moreover, this lead to assume that there is lack of performance measurements techniques in PM . With respect to sub item 5.7.7 "with weight mean = 61.84%, t-test 1.16; less than the critical value and p-value 0.246. Thus it is fair to assume that the respondents weren't being able to make any plain toward "business process has the predefined procedures that capable of managing potential Impact of problems ". This basically makes it faire, to suppose that there is deficient in the province of planning in terms of Business Process future impact. With respect to sub item 5.7.9 with p-vale = 0.117 which is greater than 0.05. Thus it is fair to assume that the respondents weren't being

able to verify the issue of "Translate IT service impact into business impact". This belong to one or more of the following reasons ; there is no such integration between IT services and Business service , the respondents are not a ware of details about IT services applied and /or there is no such effective impact for neither IT service or Business service . With respect to 5.7.10 with weight mean = 60.14%, t-test is less than the critical value and p-value is greater than 0.05.

Thus it is quite safe to conclude that the respondents could not able to measure “there is proper hardware to run all BP”. Up to the researcher view; the neutral respondents outcome belongs to on or more of the following reasons; there may be real need for hardware, the hardware is idle, the hardware is not up-to-date and/or the hardware is not fitting the Business Processes specific functions.

With respect to 5.7.12 with p-value 0.0120 which is greater than 0.05; the respondents were not being able to conclude any consistent view regarding the issue of "There is proper software tools to run all the business processes". This belongs to one or more of the following; there are no software tools available, the software tools are not adequate enough to respondents demand, the software tools are not up-to-date, the software tools are not properly setup and /or the respondents are not well trained to utilize such software tools available.

Table no. (5.6) Business Processes System evaluation

Serial	Category	Highly Agree	Agree	Don't know	Disagree	Highly disagree	Mean	Weight mean	T test	P= value
5.7.1	Business Processes are precisely defined	8.5	47.5	10.6	33.3	0.0	3.31	66.24	3.60	0.000
5.7.2	Business Process are well described including detailed procedures and tasks	10.6	53.9	10.6	22.7	2.1	3.48	69.65	5.58	0.000
5.7.3	Business Processes activities are in accordance to laws and regulations	17.7	42.6	14.9	24.8	0.0	3.53	70.64	6.00	0.000
5.7.4	There are precise measures for the quality of business processes	3.5	31.2	26.2	34.8	4.3	2.95	59.01	0.60-	0.552
5.7.5	Business Process service level tasks are well monitored.	1.4	36.9	19.9	39.7	2.1	2.96	59.15	0.53-	0.598
5.7.6	The flow of business process is well identifying both IT and business	5.7	31.2	31.9	29.1	2.1	3.09	61.84	1.15	0.254

	performance problems at ministry overall									
5.7.7	Business Processes have the predefined procedures that capable of managing potential impact of problems	1.4	42.6	22.0	31.9	2.1	3.09	61.84	1.16	0.246
5.7.8	Business Processes allow both business and IT to work together more effectively in solving mixed IT/business problems	5.7	37.6	31.9	22.7	2.1	3.22	64.40	2.79	0.006
5.7.9	Translate IT service impacts into business impact information by linking business process steps to the IT services they run on.	7.8	33.3	25.5	31.2	2.1	3.13	62.70	1.58	0.117
5.7.1	There is proper hardware to run all the business processes	1.4	40.4	19.9	34.0	4.3	3.01	60.14	0.09	0.932
5.7.1	There is proper Local Area Network (LAN) to run all the business processes	9.2	44.7	15.6	26.2	4.3	3.28	65.67	3.11	0.002
5.7.1	There is proper software tools to run all the business processes	2.8	43.3	19.9	31.9	2.1	3.13	62.55	1.56	0.120
	Total						**3.18**	**63.65**	**3.08**	**0.003**

The critical value at degrees of freedom "120" and significant level $\alpha = 0.05$ equal 1.98

5.3.3.4 Change Control System Requirements

Table no. (5.7); shows how the respondents reply on the question "how would you rate the Change Control System components at your institution that facilitate DSS utilization?" ; the respondents agree that " Change is helping to speed response to regulatory requirements " with weight mean equal " 68.94%" , " Change is positively affecting usability, reliability or safety problems " with weight mean " 68.65%", " Change is very helpful in incorporating new beneficiary requirements " with weight mean " 68.37%", " Change always fixes a bug or procedure defect of the daily activities " with weight mean " 67.66%", " Change is improving performance and/or functionality " with weight mean 67.52" %", " Change is Streamlining data and document management " with weight mean " 66.10%", " Change is integrated by DSS " with weight mean " 63.83%", " Change is positively affecting the correction of drawing or engineering document error " with weight mean " 62.98%", " Change usually accelerate workflow by use of CPA (Critical Path Analysis) techniques " with weight mean " 61.13%", " Pr-defined communication plan is applicable to manage resistance to change " with weight mean "

58.30%", and finally have agreed that " Pre-defined mechanism of change is available " with weight mean " 55.32%".

For general the results for all statements of the field show that the average mean equal 3.22 , the weight mean equal 64.44% which is greater than " 60%" and the value of t test equal 3.58which is greater than the critical value which is equal and the p- value equal 0.000 which is less than 0.05. Thus it's quite convenient to conclude that moderate number of respondents [64.44%] has agreed that there is such moderate Change Control System in PM that facilitate DSS utilization.

Verification of Hypothesis # 6 (H6)

To tie up the above results with hypothesis H6 its quite safe to reject it and make it apparent that there is statistically significant moderate to utilized DSS in the area of availability of Change Control System that facilitate utilization of DSS in PM at significant level $\alpha = 0.05$.

This result agree with Averweg and Erwin (1999) finding in the case of South Africa case, Newman and Plummer (2000) found that there is effective Change Control System in northern Australia In the other hand, Kersten and others (1999) while evaluating the DSS in the area of sustainable developments in developing countries; found that there is lack pf the control of change in general this is confirmed with other findings from Bertucci(1995) study of evaluation the public sector in developing countries , Farhan and Tarwana (1995) in the case of Jordanian public sector , El-Rashedy (2000) and Rose and Straub(1998) in terms of Arab countries study . The researcher again, believes that such ratio [64.44%] is not sufficient enough to claim that Change Control System at PM doesn't need improvements how ever this moderate result is indicator that the domain of change Control in PM is facilitating utilization of DSS.

With respect to 5.8.3, the p-value = 0.309 which is greater than 0.05; this lead to conclude that the respondents were not being able to make clear judgment toward "Pre-defined communications plan is applicable to manage resistance to change". This belongs to one or more of the following; there is no such pre-defined communications plan available, the pre-defined communications plan is not applied in the practice and /or the pre-defined communications plan is not effective.

With respect to 5.8.4, the p-value = 0.309 is greater than 0.05; thus it is quite safe to conclude that respondents were not being able to evaluate the issue of "Change usually accelerate workflow by using Critical Path Analysis (CPA). This belongs to one or more of the following; change in PM is being acting without any previous analysis, there is lack of analysis tools that support change in terms of workflow acceleration and /or the analysis tools that used in supporting change are not effective.

With respect to 5.8.5, the p-value = 0.081, which is greater than 0.05, thus it is quite reasonable to assume that respondents were not being able to have consistent view regarding "Change is positively affecting the correlation of drawing / engineering document error". This inconsistent finding belongs to one or more of the following; part of respondents aren't dealing with such drawing & engineering documents, change is ineffective in the district of drawing & engineering documents and/or there is unenthusiastic impact of the change in the vicinity of drawing & engineering documents.

Table no. (5.7) Change Control System

Serial	Category	Highly Agree	Agree	Don't know	Disagree	Highly disagree	mean	Weight mean	T test	P= value
5.8.1	Change is integrated by DSS	11.3	36.9	14.9	33.3	3.5	3.19	63.83	2.02	0.046
5.8.2	Pre-defined mechanism of change is available	3.5	25.5	18.4	48.9	3.5	2.77	55.32	-2.81	0.006
5.8.3	Pr-defined communication plan is applicable to manage resistance to change.	6.4	22.0	31.9	36.2	3.5	2.91	58.30	-1.02	0.309
5.8.4	Change usually accelerate workflow by use of CPA (Critical Path Analysis) techniques	4.3	36.2	24.8	30.5	4.3	3.06	61.13	67.	0.504
5.8.5	Change is positively affecting the correction of drawing or engineering document error	8.5	31.2	29.1	19.1	2.1	3.15	62.98	1.76	0.081
5.8.6	Change is positively affecting usability, reliability or safety problems	6.4	46.1	31.9	15.6	0.0	3.43	68.65	6.18	0.000
5.8.7	Change always fixes a bug or procedure defect of the daily activities	7.8	46.8	23.4	19.9	2.1	3.38	67.66	4.73	0.000
5.8.8	Change is improving performance and/or functionality	7.8	46.8	24.8	16.3	4.3	3.38	67.52	4.51	0.000
5.8.9	Change is very	9.9	46.8	20.6	20.6	2.1	3.42	68.3	5.00	0.00

	helpful in incorporating new beneficiary requirements							7		0
5.8.10	Change is helping to speed response to regulatory requirements	7.8	49.6	24.1	16.3	2.1	3.45	68.94	**5.71**	**0.000**
5.8.11	Change is Streamlining data and document management	7.1	40.4	32.6	15.6	4.3	3.30	66.10	**3.76**	**0.000**
Total							3.22	64.44	3.58	0.000

The critical value at degrees of freedom "120" and significant level $\alpha = 0.05$ equal 1.98

5.3.3.5 Conduct and Commitment Requirements

Table no. (5.8) shows how the respondents reply on the question " how would you rate conduct and commitment issues that facilitate utilization of DSS in PM ? " ; they agree that " Conduct to business rules is totally applied " with weight mean equal " 66.81%" ," Full commitment to team work requirements " with weight mean " 66.52%", "Full commitment to technical standards requirements " with weight mean " 63.55%", " Full commitment to cultural & social requirements " with weight mean " 63.12%", and agree that " Conduct to organization structure is totally applied " with weight mean " 62.84%", " Full commitment to time constraints " with weight mean " 59.72%". For general the results for all statements of the field show that the average mean equal 3.19 , the weight mean equal 63.76% which is greater than " 60%" and the value of t test equal 2.77 which is greater than the critical value which is equal and the p-value equal 0.006 which is less than 0.05. Thus its quite fair to conclude that moderate number [63.76%] of respondents have agreed that there is proper Conduct and Commitment at PM that facilitate DSS utilization. The researcher considers this result is acceptable indicator to claim that Change Control System at PM is facilitating the utilization of DSS however some no-end improvements should be triggered; precise recommendations in this manner are underlined in chapter 6.

Table No. (5.8) Conduct and Commitment to DSS utilization

Serial	Category	Highly Agree	Agree	Don't know	Disagree	Highly disagree	mean	Weight mean	T test	P= value
5.9.1	Conduct to business rules is totally applied	2.1	61.7	4.3	31.9	0.0	3.34	66.81	4.23	0.000
5.9.2	Conduct to organization structure is totally applied	7.8	41.8	10.6	36.2	3.5	3.14	62.84	1.52	0.130
5.9.3	Full commitment to technical standards requirements	7.1	44.7	10.6	34.0	3.5	3.18	63.55	1.93	0.056
5.9.4	Full commitment to team work requirements	3.5	51.8	18.4	26.2	0.0	3.33	66.52	4.27	0.000
5.9.5	Full commitment to time constraints	5.7	36.9	9.9	45.4	2.1	2.99	59.72	0.16-	0.875
5.9.6	Full commitment to cultural & social requirements	2.1	53.9	9.9	25.5	8.5	3.16	63.12	1.69	0.094
Total							3.19	63.76	2.77	0.006

The critical value at degrees of freedom "120" and significant level $\alpha = 0.05$ equal 1.98

Verification of Hypothesis # 7 (H7)

Base on the finding from paragraph 5.3.3.5; it's quite safe to reject hypothesis H7 and conclude that there is statistically significant moderate to utilized DSS in the domain of Conduct and Commitment that facilitate utilization of DSS in PM management levels at significant level $\alpha = 0.05$.

The finding agrees with Erwin (1999) in the study of evaluating DSS in South Africa, the Knowledge-based DSS framework by Arian (2006) in his study of Singapore in the other hand Kersten and others (1999) in the study of evaluating DSS for sustainable developments in developed countries found that there was lack of control in the change process , Heilman and others (2005) in the study of Mexican Agriculture have found that the lack of control over change process activities was main DSS faultier reason.

With respect to the sub item 5.9.5, p-value = 0.875 which is greater than 0.05. Thus it is quite fair to assume that respondents were not being able to form any clear opinion toward " Full commitment to time constrains " which belongs to one or more of the following; time constraints are not importance in the context of PM , usually there is no commitment to time constrains all over services providing in PM and/or there is no such conduct to time constraints in PM . With respect 5.9.6, the p-value = 0.094, which is greater than 0.05; thus its quite handy to suppose that respondents were not being able to wrap up clear attitude toward "Full commitment to cultural & social requirements ".Up to the researcher view; this belongs to one or more of the following, there is no such cultural & social programs available, social events are not available and /or both social & cultural programs are not effective.

5.3.4 All fields Interpretation

Table 5.9 shows average results for all the fields tied together; that the average mean equal 3.48 , the weight mean equal 69.58% which is greater than " 60%" and the value of t test equal 12.755 which is greater than the critical value which is equal and the p- value equal 0.000 which is less than 0.05. This make it clear that all the fields combined together that there is significant statistical (moderate to proper) to utilized DSS in terms of managerial requirements toward DSS utilization in PM service scheme at significant level $\alpha = 0.05$.

Table No. (5.9) All fields findings

Seria _	Field	mean	Weight mean	T test	P= value
1	Awareness of the importance of DSS	4.23	84.52	30.430	0.000
2	Need of enhancements in DSS Awareness	4.23	84.68	24.423	0.000
3	Human Resources System	2.77	55.30	-3.837	0.000
4	Organization Structure System	3.34	66.87	4.639	0.000
5	Business Process Requirements	3.18	63.65	3.075	0.003
6	Change Control System Requirements	3.22	64.44	3.576	0.000
7	Conduct and Commitment Requirements	3.19	63.76	2.766	0.006
	All fields	**3.48**	**69.57**	**12.755**	**0.000**

5.3.5 The verification of hypothesis # 8 (H8)

5.3.5.1 Age Parameter Interpretations

One way ANOVA test is used to verify hypothesis H8 ;table 5.10 and table 5.11 show; the P-Value for each tabulated items are less than 0.05, the critical value (2.66) is less than each tabulated F test value for all sub items at degrees of freedom "3,137" and significance level "0.05". For general the value of F test for all items equal 10.148 which is greater than the critical F value (=2.66 at degrees of freedom "3,137" & significance level "0.05"), and the p- value equal 0.000 which is less than 0.05.Thus it's quite safe to reject the H8 for this parameter and conclude that there are significant statistical differences of managers trends in respect to managerial requirements toward the utilization of DSS in PM due to the age of respondents at significant level ($\alpha = 0.05$)

Table no. (5.10) One way ANOVA test (Age in years)

Dependent Variable		Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Awareness of DSS Importance		Between Groups	1.912	3	0.637	2.897	0.037
		Within Groups	30.136	137	0.220		
		Total	32.047	140			
Need of Enhancements in DSS Awareness		Between Groups	3.326	3	1.109	3.227	0.025
		Within Groups	47.070	137	0.344		
		Total	50.397	140			
	Human Resource System	Between Groups	13.801	3	4.600	10.491	0.000
		Within Groups	60.078	137	0.439		
		Total	73.880	140			
	Organization Structure	Between Groups	12.574	3	4.191	5.999	0.001
		Within Groups	95.719	137	0.699		
		Total	108.294	140			
	Business Process System	Between Groups	9.473	3	3.158	7.194	0.000
		Within Groups	60.137	137	0.439		
		Total	69.610	140			
	Change Control	Between Groups	8.908	3	2.969	6.071	0.001
		Within Groups	67.015	137	0.489		
		Total	75.923	140			
	Conduct and	Between	14.508	3	4.836	8.643	0.000

	Commitment	Groups					
		Within Groups	76.651	137	0.559		
		Total	91.158	140			
Managerial Requirements that facilitate utilization of DSS		Between Groups	8.482	3	2.827	8.862	0.000
		Within Groups	43.708	137	0.319		
		Total	52.190	140			
TOTAL		Between Groups	5.054	3	1.685	10.148	0.000
		Within Groups	22.742	137	0.166		
			27.796	140			

The critical value at degrees of freedom "3,137" and significance level "0.05" = **2.66**

Table 5.11 Descriptive statistics for age in years

Category		Mean (Age in years)				
		less than 25 years	25 – 30 years	31 - 40 years	41 - 50 years	Above 50 years
Awareness of DSS Importance		**4.0500**	**4.2392**	**4.3026**	**4.3555**	**4.0500**
Need of Enhancements in DSS Awareness		**4.3200**	**4.2333**	**4.3250**	**3.8957**	**4.3200**
	Human Resource System	**2.3775**	2.8833	2.7438	3.3304	2.3775
	Organization Structure domain	**2.9222**	3.3704	3.6806	3.3382	2.9222
	Business Process System	**2.8833**	3.6222	3.1875	3.1196	2.8833
	Change Control System	**2.8250**	3.3909	3.3466	3.4308	2.8250
	Conduct and Commitments	**2.7458**	3.6500	3.2188	3.2899	2.7458
Managerial Requirements that facilitate utilization of DSS		**2.7547**	3.3715	3.2279	3.297	2.7547
Total		3.1811	3.6438	3.5667	3.596	3.1811

5.3.5.1.1 Age Parameter – Multiple Comparisons of means.

Table 5.12 includes Scheffe test analysis; highlights the multiple differences between the categories of the ordinal variable age, the significance difference can be categorized as follows:-

1. With respect to the awareness of DSS importance.

According to table 5.12; category of 31-40 has positive significant differences weigh against category of 25-30, category of 41-50 has positive significant differences weight against category 25-30 and finally category above 50 years has positive significant differences against category 31-40. Thus it's quite safe to conclude that there are significant statistical differences at trends of

managers in respect to managerial requirements of DSS due the age in years in respect to the area of awareness of DSS importance. Older managers have the most positive significant statistical differences; up to the researcher this belongs to long experiences, accumulated knowledge that acquired during their long working service.

2. With respect to the Need of Enhancements in DSS Awareness.

The age category 25-30 has positive significant differences against the category above 50 years old meanwhile category 41-50 has positive significant differences against the category above 50. To tie up conclusion in this manner; it's quite fair to conclude that young managers 25-30 have the most positive significant compared with other categories; in the researcher view this is normal result as always young individuals looking for more improvements room while older ones have such conservative attitude by disliking any changes.

3. With respect to Human Resource System.

The category 31-40 has positive significant differences against category 25-30 and category 31-40 has positive significant differences against category 25-30; meanwhile the category of above 50 has positive significant differences against both categories (25-30 and 41-50). This belongs to the fact that old individuals normally don't like change over their current routine system.

4. With respect to Organization Structure the

The age category 31-40 has major positive significant differences against the category 25-30, the age category 41-50 has major positive significant differences against the category 25-30 and age category above 50 has positive significant differences against the category 25-30. Thus it's quite safe to conclude that old ages dislike having changes on their organization structure.

5. With respect to Business Process System

The age category 31-40 has positive significant differences against the category of 25-30 meanwhile the age category above 50 has negative significant against the age category 31-40. The result in this manner shows that category 31-40 has the most positive significant differences against others.

Table 5.12 Scheffe test for Multiple Comparisons of means for the age variable

Dependent Variable	Mean Difference (I-J)			
	Categories	25 – 30 years	31 – 40 years	41 - 50 years
Awareness of DSS Importance	31 - 40 years	*0.1892		

	41 - 50 years	*0.2526	0.0634	
	Above 50 years	*0.3055	0.1163	0.0529
Need of Enhancements in DSS Awareness	31 - 40 years	-0.0867		
	41 - 50 years	0.0050	0.0917	
	Above 50 years	-*0.4243	-0.3377	-*0.4293
Human Resource System	31 - 40 years	*0.5058		
	41 - 50 years	0.3662	-0.1396	
	Above 50 years	*0.9529	0.4471	*0.5867
Organization Structure	31 - 40 years	*0.4481		
	41 - 50 years	*0.7583	0.3102	
	Above 50 years	*0.4159	-0.0322	-0.3424
Business Processes System	31 - 40 years	*0.7389		
	41 - 50 years	0.3042	-0.4347	
	Above 50 years	0.2362	-*0.5027	-0.0679
Change Control System	31 - 40 years	*0.5659		
	41 - 50 years	*0.5216	-0.0443	
	Above 50 years	*0.6058	0.0399	0.0842
Conduct and Commitment	31 - 40 years	*0.9042		
	41 - 50 years	*0.4729	-*0.4312	
	Above 50 years	*0.5440	-0.3601	0.0711
Managerial Requirements that facilitate utilization of DSS	31 - 40 years	*0.6168		
	41 - 50 years	*0.4732	-0.1437	
	Above 50 years	*0.5424	-0.0744	0.0692
Total	31 - 40 years	*0.4627		
	41 - 50 years	0.3856	-0.0771	
	Above 50 years	*0.4158	-0.0469	0.0302

* The mean difference is significant at the .05 level.

6. With respect to Change Control System.

The age category 31-40 has positive significant differences against the age category 25-30 , the age category 41-50 has positive significant differences against the category of 25-30 and the same with category above 50 against 25-30 . This confirms that old mangers appreciate the current status of the change control system. Change is not preferred term to old mangers.

With respect to Conduct and Commitment.

The age category 31-40 has positive significant differences against the age category 25-30 , the age category 41-50 has positive significant differences against the category of 25-30 and the

same with category above 50 against 25-30 . The old mangers are positively evaluating the issue of conduct and commitment.

5.3.5.2 Education Level Parameter Interpretation

With references to tables 5.13 and table 5.14, for each tabulated p-value is less than 0.05; the value of F test is greater than the critical value which equals 2.66 at degrees of freedom "3,137" at significance level "0.05". Thus it's safe; to rejects the hypothesis in terms of education level parameter and The value of F test for all sub items equal 4.802 which is greater than the critical F value (=2.66 at degrees of freedom "3,137" and significance level "0.05"), and the p- value equal 0.003 which is less than 0.05. The average results invalidate H8 in terms of education level parameter which conclude that there are significant statistical differences at trends of managers in respect to managerial requirements toward the utilization of DSS in PM in terms of education levels of respondents at significant level ($\alpha = 0.05$)

Table No. (5.13) One way ANOVA test due to Education Levels

Dependent Variable		Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Awareness of DSS Importance		Between Groups	4.173	3	1.391	6.836	0.000
		Within Groups	27.875	137	0.203		
		Total	32.047	140			
Need of Enhancements in DSS Awareness		Between Groups	3.389	3	1.130	3.293	0.023
		Within Groups	47.007	137	0.343		
		Total	50.397	140			
Managerial requirements that facilitate utilization of DSS	**Human Resource System**	Between Groups	5.262	3	1.754	3.502	0.017
		Within Groups	68.618	137	0.501		
		Total	73.880	140			
	Organization Structure domain	Between Groups	4.266	3	1.422	1.873	0.137
		Within Groups	104.028	137	0.759		
		Total	108.294	140			
	Business Process System	Between Groups	5.021	3	1.674	3.550	0.016
		Within Groups	64.589	137	0.471		
		Total	69.610	140			
	Change Control System	Between Groups	4.842	3	1.614	3.110	0.029
		Within Groups	71.082	137	0.519		
		Total	75.923	140			
	Conduct and Commitment	Between Groups	8.001	3	2.667	4.394	0.006
		Within Groups	83.157	137	0.607		
		Total	91.158	140			
Managerial requirements that facilitate		Between Groups	3.144	3	1.048	2.927	0.036

utilization of DSS	Within Groups	49.046	137	0.358		
	Total	52.190	140			
TOTAL	Between Groups	2.645	3	0.882	4.802	0.003
	Within Groups	25.151	137	0.184		
		27.796	140			

The critical value at degrees of freedom "3,137" and significance level " 0.05" **= 2.66**

Table no. (5.14) Descriptive statistics for Education Levels

Category		Mean (Education Levels)			
		Under graduate	University degree	Master degree	PHD
Awareness of DSS Importance		3.6471	4.2274	4.3566	3.8824
Need of Enhancements in DSS Awareness		4.8000	4.1707	4.2511	4.0000
	Human Resource System	2.4667	2.6512	2.9809	3.4000
	Organization Structure	2.8148	3.4051	3.3806	2.6667
	Business Processes System	2.8889	3.1636	3.3369	2.1667
	Change Control System	2.8485	3.1220	3.4642	3.2727
	Conduct and Commitment	2.6111	3.2276	3.3050	2.0000
Managerial Requirements that facilitate utilization of DSS		2.7431	3.1006	3.2961	2.750
	Total	3.1095	3.4507	3.6213	3.114

Table No. (5.15) shows ; scheffe test which illustrates the multiple differences between the categories of the ordinal variable Education Levels, and the significance difference labeled by

" * ".

5.3.5.2.1 Education level Parameter – Multiple Comparisons of means.

Table 5.15 includes Scheffe test analysis; highlights the multiple differences between the categories of the ordinal variable education level, the significance difference can be categorized as follows:-

1. **With respect to Awareness of DSS Importance**

Category of university degree has positive significant differences against the category of under graduate, category of Master degree has positive significant against under graduate and finally in this point; the category of Master has positive significant differences against PHD. Up to the

researcher this is logical result as qualified managers should be more aware of the importance of DSS those less qualified managers however in the case of Master against PHD; this belongs to the fact that mangers with Master degree are more close to technological themes.

2. With respect to Need of Enhancements in DSS Awareness.

Category of undergraduate managers has positive significant differences against categories (University, Master and PHD). The researcher believes it belongs to one or more of the following 1- Managers with undergraduate are may be related to technical themes than managers with high academic degree so they aware of the fast dynamic changes on technologies 2- the attitude of managers with undergraduate ; that they eager to acquire more new knowledge .

3. With respect to Human Resource System

The category of Master degree has positive significant differences against undergraduate; the category of PHD has positive significant differences against both (under graduate, university). Up to the researcher; this belongs to fact that more qualified mangers are more aware of the importance continuous developments on the human resource system.

Table no. (5.15) Scheffe test for Multiple Comparisons of means for the educational level

Dependent Variable	Mean Difference (I-J)			
	Categories	Under graduate	University degree	Master degree
Awareness of DSS Importance	University degree	*0.5803		
	Master degree	*0.7096	0.1292	
	PHD	0.2353	0.3451-	0.4743*-
Need of Enhancements in DSS Awareness	University degree	*0.6293-		
	Master degree	*0.5489-	0.0803	
	PHD	*0.8000-	0.1707-	0.2511-
Human Resource System	University degree	0.1846		
	Master degree	*0.5142	0.3296	
	PHD	*0.9333*	*0.7488	0.4191
Business Processes System	University degree	0.2747		
	Master degree	0.4480	0.1733	
	PHD	*0.7222-	0.9970*-	1.1702-
Change Control System	University degree	0.2735		
	Master degree	*0.6157	0.3423	
	PHD	0.4242*	0.1508	0.1915-
Conduct and Commitment	University degree	0.6165*		
	Master degree	*0.6939	0.0773	
	PHD	*0.6111-	1.2276-	1.3050-
Managerial Requirements that	University degree	0.3576		

facilitate utilization of DSS	Master degree	*0.5530	0.1955	
	PHD	0.0069	0.3506-	0.5461*-
Total	University degree	0.3412		
	Master degree	*0.5118	0.1706	
	PHD	0.0048	0.3364-	0.5070-*

* The mean difference is significant at the .05 level.

4. With respect to Business Process domain

The category of PHD has positive significant differences against under graduate category how ever the category of university degree has positive significant differences against PHD. The researcher believe that PHD mangers have full understanding of the importance of adapting enhanced and modified approach in the area of Business Process where undergraduate and even university managers may dot have the chance to have the sufficient knowledge of the term business process.

5. With respect to Change Control System.

The category of Master degree has positive significant differences against the category of under graduate and the category of PHD has positive significant differences against the category of undergraduate. This provides positive signal as the status of the change control system is facilitating utilization of DSS in PM .

5.3.5.3 The Experience Parameter Interpretation

With reference to both Table (5.16) and table (5.17); each tabulated P-Value is less than 0.05, each tabulated value of F test for is greater than the critical value which is equal 2.43 at degrees of freedom "4,137" and significance level "0.05". As average the value of F test for all relevant rows equal 6.430 which is greater than the critical F value (=2.43 at degrees of freedom "4,137" and significance level "0.05"), and the p- value equal 0.000 which is less than 0.05. The general average results ; invalidate H8 in terms of experience variable ; which conclude that there are significant statistical differences at trends of managers in respect to managerial requirements toward the utilization of DSS in PM in terms of experience at significant level ($\alpha = 0.05$) .

Table No. (5.16) One way ANOVA test due to experience

Dependent Variable	Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Awareness of DSS Importance	Between Groups	2.856	4	0.714	3.326	0.012
	Within Groups	29.192	136	0.215		

		Total	32.047	140			
Need of Enhancements in DSS Awareness		Between Groups	1.131	4	0.283	0.780	0.540
		Within Groups	49.266	136	0.362		
		Total	50.397	140			
Managerial requirements that facilitate utilization of DSS	Human resources System	Between Groups	12.785	4	3.196	7.115	0.000
		Within Groups	61.094	136	0.449		
		Total	73.880	140			
	Organization Structure domain	Between Groups	12.618	4	3.155	4.484	0.002
		Within Groups	95.676	136	0.703		
		Total	108.294	140			
	Business Process System	Between Groups	8.791	4	2.198	4.914	0.001
		Within Groups	60.819	136	0.447		
		Total	69.610	140			
	Change Control System	Between Groups	14.343	4	3.586	7.919	0.000
		Within Groups	61.580	136	0.453		
		Total	75.923	140			
	Conduct and Commitment	Between Groups	15.681	4	3.920	7.064	0.000
		Within Groups	75.477	136	0.555		
		Total	91.158	140			
Managerial Requirements that facilitate utilization of DSS		Between Groups	9.432	4	2.358	7.500	0.000
		Within Groups	42.758	136	0.314		
		Total	52.190	140			
Total		Between Groups	4.421	4	1.105	6.430	0.000
		Within Groups	23.375	136	0.172		
			27.796	140			

The critical value at degrees of freedom "4,137" and significance level "0.05" **= 2.43**

Table no. (5.16) Descriptive statistics for experience

Section	Mean (experience)				
	Less than 5 years	5 - 10 years	11 - 15 years	16 - 20 years	More than 20 years
Awareness of DSS Importance	**3.9926**	**4.3030**	**4.1256**	**4.3722**	**4.3697**
Need of Enhancements in DSS Awareness	**4.2750**	**4.3394**	**4.1189**	**4.3500**	**4.1886**

	Human Resource System	2.3500	2.6727	3.0595	2.2500	3.0029
	Organization Structure	2.7500	3.2761	3.5736	3.7222	3.4413
	Business Processes System	2.9896	3.0884	3.5901	3.1667	2.9786
	Change Control	2.9318	2.9945	3.7445	3.1364	3.1117
	Conduct and Commitment	2.7083	3.1162	3.6892	3.2083	3.0476
Managerial requirements that facilitate utilization of DSS		2.7630	3.0189	3.5242	3.0781	3.109
Total		3.1696	3.4251	3.7127	3.4810	3.492

5.3.5.3.1 The Experience Parameter – Multiple Comparisons of means

Table No. (5.17) includes scheffe showing the multiple differences between the categories of the ordinal variable experience, and the significance difference labeled by " * " and categorized as follows:

1. **With respect to Awareness of DSS Importance**

Category of experiences (5-10 years) has positive significant differences against Category of experiences (less than 5 years); which belongs to the knowledge acquired as result of the difference in experiences. Also category of experiences (16-20 years) has positive significant differences against Category of experiences (less than 5 years); which belongs to the knowledge acquired as result of the difference in experiences. The last comparison relate to the comparison between Category of experiences (more than 20 years) has the largest positive significant (0.3771) against category experiences (5-10) years.

2. **With respect to the Human Resource System**

The category of experience (11-15) has the positive significant differences against the category of experience (less than 5 years), the category of experience (more than 20 years) has the positive significant differences against the category of experience (less than 5 years), and the category of experience (11-15) has the positive significant differences against the category of experience (16-20). Obvious, that the category of experiences (11-15) has the most significant differences, in the

researcher view; this belongs to the special attributes of such category; as managers have moderate experience with potential long future career.

Table No. (5.17)
Scheffe test for Multiple Comparisons of means for the experience variable

Dependent Variable	Mean Difference (I-J)				
	Categories	Less than 5 year	5 - 10 years	11 - 15 years	16 – 20 years
Awareness of DSS Importance	5 - 10 years	0.3104*			
	11 - 15 years	0.1329	0.1774-		
	16 - 20 years	0.3796*	0.0692	0.2466	
	More than 20 years	*0.3771	0.0667	0.2442	0.0025-
Need of Enhancements in DSS Awareness	5 - 10 years	0.3227			
	11 - 15 years	0.7095*	0.3867		
	16 - 20 years	0.1000-	*0.4227-	*0.8095-	
	More than 20 years	0.6529*	0.3301	0.0566-	0.7529*
Human Resource System	5 - 10 years	0.5261*			
	11 - 15 years	*0.8236	0.2975		
	16 - 20 years	*0.9722	0.4461	0.1486	
	More than 20 years	0.6913*	0.1652	0.1323-	0.2810-
Business Processes System	5 - 10 years	0.0988			
	11 - 15 years	0.6005*	0.5017*		
	16 - 20 years	0.1771	0.0783	0.4234-	
	More than 20 years	0.0110-	0.1098-	0.6115*-	0.1881-
Change Control System	5 - 10 years	0.0627			
	11 - 15 years	*0.8127	0.7500*		
	16 - 20 years	0.2045	0.1419	*0.6081-	
	More than 20 years	0.1799	0.1172	0.6328-	0.0247-
Conduct and Commitment	5 - 10 years	*0.4078			
	11 - 15 years	*0.9809	0.5730*		
	16 - 20 years	*0.5000	0.0922	0.4809*-	
	More than 20 years	0.3393	0.0685-	*0.6416-	0.1607-
	5 - 10 years	0.2559			
	11 - 15 years	*0.7612	0.5053*		
	16 - 20 years	0.3151	0.0592	0.4461*-	
	More than 20 years	0.3465	0.0906	0.4147-	0.0314
Total	5 - 10 years	0.2555			
	11 - 15 years	*0.5431	0.2876		
	16 - 20 years	0.3113	0.0558	0.2318-	
	More than 20	*0.3230	0.0675	0.2201-	0.0117

	years				

* The mean difference is significant at the .05 level

3. With respect to Organization Structure.

The category of experience (5-10) has the positive significant differences against the category of experience (less than 5 years), the category of experience (11-15) has the positive significant differences against the category of experience (less than 5 years), the category of experience (16-20) has the positive significant differences against the category of experience (less than 5 years) and finally the category of experience (more than 20 years) has the positive significant differences against the category of experience (less than years) . This belongs to gap in experience between categories.

4. With respect to Business Process domain

The category of experience (11-15) has the positive significant differences against the category of experience (less than 5 years) and the category of experience (5-10). This belongs to the moderate attributes for the mangers of the category (11-15); they are conservative to major modifications on the domain of Business Process domain.

5. With respect to Change Control System;

The category of experience (11-15) has the positive significant differences against the category of experience (less than 5 years) and the category of experience (5-10) , the category of experience (11-15) has the positive significant differences against the category of experience (16-20). Obviously, again that the category of (11-15) has the most significant positive differences comparing with other categories. The researcher believes this belongs to the special attributes of this category as managers with (11-15) years of experience have distinguish experience comparing with less categories of experience however they have such conservative attitude in terms of the concept of change.

6. With respect to Conduct and Commitment to DSS utilization

The category of experience (5-10) has the positive significant differences against the category of experience (less than 5 years), the category of experience (11-15) has the positive significant differences against the category of experience (less than 5 years) and the category of experience (5-10),the category of experience (16-20) has the positive significant differences against the category of experience (less than 5 years) and negative significant differences against the

category of experience (11-15), The category of experience (above 20) has negative significant differences against the category of experience (11-15).

5.4.8.3 The Gender Variable Interpretation

Independent sample t test is applied In order to verify the gender variables and to test the hypothesis; independent sample t test has been applied. Table 5.18 results verify invalidity of H8 for the gender variable which leads to conclude that there are significant statistical differences at trends of managers in respect to managerial requirements toward the utilization of DSS in PM in terms of gender of respondents at significant level ($\alpha = 0.05$)

Table no. (5.18) Independent samples T test due to gender

Section		Sex	No.	Mean	Standard deviation	T value	P – value
Awareness of DSS Importance		Male	21	3.8571	0.82386	-4.034	0.000
		Female	120	4.2907	0.35638		
Need of Enhancements in DSS Awareness		Male	21	4.4286	0.99456	1.620	0.108
		Female	120	4.2000	0.49941		
Managerial requirements that facilitate utilization of DSS	Human Resources System	Male	21	2.3143	0.30706	-3.183	0.002
		Female	120	2.8442	0.75022		
	Organization Structure	Male	21	3.1270	0.71344	-1.225	0.222
		Female	120	3.3815	0.90264		
	Business Processes System	Male	21	2.7500	0.69071	-3.143	0.002
		Female	120	3.2583	0.68262		
	Change Control System	Male	21	2.8961	0.55987	-2.228	0.028
		Female	120	3.2788	0.75056		
	Conduct and Commitments	Male	21	2.7381	0.69437	-2.838	0.005
		Female	120	3.2667	0.80190		
Managerial Requirements that facilitate utilization of DSS		Male	21	2.7619	0.30509	-3.134	0.002
		Female	120	3.2009	0.62768		
Total		Male	21	3.1469	0.19635	-3.879	0.000
		Female	120	3.5367	0.45198		

The critical t value at significance level "0.05" and degrees of freedom "139" equal 1.98

Table No. (5.18) shoe for each tabulated P-Value is less than 0.05, the absolute value of t test equal for each sub item is less than the critical t value (=1.98) . The p-value of the whole

statements are less than 0.05 , the absolute value of t test equal 3.897 which is greater than the critical t value (=1.98) and the p-value equal 0.000 which is less than 0.05.

Chapter 6 - Conclusions and Recommendations

6.1 Introduction

This chapter compiles the relevant conclusions and recommendations as outcome of the data collected, analysis and hypothesis verification and validations.

6.2 Conclusions

The researcher has upon the completion of this study; is drawing the following conclusions:

1. There is statistically evident that there is proper to utilized DSS in terms of the awareness of DSS importance in PM.
   - Vast number, of respondents agrees that there is awareness of the importance of utilized DSS in PM various management levels.
   - The researcher considers this finding important to precede and conclude that Management scheme in PM is able to utilize DSS in respect to manager's perception and attitude.
2. There is a need for awareness enhancements for utilized DSS in PM main management domains (Human Resource, Organization Structure, Business Process, Control of Change and Conduct &Commitment domains) at significant level.
   - Vast number, of respondents agree that there is a need for enhancements for utilized DSS in PM main management domains
3. There is statistically significant poor to utilized DSS in the domain of Human Resource System that facilitate utilization of DSS in PM at significant level.
   - (53.76%) of the managers in PM agree that; there are no effective DSS training programs available in the area of DSS.
   - (57.45%) of the managers in PM agree that; there is no such proper performance appraisal.
   - There are no proper motivation policies.
   - Regulation is not flexible enough to mange future liabilities and challenges.
   - Existing of Inter-departmental conflict.
4. There is statistically significant moderate to utilized DSS in the domain of organization structure that facilitate utilization of DSS in PM at significant level.

- § (63.69%) of the managers in PM agree that Organization Structure is providing easy communication among specialists.
- § (70.78%) of the managers in PM agree that Organization Structure is facilitating control over the business process activities
- § (67.38%) Responsibilities are clear and precise and related to Organization Structure.
- § (63.69%) of the managers in PM agree that Organization Structure is flexible enough to manage environment and future changes.
- § (63.55%) of the managers in PM agree that Organization Structure is allowing information flow enormously
- § Organization Structure is facilitating the performance evaluation by the supervisor (63.69).

5. There is statistically significant moderate to DSS in the domain of Business Process System that facilitate utilization of DSS in PM at significant level.

- § (66.24%) of managers in PM agree that Business Process are well and precisely defined at PM.
- § (69.65%) of managers in PM agree that Detailed procedures and tasks are well described at PM.
- § There are no such precise tools to measure quality of Business Process outcome.
- § There is lack of control over the business process domain.
- § (61.84%) of managers in PM agree that Business Process flow is consistent with IT.
- § Hardware, Networking and Software tools are moderately available to run the business process activities.

6. There is statistically significant moderate to utilized DSS in the area of availability of Change Control System that facilitate utilization of DSS in PM at significant level.

- § (63.83%) of managers in PM agree that; Change; is integrated by DSS.
- § There is no such pre-defined mechanism of change is available at PM .
- § There is no such pre-defined communication plan capable to manage resistance to change.
- § Change is consequence of predefined standards.
- § (67.52%) of managers in PM agree that; Change; has positive impacts in the areas of performance and functionality enhancements.

- § (63.83%) of managers in PM agree that; Change; has positive impact in the area of speeding response to regulatory requirements.
- § (66.10%) of managers in PM agree that; Change; is moderately streaming both data and documents management.

7. There is statistically significant moderate to utilized DSS in the domain of Conduct and Commitment that facilitate utilization of DSS in PM management levels at significant level.
   - § Based on managers in PM [66.81%]; conduct to business rules is totally applied.
   - § Based on managers in PM [62.84%]; conduct to Organization Structure is totally applied.
   - § Based on managers in PM [66.52%]; full commitment to technical standards requirements.
8. There are significant statistical differences at trends of managers in respect to managerial requirements of DSS due to the age in years, experience and education level.
9. The study underlines the following significant characteristics of managers in PM .
   - § Demographic profile of managers show vast young individuals 49% of the mangers are under 40 years old and almost 84% are under 50 years old.
   - § 85 % of the managers are male while almost 15% are female.
   - § The majority of the mangers are well qualified; 93.5 % have Bachelor degree or above.
   - § Only 37% of the managers have attended more than one course in DSS.
   - § Vast (84.2%) of the managers are a ware of the DSS importance.
   - § Managers are dissatisfied with pay & condition.
   - § Managers have such conduct and commitment to business rules (66%).
   - § Managers have such conduct and commitment to Organization Structure.
   - § Managers have proper conduct and commitment to technical standards related to tier jobs.
   - § Managers are committed to social & cultural requirements.

6.3 Recommendations

Based on the above and all of the previous conclusions; the researcher is recommending the following:

1. PM should seriously consider reforming the Human Resource domain by :
   - § Adapt new effective training programs that relate to DSS.

- § Continuous awareness enhancements programs should be imitated to follow the dynamic and revolutionary environment of DSS.
- § Proper performance appraisal should be developed and applied in PM .
- § Regulation related to pay & condition should be adapted in away make it possible to reword special ICT staff.
- § Further analysis should be given to the area of inter-department conflict.

2. PM should consider developing Organization Structure by :

- § New model of Organization Structure should be applied;

3. PM should carefully consider developing Business Process domain by :

- § Develop new proper tools capable of measuring the quality of Business Processes outcome
- § Reform the monitoring current procedures in order to enhance the service level tasks of the Business Process domain.
- § Enhance the IT policies and plans in order to make IT more integrated to business particularly in Business Processes performance problems.
- § Reform the Business Process domain by adapting procedures, policies and strategies to be able to mange the future liabilities and dynamic environment challenges.
- § Establish such dedicated department focus on research & developments of Business Process domain; in order to make it sure that requirements and attributes are on the standard level.

4. PM should enhance the Control of Change domain by:

- § Develop strategic plan to manage and control the change in terms of predefined mechanism.
- § Develop special communication plan to manage the change resistance.
- § Develop proper analysis tools that should accelerate the workflow as change occurs.

5. PM should boost the Conduct and Commitment by:

- § Reform conduct & commitment of technical standards requirements by adapting the current tools.
- § Reform the commitment & conduct in the area of time constraints.

- Enhance the internal / external social and cultural programs.

Appendix I: The questionnaire

1. Demographic Profile

1.1 Age

☐ less than 25 years	☐ 25 – 30 years	☐ 31 - 40 years	☐ 41 - 50 years	☐ Above 50 years

1.2 Gender

☐ Female	☐ Male

1.3Education Levels

☐ Secondary	☐ Under Graduate	☐ University Degree	☐ Master Degree	☐ PHD

1.4Specialization

☐ Business Administration	☐ Finance & Accounting	☐ Engineering	☐ IT	Others ……..

1.5Managerial level

☐ Head of Department	☐ Manager Deputy	☐ Manager	☐ Director Deputy	☐ General Director/above

1.6Experience

☐ Less than 5 years	☐ 5 - 10 years	☐ 11 - 15 years	☐ 16 - 20 years	☐ More than 20 years

1.7 How many courses did you attend in the area of DSS?

☐ None	☐ One course	☐ Two courses	☐ Three courses	☐ More than three courses

2. Section 1 - Awareness of DSS Importance

2.1 How would you rate the importance of DSS in the following areas?

Serial	Sale / Category	Highly Agree	Agree	Don't know	Disagree	Highly Disagree
2.1.1	Define and analyze	☐	☐	☐	☐	☐

	problems					
2.1.2	Provide alternative scenarios to manage the defined problems	☐	☐	☐	☐	☐
2.1.3	Take good decisions that maximize the benefits of the ministry.	☐	☐	☐	☐	☐
2.1.4	Achieve the main objectives efficiency	☐	☐	☐	☐	☐
2.1.5	Minimize efforts, time and cost	☐	☐	☐	☐	☐
2.1.6	Assist in budgeting related decision	☐	☐	☐	☐	☐
2.1.7	Assist in providing good public services	☐	☐	☐	☐	☐
2.1.8	Assist in human resource management & developments	☐	☐	☐	☐	☐
2.1.9	Assist in the control of change	☐	☐	☐	☐	☐
2.1.10	Help management by discovering bottlenecks that hamper smooth daily activities	☐	☐	☐	☐	☐
2.1.11	Determine time constraints related to decisions taken	☐	☐	☐	☐	☐
2.1.12	Trace the pros & cons of decision implementation	☐	☐	☐	☐	☐
2.1.13	Reduce paper usage	☐	☐	☐	☐	☐
2.1.14	Enhance Business Process Management	☐	☐	☐	☐	☐
2.1.15	Enhance the Quality of Services	☐	☐	☐	☐	☐
2.1.16	Achieve better Governance	☐	☐	☐	☐	☐
2.1.17	Provide future sustainability and viability	☐	☐	☐	☐	☐

3. **Section 2 - Need of Enhancements in DSS Awareness**
How would you rate the need enhancements in DSS Awareness at the following?

Serial	Scale / Category	Highly Agree	Agree	Don't know	Disagree	Highly disagree
3.1.1	Human Resource Competency domain	☐	☐	☐	☐	☐
3.1.2	Organization Structure domain	☐	☐	☐	☐	☐
3.1.3	Business Process domain	☐	☐	☐	☐	☐
3.1.4	Control of Change domain	☐	☐	☐	☐	☐
3.1.5	Conduct & Commitment domain	☐	☐	☐	☐	☐

4. **Section 3 - Managerial requirements that facilitate utilization of DSS**

4.1 Human Resources (HR) Requirements

4.1.1 How would you evaluate the following human resource components at your institution that facilitate utilization of DSS??

Serial	Agree scale / Category	Highly Agree	Agree	Don't know	Disagree	Highly Disagree
4.1.1.1	Existence of effective training program in the area of DSS	☐	☐	☐	☐	☐
4.1.1.2	Existence of a defined and clear plan for DSS building awareness.	☐	☐	☐	☐	☐
4.1.1.3	Proper performance appraisal system is totally applied.	☐	☐	☐	☐	☐
4.1.1.4	Proper safety & health system is applied.	☐	☐	☐	☐	☐
4.1.1.5	Existence of an enhancing conduct programs.	☐	☐	☐	☐	☐
4.1.1.6	Equipments needed are totally available for all relevant staff members	☐	☐	☐	☐	☐
4.1.1.7	Proper motivation policies are applied.	☐	☐	☐	☐	☐
4.1.1.8	Regulations & rules are flexible enough to handle future developments	☐	☐	☐	☐	☐
4.1.1.9	No existence of inter-departmental conflict	☐	☐	☐	☐	☐

4.1.1.10	Staff satisfaction with pay & condition	☐	☐	☐	☐	☐

4.2 Organization Structure Requirements

4.2.1 How could you evaluate the following Organization Structure components at your institution which facilitate utilization of DSS?

Serial	Agree Scale / Category	Highly Agree	Agree	Don't know	Disagree	Highly disagree
4.2.2.1	OS is facilitating the decision-making process within the ministry	☐	☐	☐	☐	☐
4.2.2.2	OS is facilitating discipline and control over the business processes activities	☐	☐	☐	☐	☐
4.2.2.3	Business Process activities are fully related to organization structure	☐	☐	☐	☐	☐
4.2.2.4	Clear and precise responsibilities assigned to organization structure	☐	☐	☐	☐	☐
4.2.2.5	OS is providing flexibility and responsiveness to the changing organizational environment	☐	☐	☐	☐	☐
4.2.2.6	OS is allowing information flow enormously	☐	☐	☐	☐	☐
4.2.2.7	OS is providing easy communication among specialists	☐	☐	☐	☐	☐
4.2.2.8	OS is providing learning abilities i.e. enhancement of individual and organizational performance	☐	☐	☐	☐	☐
4.2.2.9	Organization Structure is facilitating performance evaluation for supervisor	☐	☐	☐	☐	☐

4.3 Business Processes Requirements

4.3.1 How could you evaluate the following Business Process components at your institution which facilitate utilization of DSS?

Serial	Agree scale / Category	Highly Agree	Agree	Don't know	Disagree	Highly disagree
4.3.1.1	Business Processes are precisely defined	☐	☐	☐	☐	☐
4.3.1.2	Business Process are well described including detailed procedures and tasks	☐	☐	☐	☐	☐
4.3.1.3	Business Processes activities are in accordance to laws and regulations	☐	☐	☐	☐	☐
4.3.1.4	There are precise measures for the quality of business processes	☐	☐	☐	☐	☐
4.3.1.5	Business Process service level tasks are well monitored.	☐	☐	☐	☐	☐
4.3.1.6	The flow of business process is well identifying both IT and business performance problems at ministry overall	☐	☐	☐	☐	☐
4.3.1.7	Business Processes have the predefined procedures that capable of managing potential impact of problems	☐	☐	☐	☐	☐
4.3.1.8	Business Processes allow both business and IT to work together more effectively in solving mixed IT/business problems	☐	☐	☐	☐	☐
4.3.1.9	Translate IT service impacts into business impact information by linking business process steps to the IT services they run on.	☐	☐	☐	☐	☐

4.3.1.10	There is proper hardware to run all the business processes	☐	☐	☐	☐	☐
4.3.1.11	There is proper Local Area Network (LAN) to run all the business processes	☐	☐	☐	☐	☐
4.3.1.12	There is proper software tools to run all the business processes	☐	☐	☐	☐	☐

4.4 Change Control System Requirements

4.4.1 How could you rate the Control of Change System components at your institution that facilitates utilization of DSS?

Serial	Scale / Category	Highly Agree	Agree	Don't know	Disagree	Highly disagree
4.4.1.1	Change is integrated by DSS	☐	☐	☐	☐	☐
4.4.1.2	Pre-defined mechanism of change is available	☐	☐	☐	☐	☐
4.4.1.3	Pr-defined communication plan is applicable to manage resistance to change.	☐	☐	☐	☐	☐
4.4.1.4	Change usually accelerate workflow by use of CPA (Critical Path Analysis) techniques	☐	☐	☐	☐	☐
4.4.1.5	Change is positively affecting the correction of drawing or engineering document error	☐	☐	☐	☐	☐
4.4.1.6	Change is positively affecting usability, reliability or safety problems	☐	☐	☐	☐	☐
4.4.1.7	Change always fixes a bug or procedure defect of the daily activities	☐	☐	☐	☐	☐
4.4.1.8	Change is improving performance and/or functionality	☐	☐	☐	☐	☐

4.4.1.9	Change is very helpful in incorporating new beneficiary requirements	☐	☐	☐	☐	☐
4.4.1.10	Change is helping to speed response to regulatory requirements	☐	☐	☐	☐	☐
4.4.1.11	Change is Streamlining data and document management	☐	☐	☐	☐	☐

4.5 Conduct and Commitment to DSS Requirements

4.5.1 How would you rate the conduct and commitment issues that facilitate utilization of DSS at Institution?

Serial	Scale Category	Highly Agree	Agree	Don't know	Disagree	Highly disagree
5.3.1	Conduct to business rules is totally applied	☐	☐	☐	☐	☐
5.3.2	Conduct to organization structure is totally applied	☐	☐	☐	☐	☐
5.3.3	Full commitment to technical standards requirements	☐	☐	☐	☐	☐
5.3.4	Full commitment to team work requirements	☐	☐	☐	☐	☐
5.3.5	Full commitment to time constraints	☐	☐	☐	☐	☐
5.3.6	Full commitment to cultural & social requirements	☐	☐	☐	☐	☐

Research References

1. ACM (2001) "Computing Curricula 2001, http://www.computer.org/education/ cc2001 /final/index.htm.

2. ACM (2003) "FY03 Membership and Technical Activity Summary," Appendix A in the 2003 Annual Report: http://www.acm.org/sigs/sgb/fy03annrpt/AppendA.xls.

3. Baskerville, R.L. and Myers, M.D.(2002) "Information Systems as a Reference Discipline," MIS Quarterly, (26)1

4. A B C Power, D. J. (2002). "Decision support systems: concepts and resources for managers " Westport, Conn., Quorum Books.

5. A. B Haettenschwiler, P.(1999) " Neues anwenderfreundliches Konzept der Entscheidungsunterstützung" Gutes Entscheiden in Wirtschaft, Politik und Gesellschaft. Zurich, vdf Hochschulverlag AG: 189-208.

6. A. b Keen, P. G. W. (1978) "Decision support systems: an organizational perspective "Reading, Mass., Addison-Wesley Pub. Co. ISBN 0-201-03667-3

7. A. b Sprague, R. H. and E. D. Carlson (1982) "Building effective decision support systems" Englewood Cliffs, N.J., Prentice-Hall. ISBN 0-130-86215-0. .

8. Arnott and Pervan (2005) "A critical analysis of decision support systems research", Journal of Information Technology, 20, 2, 2005, 67-87.

9. Ahmed, Sundaram and Srinivasan (2003) " Scenario Driven Decision Systems: Concepts and implementation, "University of Auckland, Auckland, New Zealand. Retrieved in May 2007 from http://emmsad.org/2003/Final%20Copy/14.pdf.

10. Alexandre Gachet, Patrick Brézillon (2004) " Organizational Structures and Decision Making Processes: A Multi-Level Model " ITM Department – University of Hawaii at Manoa , USA.

11. Alexandre Gachet, Patrick Brézillon (2004) " Organizational Structures and Decision Making Processes: A Multi-Level Model " ITM Department – University of Hawaii at Manoa , USA .

12. Alter, S. L. (1980) " Decision support systems: current practice and continuing challenges" Reading, Mass. Addison-Wesley Pub.

13. Alter, S. L. (1980). Decision Support Systems. Current Practices and Continuing Challeneges, Reading, MA: Addison-Wesley.

14. AMOS, (2007). "Structure Modeling – Customer Loyality Model" accessed on 6/21/2007 from http://www.spss.com/amos/.

15. Amry (2000) "Factors Affecting the Decision Making Process in Police Sector – Saudia Arabia ", Nief Arab University Science, EL-Reyad, Saudia Arabia.

16. Angela Liew and David Sundaram (2005) "Complex Decision Making Processes: their Modelling and Support". Retrieved in June 2007 from http://homepages.cwi.nl/~paulk/thesesMasterSoftwareEngineering/2006/ReinierLabee.pdf

17. Anthony, Robert N (1965) "Planning and Control Systems A Framework for analysis" Harvard University Press, Boston.

18. Arain (2006) "A framework for developing knowledge –based DSS for management of variation orders for Institutional Building", school of design and environment, National University of Singapore, Singapore, April 2006.

19. Averweg and Erwin (1999) " Critical Success Factors for Implementation of Decision Support Systems in South Africa " , the 32nd Annual Hawaii International Conference on Volume Track7, retrieved in July 2007 from http://ieeexplore.ieee.org/Xplore/login.j

20. Balasubramaniam, S., Peterson, R.A., and Jarvenpaa, S.L. (2002) "Exploring the implications of ecommerce for markets and marketing," Adacemy of Marketing Science 30 (4), 348-361.

21. Beairsto, J. A. B.(1997) "Leadership in the quest for adhocracy: new directions for a postmodern world". Ph.D. Dissertation, University of Tampere, Finland, 1997.

22. Beard, J.W. and Peterson, T.O. (1988) Taxonomy for the Study of Human Factors in Management Information Systems (MIS)," in J. M. Carey (ed.), Human Factors in MIS, Norwood, NJ: Ablex.

23. Bell, P. C. (1992). "Decision Support Systems: Past, Present and Prospects", Revue des systèmes de décision 1(2-3), 126-137.

24. Bennis, W. Gand Slater P. E.(1968)., "The temporary society. New York,, Harper & Row, 1968".

25. Beulens, A. J. and J. A. van Nunen (1988). "The Use of Expert System Technology in DSS", Decision Support Systems, 4(4): 421-431.

26. Bohanec, (2004) "What is Decision Support System", department of Intelligent Systems Jožef Stefan ,Institute Ljubljana, Slovenia, April, 2004. Accesses in September 2007 from http://en.wikipedia.org/wiki/Decision_support_system .

27. Bonczek, H., C. W. Holsapple and A. Whinston (1980). "Evolving Roles of Models in Decision Support Systems", Decision Sciences, 11(2), 337-356.

28. Bostrom, R.P. and Heinen, J.S. (1977) "MIS Problems and Failures: A Socio-Technical Perspective. Part I: The causes," MIS Quarterly, (1)3

29. Brackett and Michael H. (2000). "Data Resource Quality: Turning Bad Habits into Good Practices", Upper Saddle River, NJ: Addison-Wesley.

30. Carey, J.M. (1988) "Human Factors in Management Information Systems" Norwood, NJ: Ablex.

31. Carey, J.M. (1991) "Human Factors in Information Systems: A Position Treatise," General introduction to J.M. Carey (ed.), Human Factors in Information Systems, Norwood, NJ

32. Carr, N. (2003) "IT Doesn't Matter" , Harvard Business Review (81)5

33. Cordier (2006) "Lessons Learned From the Model-Driven Architecture Applied to Critical Systems Reliability: A Case Study ", Master thesis, Stockholm University, Sweden. Retrieved in May 2007 from http://www.dsv.su.se/en/seclab/pages/pdf-files/2006-x-424.

34. CSU Writing Lab (Colorado State University). (2005). "Conducting Content Analysis". Writing Guides. Retrieved September 26, 2005 from

http://writing.colostate.edu/guides/research/content/index.cfm.

35. Dhar, V. and R. Stein (1997). Intelligent Decision Support. The Science of Knowledge Work. Upper Saddle River, NJ, Prentice Hall.

36. Donovan, J.J. and S.E. Madnick (1977) "Institutional and Ad Hoc DSS and Their Effective Use".

37. Druzdzel, M. J. and R. R Flynn (1999) "Decision Support Systems" Encyclopedia of Library and Information Science" A. Kent, Marcel Dekker, Inc.

38. El Shanatf (2000) "Role of Computerized Management Information Systems in the decision making process at trade banks of Gaza - Palestine " , Master thesis , Gaza , Palestine

39. El-Rashedy (2000) "The Factors that hampering usage of Computerized Systems in Decision Making Process " , Nief Arab University Science , EL-Reyad Saudia Arabia.

40. English (2002) "Ten mistakes to avoid if your data warehouse is to deliver quality information",INFORMATION IMPACT International, Inc. Retrieved in June 2007 from http://dssresources.com/papers/features/english08112002.html.

41. Erkka Jalonen (2007), "Portfolio Decision Making in Innovation Management "Helsinki University of Technology, Finland, May 2007.

42. Farhan and Tarwana (1995) "Effective Information & Control Systems in Jordanian Public and Private sector", Aman , Jordan.

43. Finlay, P. N. (1994) "Introducing decision support systems" Oxford, UK Cambridge, Mass., NCC Blackwell; Blackwell Publishers.

44. Gachet, A. (2004) "Building Model-Driven Decision Support Systems with Dicodess " Zurich, VDF.

45. Galletta, D. (2003) "The Role of HCI in the MIS Curriculum," Proceedings of the Americas Conference on Information Systems, August, Tampa, FL. pp. 2080-2082. Also online at http://melody.syr.edu/hci/amcis03 t panel/.

46. Goneem (2004) "Role of Computerized Information Systems in the decision making process at municipalities of Gaza - Palestine", Master thesis, Islamic University, Gaza, Palestine.

47. Gorgone, J.T., Gray, P., Feinstein, D.L., Kasper, G.M., Luftman, J.N., Stohr, E.A., Valacich, J.S., and Wigand, R.T. (2000) "MSIS 2000: Model Curriculum and Guidelines for Graduate Degree Programs in Information Systems," Communications of the Association

48. Gorry, Anthony G. and Michael S. Scott Morton, (1971) "A Framework for Management Information Systems," Sloan Management Review, Vol. 13, No. 1, Fall 1971.

49. Guido Bertucci (1995) "Government Information Systems a Guide to Effective use of

Information Technology in the Public Sector of Developing Countries ", UN Public Administration Program Publications . Retrieved in September 2007 from http://www.unpan.org.

50. Haag, Cummings, McCubbrey, Pinsonneault, Donovan (2000) " Management Information Systems: For the Information Age " McGraw-Hill Ryerson Limited: 136-140. ISBN 0-072-81947-2

51. Hackathorn, R.D. and P.G.W. Keen(1981), "Organizational Strategies for Personal Computing in cision Support Systems," MIS Quarterly, 5, 3, September 1981, 21-26

52. Hammer, M. and Champy J (2001) Reengineering the corporation: a manifesto for business revolution. New York, HarperBusiness, 2001.

53. Heilman, Jeffry Stone, Ignacio Sanchez Cohen, Hilario Macias Rodriguez, and Roy S. Mann (2005) "Working Smarter: Research and Decision Support Systems in Mexican Agriculture", Modeling and Remote Sensing Applied To Agriculture (U.S. And Mexico).

54. Horn, P. (2001) "Autonomic computing: IBM's perspective on the state of information technology," White Paper, IBM T.J. Watson Research Center, Yorktown Heights, NY 10598 (www.ibm.com/research/autonomic). http://faculty.ucr.edu/~hanneman/SOC157/NETTEXT.PDF, 2001.

55. Ibrahim Elbeltagi (2004) "Evaluating the Factors Affecting DSS Usage by Senior Managers in Local Authorities in Egypt" Retrieved in April 2007 from http://www.cse.dmu.ac.uk/~nkm/PAPERS/JGIM%20Revision%202.pdf .

56. Imran (2005) "Strategies for ICT Use in the Public Sector in the Least Developed Countries: A Cross-Country Analysis" Retrieved in June 2007 from http://unpan1.un.org/intradoc/groups/public/documents/UNPAN/UNPAN023847.pdf

57. Jane Carey (2004) " The Role of HCI in Management Information System CURRICULA: A Call to action " CAIS Pub, Arizona State University West.

58. Judith Gebauer and Franz Schober (2005) " Information System Flexibility and the Performance of Business Processes " University of Illinois at Urbana-Champaign Campus Research , May , 2005.

59. KAMEL (1998) "Decision Support Systems and Strategic Public Sector Decision Making in Egypt" , The commonwealth network of Information Technology for development publisher , retrieved in August 2007 from http://unpan1.un.org/intradoc/groups/public/docume

60. Keen, P. G. W. (1980) "Decision support systems: a research perspective. Decision support systems: issues and challenges " G. Fick and R. H. Sprague. Oxford; New York, Pergamum Press.

61. Keen, P. G. W. and M. S. Scott Morton (1978) "Decision support systems: an organizational perspective" Reading, Mass., Addison-Wesley Pub. Co. Keen, P. G. W.

and M. S. Scott-Morton (1989). Decision Support Systems: An Organizational Perspective, Reading, MA, Addison-Wesley.

62. Keen, Peter and Michael S. Scott Morton (1978) "Decision Support Systems: An Organizational Perspective" Addison-Wesley Publishing Co., Reading, Mass., 1978.

63. Kelly, Sean. (1995).Data Warehousing. The Route to Mass Customization. New York: John Wiley & Sons.

64. Kersten, Mikolajuk and Yeh (1999) "Decision Support Systems for Sustainable Development in Developing Countries", Kluwer Academic Publishers, October 1999. Retrieved in April 2007 from http://interneg.concordia.ca/views/bodyfiles/paper/2002/04.pdf

65. Khorshid (2004),"Model-Centered Government Decision Support Systems for Socioeconomic Development in the Arab World " , the International Conference on Input-Output and General Equilibrium Data, Modeling and Policy analysis , Brussels, Belgium , September 2004.

66. Kimball, Ralph, & Caserta, Joe. (2004). "The Data Warehouse ETL toolkit", New York: Wiley Computer Publishing.

67. Kimball, Ralph, Reeves, Laura, Ross, Margy, & Thornhwaite, Warren. (1998). the Data Warehouse , Lifecycle Toolkit. New York: Wiley Computer Publishing.

68. Kwakkel (2006) "DSS failure studied from an adaptive design perspective", Faculty TPM (Technology, Policy and Management) of the TU Delft (University of Tehnology), Netherlands.

69. Li, S. (2007). AgentStra: An Internet-based multi-agent intelligent system for strategic decision-making. Retrieved 3/21/2007 from http://portal.acm.org/citation.cfm?id=1230143.1230206&coll=GUIDE&dl=&CFID=15151515&CFTOKEN=6184618

70. List, Schiefer, and Tjoa (2003) "Process-Oriented Requirement Analysis ", the Institute of Software Technology, Vienna University of Economic and B.A, Austria . Retrieved in April 2007 from http://www.ifs.tuwien.ac.at/ifs/general_information/people/tjoa

71. Little, J. D. C. (1970), "Models and Managers: The Concept of a Decision Calculus", Manage- ment Science, 16(8), 3 5-43.

72. Little, J.D.C (1970) " Models and Managers The Concept of a Decision Calculus." Management Science, Vol.16,NO.8 April , 1970.

73. Lorenz, M.O. (1905) "Methods of measuring the concentration of wealth," Publications of the American Statistical Association 9, 209-219.

74. Loshin, David. (2003) "Business Intelligence.", San Francisco: Morgan Kaufmann Publishers.

75. MaLec, R. (2002). "Using DSS for Marketing Decision-Making: The MDSS, Central

Michigan University. Ronald Rubin and William Leigh (2000). Mining Customer Intelligence: A Practical Framework for the Development of a Database Marketing System .

76. Marakas, G. M. (1999)"Decision support systems in the twenty-first century" Upper Saddle River, N.J., Prentice Hall.

77. Mason, R. O., and I. I. Mitroff (1973) "A Program for Research on Management Information Systems" Management Science, Vol. 19, No. 5, January 1973.

78. McCosh, A. M and Scott Morton (1978) , M. S., "Management Decision Support Systems ", London, Macmillan.

79. McKenney, James L. and Peter G. W. Keen (1976) "How Managers' Minds Work," Harvard Business Review, Vol. 52, No. 3, May-June 1976.

80. McNurlin, B. C. and Sprague, R. H., Jr. (1993). Information Systems Management in Practice, Engelwood Cliffs, NJ: Prentice Hall.

81. Mintzberg, H (1979) "The structuring of organizations: a synthesis of the research ". Englewood Cliffs, N.J., Prentice-Hall, 1979.

82. Mohan (2007), "Decision Support System and management decisions "Business Administration 361C 1400 Washington Avenue, Albany, NY- 12222.

83. Moore, J. H. and M. G. Chang (1980). "Design of Decision Support Systems", Data Base 12(1- 2).

84. Moore, J.H.,and M.G.Chang.(1980) " Design of Decision Support Systems" Data Base, Vol.12, Nos.1 and 2.

85. Naylor, T. H. (1982). "Decision Support Systems or Whatever Happened to MIS?" Interfaces, 12(4).

86. Naylor, T. H. (1982). "Decision Support Systems or Whatever Happened to MIS?" Interfaces, 12(4).

87. Newman, Lynch, and Plummer (2000) "Success and failure of decision support systems learning as we go" Faculty of Informatics and Communication, Central Queensland University, North Rockhampton, Queensland 4702 , Australia. . Retrieved in July 2007 from http://jas.fass.org/cgi/content/abstract/77/E-Suppl/1-ad.

88. Olson, Jack E. (2003) "Data Quality: The Accuracy Dimension", San Francisco: Morgan Kaufmann Publishers.

89. Orlikowski, W. J.(1991) "Integrated Information Environment or Matrix of Control? The Contradictory Implications of Information Technology". Accounting, Management and Information Technology 1(1)

90. Patrick, J. (2003) the Future of the Internet, Keynote Speech. AMCIS 2003 Tampa, Florida.

91. Polit, D. F. & Hungler, F. P. (1999) " Overview of the research process" and Methods (6th ed), Massachusetts: Lippincot

92. Porter, M. (1985) “Competitive Advantage", Free Press, New York, 1985.

93. Pounds, William F(1969) “The Process of Problem-Finding,” Industrial Management Review, Fall 1969.

94. Power, D. J., (2004b) “Specifying an Expanded Framework for Classifying and Describing Decision Support Systems,” Communications of the Association for Information Systems, Vol. 13, Article 13, February 2004b, 158-166.

95. Power, D. J. (1997). "What is a DSS?" The On-Line Executive Journal for Data-Intensive Decision Support 1(3).

96. Power, D. J. (2000). Web-based and model-driven decision support systems: concepts and issues.Americas Conference on Information Systems, Long Beach, California.

97. Power, D. J. (2002). Decision support systems: concepts and resources for managers. Westport,Conn., Quorum Books.

98. Power, D. J.,(2007a), "What are the features of a communications-driven DSS?" DSS News, Vol. 8, No. 2, January 28, 2007a.

99. Power, D. J., (2007b)"What are the features of a data-driven DSS?" DSS News, Vol. 8, No. 4, February 25, 2007b.

100. Power, D. J., (2007c),"What are the features of a document-driven DSS?" DSS News, Vol. 8, No. 5, March 11, 2007c.

101. Power, D. J., "What are the features of a knowledge-driven DSS?" DSS News, Vol. 8, No. 6, March 25, 2007d.

102. Power, D. J., (2007e) "What are the features of a model-driven DSS?" DSS News, Vol. 8, No. 7, April 8, 2007e.

103. Radford, K.J. (1990) "Information Systems for Strategic Decisions ", P 8-10; Reston, Virginia; Prentice Hall Co.

104. Ramlah Hussein , Mohd Hasan Selamat ,and Ali Mamat (2004) " The impact of Organization Factors on Information Systems Success: an empirical investigation in the Malaysian electronic government sector. Retrieved in October 2007 from http://kmap2005.vuw.

105. Redman, Thomas C. (1996). Data Quality for the Information Age. Boston: Artech House.

106. Redman, Thomas C. (2001). Data Quality. The Field Guide. Boston: Digital Press.

107. Ronald Rubin and William Leigh (2000). Mining Customer Intelligence: A Practical Framework for the Development of a Database Marketing System for the Small Business. Retrieved 2/22/2007 from

http://www.usasbe.org/knowledge/proceedings/2001/071.pdf.

108. Rose and Straub(1998) " Predicting General IT Use: Applying Technology Accepted Model TAM to the Arabic World" , College of Business Administration , Georgia State University ,University Plaza , Atlanta, U.S.A. Accessed in April 2007 from http://www.palgrave-journals.com/ejis/journal/v16/n1/full/3000659a.html

109. Saaty, T.,(1982) " Decision Making for Leaders; the Analytical Hierarchy Process for Decisions in a complex World", Wadsworth, Belmont, Calif.,.

110. Sabherwal(2006) " Information Systems Success: Dimensions and Determinants" , College of Business Administration, University of Missouri , Louisiana , USA http://www.rhsmith.umd.edu/DIT/News/pdf/MetaSEM2004Presented2004.pdf

111. Sauter, V. L. (1997) "Decision support systems: an applied managerial approach " New York, John Wiley.

112. Sean B. (2000) "Decision Support Systems Implementation Research: Review of Current State and Future Directions" The Ninth International Conference Information Systems Development, Kristiansand, Norway, 14-16 August, 2000.

113. Sean B. (2000)Eom "Decision Support Systems Implementation Research: Review of Current State and Future Directions, The Ninth International Conference Information Systems Development, Kristiansand, Norway, 14-16 August, 2000.

114. Sean Eom (2004), "The Changing Structure of Decision Support Systems Research: An Empirical Investigation through Author Cogitation Mapping" , College of Business Administration ,Southeast Missouri State University Cape Girardeau, MO, USA. http://s-cah-vishnu.infotech.monash.edu.au/dss2004/proceedings/pdf/24_Eom.pdf.

115. Senge, P. M., (1990) "The fifth discipline: the art and practice of the learning organization" New York, Doubleday/Currency, 1990. Simon, Herbert A (1990) "the New Science of Management Decision" Harper & Row, New York, 1960.

116. Simon, Herbert A.1969) "Sciences of the Artificial" MIT Press, Cambridge, Mass., 1969.

117. Sprague, R. H. and E. D. Carlson (1982). Building effective decision support systems. Englewood Cliffs, N.J., Prentice-Hall.Friday,.

118. Stanhope, P. (2002). Get in the Groove: building tools and peer-to-peer solutions with the Groove platform. New York, U.S.A Toffler, A., (1970) "Future shock. New York", Random House, 1970.

119. Turban, E. (1995). "Decision support and expert systems: management support systems" Englewood Cliffs, N.J., Prentice Hall. ISBN 0-024-21702-6

120. Turban, E.,Aronson, J.E., and Liang, T.P.(2005) "Decision Support Systems and Intelligent Systems" New Jersey, Pearson Education, Inc U. S.A

121. Van Aken, J. E., (1982) "On the control of complex industrial organizations" Boston, Kluwer-Nijhoff Pub, 1982.

122. Venkatesh, V. and Davis, F.D. (1996) “A Model of the Antecedents of Perceived Ease of Use: Development and Test,” Decision Sciences, (27)3.

123. Vetschera (1997) "Decision Support Systems in Networked Organizations" University of Vienna Management Center, Vienna, Austria. Retrieved in August 2007 from http://www.iiasa.ac.at/~marek/ftppub/Pubs/dss97/vetschera.pdf

124. W. Richard Scott (2002) , “Organizations: Rational, Natural and Open Systems” 5th Edition, Prentice Hall , Kasper Reinink , November 2002

125. W. Richard Scott (2002) , “Organizations: Rational, Natural and Open Systems” 5th Edition, Prentice Hall , Kasper Reinink , November 2002.

126. Waterman, R. H., (1992) " Adhocracy: the power to change." New York, W.W. Norton, 1992.

127. Weber, M., Henderson A. M. and Parsons T., (1947) "The theory of social and economic organization "; being Part I of Wirtschaft und Gesellschaft. London,, W. Hodge, 1947.

128. Wenger, E., McDermott R. A. and Snyder W., (2002) "Cultivating communities of practice: a guide to managing knowledge " Boston, Mass., Harvard Business School

129. Wildemuth, B. (2003) “The Role of HCI in the MIS Curriculum,” Proceedings of the Americas Conference on Information Systems, August, Tampa, FL. pp. 2080-2082. Also online at http://melody.syr.edu/hci/amcis03 t panel/.

130. Zhang, P. (2003) “The Role of HCI in the MIS Curriculum,” Proceedings of the Americas Conference on Information Systems, August, Tampa, FL. pp. 2080-2082. Also online at http://melody.syr.edu/hci/amcis03 t panel/.

131. Zhang, P. and Li, N. (2004) “An Assessment of Human-Computer Interaction Research in Management Information Systems: Topics and Methods,” Computers in Human Behavior,(20)2

132. Zhang, P., Benbasat, I., Carey, J.M., Davis, F., Galletta, D. and Strong, D. (2002) “Human Computer Interaction Research in the MIS Discipline,” Communications of the Association of Information Systems, (9)20.

.