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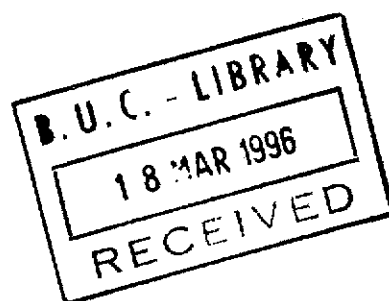
**LEBANESE AMERICAN UNIVERSITY**

**TASK-TECHNOLOGY FIT  
IMPACT ON INDIVIDUAL PERFORMANCE  
AND DECISION MAKING**

**BY**

**JAMAL EL-Kari**

**A PROJECT SUBMITTED IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF  
SCIENCE IN BUSINESS ADMINISTRATION**



**FEB 1996**

**BEIRUT - LEBANON**

L.A.U.

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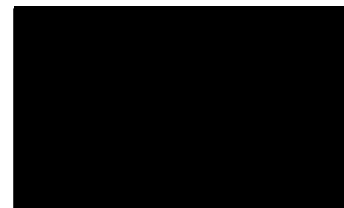
TASK-TECHNOLOGY FIT  
IMPACT ON INDIVIDUAL PERFORMANCE  
AND DECISION MAKING

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To my Parents  
Hayat and Sami  
whose passion and sacrifice  
flourish my way with accomplishment

## ***Acknowledgment***

Thankful acknowledgment goes to Dr. Ali Hejase for his effort and motivation that were of great help towards achieving this study. My deepest gratitude goes to Dr. Hussein Hejase for his support and guide. Great appreciation is also extended to Tarek Mikdashi for his constant support and paternal encouragement. A great acknowledgment is addressed to Miss. Manal Yunis whose continuous advice, assistance, and support made viable for this research work to its completion. Also a great acknowledgment goes to my friend Mr. Kamal Mirza for his valuable assistance without which this study would not have been completed on time.

My sincere and appreciation and gratefulness are forwarded to my beloved parents, Sami, Hayat, Vivian, Wissam, Nader and my brother-in-law Mahmoud for their love, support, and patience.

My hope and expectations are that this effort will be a helpful work towards assisting further studies aiming to reveal the impact on decision making and quality performance of potential users belonging in two or three Lebanese organizations only.

## ***Preface***

Information systems is the field that occupies the space where management and technology overlap. Advances in computer and communications technology over the past several years, as well as increased business pressures, have brought MIS out of the shadow to light. In other words, information systems are now widely recognized as major organizational resources that can determine the success or failure of today's organizations. That's why access to the right type of data at the right time means attaining a highly competitive edge. To achieve this, planning for the acquisition of proper information technology systems is of high importance.

Unfortunately, many information systems fail to meet their objectives, costing their companies thousands or even millions of dollars. Such failure can be contributed to the end users' resistance of utilizing the system, lack of user involvement and participation during the design and development of the system. Moreover, the fit between technology and task requirements has a substantial influence on whether to use it or not. Therefore, the basic need for this study stems from the importance of having an efficient, and effective computer based information system that is compatible with the tasks users perform, in a way that it meets the users as well as organization needs in order to have a positive impact on individual performance which consequently affect organization performance.

To investigate the impact of TTF on individual performance, task, technology, and individual characteristics were considered and examined to see how they predict TTF. Moreover, it was

possible to hypothesize that as TTF becomes stronger as users utilize the system more and more, as users become more satisfied. Hence performance increases.

It is hoped that this effort will assist in furthering the studies aimed at improving the level of computer usage in Lebanese organizations and at investigating the factors that are most likely increase the fit between the tasks being performed and the technology being utilized.

## **Table of Contents**

Acknowledgment.....	i
Preface.....	ii
Table of Contents.....	iv
List of Tables.....	x
List of Figures.....	xii

---

### **CHAPTER I            INTRODUCTION**

1.1    General Overview.....	1
1.2    Information Systems as Sociotechnical Systems.....	2
1.2.1    Information System & Decision Making.....	3
1.2.1.1    Different Kinds of Systems.....	4
a. Operational-Level System.....	4
b. Knowledge-Level System.....	5
c. Management-Level System.....	5
d. Strategic-Level System.....	5
1.2.1.2    Overview of Systems In The Organizations .....	6
a. Transaction Processing System (TPS).....	6
b. Knowledge Work Systems (KWS) and Office Automation Systems (OAS).....	6
c. Management Information System (MIS) and Decision Support System (DSS).....	7
d. Executive Support System (ESS).....	7
1.2.2    Information Systems & Human Behavior.....	7
a. Intelligence and Sophistication.....	8
b. Willingness To Change.....	8
c. Stress.....	8



	d. Perception.....	9
	e. Bias.....	9
	f. Attitude.....	9
	g. Flexibility.....	10
	h. Memory.....	10
	i. Information Overload.....	10
	j. Culture.....	10
	k. Optimism.....	11
	l. Values.....	11
	m. Motivation.....	11
	n. Expectancy Theory.....	12
1.3	Information Technology: Stages of Evolution.....	12
	1.3.1 Physical Control of Information.....	12
	1.3.2 Management of Automated Technology.....	13
	1.3.3 Information Resource Management.....	13
	1.3.4 Knowledge Management.....	14
1.4	Importance of Information Technology.....	14
1.5	The Need of the Study.....	14
1.6	Statement of Hypotheses.....	15
1.7	Statement of Purpose.....	16
1.8	Construction of This Study.....	16

---

## CHAPTER II LITERATURE REVIEW

2.1	Overview.....	17
2.2	IT Assessment and Adoption.....	18
	2.2.1 System Analysis.....	18
	2.2.2 Users Participation and Involvement.....	20
	2.2.2.1 What is User Participation?.....	20
	2.2.2.2 What is User Involvement?.....	21

	a.	End User Computing and User Involvement.....	23
	b.	Effect of User Involvement Upon IS Success.....	25
2.2.3		End-User Computer Literacy.....	27
2.2.4		Variety of CBIS Characteristics in Various Organizations.....	27
	a.	Size.....	27
	b.	Sector.....	28
	c.	Performance.....	28
	d.	Task.....	28
	e.	People.....	28
	f.	Structure.....	29
	g.	Environmental Factors.....	29
2.3		Characteristics of Technology.....	29
2.4		Understanding User Behavior.....	30
2.4.1		Theory of Reasoned Action (TRA).....	31
2.4.2		Technology Acceptance Model (TAM).....	32
2.4.3		Theory of Planned Behavior (TPB).....	35
2.4.4		Applying TRA, TAM, and Other Competing Theories.....	36
2.4.5		Perceived Consequences.....	37
	2.4.5.1	Short Term Consequences of Use.....	38
	2.4.5.2	Long Term Consequences of Use.....	39
2.4.6		Facilitating Conditions.....	39
	2.4.6.1	Social Factors.....	39
	2.4.6.2	User Attitudes Toward the System.....	40
2.4.7		Social Cognitive Theory.....	41
2.4.8		Affect.....	42
2.5		Factors Affecting System Utilization and User Satisfaction.....	43
2.5.1		Training.....	44
2.5.2		Management & EDP Support.....	45
2.6		Task-Technology Fit (TTF).....	47
2.6.1		Technology-To-Performance Chain Model (TPC).....	49

2.6.2	Effect of Task Characteristics on TTF.....	51
2.6.3	Effect of Technology Characteristics on TTF.....	52

---

### **Chapter III      RESEARCH METHODOLOGY & DESIGN**

3.1	The Basic Approach.....	56
3.2	Sources of Information & Survey Design.....	59
3.3	Sample & Data Collection.....	59
3.4	Research Variables.....	60
3.4.1	Computer Usage.....	60
a.	Tasks Inclusion in Computer.....	60
b.	Extent of Computer Use.....	61
c.	Frequency of Use.....	61
d.	Number of Packages Used.....	61
e.	Level of Sophistication of Usage.....	62
3.4.2	Computer Experience & Training.....	63
3.4.3	Demographic Variables.....	63
3.4.4	Organization Characteristics.....	64
3.4.5	Tasks Characteristics.....	64
3.4.6	User Satisfaction.....	65
3.4.7	Beliefs & Attitudes about Computer Usage.....	65
3.4.8	Task-Technology Fit (TTF).....	65
3.4.9	Technology Characteristics.....	66
3.5	Data Analysis.....	67

---

### **Chapter IV      RESEARCH FINDINGS AND ANALYSIS**

4.1	Introduction.....	69
4.2	Profile of Respondents.....	70
4.3	Profile of Organizations.....	73

4.4	Antecedents of TTF.....	76
4.4.1	Relationship between Task Characteristics and TTF.....	77
4.4.2	Relationship between Technology Characteristics and TTF.....	80
4.4.3	Relationship of Individual Variables to TTF.....	90
4.5	System Utilization.....	91
4.5.1	Relationship between Utilization and TTF.....	95
4.5.2	Relationship between Utilization and Other Variables.....	97
4.6	Testing the Model.....	98
4.7	Task, Technology, and Individual Characteristics Predict TTF.....	99
4.7.1	Quality.....	102
4.7.2	Locatibility.....	103
4.7.3	Reliability.....	104
4.7.4	Ease_Use/ Training.....	105
4.7.5	Relationship of IS people with Users.....	107
4.7.6	Timeliness.....	108
4.7.7	Compatibility.....	110
4.7.8	Authorization.....	112
4.8	TTF Predicts the Precursor of Utilization: BFPCU.....	114
4.9	TTF Predicts Utilization.....	115
4.9.1	Building a Regression Equation for TaskI_AV.....	116
4.9.2	Building a Regression Equation for EXTCOMU1.....	117
4.10	TTF and Utilization Predict User Satisfaction.....	118
4.11	User Satisfaction and TTF Predict Impact on Performance.....	121

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## CHAPTER V CONCLUSIONS AND RECOMMENDATIONS

5.1	Introduction.....	124
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5.2	Major Conclusions.....	125
5.3	Limitations of the Study.....	131
5.4	Recommendations.....	132
<hr/>		
	<b>Bibliography</b> .....	135
<hr/>		
	<b>Appendices</b> .....	138
	Appendix A.....	139
	Appendix B.....	153
<hr/>		

## ***List Of Tables***

Table I	Demographic Characteristics of Respondents.....	71
Table II	Crosstabulation Analysis: Business Growth by Organizational Sector.....	75
Table III	Crosstabulation Analysis: Routiness by Organizational Sector.....	76
Table IV (a)	Correlation Analysis: TTF with Task Characteristics.....	78
Table IV (b)	Correlation Analysis: TTF Eight Factors with Task Characteristics.....	78
Table V	Crosstabulation Analysis: Compatibility by Routiness.....	79
Table VI	Crosstabulation Analysis: Relationship with Users by Interdependence.....	80
Table VII (a)	Correlation Analysis: TTF with TECCHA and SYSUAV.....	81
Table VII (b)	Correlation Analysis: TTF Eight Factors with Software Used & Department	82
Table VIII	One-way Anova: TTF by Technology Characteristics.....	85
Table IX	One-way Anova: TTF by System Ease of Use.....	87
Table X	Crosstabulation Analysis: TTF Factors by Measures of Technology Characteristics.....	88
Table XI	Crosstabulation Analysis: Software Used by Department.....	89
Table XII	Correlation Analysis: TTF with Individual Variables.....	90
Table XIII (a)	Frequency Distribution: Extent of Computer Use.....	92
Table XIII (b)	Frequency Distribution: Frequency of Computer Use.....	93
Table XIII (c)	Percentages of Respondents Using Computers To Accomplish Their Tasks..	94
Table XIV	Correlation Analysis: TTF Factors with Utilization Measures.....	95
Table XV	Chi-Square Analysis Results: TTF Factors with Utilization Measures.....	96
Table XVI	Correlation Analysis: Utilization with Antecedents to Utilization & User Satisfaction.....	97
Table XVII	Regression Analysis with TTF AVG_R Being The Dependent Variable.....	100
Table XVIII	Regression Analysis with QUALITY Being The Dependent Variable.....	102
Table XIX	Regression Analysis with LOCATBLT Being The Dependent Variable.....	103
Table XX	Regression Analysis with RELIABLTL Being The Dependent Variable.....	104
Table XXI	Regression Analysis with EASE_USE Being The Dependent Variable.....	106

Table XXII	Regression Analysis with RELTNUSR Being The Dependent Variable.....	108
Table XXIII	Regression Analysis with TIMELNSS Being The Dependent Variable.....	109
Table XXIV	Regression Analysis with COMPATBL Being The Dependent Variable.....	111
Table XXV	Regression Analysis with AUTHORZN Being The Dependent Variable.....	112
Table XXVI	Regression Analysis with BFPCU_AV Being The Dependent Variable.....	114
Table XXVII	Regression Analysis with TASKI_AV Being The Dependent Variable.....	116
Table XXVIII	Regression Analysis with EXTCOMU1 Being The Dependent Variable.....	117
Table XXIX	Regression Analysis with USTF_AVG Being The Dependent Variable.....	118
Table XXX	Regression Analysis with USTF_AVG Being The Dependent Variable.....	119
Table XXXI	Regression Analysis with USTF_AVG Being The Dependent Variable.....	120
Table XXXII	Regression Analysis with IMPER_AV Being The Dependent Variable.....	122
Table XXXIII	Regression Analysis with IMPER_AV Being The Dependent Variable.....	123

## ***List Of Figures***

Figure 3.1	Suggested Model.....	58
Figure 4.1	Categorized Histogram for TTF by Technology Characteristics.....	85
Figure 4.2	Categorized Box-Whisker Plot for TTF by Technology Characteristics.....	86
Figure 4.3	Categorized Histogram for TTF by System Ease of Use.....	87
Figure 4.4	Categorized Box-Whisker Plot for TTF by System Ease of Use.....	88
Figure 4.5	Extent of Computer Use Distribution.....	92
Figure 4.6	Frequency of Computer Use Distribution.....	93
Figure 4.7	Proposed Model.....	98
Figure 5.1	Proven Model.....	133



# Chapter I

## Introduction

### 1.1 General Overview

Information technology (IT), hardware and systems software including computers and communication technology<sup>1</sup>, is recognized today as a major force influencing business performance. Consequently, there has been increasing concern in most organizations regarding its management. This is essential since information is a competitive resource, and its successful management can provide organizations with competitive advantage. Competitive advantage can be achieved by enhancing the firm's ability to deal with customers, suppliers, and new entrants to its markets, which in turn may empower the firm against other competitors in the industry.

Information system (IS) is the computer structure applications that translate technology into something of value to users<sup>2</sup>. IS gives companies a competitive advantage. It is best described as the use of an IT resource.

Such a system treats existing information as a resource that can be managed by the organization to increase profitability and decision making.

In fact, the success of information systems depends on interacting factors. The influence of these factors varies among different organizations and even among different units within an organization.

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<sup>1</sup> Darrel E. Owen, "IRM Concepts: Building Blocks for the 1990s", Information Management Review, (Vol. 5, No. 2, 1989), p. 21.

<sup>2</sup> Ibid., p. 22.

This is why the major questions raised, in relation to the successful adoption of a successful Computer Based Information System (CBIS), are: "How is the computer technology being absorbed within the organization?" "What problems are being encountered in absorbing these technologies?" and "What are the possible strategies for providing a better fit between organizational needs and the available technologies?"

In search of an answer for these questions, it is important to note that in recent years, radical changes have been taking place in the office work in organizations as various automated office systems and technologies have been introduced. Virtually every function has been affected. Clerical and secretarial operations have been altered as word processing and electronic information storage and retrieval systems have been used. Management information systems and Decision support systems (DSS) have been implemented to aid in the decision making and control processes of the organization. Even the normal modes of communication have been affected with the advent of such technologies as electronic mail and teleconferencing.

## **1.2 Information Systems as Sociotechnical Systems**

Information systems are sociotechnical systems<sup>3</sup>. Though they are composed of machines, devices, and hard physical technology, they require substantial social, organizational, and intellectual investments to make them work properly.

A sociotechnical systems perspective helps to avoid a purely technological approach to IS. For instance, the fact that information technology is rapidly declining in cost and growing

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<sup>3</sup> Kenneth C. Laudon & Jane P. Laudon, Management Information Systems: Organization and Technology, New York: Macmillan College Publishing Company, 1994, p. 20.

in power doesn't necessarily or easily translate into productivity enhancement or bottom-line profits. Technology must be designed in such a way as to fit organizational and individuals' needs.

### 1.2.1 Information System and Decision Making

At the heart of management are decisions and the most fundamental basis of decision is information. Systems analysts have been following certain principles that may lead to better results<sup>4</sup>:

- Information is something that is perceived.
- Information reduces uncertainty about a situation.
- The human mind processes information in chunks, taken from short term memory.
- The rate at which people can process data into information is finite.

Obviously, these principles have been utilized in MIS design affecting both the content and presentation of IS outputs. Here "content" refers to availability, timeliness, comprehensibility, relevancy, usefulness, reliability, accuracy, and consistency. While "presentation" refers to methods of increasing the likelihood that reported information will be both comprehensible and useful. In order for information to be effective, unnecessary information should be eliminated, critical information should be carefully formatted, and information should be put into its most useful form with the help of color graphics<sup>5</sup>.

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<sup>4</sup> Charles S. Parker, Management Information Systems: Strategy and Action, New York: McGraw-Hill Publishing Company, 1989, pp. 148-152.

<sup>5</sup> Ibid., pp. 150-151.

Information systems can be defined technically as a set of interrelated components that collect or retrieve, process, store, and distribute information to support decision making and control in an organization. In addition to their ability to support decision making, coordination, and control, information systems may also help managers and workers analyze problems, visualize complex subjects, and create new products. Information systems may contain information about significant people, places, and things within the organization or in the environment surrounding it.

From a business perspective, an information system is an organizational and management solution, based on information technology, to a challenge posed by the environment<sup>6</sup>. Because there are different interests, specialties, and levels in an organization, there are different kinds of systems.

#### 1.2.1.1 Different Kinds of Systems

The organization is divided into strategic, management, and operational levels and then is further divided into functional areas such as sales and marketing, manufacturing, finance, accounting, and human resources. Hence Information systems are built to serve these different organizational interests<sup>7</sup>.

a. **Operational Level-System** supports operational managers by keeping track of the elementary activities and transactions of the organization, such as sales, receipts, cash deposits, payroll, credit decisions, and the flow of materials in a factory. The main purpose of the

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<sup>6</sup> Kenneth C. Laudon & Jane P. Laudon, Management Information Systems: Organization and Technology, p. 10.

<sup>7</sup> Ibid. p. 13.

system at this level is to answer routine questions and to track the flow of transactions through the organization.

b. **Knowledge-Level System** supports knowledge and data workers in an organization. Its purpose is to help the business firm integrate new knowledge into the business and to help the organization control the flow of paper work.

c. **Management-Level System** is designed to serve the monitoring, controlling, decision-making, and administrative activities of middle managers. It typically provides periodic reports rather than instant information on operations. Some management-level systems support non routine decision making<sup>8</sup>. They tend to focus on less structure decisions for which information requirements are not always clear. These systems often answer "what if" questions.

d. **Strategic-Level System** helps senior management tackle and address strategic issues and long-term trends, both in the firm and in the external environment. Their principal concern is matching changes in the external environment with existing organizational capability.

IS may also be differentiated by functional specialty- sales, marketing, manufacturing, finance, accounting, and human resources. Different organizations have different information systems for the same functional areas. Since every unique organization has its unique objectives, structures, or interests, information systems must be custom-made to fit the unique characteristics of each. There is not a universal IS that can fit all organizations, even in such standard areas as payroll or accounts receivable. Every organization does the job somewhat differently. Nowadays, Information systems cannot be ignored by managers because they play

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<sup>8</sup> Ibid. p. 14.

a critical role in organizations. IS plays a strategic role in the life of the firm because it affects managers' decisions and senior managers' planning.

### 1.2.1.2 Overview of Systems In The Organizations

No single system can provide all the information and organizational needs. Organizations have many information systems serving different levels and functions. The typical systems found in organizations are designed to assist employees at each level and in various functional areas. There are six major types of systems<sup>9</sup>. Different types of systems are needed at different levels of the organization and by different levels of specialties.

The organization has an executive support system (ESS) at the strategic level, Management Information Systems (MIS), Decision support systems (DSS), Knowledge Work Systems (KWS) and Office Automation System (OAS) at the knowledge level, and Transactions processing System (TPS) at the operational level.

Systems at each level in turn are specialized to serve each of the major functional areas.

a. **Transaction Processing System (TPS)** serves the operational level of the organization. It is a computerized system that performs and records daily routine transactions necessary to the conduct of the business. It informs managers about the status of internal operations and about the firms' relations with the external environment, and supporting other information systems that facilitate management decision making.

b. **Knowledge Work Systems (KWS)** and **Office Automation Systems (OAS)** serve the information needs at the knowledge level of the organization. KWS aid knowledge workers,

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<sup>9</sup> David M. Kroenke & Kathleen A. Dolan, Business Computer Systems: An Introduction, New York: McGraw-Hill inc., 1990, pp. 66-92.

whereas OAS primarily aid data workers. OAS coordinate diverse information workers, geographic units and functional areas. Typical OAS handle document management (Word processing, desktop publishing, digital filing), scheduling (through electronic calendars), and communication (through electronic mail, voice mail, or video conferencing).

c. **Management Information System (MIS) and Decision Support System (DSS)** serve the management level of the organization. MIS provides managers with reports and, in some cases with on line access to the organization's current performance and historical records. MIS primarily aids the functions of planning, controlling, and decision making at the management level. Managers use DSS to assist them in making decisions that are semi-structured, unique or rapidly changing, and not easily specified far in advance. It has more advanced analytical capabilities that permit the user to employ several different models to analyze information. DSS draw on internal information from TPS and MIS, and they often bring in information from external sources.

d. **Executive Support System (ESS)** serves the strategic level of the organization. It addresses unstructured decision and creates a generalized computing and communications environment rather than providing any fixed application or specific capability. ESS are designed to incorporate data about external events, but they also draw summarized information from internal MIS and DSS.

### 1.2.2 Information Systems and Human Behavior

Many organizations had failed in implementing IT or in meeting its expectations regarding increased efficiency, effectiveness and mainly sustaining its competitive advantage. For this reason much work has been conducted revealing the importance of not ignoring users

attitudes and behaviors toward acceptance of technology and utilizing it. Considering users' attitudes, norms, and beliefs in implementing IS are of great importance to the system success. Taking this into consideration will influence or direct users' behavior towards the system and its usage. So users will psychologically contribute to IS success or failure. There are many ways in which human behavior might impact the "development" or use of IS. Some of the most important issues regarding human ability and behavior in the information systems environment are<sup>10</sup>:

**a. Intelligence and Sophistication**

Information systems must be tailored to both the level of intelligence and the level of sophistication of the people using it. Intelligence refers basically to one's ability to reason, whereas sophistication refers largely to factors such as age and experience. Both, contribute to users' ability to perform on the job.

**b. Willingness To Change**

Some people no matter what is done to encourage or to persuade them, refuse to do certain things. This type of behavior can often be seen, in high level managers and executives who are absolutely unwilling to act interactively with computer systems.

**c. Stress**

Change introduces emotional stress. Extreme stress can worsen one's ability to make decisions. It often forces people into coping patterns, when they just "put up with" things

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<sup>10</sup> Charles S. Parker, Management Information Systems: Strategy and Action, pp. 42-52.



rather than change them. Anticipating how people may react under stressful conditions brought about by major changes can make a difference between MIS success or failure. Although excessive amounts of stress are harmful to one's well-being, moderate amounts of stress may actually produce some good.

**d. Perception**

Two people often see the same thing in two different ways. Because people differ in the way they perceive data, some pre-planned direction may need to be introduced into a system to ensure that everyone using it perceives certain things in the same desired way.

**e. Bias**

Almost everyone has biases of some sort that affect his/her behavior. Stereotyping, generalization of a trait or behavior to all members of a given group, is dangerous and can overwhelm otherwise healthy interactions between people, and hinder information systems development.

**f. Attitude**

Attitude is an expression of feelings about people, objects, activities, and events. One of the most important attitude measures in an organizational environments is whether one's predisposition toward work and other people is positive or negative. People with bad attitude work less effectively or, at worse, attempt to undermine a system.

**g. Flexibility**

Because people are seldom sure of their needs, and because needs are not static, flexibility must be designed into most systems.

**h. Memory**

People differ in their ability to memorize and the speed with which they recall the facts they commit to memory. Thus IS must be built to incorporate memory principles. The system should allow the user to backtrack easily to an earlier point.

**i. Information Overload**

The rate at which people can process the facts with which they are presented has limits, in addition, this rate differs among individuals. IS should take care of filtering and presenting information to users, so that not to provide users with useless information.

**j. Culture**

The way people think and behave is largely a result of the social environment, or culture, to which they are accustomed. Culture is a concept that relates to the shared philosophies, ideologies, values, assumptions, beliefs, expectations, and norms that knit any type of community together<sup>11</sup>. Many IS characteristics have been attributed to cultural differences, such as just-in-time production methods and innovative quality control procedures.

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<sup>11</sup> Ibid., p. 51.

**k. Optimism**

People are often optimistic with regard to what they think can be accomplished. A reality of human nature is that people are more sensitive to negative outcomes than to positive ones<sup>12</sup>.

**l. Values**

Virtually everyone has a set of values, or ideals, that are held in high regard. In assessing the impact of personal values, it is sometimes possible to see where people are “coming from” and, from this, to determine why some organizations and systems function the way they do.

**m. Motivation**

So far innate and environmental factors contribute to the way people behave. But these factors alone are not sufficient to explain behavior totally. They merely provide “background facts” about people. Such facts need a mechanism to shape them into some type of action. That mechanism is motivation which is the inner state that energizes or channels behavior toward goals.

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<sup>12</sup> A. Tversky & D. Kahneman, “The framing of decisions and the psychology of choice” Science, (January 1981), pp. 453-458.

**n. Expectancy Theory<sup>13</sup>**

Expectancy theory which comes largely from the work of Victor Vroom (1964), concerns peoples' motivations in making decisions. Expectancy theory holds that most logical course of action a person can take is a function of the relative strength of three different psychological forces:

- The belief that the action taken will lead to a certain outcome.
- The value of the outcome to the individual.
- The likelihood, as perceived by the individual that the outcome will be achieved.

Expectancy theory holds that a rational individual will generally choose an outcome for which the combination of these three forces is the highest.

**1.3 Information technology: Stages of evolution**

Information technology is the basis of empowerment and civilization. The world is witnessing a special revolution, neither military nor politically, but technologically. It is the era of information. A profound change is taking place in the way corporations are working; information is not considered, any more, as an overhead cost but as a strategic resource needed to be managed. There have been four stages in the evolution of information management<sup>14</sup>.

**1.3.1 Physical Control of Information**

Started in the late 19<sup>th</sup> century and lasted until the 1950s, during this stage,

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<sup>13</sup> Ibid. p.456.

<sup>14</sup> Donald A. Marchand. "Information management: strategies and tools in transition", Information Management Review, (Summer 1985), pp. 27-28.

companies were transformed from a local entity with a few product lines into an organization with diverse product lines and far-flung offices and production plants. In this stage of its evolution, information management was a lower level, support-oriented, background activity. Therefore, because costs were not directly identified, they were considered to be part of overhead.

### **1.3.2 Management of Automated Technology**

The second stage occurred in the 1960s and 1970s. In this stage the separate evolution and application of electronic data processing, telecommunications and office automation technologies are widely spread. The strategic objective of information management at that time was enhanced technical efficiency and physical control of new technologies. The scope of the new technical management activities was usually limited to middle management levels in most businesses except the EDP function which is charged from being a middle management concern to a more senior management concern as data processing management evolved into MIS management.

### **1.3.3 Information Resource Management**

The strategic objectives for information management at this stage had shifted away from an exclusive focus on physical control of paper work or technologies to treating information as a key resource in the firm. This shift had required the application of resource of management techniques- plan, cost, budget, and evaluating to the information resources of the firm.

### **1.3.4 Knowledge Management**

This is the current stage. The focus is on the content of information itself and how it is used and valued in the organizational setting. The dependence on information and its increased penetration into every level of decision making will encourage further integration of concerns with the physical and technical management of information technologies, and with the management of the firm's information processes for improving organizational decision making, planning, management, and operations.

### **1.4 Importance of information technology**

"Information technology includes hardware and software that perform one or more data processing tasks such as capturing, storing, retrieving, manipulating, or displaying data"<sup>15</sup>.

The ultimate goal of any organization is to provide value to customers, hence, the role of information technology is to create this value so that organizations can outperform their rivals. Companies should invest in information technology in order to gain the competitive edge which is essential for survival. It will have a positive impact on organizational performance- improved productivity, utility in decision making, and higher relative value or net utility of a means of inquiry.

### **1.5 The need of the study**

Most organizations are following the trend of making their operational, tactical, and strategic processes more efficient and effective so that they will gain a competitive means

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<sup>15</sup> S. Alter, Information Systems: A Management Perspective, New York: Benjamin/Cummings Publishing Company, Inc.

among others. An increasingly attractive means of improving these processes lies in today's wide variety of information technologies<sup>16</sup>. The competitive use of information technology may provide easier access to markets, provide cost efficiencies, and may lead to increases in profitability and market shares.

Unfortunately, many information systems fail to meet their objectives, costing their companies thousands or even millions of dollars. Such failure can be contributed to the end users' resistance of utilizing the system, lack of user involvement and participation during the design and development of the system. Moreover, the fit between technology and task requirements has a substantial influence on whether to use it or not. Therefore, the basic need for this study stems from the importance of having an efficient, and effective computer based information system that is compatible with the tasks users perform, in a way that it meets the users as well as organization needs in order to have a positive impact on individual performance which consequently affect organization performance.

## **1.6 Statement of hypotheses**

This study intends to deal with the following hypotheses:

**H1:** Task characteristics and technology characteristics will affect user evaluations of TTF.

**H2:** Utilization of IS is influenced by user evaluations of TTF.

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<sup>16</sup> Darrell E. Owen, "IRM concepts: Building blocks for the 1990s", Information Management Review, (Fall 1989), pp. 19-27.

**H3:** User evaluations of TTF will have additional explanatory power in predicting perceived performance impact beyond that from utilization alone.

### **1.7 Statement of purpose**

In this research the focus is on Task-technology fit and its impact on individual performance and decision making, i.e. for an information technology to have a positive impact on individual performance, the technology must be utilized and meet the task requirements it supports. So this research is mainly of two parts:

- Utilization focus part, it employs user attitudes and beliefs to predict the utilization of information systems.
- Task- technology focus part, it proposes that information systems have a positive impact on performance only when there is correspondence between their functionality and the tasks requirements of users.

### **1.8 Construction of This Study**

After the general overview presented in Chapter I, a review of literature concerning system utilization and task technology fit will be presented in chapter II. Chapter III describes the methodology adopted in this study to gather and analyze data where questionnaires will be distributed to supervisors, middle managers, and top managers who are not IS people. All these managers belong to different organizations, have IS departments, operating in different sectors. Chapter IV presents the findings of the data analysis. Finally, a summary of the findings is made and recommendations are proposed in chapter V.



## **Chapter II**

### **Literature Review**

#### **2.1 Overview**

Organizational investments in IT to support planning, decision making, and communication processes are inherently risky. This risk is related to critical factors. Some of the most important factors that organizations should keep eyes on, and give more attention are the ignorance of users attitudes, participation, and involvement by system designers in the system development process. Moreover, the fit between technology characteristics and task requirements has strong influence on individual performance which finally leads to organizational performance, i.e. higher profits. In order to cut unproductive time, improve quality of work output, and individual job productivity, and obtain better information for decision making, MIS researchers have been interested in Task-Technology Fit (TTF) concept and its impact on quality decision making.

TTF is the degree to which technology features meet task requirements. The wider the gap between technology and task characteristics the less is the fit. As it was spoken in Chapter I, thousands of dollars are being invested in IT without achieving managers' expectations. An extensive body of research has been conducted revealing the importance of utilization for system success. In this research, an important factor, TTF, is going to be added. Throughout this study, users' evaluations of TTF are examined thoroughly showing how they are affected by individual, task, and technology characteristics. Also, the extent to which this evaluation affects system utilization and the impact of perceived performance on decision making, will

also be investigated. Since utilization alone doesn't guarantee system success, the system should be compatible enough with tasks being performed in order to have a strong effect on system success and individual performance.

This chapter will present a review of the literature and the major work of research that was conducted in the field related to the concept of TTF.

## **2.2 IT Assessment and Adoption**

Adopting an IS is not an easy decision for an organization to take. Organizations consider a multi-step program in order to adopt a system. In assessing information technology, there is a need to collect information related to the hardware and software that include policies governing the analysis, design, development and acquisition, and end users' computer literacy<sup>17</sup>.

### **2.2.1 System Analysis**

The term "system analyst" refers to one who analyzes organizational requirements for information and who designs CBIS to collect, store, and disseminate data in order to meet organizational goals. In order to assist managers and staff, the prospective users, system analysts are expected to do each of the following<sup>18</sup>:

- Learn the details of the system as well as procedures currently in place.

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<sup>17</sup> Ali R. Montazemi, "End User Information Satisfaction in the Small Business Environment", MIS Quarterly, (June 1988), p. 242

<sup>18</sup> Janaes A. Senn, Analysis and Design of Information Systems, New York: McGraw-Hill Inc., 1989, p. 151

- . Develop insight into future demands on the organization as a result of growth, added competition in the market place, changing consumer needs, evolving financial structures, the introduction of new technology, government regulatory changes, and other changes.
- . Document details of the current system for discussion and review by others.
- . Evaluate the effectiveness and efficiency of the current system and procedures, taking into account the impact of anticipated future demands.
- . Recommend any necessary revisions and enhancements to the current system, indicating how they are justified. If appropriate, an entire, new system may be proposed.
- . Document the new system features at a level of detail that allows others to understand its components (and their interrelationship), doing so in a manner that will allow the development of the new system to be managed.
- . Involve managers and employees in the entire process, both to draw on their expertise and knowledge of the current system as well as to learn their ideas, feelings, and options about requirements for the new or changed system.

Senn<sup>19</sup> also proposed eight hypotheses to be tested by means of a structured questionnaire. It was manifested that end-user satisfaction is positively associated with the:

- . Presence of a systems analyst in the firm.
- . Level of information requirements analysis performed.
- . Intensity of participation in the systems development process.
- . Level of computer literacy the user has.

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<sup>19</sup> Ibid., pp. 242-245.

- . Proportion of online application systems adopted by the firm.
- . Proportion of special purpose software acquired by the firm.
- . Duration of the company's CBIS operation.
- . Degree of decentralization in a firm.

### **2.2.2 Users Participation and Involvement**

User participation is a crucial factor that may lead to the success or failure of an MIS project. Too little involvement in developing a system and too little ownership of a resulting system will most probably lead to lack of use and satisfaction with the system<sup>20</sup>.

Increased user acceptance may be achieved by greater user participation; more participation will help in developing realistic expectations about system capabilities leading to system ownership by users, decreasing user resistance to change and committing users to the system.

#### **2.2.2.1 What is User Participation?<sup>21</sup>**

In the organizational behavior literature, there has been little consensus concerning a definition of participation. Vroom and Jago<sup>22</sup> (1988) note that, in everyday terms, participation refers to "taking part." They go on to suggest that, typically, one participates when one has

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<sup>20</sup> William Doll and Gholareza Torkzadeh, "A Discrepancy Model of End-User Computing Involvement", *Management Science*, (Vol. 35, No. 10, October 1989), pp. 1151 - 1155.

<sup>21</sup> Henri Barki & John Hartwick, "Measuring User Participation, User Involvement & User Attitude" *MIS Quarterly*, (March 1994), P.60 - 70.

<sup>22</sup> *Ibid.*, p. 60.

contributed to something. Such participation can take a variety of forms: direct (participation through personal action) or indirect (participation through representation by others); formal (using formal groups, teams, meetings, and mechanisms) or informal (through informal relationships, discussions, and tasks); performed alone (done by oneself) or shared (activities performed with others). In addition, participation can also vary in scope, occurring during one or several stages of the problem-solving process (problem identification, evaluation, solution generation, choice, and implementation). Vroom and Jago also distinguished between actual and perceived participation. Research in participative decision making (PDM) has shown that the motivational effects of participation are more closely related to perceived participation. On the other hand, decision quality has been found to be more closely related to actual participation. In developing a general measure of user participation all its forms need to be considered.

#### **2.2.2.2 What is User Involvement?**

User involvement is defined as “a subjective psychological state reflecting the importance and personal relevance that a user attaches to a given system”<sup>23</sup>.

It is believed that involving end users in systems development may lead to improvement in the quality of design decisions and resultant applications, improvement in end user skills in system utilization, development of user abilities to define their own information requirements, and enhancement in user commitments to and acceptance of the resultant applications. In an end user computing environment, user involvement is expected to be particularly important in

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<sup>23</sup> Ibid., p. 61.

determining user satisfaction and improving decision making. Four interrelated factors<sup>24</sup> explain how user involvement can more effectively improve user satisfaction and decision making in an end user computing vs. a traditional data processing environment. These factors are:

- 1- Less restrictive involvement arrangements permitting much higher levels of user involvement.
- 2- An emphasis on providing decision support for semi structured tasks where user involvement is essential to system success.
- 3- The ability, through end user tools, to more easily personalize or custom tailor applications in response to individual differences or preferences for output format or content.
- 4- The dynamic manner in which involvement leads to improvements in end user skills and expertise that enhance the effectiveness of subsequent involvement episodes.

In the case of user involvement, the system is being linked to two attributes: Importance and personal relevance. Individuals who view the system as both important and personally relevant are also likely to hold positive attitudes concerning the system. In attitude research in psychology, highly involved individuals (with an issue) have been found to have more positive attitudes concerning the issue<sup>25</sup>. In Marketing, highly involved individuals (with a product)

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<sup>24</sup> William J. Doll & Gholamreza Torkzadeh, "A Discrepancy Model of End-User Computing Involvement", Management Science, (Vol. 35, Nov. 10), October 1989, pp. 1151-1152.

have been found to have more positive attitudes toward the product<sup>26</sup>. In organizational behavior, highly involved individuals (with their job) have been found to have more positive job attitudes<sup>27</sup>. It, therefore, stands to reason that a highly involved user will have a more positive attitude toward the system.

**a. End User Computing and User Involvement<sup>28</sup>**

End user computing technology enhances opportunities for individuals to learn new skills and develop new capabilities; it facilitates human growth and development. So it is similar to organizational design strategies such as job enrichment or management by objectives that seek to increase intrinsic motivation with autonomy and responsibility. Individual differences between users may affect the level of user involvement and resulting benefits. Rockart and Flannery suggest that the end user computing population is characterized by great diversity in skill and motivation. People differ widely in their reaction to computers. Some enjoy getting involved while others concerned about the complexity of the technology, suffer from computer anxiety. Hill, Smith, and Mann describe personal efficacy (i.e. the belief that one is able to master a particular behavior) and instrumentality (i.e. beliefs about the benefits/ outcomes) as factors affecting the use of

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<sup>25</sup> John Hartwick & Henri Barki, "Explaining the Role of User Participation in Information System Use", Management Science, (Vol. 40, No. 4), April 1994, p. 442.

<sup>26</sup> Ibid., p. 442.

<sup>27</sup> Ibid., p. 442.

<sup>28</sup> William J. Doll & Gholamreza Torkzadeh, "A Discrepancy Model of End-User Computing Involvement", Management Science, (Vol. 35, Nov. 10), October 1989, pp. 1152-1153.

computers. The end user computing population includes many “early adopters”, users who quickly adopt new end user tools and easily develop considerable skills in the use of these tools. But they remain far larger potential population of “reluctant users”, individuals who lack motivation for involvement and have considerable difficulty learning to use computer system. Especially among these “reluctant users”, end users computing skill level tend to asymptote at relatively mediocre levels. Furthermore, among these “reluctant users”, involvement is less likely to lead to improvement in end user expertise that enhances the effectiveness of subsequent involvement episodes. A broad array of both micro and macro level of contextual/conditional factors form the technological, organizational and social contexts for end user computing. These contextual factors can be viewed as setting boundaries on the potential of end user involvement (i.e. what is capable of being and what it can ideally achieve). Of these factors, individual differences are, perhaps, the most important for determining the level of user involvement and subsequent outcomes.

For the most part, studies of user involvement in systems development have assumed a traditional data processing environment where users interact with computer resources indirectly, and systems development follows the normal stages of the systems life cycle. In this traditional systems life cycle, the user influences systems design indirectly through a system analyst. User involvement is considered particularly important in the definitional stage where the project is initiated, user information requirements and systems objectives are specified, and the project is justified.



**b. Effect of User Involvement Upon IS Success<sup>29</sup>**

Ives and Olson 1984 consider user involvement as a special case of participative decision making. They provide a descriptive frame work that defines success in terms of quality and acceptance, and identifies user information satisfaction as the most common outcome variable. User information satisfaction is defined as the extent to which users believe that the information system meets their requirements. It is usually treated as a perceived measure of system quality but may also be interpreted as an indicator of system acceptance. Thus, a basic contention of the user involvement literature that user participation in the determination of information requirements and the development of a logical design will enhance user satisfaction. In reviewing previous studies on the relationship between user involvement and user satisfaction, Ives and Olson categorize results as positive, non-significant, and mixed. A closer examination of the original studies revealed that this mixed category includes significant negative association. Edstrom found the significant negative correlation between functional manager involvement in system analysis and programming stage and perceived MIS success. Powers and Dickson found that user involvement in a project team was associated with lower management satisfaction with the result of MIS projects. In an unpublished dissertation, Sartore provides some additional evidence supporting a negative relationship between involvement and satisfaction. Thus, although the term (mixed) is not used inappropriately by Ives and Olson, it might tend to obscure the extent of the conflict among research findings in the MIS literature.

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<sup>29</sup> William J. Doll & Gholamreza Torkzadeh, "A Discrepancy Model of End-User computing Involvement", *Management Science*, (Vol. 35, Nov. 10), October 1989, pp. 1155 - 1160.

Ives and Olson emphasise two sets or categories of conditional variables. The first set of conditional variable focuses on who is involved in systems development i.e., actual user vs. Staff, top management involvement and how much influence they exercise. The second set describes development conditions i.e., task structure, types of systems and stages of the development process. Ives and Olson present these conditional variables as antecedents of user involvement, factors that come before and affect the level or efficacy of user involvement. More recently, Franz and Robey identified organizational contextual variables that 'moderate' the relationship between user involvement and perceived usefulness of MIS. The respondents in these studies were typically managerial or professional personnel who use computers indirectly, through other people, rather than end users who directly interact with application software. Thus, the studies often focused on general involvement rather than user involvement with a specific application. Of the studies reporting negative association, two used application specific measures of user involvement and user satisfaction/success. None of these studies focused on end user computing. These studies emphasized outcomes pertained to productivity/efficiency or satisfaction.

The user involvement literature is largely silent on the issue of 'why' individual users participate. Much of the traditional MIS literature focuses on the project as a unit of analysis and discusses representative or general involvement, often in the context of interdisciplinary project teams. Eason discussed role factors that determine the effort a user is able and willing to put into using computing systems; however, he does not discuss how individual differences between users might affect their motivation for involvement or the efficacy of involvement activities. Whatever the case is, users through involvement in logical design decisions, may be able to shape design decisions in ways that deal with their concerns or make their work easier.

Thus, in both traditional and end user computing environments, value attainment might be viewed as the primary motive for user involvement.

### **2.2.3 End User Computer literacy**

Referring to the research done by Montazemi<sup>30</sup>, it was found that the level of an end user's computer literacy directly affects satisfaction with a CBIS, since end users with computer experience were more at ease participating in CBIS activities. Also, analysis of the data indicated that the level of an end user's computer literacy is correlated with his/her participation in the systems development process and with the level of information requirements analysis performed.

### **2.2.4 Variety of CBIS Characteristics in Various Organizations**

Chee Sing Yap<sup>31</sup> identifies ten organizational characteristics that distinguish organizations using computers from those that do not. Among these characteristics are size, sector, performance, task, people, structure, and environmental factors.

#### **a. Size**

One of the factors often found to be relevant is organizational size. Large firms were more likely to be early adopters of computer systems than smaller ones. Organizational

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<sup>30</sup> Ali R. Montazemi, "End User Information Satisfaction in the Small Business Environment", MIS Quarterly, (June 1988).

<sup>31</sup> Chee Sing Yap, "Distinguishing Characteristics of Organizations Using Computers", Information & Management, (Vol. 18, 1990), pp. 98-99.

theorists suggest that as the size of an organization increases, the task of coordination becomes more complicated and its information processing requirements increase.

**b. Sector**

Organizations in different sectors are expected to have different information processing requirements. Certain sectors, such as the business and financial services sectors, are more information intensive, since their main functions are to process and package information.

**c. Performance**

Organizations which have above average performance are likely to be in a better position to invest in technological innovations.

**d. Task**

An important characteristic is how routine the main work activities are. When the work activities are routine, rules and procedures can be developed and implemented, hence simplifying the job of coordination and control. The decision processes are generally better understood and structured, or programmable.

**e. People**

An organization with a large number of office workers is more likely to invest in computers and other IT than an organization with fewer office workers.

**f. Structure**

Organizational structure refers to systems of communication, authority and work flow. Organizations which are more formalized have written procedures for various functional activities, decision and control processes. To implement CBIS, these organizational processes must be well understood, and amenable to processing and analysis. Organizations which tend to favor centralized decision making are likely to be attracted by the capability of computer systems to facilitate centralized structure and control through central corporate databases. However, computer systems also facilitate decentralized control through the use of distributed processing technology.

**g. Environmental factors**

CBIS are expected to be used more extensively by organizations with a high degree of market place uncertainty. Predictability of customers' requirements is another measure of environmental uncertainty which may be directly related to information processing needs. When the requirements are highly unpredictable, more information gathering and processing activities, have to be carried out.

**2.3 Characteristics of Technology**

Generally technology has been defined as the organizational process of transforming inputs into outputs. Fry<sup>32</sup> exposes five specific technology conceptions:

- Technical complexity

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<sup>32</sup> Louis W. Fry, "Technology-Structure Research: Three Critical Issues", Academy of Management Journal, (Vol. 25, No. 3), p. 533.

- Operations technology and operations variability
- Interdependence
- Routine- non routine
- Manageability of raw materials

According to Fry, the literature pertinent to the interdependence factor doesn't explicitly state the relationship between technology and interdependence. But, a mediating technology, e.g. banks, would require a lesser degree of interdependence than long linked technologies, e.g. Auto-assembly line<sup>33</sup>. He argues that intensive technologies have the greatest interdependence.

Researchers have conceptualized technology differently in terms of both its meaning and its dimensionality. They have used the construct as being unidimensional or multidimensional. They also have used two or more of the six general theoretical dimensions to define a more comprehensive view of technology<sup>34</sup>.

## **2.4 Understanding User Behavior**

Understanding why people accept or reject computers has proven to be one of the most challenging issues in information systems (IS) research. The impact of users' internal beliefs and attitudes on their usage behavior have been studied<sup>35</sup>.

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<sup>33</sup> Ibid., p. 538.

<sup>34</sup> Ibid., p. 538.

<sup>35</sup> Fred D. Davis, Richard P. Bagozzi & Paul R. Warshaw, "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models", Management Science, (Vol. 35, No. 8, 1989), pp. 983-984.

Intention models from social psychology as a potential theoretical foundation for research on the determinants of user behavior have been suggested. Fishbein and Ajzen's Theory of reasoned action- TRA is a especially well-researched intention model that has proven successful in predicting and explaining behavior across a wide variety of domains. TRA is very general; it is designed to explain virtually any human behavior, and should therefore be appropriate for studying the determinants of computer usage behavior. Technology Acceptance Model (TAM) is considerably less general than TRA, and designed to apply only to computer usage behavior, but because it incorporates findings accumulated from over a decade of IS research, it may be especially well-suited for modeling computer acceptance.

Moreover, Hartwick and Barki<sup>36</sup> have conducted a research explaining the role of user participation in information system use. The study provided several findings concerning the relationship between user attitudes, intentions, and system use. Three theoretical formulations incorporating these variables have recently been investigated- the Theory of Reasoned Action (TRA); the Acceptance Model (TAM); and the Theory of Planned Behavior (TPB).

#### **2.4.1 Theory of Reasoned Action (TRA)<sup>37</sup>**

TRA is a widely studied model from social psychology which is concerned with the determinants of consciously intended behaviors. According to TRA, a person's performance of

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<sup>36</sup> John Hartwick & Henri Barki, "Explaining the Role of User Participation in Information System Use", *Management Science*, (Vol. 40, No. 4), April 1994, p. 460.

<sup>37</sup> Fred D. Davis, Richard P. Bagozzi & Paul R. Warshaw, "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models", *Management Science*, (Vol. 35, No. 8, 1989), pp. 983-984.

a specified behavior is determined by his/her behavioral intention (BI) to perform the behavior, and BI is jointly determined by the person's attitude (A) and subjective norm (SN) concerning the behavior in question.  $BI = A + SN$ . According to TRA, a person's attitude toward a behavior is determined by his/her salient beliefs about consequences of performing the behavior multiplied by the evaluation of those consequences. TRA theorizes that an individual's subjective norm (SN) is determined by a multiplicative function of his/her normative beliefs, i.e., perceived expectations of specific referent individuals or groups, and his/her motivation to comply with these expectations.

#### **2.4.2 Technology Acceptance Model (TAM)<sup>38</sup>**

TAM, is an adaptation of TRA specifically tailored for modeling user acceptance of IS. The goal of TAM is to provide an explanation of the determinants of computer acceptance that is general, capable of explaining user behavior across a broad range of end user computing technologies and user populations, while at the same time being both parsimonious and theoretically justified. The purpose of TAM is to provide a basis for tracing the impact of external factors or internal beliefs, attitudes and intentions on system acceptance and use. TAM was formulated in an attempt to achieve these goals by identifying a small number of fundamental variables suggested by a previous research dealing with the cognitive and affective determinants of computer acceptance, and using TAM as a theoretical backdrop for modeling the theoretical relationships among these variables.

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<sup>38</sup> Ibid., pp. 985-986.



TAM posits that two particular beliefs, perceived usefulness and perceived ease of use, are of primary relevance for computer acceptance behaviors. Perceived usefulness (U) is defined as the prospective user's subjective probability that using a specific application system will increase his or her performance within an organizational context. Perceived ease of use (EOU) refers to the degree to which the prospective user expects the target system to be free of effort. TAM postulates that computer usage is determined by BI, but differs in that BI is viewed as being jointly determined by the person's attitude toward using the system (A) and perceived usefulness (U) with relative weights estimated by regression:  $BI = A + U$ . The A-BI relationship represented in TAM implies that, all else being equal, people form intentions to perform behaviors toward which they have positive affect. The A-BI relationship is fundamental to TRA and related to models presented by Triandis (1977) and Bagozzi (1981). Although the direct effect of a belief (such as U) on BI runs counter to TRA, alternative intention models provide theoretical justifications and empirical evidence of direct belief-intention links. The U-BI relationship is based on the idea that, within an organizational setting, people form intentions toward behaviors they believe will increase their job performance, over and above whatever positive or negative feelings may be evoked toward the behavior per se. This is because enhanced performance is instrumental to achieving various rewards that are extrinsic to the content of the work itself, such as pay increases and promotions. Intentions toward such means-end behaviors are theorized to be based largely on cognitive decision rules to improve performance, without each time requiring a reappraisal of how improved performance contributes to purposes and goals higher in one's goal hierarchy, and therefore without necessarily activating the positive affect associated with performance-contingent rewards. If effect is not fully activated whether to use a particular system, one's attitude wouldn't be

expected to completely capture the impact of performance considerations in one's intention. Hence, the U-BI relationship in TAM represents the resulting direct effect, hypothesizing that people form intentions toward using a computer system based largely on cognitive appraisal of how it will improve their performance. Hence, the results reached by this theoretical reference<sup>39</sup> revealed three main insights concerning the determinants of managerial computer use:

- 1- People's computer use can be predicted reasonably well from their intentions.
- 2- Perceived usefulness is a major determinant of people's intention to use computers.
- 3- Perceived ease of use is a significant secondary determinant of people's intentions to use computers.

Both TRA and TAM postulated that BI is the major determinant of usage behavior; that behavior should be predictable from measures of BI, and that any other factor that influence user behavior do so indirectly by influencing BI.

Although the intention-usage relationship per se has been essentially overlooked in the IS literature, usage predictions based on numerous other variables have been investigated. Ginzberg (1981) obtained a correlation of 0.22 between a measure of users "realism of expectations" and usage. DeSanctis (1983) obtained correlation around 0.25 between "motivational force" and DSS usage. Swanson (1987) obtained a 0.20 correlation between usage and a variable referred to as "value" which is similar to perceived usefulness. Robey obtained a striking 0.79 between usage and Schultz and Slevin's (1975) performance factor which is similar to perceived usefulness. Baroudi, Olson and Ives (1986) found both user

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<sup>39</sup> Ibid., pp. 982-1003.

information satisfaction and user involvement to be correlated with system usage (0.28). Srenivasan (1985) found relationships varying from -0.23 to 0.38 between various measures of user satisfaction and usage.

Both TRA and TAM hypothesized that expected performance impact due to using the specified system, i.e., perceived usefulness would be a major determinant of BI.

### **2.4.3 Ajzen's Theory of Planned Behavior (TPB)<sup>40</sup>**

Also an extension of TRA, TPB introduces one new construct, perceived behavioral control (the belief that one is able to control personally the performance of behavior). The greater the resources and opportunity that one has, and the fewer the impediments or obstacles that one faces, the greater one's perceived control. Thus, in IS, a number of individual difference (i.e., system knowledge and ability), task (i.e., task complexity, system ease of use), and situation (i.e., system availability and access) variables are apt to influence perceived behavioral control. In TPB, perceived

behavioral control is said to combine with attitude and subjective norm to determine intention. Individuals form intentions to perform behaviors that are perceived to be affectively positive, normatively expected, and under their control. Further, as a surrogate measure of actual control, perceived control is said to combine with intention to determine behavior. Individuals perform behaviors that they intend to, and are able to, perform. In the present study, perceived behavioral control was not measured. This is an important omission. User participation is

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<sup>40</sup> John Hartwick & Henri Barki, "Explaining the Role of User Participation in Information System Use", Management Science, (Vol. 40, No. 4), April 1994, p. 460.

likely to improve one's knowledge of, and ability to use, a system. Moreover, through user recommendations and influence during ISD, system access and ease of use could be improved. Thus, like attitude and involvement, perceived behavioral control is apt to mediate the influence of participation on intentions and use of a system. The presence of such relationships needs to be investigated in future research.

#### **2.4.4 Applying TRA, TAM and Other Competing Theories**

To better understand the factors that influence the use of personal computers, researchers have recently adopted the theory of reasoned action proposed by Fishbein and Azjen. A study<sup>41</sup> used a competing theory of behavior proposed by Triandis (1980). Responses were collected from 212 knowledge workers in nine divisions of a multinational firm, and the measures and research hypothesis were analyzed using partial least squares (PLS). Accordingly, the purpose of his study is to conduct an initial test of a model of personal computer (PC) utilization using a subset of Triandis' (1980) theory of attitudes and behavior. It's implied that the utilization of a PC by a knowledge worker in an optional use environment would be influenced by the individual's feelings (effect) toward using PCs, social norms in the work place concerning PC use, the individual's expected consequences of using a PC, and facilitating conditions in the environment conducive to PC use.

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<sup>41</sup> Ronald L. Thompson, Christopher, A. Higgins & Jane M. Howell, "Personal Computing: Toward a Conceptual Model of Utilization", *MIS Quarterly*, March 1991, pp. 125- 141.

### 2.4.5 Perceived consequences

According to Triandis, the expected consequences of the behavior, later renamed perceived consequences, is another important factor influencing behavior. He holds that each act is perceived as having potential consequences that have value, together with a probability that the consequence will occur. The perceived consequences construct is consistent with the expectancy theory of motivation proposed by Vroom and developed further by Porter and Lawler. The basic premise of expectancy theory is that individuals evaluate the consequences of their behavior in terms of potential rewards and base their choice of behavior on the desirability of the rewards. Robey suggests that future research on attitudes should be done within the context of the expectancy theory of behavior and proposed a model based on this theory. In her study of the optional use of a decision support system by senior undergraduate students, DeSantis finds weak-to-moderate support for her hypotheses derived from expectancy theory. Beatly also uses expectancy theory as the basis for her investigation of the use of computer-aided design and manufacturing (CAD/CAM) systems. She finds a stronger relationship between expectations and actual use. Based on expectancy theory, if the expected consequences of using a PC are attractive, and the probability of obtaining the consequences are high, then utilization of a PC will be greater.

Perceived consequences are likely to have many dimensions. For example, enhanced job satisfaction and more job flexibility may be two different constructs that could identify perceived consequence. Triandis acknowledges that the perceived consequences construct in his model is not unidimensional, possibly having several components. This is consistent with conceptual arguments and empirical findings of other researchers, who suggest there are

multiple components. In that research<sup>42</sup> one of the dimensions of perceived consequences is near term in nature- system complexity, and the other one is more future oriented.

#### **2.4.5.1 Short Term Consequences of Use<sup>43</sup>**

According to Rogers and Shoemaker (1971) one of the short term consequences is complexity. Complexity is defined as: "The degree to which an innovation is perceived as relatively difficult to understand and use". Tornatzky and Klein find that the more the innovation is complex, the lower the rate of adoption. Within the IS literature, Davis, et al. propose a technology acceptance model that includes a construct that they term perceived ease of use. This is defined as the degree to which the user expects the system to be free from effort. In their study they found a positive correlation between perceived ease of use and behavioral intentions. Ronald. Thompson, Christopher et. al, found that there will be a negative relationship between the perceived complexity of a PC and the utilization of PC's.

Moreover, in a research that was conducted by Fred Davis (1989) concerning perceived usefulness, perceived ease of use, and user acceptance of information technology, it was hypothesized that perceived usefulness is significantly correlated with both self reported current usage ( $r = 0.63$ ) and self predicted future usage ( $r = 0.85$ ). Perceived ease of use was also significantly correlated with current usage ( $0.45$ ) and future usage ( $r = 0.59$ ).

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<sup>42</sup> Ibid., pp. 128-129.

<sup>43</sup> Ibid., pp. 128-129.

#### 2.4.5.2 Long-Term Consequences of Use

In her study regarding perceived consequences, Beatly (1986) finds a strong relationship between perceived long term consequences of use and actual use of CAD/CAM systems. Adopters revealed that they believed that use of the system would enhance their career mobility, even though they were not convinced it would assist them greatly on their current job.

#### 2.4.6 Facilitating conditions

Triandis (1980) states that behavior cannot occur if objective conditions in the environment prevent it. He defines *facilitating conditions* as “objective factors, ‘out there’ in the environment, that several judges or observers can agree make an act easy to do”<sup>44</sup>.

##### 2.4.6.1 Social factors

According to Triandis<sup>45</sup>, the term “the individual’s internalization of the reference groups’ subjective culture, and specific interpersonal agreements that the individual has made with others in specific social situations”. Subjective culture consists of norms- “self-instructions to do what is perceived to be correct and appropriate by members of a culture in certain situations”<sup>46</sup>; roles, which are also concerned with behaviors that are considered correct

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<sup>44</sup> Quoted in Ronald L. Thompson, Christopher, A. Higgins & Jane M. Howell, “Personal Computing: Toward a Conceptual Model of Utilization”, *MIS Quarterly*, (March 1991), p. 205.

<sup>45</sup> Ibid., p. 126.

<sup>46</sup> Ibid., p. 126.

but relate to persons holding a particular position in a group, society, or social system; and values- abstract categories with strong affective components.

Many studies supported the relationship between social norms and behavior. For example, Tornatsky and Klein (1982), in a meta-analysis of 75 studies of the relationship between innovation characteristics and adoption, found that compatibility of the innovation with the norms of the potential adopters had a significant influence on adoption. The relationship is also consistent with the theory of reasoned action proposed by Fishbein and Ajzen (1975), a theory that has already been tested within the IS context. More specifically, Pavri (1988) stated that there is a positive relationship between social norms and system utilization by managers in voluntary use environments. Davis, et al. (1989) report no significant relationship between social norms and usage, but they referred this unexpected finding to the weak psychometric properties of their social norms scale, and the particular IS context (i.e., use of a word processing system) in which their research was conducted.

#### **2.4.6.2 User Attitudes Toward the System<sup>47</sup>**

According to Fishbein and Ajzen, 'attitudes' refers to the affect, that is to feel for or against an object or behavior. They distinguish two different kinds of attitudes; Attitudes towards objects and attitudes concerning behaviors. Davis et. al. (1989) and Mathieson (1991) have found that attitudes concerning system use significantly influence user intentions to use the system. Individuals who view the system as both important and personally relevant are also likely to

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<sup>47</sup> John Hartwick & Henri Barki, "Explaining the Role of User Participation in Information System Use", Management Science, (Vol. 40, No. 4), April 1994, p. 460.



hold positive attitudes concerning the system. In attitudes research in psychology, highly involved individuals with an issue have been found to have more positive attitudes concerning the issue. Hence, a highly involved user will have a more positive attitude toward the system. Attitudes are said to be performed on the basis of beliefs.

#### 2.4.7 Social Cognitive Theory<sup>48</sup>

According to Bandura, behavior is influenced by cognitive and personal factors, and in turn, affects those same factors. While Social Cognitive Theory has many dimensions, her research is particularly concerned with the role of cognitive factors in individual behavior. As the major cognitive forces guiding behavior, Bandura proposes two sets of expectations. The first set of expectations relates to outcomes. Individuals are more likely to undertake behaviors they believe will result in valued outcomes than those they do not see as having favorable consequences. The second set of expectations includes what Bandura calls self-efficacy, or beliefs about one's ability to perform a particular behavior. Self-efficacy influences choices about which behaviors to undertake, the effort and persistence exerted in the face of obstacles to the performance of those behaviors, and thus, ultimately, the mastery of the behaviors. Outcomes expectations have been considered by many IS researchers. For example, Thompson, et al. (1991) tested a model of personal computer use based on Triandis (1980), which included perceived consequences as a central determinant of behavior. As a result, her research has showed that the higher the encouragement of use by members of the

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<sup>48</sup> Deborah R. Compeau & Christopher Higgins, "Computer Self Efficacy: Development of a Measure & Initial Test", *MIS Quarterly*, June 1995, pp. 190-191.

individual's reference group, the higher the individual's out-come expectations. And the higher the use of the technology by others in the individual's reference group, the higher the individual's out-come expectations. Also the higher the support for computer users in the organization, the higher the individual's out-come expectations.

#### 2.4.8 Affect<sup>49</sup>

Individuals' affect (or liking) for particular behaviors can, under some circumstances, exert a strong influence on their actions. Television preferences, for example, are almost solely based on affect. Consumer choices are also often made on the basis of affective reactions. But with respect to computers, the evidence is not clear; Thompson, et al. (1991), found no relationship between affect for PC use and the use of personal computers among managers. However, as the authors acknowledge, the measure of affect was somewhat weak, and thus, the finding may simply be a reflection of the measurement. It was shown in Deborah R. Compeau & Christopher Higgins's research<sup>50</sup> that the higher the individual's affect for computer use, the higher his/her use of computers.

In the context of system utilization, the existence of support for users may be one type of facilitating conditions that can influence system utilization. Also by training users and assisting them when they encounter difficulties, some of the potential barriers to use are reduced or eliminated.

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<sup>49</sup> Ibid., pp. 196-197.

<sup>50</sup> Ibid., pp. 196-197.

Moreover, Ronald R. Thompson, et al.<sup>51</sup>, followed Triandis and postulated that there is a positive relationship between affect toward PC use and the utilization of PCs. Triandis (1971) acknowledges that attitude is an imprecise term that is more useful for discussions where precision is not necessary. For research involving a link between attitudes and behavior, however, Triandis (1980) argues for precision through the separation of the affective and cognitive components of attitudes. To do this, Triandis (1980) uses the term affect, which describes it as the feelings of joy, pleasure, or depression, hate associated by an individual with a particular act. According to Goodhue (1988), most IS researchers have not made a distinction between the affective component of attitudes (which have a like/dislike connotation) and the cognitive component or beliefs (which are the information a person holds about an object, issue, or person). Schutlz and Sleven's (1975) operationalization of user attitudes (a single construct) toward mainframe systems suggests that many questions hit the cognitive as well as the affective components. If these are really separate components, combining them into a single component would not have influence. Similarly, Lucas (1978) also used a mixture of cognitive and affecting questions to measure the single constructs of attitudes.

## **2.5 Factors Affecting System Utilization and User satisfaction**

There are many factors that influence system utilization and user satisfaction. Some of the important factors are management and EDP support, training, and job fit. After examining the two factors management and EDP support, Job fit is going to be discussed in a separate section for its importance in system utilization and performance impact.

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<sup>51</sup> Ronald L. Thompson, Christopher, A. Higgins & Jane M. Howell, "Personal Computing: Toward a Conceptual Model of Utilization", *MIS Quarterly*, March 1991.

Moreover, Mawhinney and Lederer assured that persons who are more satisfied with their level of computer competence utilize PCs to a greater extent. Moreover, those who are more satisfied with the ease of learning or using a PC system utilize PCs to a greater extent. Also, persons with more computer training or who are more satisfied with the support provided by data processing departments and vendors use PCs to a greater extent.

### 2.5.1 Training<sup>52</sup>

One of the important factors that influences the use of computer software is training. An effective training program can provide users with the necessary understanding and motivation to use their available desktop technology.

Bostrom, et al. provide a framework for studying end-user training/learning. They suggest measuring training outcomes in terms of understanding and motivation to use the software because both outcomes will directly impact later usage. A user who understands a software package, but does not perceive its usefulness on the job will not use it. A person who is motivated to use a piece of software, but does not understand how to use it, will either not use it, require much support, and/or will encounter problems while learning the software.

It seems to be generally recognized in the literature on end user computing (EUC) that a formal training and support environment is necessary for organizations to get the most effective use of their EUC investment and for end users to become efficient and effective workers. This infrastructure should be planned, implemented and controlled by the organization's central information systems (IS) or data processing (DP) department. Yet recent research has

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<sup>52</sup> Lorne Olfman and Munir Mandviwallaan, Desktop Information Technology "Experimental Comparison of End User Software Training Manuals".

demonstrated that the majority of the training and support end users receive comes from their colleagues. In other words, end users rely more on informal than formal training and support infrastructures.

### 2.5.2 Management and EDP Support

According to A. Jackson Forster, SMIS conference<sup>53</sup> 1978,

“The importance of top management involvement and input must be considered by the Management Information Systems (MIS) professionals as critical to the success of the MIS activities. The rationale is simple and basic: Without management support and input, a company wide commitment to MIS will not exit... This lack of commitment will be significantly detrimental in terms of the development and approval of an MIS master plan as well as the availability of adequate budget and resources”.

It is essential, therefore, that the MIS executive clearly understands the proper role and relationships between top management and MIS, and most importantly, identifies those strategies and technologies that will result in effective top management input into the master MIS plan. Schultz and Slevin (1975) consider “support/resistance” as one factor influencing utilization. Robey (1979) finds a positive correlation between “support/resistance” and use of a system.

While in the research that was conducted by Ronald R. Thompson et al., have proven that there is a positive relationship between facilitating conditions for system use and the utilization of a system. The importance of management and EDP support has been demonstrated by several researchers. Just as user involvement is indispensable to successful project

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<sup>53</sup> A. Jackson Foster, “Power Strategies and Techniques for Obtaining Top Management Input into MIS Master Plans”, SMIS Conference Proceedings, (Sept. 1978), p. 57, quoted from Synnott & Gruber, Information Resource Management, p. 127.

management, so management involvement with IM (information management) is a critical success factor in achieving IM effectiveness in organizations.

Thus, it is important, as an information planning activity to close the communications gap between the management and technical information people. To achieve this, it is important to upgrade the business quality of the information organization by placing there people who were equally proficient as businessmen and as systems people. In fact, end users should not be left alone with their tasks. They should be provided with both management and EDP support to be more productive. The importance of the EDP guidance and support to end users are vital when variety of problems approached them such as<sup>54</sup>:

- . The systems that users or vendors developed did not solve business needs and were very difficult to modify in order to be useful.
- . Redundant data and data integrity problems resulted from unsystematized (i.e ad hoc) development of files or databases from re-keyed data.
- . Limitations in hardware and software prevented or complicated communication with other systems owned by a company.
- . Computing costs were growing rapidly, but productivity gains were minimal or impossible to prove.

In such cases, the need for an environment in which a central MIS group provides control and direction is vital and critical.

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<sup>54</sup> John A. McGann, "Meeting The Challenge of End User Computing" Journal of Systems Management, (March 1990), p. 13-16

## 2.6 Task-Technology Fit (TTF)

A number of researches have focused on situations where utilization can often be assumed and have argued that performance impacts will result from task-technology fit, that is, when a technology provides features and support that 'fit' the requirements of a task. Job 'fit' is defined as perceived job fit; it measures the extent to which an individual believes that using a PC can enhance the performance of his or her job (e.g., obtaining better information for decision making or reducing the time required for completing important job tasks)<sup>55</sup>. Many researches have been conducted revealing the positive relationship between perceived job fit and PC utilization. For example, it was found that:

- . An innovation is more likely to be adopted when it is compatible with individuals' job responsibilities.
- . The "performance factor," is the strongest predictor of utilization.

Their construct is similar to Floyd's (1986) "system/work fit" (i.e., facilitating accomplishment of core tasks, improving individual job productivity, and improving quality of work output)<sup>56</sup>, was found to be positively related to the use of mainframe-based information systems. Similarly Davis, et al.'s (1989) "perceived usefulness" construct (defined as the user's subjective probability that using a specific application system will increase his or her job performance)<sup>57</sup>, found it to be strongly correlated with utilization. Addition support is offered

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<sup>55</sup> Ronald L. Thompson, Christopher, A. Higgins & Jane M. Howell, "Personal Computing: Toward a Conceptual Model of Utilization", *MIS Quarterly*, March 1991.

<sup>56</sup> Ibid., p. 129.

<sup>57</sup> Ibid., p. 129.

by Goodhue (1988), who suggests that an important predictor of use is the correspondence between job tasks and the capabilities of the information system to support the tasks.

In studies examining the impact of graphs versus tables on individual decision-making performance, the "fit" focus has been mostly considered. Through a series of laboratory experiments, it is reported that the impact of data representation on performance seemed to depend on fit with the task. Another study revealed that mismatches between data representation (a technology characteristic) and tasks would slow decision-making performance by requiring additional translations between data representations or decision processes. Moreover, it is found that there is strong support for this linkage between "cognitive fit" and performance in laboratory experiments.

R. L. Thompson et al.<sup>58</sup> propose that information systems (systems, policies, IS staff, etc.) have a positive impact on performance only when there is correspondence between their functionality and the task requirements of users.

"Fit" and utilization or adoption have been linked at the organizational level. While at the individual level a "system/work fit" construct has been found to be a strong predictor of managerial electronic workstation use<sup>59</sup>.

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<sup>58</sup> Ibid.

<sup>59</sup> Dale L. Goodhue & Ronald L. Thompson, "Task-Technology Fit and Individual Performance", *MIS Quarterly*, (June 1995), pp. 216-218.



### 2.6.1 Technology-to-Performance Chain (TPC)

Goodhue and Thompson<sup>60</sup>, proposed a new model that focuses on utilization and task-system fit. This technology-to-performance chain (TPC) is a model of the way in which technologies may lead to performance impacts at the individual level. By combining the insights of both 'focuses', and recognizing that technologies must be utilized and fit the task they support to have a performance impact, this model gives a more accurate picture of the way in which technologies, user tasks, and utilization relate to changes in performance.

Technologies are viewed as tools used by individuals in carrying out their tasks. In the context of information systems, technology refers to computer systems (hardware, software, and data) and user support services (training, help lines, etc.) provided to assist users in their tasks<sup>61</sup>. The model is intended to be general enough to focus on either the impacts of a specific system or the more general impacts of the entire set of systems, policies, and services provided by a department.

Tasks are broadly defined as the actions carried out by individuals in turning inputs into outputs. Task characteristics of interest include those that might move a user to rely more heavily on certain aspects of the information technology.

Individuals may use technologies in order to assist them in performing their tasks. Characteristics of the individual (training, computer experience, motivation) could affect how easily and well he or she will utilize the technology.

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<sup>60</sup> Ibid. p.218.

<sup>61</sup> Ibid., p. 216.

Task-technology fit (TTF) is the degree to which a technology assists an individual in performing his or her portfolio of tasks. More specially, TTF is the correspondence between task requirements, individual abilities, and the functionality of the technology.

The antecedent of TTF are the interactions between task, technology, and individual. Certain kinds of tasks (for example, interdependent tasks requiring information from many organizational units) require certain kinds of technological functionality (for example, integrated data-bases with all corporate data accessible to all). As the gap between the requirements of a task and the functionality of a technology widens, TTF is reduced. Starting with the assumption that no system provides perfect data to meet complex task needs without any expenditure of effort (i.e. there is usually some non-zero gap), as tasks become more demanding or technologies offer less functionally, TTF will decrease.

Goodhue's and Thompson's research, showed that the utilization focus part is derived from theories about attitudes (beliefs or affect) and behavior.

The focus is expanded to include a portfolio of some number of tasks (such as in a field study of information systems use).

Their research, also has shown that TTF has an impact on utilization through a link between task fit and beliefs about the consequences of using a system. This is because TTF should be one important determinant of whether systems are believed to be more useful, more important, or give more relative advantage. And all of these related constructs have been shown to predict utilization of systems in addition to other factors shown in the model.

Performance impact in this context relates to the accomplishment of a portfolio of tasks by an individual. Higher performance means improved efficiency, improved effectiveness, and/or higher quality. High TTF increases the likelihood of utilization as well as the

performance impact of the system regardless of why it is utilized. Regardless of utilization level, a system with higher TTF will lead to better performance since it more closely meets the task needs of the individual.

Portions of the TPC model have already been tested by a variety of researchers. Support for a "fit" relationship between task characteristics, technology characteristics, and individual characteristics on the one hand, and user evaluations of TTF on the other was found by Goodhue. Support for the link between TTF and performance was found by Jarvenpaa and Vessey. Support for the precursors of utilization (i.e. the bottom box) has been found by Adams, et al., Davis, Davis, et al., Mathieson, and Thompson, et al.

The TPC model suggested by Goodhue and Thompson was not tested within a narrowly controlled domain but in a more generalized domain since in a controlled domain extraneous influences would have been removed, but made generalization more difficult. The focus was at a more macro level and to span multiple technologies, multiple tasks, multiple types of users, and multiple organizational settings.

### **2.6.2 Effect of Task Characteristics on TTF<sup>62</sup>**

In trying to show the effect of task characteristics on TTF, it was found that non-routine tasks exert the strongest effect on TTF. Individuals engaged in more non-routine tasks rated their information systems lower on data quality, data compatibility, data locatability, training/ease of use, and difficulty of getting authorization to access data. This is consistent with the idea that because of the non-routine nature of their jobs, these people are constantly

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<sup>62</sup> Ibid., p. 226.

forced to use information systems to address new problems, such as seeking out new data and combining it in unfamiliar ways. Thus, they make more demands on systems and are more actually aware of shortcomings. Interdependence of job tasks was observed to influence perceptions of the compatibility and reliability of systems.

A relation exists between TTF factors- compatibility and ease of getting authorization for access and Job Level. Lower and middle-level staff and managers found the data least compatible, while upper-level management found it most compatible. Since upper-level management found it much easier obtaining authorization for access to data, and administrative and clerical staff faced red tape in getting permission to access the data they need.

### **2.6.3 Effect of Technology Characteristics on TTF**

The Two proxies for characteristics of the technology were "systems use" and "department". Together these were significant predictors for four of the eight factors- Timeliness, Locatability, Ease/Training\*, and Reliability- of TTF. The specific findings have good face validity, although not all anticipated influences were observed. Department is a significant predictor of user evaluations of production timeliness and of training/ease of use. If IS groups focus special emphasis on strategically important or powerful departments, different levels of training and easier-to-use, more up-to-date systems would be provided to those departments. To the extent that IS groups have consistent standards for production turnaround, interface design, training policies, and so on, there are likely some departments for whom these standards are more appropriate than for others. Another area where it was expected to see differences between departments, but did not, was the relationship with IS.

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\* Highly significant.

Systems used is a significant predictor of locatability and systems reliability, this too suits their expectations. Users reflect that some systems are better than others for locatability of data or for system reliability. Another area where they expected to see differences between systems, but did not, was in the quality of the data. It is possible that the proxy measures of technology characteristics were too crude to pick up any but the strongest influences within the study.

In examining the relation between Task-Technology Fit and Utilization, it was found weak. Although the regression as a whole and three of the path coefficients were statistically significant, the adjusted R square was only 0.02.

In addition, two of the three significant path coefficients (reliability of systems and relationship with IS) had negative path coefficients. Interpreted within a theoretical framework in which attitudes (beliefs, affect) determine behavior, the two negative links suggest that users who believe that systems are less reliable and who are less positive about the relationship with IS, will be more likely to use the systems. This contrary behavior seems implausible.

A more compelling interpretation is that perhaps individuals who use the systems a great deal and are very dependent on them will be more frustrated by system downtime and the performance impacts it engenders. These highly dependent users are more likely to be confused in their work by downed systems and more likely to rate those systems as unreliable. Similarly, people who are more dependent on systems might be more frustrated with poor relationships with the IS department and might give poorer evaluations of that relationship. This is quite different from numerous findings showing the link from user attitudes (beliefs, affect) to utilization but is consistent with arguments made by Melone (1990) that under certain circumstances utilization will influence attitudes.

Several possible explanations were made to verify why TTF doesn't influence utilization. First, they have conceptualized utilization as dependence on information systems, rather than on the more common concept of duration of frequency of use. This shift in conceptualization, they claimed, is responsible for the weak link between TTF beliefs and behavior. Two additional regressions were run, one with TTF predicting duration and the other with TTF predicting frequency. Though the R increased to 0.10 for both new regression, in each case the strongest link by far was between negative beliefs about "systems reliability" or "relationship with IS" and greater utilization. Thus, it appeared that their conceptualization of utilization is not responsible for this mismatch.

A more promising explanation is that the direct link between TTF and utilization may not be justified in general. That is, TTF may not dominate the decision to utilize technology. Rather, other influences from attitudes and behavior theory such as habit, social norms (and mandated use), etc. may dominate, at least in these organizations. This would suggest that testing the link between TTF and utilization requires much more detailed attention to other variables from attitudes and behavior research.

A third possibility is that none of the current conceptualizations of utilization are well suited for field settings where many technologies are available and individuals face a portfolio of tasks. Finally, in order to see whether TTF and Utilization are significant predictors of Performance Impacts, they used the test suggested by Neter and Wasserman. It was used to explicitly test for the importance of adding the eight TTF factors as a group to a regression predicting performance using utilization. To get a complete picture, they ran three regressions predicting performance impact, using three different sets of independent variables : (1) Only utilization, (2) Only the eight TTF factors, and (3) Both the eight TTF factors and utilization.

The results showed that utilization alone explained 4 percent (adjusted R square) of the variance in performance, while TTF and utilization explained 14 percent of the variance. Together, utilization and TTF explained 18 percent. Hence the F-test of the improvement in fit from adding the eight TTF factors as a group was significant at the 0.001 level.

Results show that quality of the data, production timeliness, and relationship with IS all predict higher perceived impact of information systems, beyond what could be predicted by utilization alone. It appears that performance impacts are a function of both task technology fit and utilization, not utilization alone.

The above literature showed the various factors emphasized by the various researchers who attempted to find a link between TTF and system success. Literature pertinent to factors affecting TTF including technology, task, and individual characteristics, perceived usefulness, perceived ease of use, and other precursors of utilization was also presented. The following chapter will identify the research design and methodology that will be applied in this study to gather data and analyze it. This, of course, will help in investigating the TTF level in the Lebanese organizations, and in determining the factors that are most likely to be associated with this fit and with systems performance.

## Chapter III

### Research Methodology and Design

#### 3.1 The Basic Approach

Organizational investments in IT to support planning, decision making, and communication processes are inherently risky. This risk is related to critical factors. Some of the most important factors that organizations should keep eyes on, and give more attention is the ignorance of users' attitudes, participation, and involvement by system designers in the system development process. Moreover, the fit between technology characteristics and task requirements should not be overlooked for its strong influence on individual performance. This research has been conducted as a result of interest in determining the effect of task-technology fit (TTF) on individual performance and decision making in Lebanese organizations. Based on previous research, and as was mentioned in the Chapter II, TTF is the degree to which a technology meets the tasks' requirements and needs. Also, the study is intended to show how important system utilization is and its impact on individual performance. In addition, various aspects related to IS and system usage mainly organizational, demographic, and other characteristics are identified.

As an initial step the basic model proposed for this research is shown in Figure 3.1. Following the methods used by Goodhue & Thompson<sup>63</sup>, TTF will be examined through eighteen statements measuring data quality, locatability of data, authorization to access data, data compatibility (between systems), training and ease of use, production timeliness (IS meeting

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<sup>63</sup> Dale L. Goodhue & Ronald L. Thompson, "Task-Technology Fit and Individual Performance", MIS Quarterly, (June 1995), pp. 216-218.



scheduled operations), systems reliability, and IS relationship with users. The interactions between task, technology and individual characteristics, and 'system utilization' is investigated through the use of five dimensions- system usage duration, frequency of usage, information inclusion, number of software packages used, and the level of usage sophistication- proposed by Igbaria<sup>64</sup> and other researchers such as Delone<sup>65</sup>, Yaverbaum<sup>66</sup>, Mansour & Watson<sup>67</sup>, and Srinivasan.<sup>68</sup>

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<sup>64</sup> Magid Igbaria et al., "Microcomputer Applications", Information & Management, (Vol. 16, 1989), pp. 187-196.

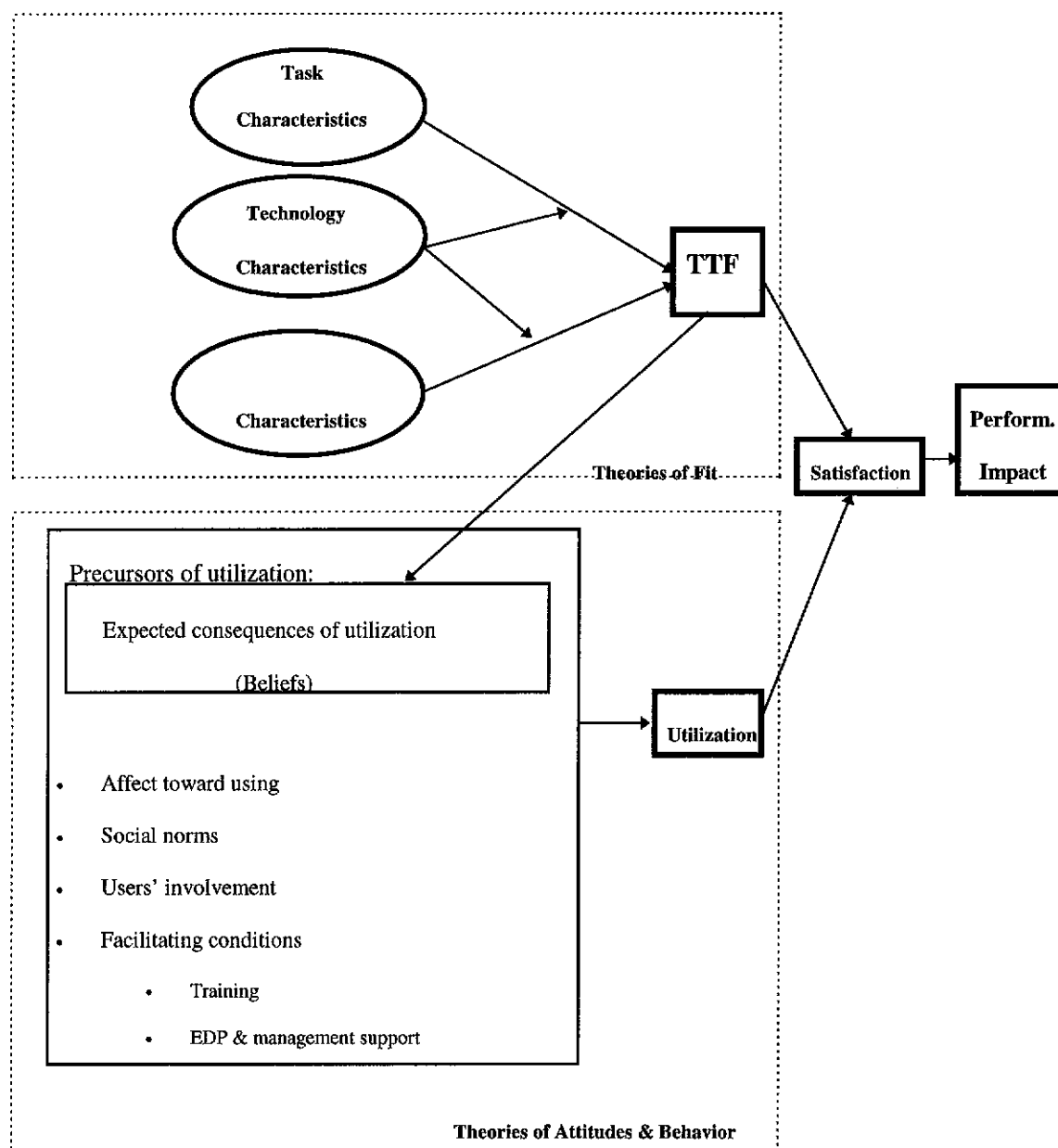
<sup>65</sup> William H. Delone, "Determinants of Success for Computer Usage in Small Business", MIS Quarterly, (Vol. 12, No. 1, March 1988), pp. 51-61.

<sup>66</sup> Gale J. Yaverbaum, "Critical Factors in the User Environment", MIS Quarterly, (Vol. 12, No. 1, March 1989), pp. 75-88.

<sup>67</sup> Ali H. Mansour & Hugh J. Watson, "The Determinants of CBIS Performance", Academy of Management Journal, (Vol. 23, No. 3, 1980), pp. 521-533.

<sup>68</sup> Ananth Srinivasan, "Alternative Measures of System Effectiveness", MIS Quarterly, (Vol. 9, No. 3, Sep. 1985), pp. 243-258.

**Figure 3.1: Suggested model** (Adjusted from ref.: Dale L. Goodhue & Ronald L. Thompson, "Task-Technology Fit and Individual Performance", *MIS Quarterly*, (June 1995), pp. 216-218).



### **3.2 Sources of Information and Survey Design**

The major sources of information for this research were the Lebanese organizations that have an EDP department. Questionnaires were directed to managers, at all organizational levels, excluding IS people, who interact with the existing system and where decision making is part of their jobs. The user survey selected to be used in this study is structured, according to the basic methodology, to cover a variety of factors related to TTF and system utilization impact on individual performance. The questionnaire used is divided into parts including demographic characteristics, organizational characteristics, task characteristics, computer and software use, task inclusion in computers, extent of computer use, computer training, computer knowledge and experience, TTF, beliefs about computer usage, current technology characteristics, system ease of use, impact on performance, and finally user satisfaction section. Within each part, item questions were designed to build each specific measure. The validity of the survey scales adopted in this study was proved by many researchers who used them as main tools for data collection (e.g., Igbaria, Mansour & Watson, Goodhue & Thompson). A sample of questionnaires could be referred to in Appendix A.

### **3.3 Sample and Data Collection**

The sample consists of supervisors, operational, middle, and top managers who use computers in their work and belong to organizations that include EDP departments. Two hundred and fifty questionnaires were distributed. Only hundred and thirty-two have been collected. So the response rate is 52.8%. Among these hundred and thirty questionnaires, hundred and two are valid ones. Hence, the valid response rate is 40.8%. Although no random sampling technique was applied, the end users sampled came from a wide variety of organizations belonging to

various economic sectors, e.g., Manufacturing, Merchandising, Transportation, Consultancy and Research, Educational, Accounting and Audit, Financial Institutions, Public Sector, and Health Care, and from a broad spectrum of management levels and functional divisions.

### **3.4 Research Variables**

The proposed factors to influence computer usage and TTF are chosen on the basis of their perceived importance in the organizational context as was presented by previous research.

#### **3.4.1 Computer Usage**

Based on previous research on MIS usage [Delone (1988), Srinivasan (1985), Igbaria et al. (1989)], five dimensions of computer usage are included in this study:

##### **a. Tasks Inclusion in Computer**

This dimension was suggested by Lucas (1973) and by Cheney & Dickson (1982)<sup>69</sup> and has been used by Igbaria et al. (1989). The scale was developed for measuring thirteen tasks: Looking for trends, finding problems, planning, budgeting, taking actions, communicating with others, controlling and guiding activities, making decisions, historical reference, keeping activities and performance up-to-date, aiding in reporting to superiors, aiding in increasing productivity, and aiding in cutting costs. Ordinal scaling was used to measure each task category. Five ordinal answers were listed. No usage at all, made up the low end of the scale and was assigned the value of 1.

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<sup>69</sup> Magid Igbaria et al., "Microcomputer Applications", *Information & Management*, (Vol. 16, 1989), pp. 189.

A great extent of usage was assigned a value of 5. For each of the thirteen tasks, respondents were asked to indicate the extent to which they used computers in a scale ranging from "not at all" to "to a great extent". The number of these tasks was used as an index for this measure.

**b. Extent of computer Use**

This dimension is widely used in MIS studies. For the purpose of this study, the scale used by Igbaria (1989) was applied. Self reported time was used, as measured on a five point scale ranging from "almost never" to more than 3 hours per day".

**c. Frequency of use**

This dimension was suggested by Raymond<sup>70</sup> (1985) and Delone (1988), and was used by Igbaria (1989). It provides a slightly different perspective than duration of use. Srinivasan (1985) and Igbaria (1989) included actual daily use of microcomputers and frequency of use of microcomputers in their measures of usage. Frequency of use was measured on a six point scale ranging from "less than once a month" to "several times a day".

**d. Number of packages used**

A good indication of overall usage and the variety of tasks performed on the computer can be provided by measuring the number of different packages used by each manager.

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<sup>70</sup> L. Raymond, "Organizational Characteristics and MIS Success in the Context of the Small Business", MIS Quarterly, (Vol. 9, No. 1, March 1985), pp. 37-52.

This was proposed by Lee<sup>71</sup>, and used by Igarria et al. (1989). A list of 10 different categories of packages was specified. The list consists of: Spreadsheets (e.g. Excel), word processors (e.g. Word-Perfect), data management packages (e.g. Dbase III+), modeling systems (e.g. IFPS), statistical packages (e.g. Statistica), graphical programs (e.g. Energraphics), communication packages (e.g. via electronic mail), fourth generation languages (e.g. FOCUS), third generation language (e.g. Pascal), & others (e.g. Accounting packages, Payroll packages,...). For each of the ten applications, ordinal scaling was used where respondents were asked to indicate to what extent they used computer software applications. The number of these respondents reported was used as a measure of this variable.

**c. Level of sophistication of usage**

This was used by Maish<sup>72</sup> and Igarria (1989). This serves to measure proficiency of use of the computer. For each of the 10 different categories of applications, respondents were asked to indicate their level of expertise. Each items was measured on a five point scale ranging from (1) "Not at all" to (5) "To a great extent". The measure was the sum of the levels of expertise indicated for each category of package used.

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<sup>71</sup> D. S. Lee, "Usage Patterns and Sources of Assistance to Personal Computers Users" MIS Quarterly, (Vol. 10, No. 4, Dec. 1986), pp. 313-325.

<sup>72</sup> A. M. Maish, "A Users Behavior Toward His MIS", MIS Quarterly, (Vol. 3, No. 1, March 1979), pp. 39-52.

### 3.4.2 Computer Experience and Training

Computer experience was assessed by asking respondents to indicate whether they had experience in using different types of computer software, languages, and development of computerized information systems. Responses were measured using a five point scale from (1) "Not at all" to (5) "To a great extent". Computer training was measured by the individual's responses to a question which asked them to report the extent of training they had received from four sources: College or university courses; vendor and outside consultants training ; in house training; and self training. This scale was proposed by Nelson and Cheney<sup>73</sup> and used by Igarria et al. (1989). The mean of the responses to these four questions was used as an indicator of computer training. The validity of the scale was proved by Igarria since it had an internal consistency reliability of 0.86.

### 3.4.3 Demographic Variables

Single item questions were used to ascertain respondents' gender, age, and education. The business sector consists of ten categories: Manufacturing, financial institutions, merchandising, public, transportation, consultancy and research, educational, accounting and audit, health care, and others. The level in the organizational hierarchy consisted of four categories: top, middle, operation, or first level supervisor. As to the functional division, ten categories were used: Accounting, finance, marketing, general management, personnel and HRD, information systems/EDP, sales, manufacturing, R&D, and other.

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<sup>73</sup> R. Nelson and P. Cheney, "Training End Users: An Exploratory Study", *MIS Quarterly*, (Vol. 11, No. 4, Dec. 1987), pp. 547-559.

### 3.4.4 Organizational Characteristics

In this section general information concerning the organization is emphasized concerning number of employees, relevant industry growth which is measured along a five point scale ranging from "Large Contraction to Large Expansion". Concerning job characteristics, routiness is measured along a five point scales ranging from "< 20%" to "> 80%" stating to what extent the job can be considered as routine. Organization style (e.g., formality, centralization), and market characteristics (e.g. competition, easiness of needs' prediction) are measured using a Likert scale of five points.

### 3.4.5 Task Characteristics<sup>74</sup>

Task characteristics and their impact on information use have been studied by many researchers (e.g., Culnan, 1983; Daft and Macintosh, 1981; O'Reilly 1982). Following Fry and Slocum's (1984) suggestion of a general characterization of tasks, Goodhue (Sep. 1995) combined Perrow's (1967) and Thompson's (1967) dimensions and successfully measured a two-dimensional construct of task characteristics, non-routiness and interdependence. In this section a set of 17 statements that measures tasks complexity (non-routiness) and interdependence (with tasks performed in same department, and other departments) are evaluated using a Likert scale consisting of five points ranging from (1) Strongly Agree to (2) Strongly Disagree.

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<sup>74</sup> Dale L. Goodhue & Ronald L. Thompson, "Task-Technology Fit and Individual Performance", MIS Quarterly, (June 1995), pp. 216-218.



#### **3.4.6 User Satisfaction**

A major indicator that reflects the success of end user computing can be provided by the user satisfaction measure. Respondents were asked to report their description of the computer-based information system products. A list of sixteen items was used, and the response options range in a Likert type scale from "Strongly Agree" to "Strongly Disagree". The mean of the responses to these question items was used as a measure for this variable. This measure is used as the dependent variable in this study. The validity of the scale used was proved by Srinivasan and Igarria as was mentioned above.

#### **3.4.7 Beliefs and Attitudes about Computer Usage**

This measure reflects the general attitude of users about using computers in their jobs. This was used by Igarria (1989) in term of computer anxiety and had an internal consistency reliability (coefficient alpha) of 0.94. The instrument asked individuals to indicate their agreement or disagreement with ten statements reflecting the beliefs of users about the advantages and disadvantages of using computers. The response options in this scale range from (1) "Strongly Agree" to (5) "Strongly Disagree". The mean of the responses was used as a measure for this variable.

#### **3.4.8 Task-Technology Fit (TTF)**

Task-technology fit has been measured by Goodhue (1993; September 1995) within the user task domain of IT-supported decision making. From Goodhue's instrument we borrowed multiple questions addressing the extent to which existing information systems support the identification access, and interpretation of data for decision making and the extent

to which IS meets user task needs: Having sufficient understanding of the business, having sufficient interest and dedication, providing effective technical and business planning assistance, delivering agreed-upon solutions on time, responsiveness on requests for services, production timeliness, and impact of IS policies and standards on ability to do the job.

Eight components of TTF that were successfully measured included (1) data quality; (2) locatability of data; (3) authorization to access data; (4) data compatibility (between systems); (5) training and ease of use; (6) production timeliness (IS meeting scheduled operations); (7) systems reliability; and (8) IS relationship with users. The first five factors focused on meeting task needs, and the last focused on responding to changed business needs.

#### **3.4.9 Technology Characteristics**

In this section respondents are asked to report the extent to which they believe the statement is true. The first part consists of five statements. One statement shows whether the computer system has up-to-date hardware and software. The remaining four show the respondent beliefs about the system concerning dependability, expensiveness, relevancy, and management support towards system development and use.

The second part measures 'system ease of use'. It contains six items revealing respondents' perception concerning the easiness of operating and using the system (e.g., easiness of getting the system to do what the user needs and commitment of errors while using the system).

The last part measures the impact on performance. It is measured by perceived performance impacts, since objective measures of performance were unavailable in this field context, and at any rate would not have been compatible across individuals with different task portfolios.

Individuals are asked to self-report on the perceived impact of computer systems and services on their effectiveness, productivity, and performance in their job.

In all of these sections, technology characteristics, are measured along a five point Likert scale ranging from (1) "Strongly Agree" to (5) "Strongly Disagree".

### **3.5 Data Analysis**

In the light of the hypotheses stated in Chapter I, the data gathered using the methodology applied will be analyzed using a statistical package (Statistica) according to the following aspects:

- A descriptive analysis will be performed to investigate the computer usage along the computer use dimensions and in relation with other variables including demographic variables, individual, organizational and technological characteristics. This analysis includes frequency distribution and cross tabulation analysis.
- A bivariate and a multivariate analysis will be used to investigate significance variability among variables including individual, organization, and technology characteristics along with beliefs about computer use, computer experience, training level and other variables. This analysis includes Chi-square analysis, One-way Anova, Anova, and Pearson correlation.
- A regression analysis that determine the factors that are most likely to be associated with the attainment of TTF, as well as regression analysis that would explain variations in user satisfaction and performance are going to be run.

Having identified the design and methodology of this research, the variables to be included, and the analysis tools to be used, it is the purpose of the following chapter to analyze the findings, study their implications, and evaluate them in light of the hypotheses to be tested.

## **Chapter IV**

### **Research Findings and Analysis**

#### **4.1 Introduction**

Information systems is the field that occupies the space where management and technology overlap. Advances in computer and communications technology over the past several years, as well as increased business pressures, have brought MIS out of the shadow to light. In other words, information systems are now widely recognized as major organizational resources that can determine the success or failure of today's organizations. That's why access to the right type of data at the right time means attaining a highly competitive edge. To achieve this, planning for the acquisition of proper information technology systems is of high importance.

Furthermore, information technology offers the potential for substantially improving performance in organizations. But performance gains are often obstructed by users' unwillingness to accept and use available systems since it is believed that these systems are not always compatible with the requirements of the tasks performed. Because of the persistence and importance of this problem, explaining the importance of Task-Technology fit, investigating the factors that are most likely to be associated to this fit, and analyzing its effect upon user satisfaction and job performance have become important issues in MIS research. Conducting a literature review concerning system utilization aided in forming a clear picture of the importance of TTF and how it affects users' beliefs towards system usage and success.

Referring to Goodhue and Thompson's research<sup>75</sup> it was found that users' evaluations of TTF affect system utilization and has a further impact on performance. Therefore, in light of this issue, a descriptive analysis was performed investigating computer usage in relation to demographic variables, individual, technological, and organizational characteristics. Moreover, a bivariate and a multivariate analysis were conducted testing the significance of the hypotheses mentioned in Chapter I:

**H1:** Task characteristics and technology characteristics will affect user evaluations of TTF.

**H2:** Utilization of IS is influenced by user evaluations of TTF.

**3:** User evaluations of TTF will have additional explanatory power in predicting perceived performance impact beyond that from utilization alone.

## **4.2 Profile of Respondents**

As mentioned in Chapter III the sample was chosen among managers belonging to different economic sectors operating in various departments excluding EDP. With respect to gender, 81.37% of participants are males and 18.63% are females. Respondents have an age category average of 2.7, i.e., within the range of (31-35) years. Another feature is that the participants' educational level ranged from those having a maximum of high school (1.96%) to those with some college (4.9%) to those with BS degrees (48.04%) to those with MS degrees (41.18%) and finally to those with postgraduate studies (3.92%). It has shown that respondents belong to certain organizational levels: Top managers (17.65%), middle-managers (38.24%), operational managers (21.57%), and first level supervisors (21.57%). Moreover, these

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<sup>75</sup> Dale L. Goodhue & Ronald L. Thompson, "Task-Technology Fit and Individual Performance", MIS Quarterly, (June 1995), pp. 216-218.

participants work in different functional areas such as accounting (5.88%), finance (9.8%), personnel and human resource development (2.94%), general management (29.41%), sales (6.86%), marketing (8.82%), research and development (6.86%), and others (27.45%). These and other characteristics are presented in Table I.

**Table I - Demographic Characteristics of Respondents**

Variable	Value	Frequency	Percentage	Cum. Percentage
<b>Individual Characteristics</b>				
<b>Age</b>	< = 25	31	30.39%	30.39%
	26 - 30	26	25.49%	55.88%
	31 - 35	16	15.69%	71.57%
	36 - 40	12	11.76%	83.33%
	41 - 45	8	7.84%	91.18%
	46 - 50	5	4.90%	96.08%
	51 - 55	4	3.92%	100.00%
<b>Gender</b>	Male	83	81.37%	81.37%
	Female	19	18.63%	100.00%
<b>Educational Level</b>	<= High school	2	1.96%	1.96%
	Some College	5	4.90%	6.86%
	B.S	49	48.04%	54.90%
	MS.	42	41.18%	96.08%
	Post Graduate	4	3.92%	100.00%
<b>Department</b>	Accounting	6	6.00%	6.00%
	Finance	10	10.00%	16.00%
	Personnel & HRD	3	3.00%	19.00%
	General Management	30	30.00%	49.00%
	Sales	7	7.00%	56.00%
	Marketing	9	9.00%	65.00%
	Research & Develop.	7	7.00%	72.00%
	Others	28	28.00%	100.00%
<b>Organizational Level</b>	Top management	18	17.82%	17.82%
	Middle Management	39	38.61%	56.44%
	Operational	22	21.78%	78.22%
	First Level Supervisor	22	21.78%	100.00%

Cont. Table I

Variable	Value	Frequency	Percentage	Cum. Percentage
<b><u>Organizational Characteristics</u></b>				
<b>Sector</b>				
	Manufacturing	14	13.73%	
	Merchandising	16	15.69%	
	Transportation	3	2.94%	
	Education	8	7.84%	
	HealthCare	7	6.86%	
	Finance	29	28.43%	
	Public	1	0.98%	
	Consultancy & Research	6	5.88%	
	Accounting & Auditing	7	6.86%	
	Others	11	10.78%	
<b>Business Growth</b>				
	Large Contraction	7	6.86%	6.86%
	Small Contraction	4	3.92%	10.78%
	Same	10	9.80%	20.59%
	Small Expansion	36	35.29%	55.88%
	Large Expansion	45	44.18%	100.00%
<b>Routiness</b>				
	< 20%	15	14.71%	
	20% - 40%	28	27.45%	
	41% - 60%	32	31.37%	
	61% - 80%	20	19.61%	
	> 80%	7	6.86%	
<b>Formality</b>				
	Very Informal	5	4.90%	
	Informal	22	21.57%	
	Neutral	25	24.51%	
	Formal	34	33.33%	
	Very Formal	16	15.69%	
<b>Centralization</b>				
	Highly Decentralized	3	2.94%	
	Decentralized	4	3.92%	
	Neutral	11	10.78%	
	Centralized	47	46.08%	
	Highly Centralized	37	36.27%	
<b>Competitiveness</b>				
	Relatively not Competitive	2	1.96%	
	Somehow Competitive	4	3.92%	
	Competitive	16	15.69%	



Cont. **Table I**

Variable	Value	Frequency	Percentage	Cum. Percentage
	More Competitive	24	23.53%	
	Very Competitive	56	54.90%	

**Customers needs' Predictability**

Easily Predictable	8	7.84%
Predictable	35	34.31%
Average	42	41.18%
Unpredictable	15	14.71%
Very Unpredictable	2	1.96%

**4.3 Profile of Organizations**

In investigating the zones that respondents' organizations operate in, descriptive statistics revealed that most of the respondents (28.43 %) belong to the financial sector, 15.69% belong to the merchandising sector, 13.73 % manufacturing, 7.84 % education, 6.86% health care, 6.86% accounting and auditing, 5.88% consultancy and research, 2.94% transportation, and finally 0.98% belong to the public sector.

Concerning the growth of business activities, it has shown that since two years Lebanese organizations (44.11%) have been witnessing large expansion, 35.29% small expansion, 9.80% stagnation, 3.9% small contraction, and only 6.86% are experiencing large contraction.

Assuring what has been mentioned before- that the sample selected is mainly supervisors, middle managers, and above- it is found that only 6.86% of the respondents have more than 80% of their work routine, 19.6% have 61% - 80% of their work routine; 31.37%, 41% - 60%;

27.45%, 20% - 40%; and 14.71% have less than 20% of their work routine.

Another organizational characteristic- formality, is considered. According to the sample selected, only 4.9% of the procedures is very informal, 21.57% informal, 24.5 neutral, 33.3% formal, and 15.69% very formal. A feature that describes Lebanese organizations and tells more about its management style is centralization. It is reported that 2.94% of respondents' organizations are highly decentralized, 3.92% decentralized, 10.78% neutral, 46.08% are centralized, and 36.27% are highly centralized. This indicates that most of selected organizations (82.35%) are centralized which discourage autonomy, entrepreneurial spirit among employees, and increase bureaucracy.

With respect to the competitiveness of the markets where these organizations operate, it is found that only 1.96% are functioning in a relatively not competitive market, 3.92% somehow competitive, 15.69% competitive, 23.53% more competitive, and 54.9% are functioning in a highly competitive market. Finally, most of the sample (41.17%) admit that customers' needs and preferences are somehow predictable, 34.31% say that it is predictable, 14.71% easily predictable, and 1.96 admit that customers' needs and preferences are unpredictable. These and other characteristics are presented in Table I.

An interesting question to ask here is: Is there any kind of relationship between the growth of business and the sector to which the organization belongs. A Chi-square analysis was performed to study the variability of ORGCHT2, i.e. growth of business activities, along the organizational sector to which the respondent belongs. As shown in Table II, statistically significant differences were observed in the results of this analysis. At a level of significance 0.05, the Chi-square ratio is equal to 65.4488 and the p-level = 0.001940, thus indicating statistically significant variability of ORGCHT2 along organizational sector.

**Table II - Crosstabulation Analysis: Business Growth by Organizational Sector**

Summary Frequency Table  
Table: ORGCHT2 (5) x Sector  
(10)

Pearson Chi-square: 65.4488, df = 36, p = 0.001940

ORGCHT2	SECTOR Mnfactng	SECTOR Merchdsg	SECTOR Transptn	SECTOR Educatn	SECTOR HealthCr	SECTOR Finance	SECTOR PublcSct	SECTOR s	SECTOR Acc&A
<b>Lrg_cont</b>	1	1	0	2	0	0	0	1	1
<b>Column %</b>	7.14%	6.25%	0.00%	25.00%	0.00%	0.00%	0.00%	16.67%	14.29%
<b>Total %</b>	0.98%	0.98%	0.00%	1.96%	0.00%	0.00%	0.00%	0.98%	0.98%
<b>sml_cont</b>	0	0	2	0	0	1	0	0	0
<b>Column %</b>	0.00%	0.00%	66.67%	0.00%	0.00%	3.45%	0.00%	0.00%	0.00%
<b>Total %</b>	0.00%	0.00%	1.96%	0.00%	0.00%	0.98%	0.00%	0.00%	0.00%
<b>Same</b>	3	3	1	0	1	2	0	0	0
<b>Column %</b>	21.43%	18.75%	33.33%	0.00%	14.29%	6.90%	0.00%	0.00%	0.00%
<b>Total %</b>	2.94%	2.94%	0.98%	0.00%	0.98%	1.96%	0.00%	0.00%	0.00%
<b>Sml_exp</b>	7	5	0	5	3	7	1	1	3
<b>Column %</b>	50.00%	31.25%	0.00%	62.50%	42.86%	24.14%	100.00%	16.67%	42.86%
<b>Total %</b>	6.86%	4.90%	0.00%	4.90%	2.94%	6.86%	0.98%	0.98%	2.94%
<b>Lrg_exp</b>	3	7	0	1	3	19	0	4	3
<b>Column %</b>	21.43%	43.75%	0.00%	12.50%	42.86%	65.52%	0.00%	66.67%	42.86%
<b>Total %</b>	2.94%	6.86%	0.00%	0.98%	2.94%	18.63%	0.00%	3.92%	2.94%
<b>All Grps</b>									
<b>Total %</b>	14 13.73%	16 15.69%	3 2.94%	8 7.84%	7 6.86%	29 28.43%	1 0.98%	6 5.88%	7 6.86%

Another Chi-square analysis was conducted in order to study the variability of ORGCHT3, i.e. degree of task routiness, along the organizational sector also to which the respondent's organization belongs. As shown in Table III, at a level of significance 0.05, the Chi-square ratio is = 54.3897 and the p-level = 0.025342, thus indicating significant variability of ORGCHT2 along the organizational sector\*.

\* Of course, due to economic factors, nature of work in the organization, and types of decisions made, it is natural to find that there is variability in growth of business activities and in task routiness along different organizational sectors.

**Table III - Crosstabulation Analysis: Routiness by Organizational Sector**

Summary Frequency Table Table: ORGCHT3 (5) x Sector (10)									
Pearson Chi-square: 54.3897, df = 36, p = 0.025342									
ORGCHT3	SECTOR Mnfactng	SECTOR Merchdsg	SECTOR Transptn	SECTOR Educatn	SECTOR HealthCr	SECTOR Finance	SECTOR PublicSct	SECTOR s	SECTOR Acc&A
< 20%	3	1	0	2	1	3	1	2	1
Column %	21.43%	6.25%	0.00%	25.00%	14.29%	10.34%	100.00%	33.33%	14.29%
Total %	2.94%	0.98%	0.00%	1.96%	0.98%	2.94%	0.98%	1.96%	0.98%
20% - 40%	5	8	0	1	0	7	0	2	3
Column %	35.71%	50.00%	0.00%	12.50%	0.00%	24.14%	0.00%	33.33%	42.86%
Total %	4.90%	7.84%	0.00%	0.98%	0.00%	6.86%	0.00%	1.96%	2.94%
41% - 60%	2	5	0	5	1	10	0	2	1
Column %	14.29%	31.25%	0.00%	62.50%	14.29%	34.48%	0.00%	33.33%	14.29%
Total %	1.96%	4.90%	0.00%	4.90%	0.98%	9.80%	0.00%	1.96%	0.98%
61% - 80%	3	2	1	0	4	7	0	0	1
Column %	21.43%	12.50%	33.33%	0.00%	57.14%	24.14%	0.00%	0.00%	14.29%
Total %	2.94%	1.96%	0.98%	0.00%	3.92%	6.86%	0.00%	0.00%	0.98%
> 80%	1	0	2	0	1	2	0	0	1
Column %	7.14%	0.00%	66.67%	0.00%	14.29%	6.90%	0.00%	0.00%	14.29%
Total %	0.98%	0.00%	1.96%	0.00%	0.98%	1.96%	0.00%	0.00%	0.98%
All Grps Total %	14 13.73%	16 15.69%	3 2.94%	8 7.84%	7 6.86%	29 28.43%	1 0.98%	6 5.88%	7 6.86%

#### 4.4 Antecedents of TTF

To recall, TTF is the extent to which an individual can use a technology to perform his or her tasks. As put by Goodhue, TTF is the “correspondence between task requirements, individual abilities, and functionality of technology”. It comes therefore natural to consider the antecedents of TTF as the interactions between task, technology and individual characteristics. Of course, different kinds of tasks require different kinds of technologies. The more the proper

technologies are used to help accomplish the various tasks in the organization, the higher would be the TTF level.

The following sections will be a presentation of the task and technology characteristics as reported by respondents. The relationship of each with the TTF factor will also be examined. It's worth recalling here that the TTF factor in this study has been measured along eight dimensions: Quality, Locatability, Compatibility, Authorization, Ease of use/Training, Timeliness, Reliability, and IS people Relationship with users.

#### **4.4.1 Relationship Between Task Characteristics and TTF**

The task characteristics used here are the (1) Routiness of tasks, and the (2) Interdependence of tasks. A correlation analysis was conducted to investigate the relationships between TTF and the various TTF components on one hand and the task characteristics on the other. The results of the correlation analysis are displayed in Tables IV(a) and IV(b). As the results show, a strong and a direct relationship exists between task characteristics and TTF (0.23) at a significance level of  $\alpha = 0.05$ .

This means the higher the level of routiness and the higher the level of interdependence, the higher would be the level of users' perception of TTF. This could be interpreted as follows: As tasks get more routine, they would be easily computerized, and the user will find that the system being used is well capable of handling the structured task activities. Also, as tasks get more interdependent, users will be more apt to perceive the fit between the task accomplished and the technology used. This is natural since the computer will facilitate the aspects of data integrity, sharing, and retrieval.

**Table IV(a)- Correlation Analysis: TTF with Task Characteristics**

Variable	TASKAV
TTFAVG	0.23*

\*Significance at  $p < 0.05$ **Table IV(b)- Correlation Analysis: TTF Eight factors with Task Characteristics**

Variable	Routiness	Interdependence
Quality	0.04	-0.14
Locatibility	-0.11	0.02
Reliability	-0.11	-0.01
Ease of Use/ Training	0.03	0.11
Relationship w/ users	0.04	0.01
Timeliness	-0.21*	0.26*
Compatibility	-0.17	-0.06
Authorization	-0.1	0.05

\*Significance at  $p < 0.05$ 

Coming to the results of the correlation analysis of the TTF eight factors with the task characteristics- routiness and interdependence ((Table IV(b))), a significant relationship was found between one of the TTF elements (Timeliness) and the two task characteristics. This means the less complicated tasks handled are, the higher would be the probability that the regular system activities would be completed on time. This is because the tasks are structured, and thus could be easily computerized. As for interdependence, a positive relationship exists between this task characteristic and timeliness. If the system being used supports interdependent tasks, it would be more capable of relating, organizing, integrating, and making data needed by various users involved in accomplishing interdependent tasks well shareable by them in a timely manner.

Moreover, a crosstabulation analysis was performed to study the variability of TTF along task characteristics. Results showed that one of the TTF elements (Compatibility) has a significant variability along Routiness, and another one (Relationship of IS people with users) has a significant variability along interdependence. Results are displayed in Tables V and VI respectively.

**Table V- Crosstabulation Analysis: Compatibility by Routiness**

Summary Frequency Table					
Table: COMPATBL (5) X ROUTIN_R (4)					
Pearson Chi- square: 24.5700, df = 12, P = 0.017027					
COMPATBL	Routine_R Str.Agree	Routine_R Agree	Routine_R Uncertan	Routine_R Disagree	Row Totals
Str.Agree	0.117647	4.11765	6.70588	1.058824	12.0000
Agree	0.254902	8.92157	14.52941	2.294118	26.0000
Uncertain	0.382353	13.38235	21.79412	3.441176	39.0000
Disagree	0.186275	6.51961	10.61765	1.676471	19.0000
Str. Disagree	0.058824	2.05882	3.35294	0.529412	6.0000

As could be noticed from the results of this crosstabulation analysis, at a significance level of  $\alpha = 0.05$ , the Chi-square was calculated to be 24.57 and the p-level = 0.01702. This means that significant variability exists in the compatibility of the data provided by various sources along the Routiness of tasks performed by users.

It is certainly expected that systems supporting the processing of data pertinent to structured and routine tasks would provide users with more consistent data, which means support at higher compatibility level.

As for the variability test of 'Relationship with users' along the task characteristic interdependence, it also showed to be significant. At a significance level of  $\alpha = 0.05$ , The Chi-square is equal to 21.756 and the p-level = 0.0097, implying a significant variability. Different levels of interdependence among tasks performed by users would entail different types or

degrees of relationship between IS people and system users. It could be stated that the higher the level of task interdependence, the more would IS people be expected to show interest in what users are doing,

**Table VI - Crosstabulation Analysis: Relationship with Users by Interdependence**

Summary Frequency Table Table: RELTNU_R (4) X INTERD_R (4) Pearson Chi- square: 21.7564, df = 9, P = 0.009701					
RELTNU_R	INTERD_R Str.Agree	INTERD_R Agree	INTERD_R Uncertain	INTERD_R Uncertain	Row Totals
Str.Agree	0.264706	1.441180	1.029410	0.264706	3.0000
Agree	4.323529	23.53922	16.81373	4.323529	49.0000
Uncertain	3.352941	18.25490	13.03922	3.352941	38.0000
Disagree	1.058824	5.76471	4.11765	1.058824	12.0000

anticipate problems, solve existing problems, plan for changes, give prompt responses and quick services, and coordinate the technical activities to ensure proper data communication and flow of information among those involved in interdependent tasks. These things, important in all cases are of utmost importance in case of interdependent tasks since any mistake in data processing or information handling in one would have an adverse effect upon the accomplishment of the other related tasks.

#### **4.4.2 Relationship between Technology Characteristic and TTF**

In reference to the research conducted by Goodhue and Thompson, technology characteristics were measured along two dimensions: (1) The information systems used by each respondent, and (2) The department of the respondent. This study uses these two measures and adds to them (3) General technology characteristics and (4) Ease of use of the system being used.



Now, to examine the relationships between these factors and the TTF perceived by users, a correlation analysis was conducted. The results are shown in Table VII(a) and VII(b). At a significance level of  $\alpha = 0.05$ , Table VII(a) shows significant positive correlation between TTF on one hand, and two of the used technology characteristics: The general technology characteristics (TECCHA) and the ease of use of the system being used (SYSUAV) on the other.

**Table VII (a): Correlation analysis - TTF with TECCHA and SYSUAV**

Variable	TECCHA	SYSUAV
TTFAV	0.40*	0.26*

\*Significance at  $p < 0.05$

As could be derived from these correlation results, the more the computer system being currently used by the respondents is perceived to be dependable, up-to-date, inexpensive to maintain, up to what they expect, and well supported and considered within the organizational priorities, the higher would be the level of the users' perception about TTF. Likewise, the more the current system being used is perceived by the users as easy to use, the more they find it a good help for them to accomplish their tasks, and in turn the higher would they perceive the TTF.

Table VIII(b) shows the results of the correlation analysis conducted to study the relationships between the TTF eight elements and the other two measures of technology characteristics: The software used and the department of the user.

**Table VII (b)- Correlation Analysis: TTF Eight factors with Software used and Department**

Variable	Spread Sheets	Modeling Systems	Graphical Systems	Word Processing	4th gener. language	Other S.W.	Services Dep't
Quality	-0.03	-0.08	0.00	-0.03	0.05	-0.05	0.05
Locatibility	-0.06	-0.12	-0.05	-0	0.00	0.19	-0.05
Reliability	-0.09	-0.15	-0.22*	-0.21	-0.09	0.23	0.03
Ease of Use/ Training	0.21*	-0.15	-0.13	-0.25*	-0.14	0.3*	0.15
Relationship w/ users	0.06	0.09	0.09	0.06	-0.06	0.06	0.18
Timeliness	0.01	-0.18	0.10	-0.05	-0.03	-0.09	0.16
Compatibility	0.01	0.18	0.08	0.07	0.24	-0.15	-0.27*
Authorization	-0.06	0.23*	0.06	-0.10	0.25	0.07	-0.04

\*Significance at  $p < 0.05$ 

The listed results trace certain significant relationships between some of the TTF factors and some of the software applications used. Ease of use perceived and felt as a result of training provided by IS people is significantly correlated to the use of spreadsheets. The more users are required to use the spreadsheets to accomplish their tasks, the more they will find it easy to use based on the training provided to them by the IS people. Note that the negative sign is because of differences in coding. The more modeling systems are required to be used to accomplish the tasks performed by users, the more it will be required from them to get authorization to have access to the required data. It is well known that modeling systems such as IFPS (interactive financial problem solver), marketing simulation models, and others are intended, if any, to be used by high levels managers for planning, sensitivity analysis, and evaluating various courses of action based on estimations and a kind of data that they only can have an access to. Now if these modeling problems are to be used more by management levels other than the top level, then users should get authorization to have access to the needed data.

Moreover, a significant correlation is found between the use of Graphical applications and Reliability. Graphical applications are majorly used as visual tools for data analysis. More specifically, they are used to show trends, compare quantities, compare parts of a whole, and

show how data is distributed. Reaching to this stage of computer use will enhance the users' perception of the Reliability of the system. (Note again here that the negative sign is the result of coding differences).

The use of word processing systems was found to be significantly correlated to Reliability and Ease of use/ training. Users of word processing systems use them more or less on a consistent basis. Moreover most, if not all, word processing systems provide users with the automatic saving and automatic backup along with other facilities. This of course adds to the perception of reliability users have about such systems. Also, users of word processing systems are apt to perceive them as easy to use as a result of the training provided to them. (negative signs are due to coding differences).

The use of Fourth Generation Languages (4<sup>th</sup> GLs) was found to have significant correlation with Compatibility and Authorization. 4<sup>th</sup> GLs have the capability of building decision support systems (DSS), in addition to merely processing data. Among its uses, 4<sup>th</sup> GLs help managers run sensitivity analysis, evaluate trends, plan, and others. That is why they are expected to be used by higher level than lower level managers. The more 4<sup>th</sup> GLs are used by users belonging to levels other than the higher levels, the more they will be in need for authorization to have an access to the needed data. Moreover, the more 4<sup>th</sup> GLs are used, the less compatible would users perceive the system (positive sign is due to scale change for a negatively related question.). This could be attributed to a reason derived from the first relationship. That is, if authorization was not given or was partially given, users are more apt to perceive the system as incompatible.

Furthermore, significant and positive correlation (due to coding differences) were traced between the other software applications used by users and two TTF factors: Reliability

and Ease of use/ Training. It is worth mentioning here that the other software category includes the specific application software packages that organizations acquire for supporting specific tasks in the organization (such as Banking, Accounting, Inventory, etc...). As these software applications are more used, users are more perceiving them as less reliable. This could be attributed to the fact that a lot of these systems are not performing well and are frequently exposed to problems and crashes. Also, proper training is rarely provided properly to the users of these systems, which would lead them to perceive these systems as less easy to use.

Finally, a significant correlation is found between the services department and the TTF factor, Compatibility. Users belonging to "services" departments are more apt to find the system as compatible (negative sign is due to differences in coding). This could be because users in the services department are provided with systems that would enable them to keep updated with consistent data derived from various sources in the organization. This is important for them to keep track of what is going on and which parts of the organization are in need for certain kinds of services (training, maintenance, technical support, and so on).

Other than the correlation analysis, crosstabulation analysis and ANOVA were conducted to test for variability in TTF or TTF factors along the measures of technology characteristics. These types of analysis were done based on the assumption that users' evaluation of TTF could be affected by various technological characteristics.

To start with, a One-way ANOVA was conducted to study the variability of TTF along the general technology characteristics, TECCHA. As demonstrated in Table VIII, Figure 4.1, and Figure 4.2, at a significance level of  $\alpha = 0.05$ , significant mean variances in TTF were revealed along TECCHA. As could be noticed, the F-ratio is = 13.3095 and the p-level = 0.0000.

**Table VIII- One-way Anova: Task-Technology Fit by Technology Characteristics**

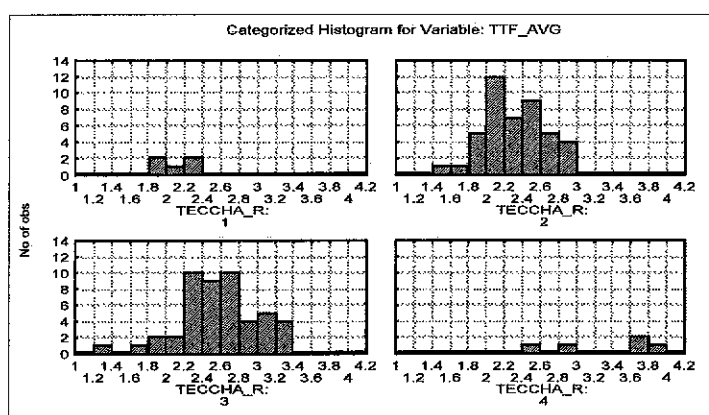
Design: One-way Anova

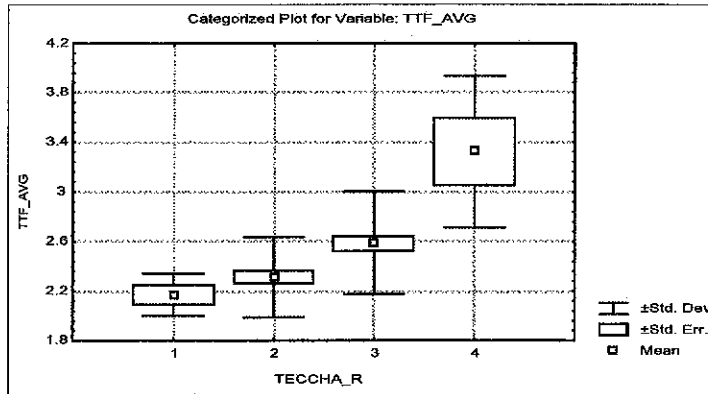
Dependent: TTF\_AVG

Between: TECCHA\_R

Within: none

Summary of all Effects						
Effect	df Effect	MS Effect	df Error	MS Error	F	P_Level
1	3*	1.940129*	98*	0.145770*	13.30952*	.000000*

\* Significant at  $p < 0.05$ **Figure 4.1- Categorized Histogram for Task-Technology Fit by Technology Characteristics**

**Figure 4.2- Categorized Box-Whisker Plot for Task-Technology Fit by Technology Characteristics**

This variability could be attributed to the reasoning that the more the technology used is up-to-date, the more the management motivates and initiates system development and use, and the more the system is user friendly in helping users perform their tasks, the more would the user perceive the system as being effective. This will consequently lead the user to perceive a strong fit between the system used and the task performed.

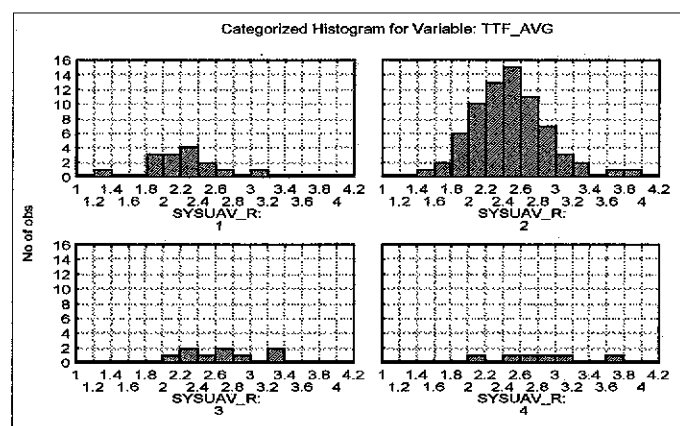
Another One-way ANOVA was performed in testing the variability of TTF along the system ease of use measure (SYSUAV). Again here, at a significance level of  $\alpha = 0.05$ , F-ratio = 3.7392 and the p-level = 0.01362. These results are shown in Table IX, Figure 4.3, and Figure 4.4. It is believed that the easier the system is perceived by the user, the more he/she will be motivated to learn the system, understand its features, and apply it.

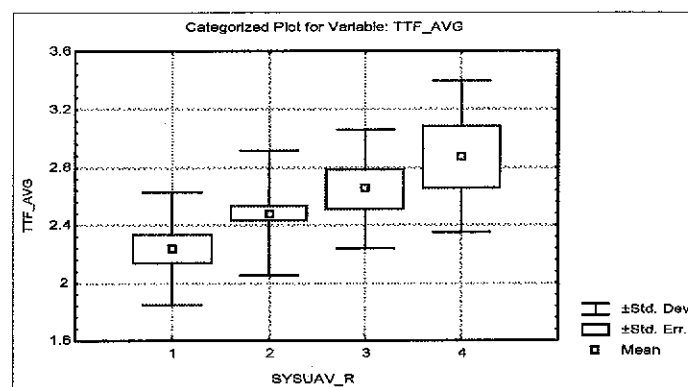
**Table IX- One-way Anova: Task-Technology Fit by System Ease of Use**

Design: One-way Anova  
 Dependent: TTF\_AVG  
 Between: SYSUAV\_R  
 Within: none

Summary of all Effects						
Effect	df Effect	MS Effect	df Error	MS Error	F	P_Level
1	3*	0.688353*	98*	0.184090*	3.739224*	0.013624*

\* Significant at  $p < 0.05$

**Figure 4.3- Categorized Histogram for Task-Technology Fit by System Ease of Use**

**Figure 4.4- Categorized Box-Whisker Plot for Task-Technology Fit by System Ease of Use**

Moreover, a crosstabulation analysis was performed to study the variability of TTF factors along the measures of technology characteristics. The significant results are listed in Table X. As could be noticed, at a significance level of  $\alpha = 0.05$ , the quality factor of TTF showed significant variability along using the Modeling System Software. Depending upon the up-to-dateness, relevance and level of detail of data,

**Table X - Crosstabulation Analysis: TTF Factors by measures of Technology Characteristics**

Variable	Chi- square	P_Level
Quality by modeling System	17.0979	0.0472
Locatibility by DBMS	20.6242	0.056218
Locatibility by Statistical Packages	23.5015	0.0237
Locatibility by Modeling Systems	24.2139	0.00398
Reliability by Spreadsheets	21.4328	0.04444
Reliability by Statistical Packages	22.3341	0.033986
Reliability by Word-processing	26.7866	0.008312
Timeliness by Services Department	9.5304	0.049150



various users are expected to report different perceptions of the quality of the systems. Also, Locatability showed significant variability along the use of database management systems, modeling systems and spreadsheets. Using such software systems require data to be located easily in the various divisions and corporate levels and to be understood in terms of its meaning and its relationship to other data. Reliability also showed significant variability along the use of spreadsheets, statistical packages and word processing. Different users of these software systems have different perceptions of the system's reliability based on the results provided to them by the system. Finally, significant variability was found in the Timeliness factor along the Services department. Users working on the Services department should obtain and handle data and information that they should use to provide services to the various departments in a timely manner. That's why they are in need to be provided with systems that can help them complete regular activities on time. The variability shown indicates that various users in the service departments have different perceptions of the timeliness of the systems that are dealing with.

A finding of interest that was reached to as a result of conducting a crosstabulation analysis was that explaining the variability in software used along the various departments. The results reached are incorporated in Table XI:

**Table- XI**

Software by Department	Pearson Chi-square	P- Level
Statistical Packages by Department	63.3519	0.000796
Modeling Systems by Department	49.1266	0.027095
Graphical Systems by Department	57.3169	0.003923
Third Generation Languages by Department	51.3397	0.016555

Every department has its policies and rules; tasks performed in one department may differ from those performed in others regarding the level of routiness, complexity, and interdependence. Hence, everyone may use different software applications, and if the same software is used in different departments, it will be utilized differently and to different extents. To study the variability of software-use along department a Chi-square analysis is conducted implying significant differences in software-use along various departments.

#### 4.4.3 Relationship of Individual Variables to TTF

Being the last antecedent to TTF, a correlation analysis was conducted to examine the relationships and the individual variables included in the study. The results are shown in Table XII.

**Table XII - Correlation Analysis: TTF with Individual variables**

Variable	Age	Gender	Educlvl	Orglevel	COMPTA
TTF	0.26*	0.33*	0.30*	0.37*	0.01

\* Significant at  $p < 0.05$

Taking into consideration the differences in scaling, one can notice that there are significant negative correlations between the users' perception about the TTF and individual variables like age, gender, education level, and organization level. The older the user is, the higher would his/ her resistance to use computers be, and in turn the lower the fit he would perceive between the technology used and the task performed. Moreover, in a lot of research work, males were considered as more capable to handle issues belonging to scientific fields than women, and in turn they are expected to find interest in computer work, learn new features, and try to apply them more than women do. The negative correlation between TTF and educational level

indicates that the higher the user's educational level, the lower would he perceive the tasks between tasks and technology. This could be interpreted by saying that the higher the education level, the more one will expect that technology adopted in organizations should be up to the level of what is required in terms of information needs and tasks specifications. Coming to reality, they find a gap between what they expect and what they are provided with. This will lead them to perceive a lower TTF. Finally, TTF has a negative correlation with organization level. This is expected, since in most Lebanese organizations, the computer is used to keep records and handle routine transactions rather than to handle managerial processing requirements for decision making, statistical and trend analysis, planning and simulation analysis, and so on. Because they either do not use the computer or use it mainly as executive workstations, for data retrieval, and similar tasks, they are likely expected to perceive the fit between the tasks performed and the technology used as a low one. No significant relationship was found between TTF and the computer training the user has, this could be due to the constancy of answers where most, if not all, respondents reported self training as a major source of training, which caused a lack of variability in the computer training variable.

#### **4.5 System Utilization**

As defined by Goodhue, Utilization is "the behavior of employing the technology in completing tasks"<sup>76</sup>. Goodhue and Thompson conceptualized utilization as the extent to which information system have been used to complete each individual's work routine. In this study,

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<sup>76</sup> Ibid., p. 218.

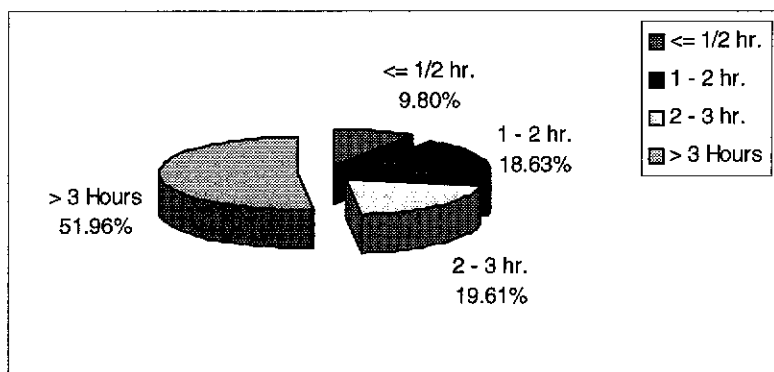
this same measure (TASKI\_AV) was used along with two other measures: Extent of computer use (EXTCOMU1) and the frequency of computer use (EXTCOMU2).

A descriptive analysis for each of these measures is displayed in Table XIII(a), Figure 4.5, Table XIII(b), Figure 4.6 and XIII(c).

**Table XIII(a)- Frequency Distribution: Extent of Computer Use**

Value	Frequency	Percentage	Cumulative Percentage
< = 1/2 Hour	10	9.80%	9.80%
1 - 2 Hours	19	18.63%	28.43%
2 - 3 Hours	20	19.61%	48.04%
> 3 Hours	53	51.96%	100.00%

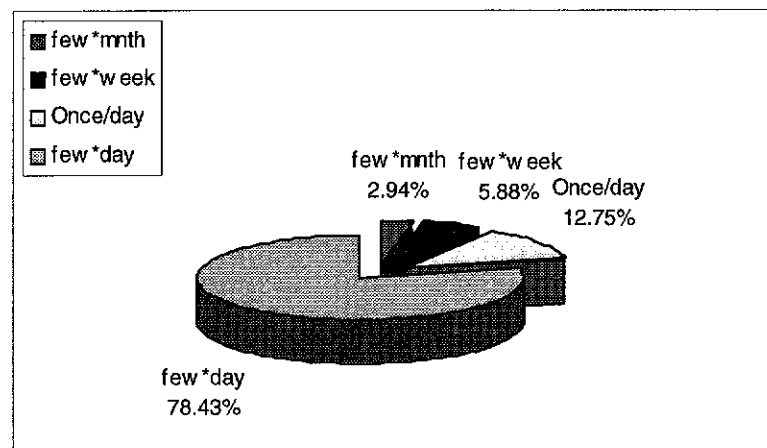
**Figure 4.5- Extent of Computer Use Distribution**



As could be noticed from this frequency distribution, 9.8% of respondents reported using the computer for less than half an hour a day, 18.6% for 1-2 hours, 19.6% for 2-3 hours, and about 52% for more than 3 hours a day. This means that the majority of the respondents could be termed as heavy users.

**Table XIII(b) - Frequency Distribution: Frequency of Computer Use**

<b>Value</b>	<b>Frequency</b>	<b>Percentage</b>	<b>Cumulative Percentage</b>
few*mnth	3	2.94%	2.94%
few*week	6	5.88%	8.82%
Once/day	13	12.75%	21.57%
few*day	80	78.43%	100.00%

**Figure 4.6- Frequency of Computer Use Distribution**

Regarding the frequency of computer use, about 3% of the respondents reported using the computer few times a month, 5.8% few times a week, 12.7% once a day, and 78.4% reported using the computer several times a day. This is another indication that the majority of respondents in this study are heavy users.

**Table XIII (c)- Percentages of Respondents Using Computers (Frequently and To a great extent) to Accomplish their**

<b>Tasks</b>	
<b>Task Included</b>	<b>Percentage (%)</b>
Looking for Trend	44.1%
Planning	56.9%
Forecasting	51.9%
Decision Making	52.9%
Problem Solving	43.1%
Budgeting	43.1%
Preparing Reports	91.2%
Data Entry and Retrieval	75.5%
Historical Reference	63.7%
Controlling	63.7%
Up-to-Date with Current Activities	65.7%
Adequately Reporting to the Superiors	73.5%
Adding the Productivity in the Department	71.6%

As could be derived from the results, the highest percentage was reported by respondents using computers to prepare reports. This was followed by using the computer for data entry and retrieval (75.5%), adequately reporting to superiors (73.5%), adding to the productivity of the department (71.6%), staying up-to-date with current activities (65.7%), historical references and controlling (63.7% each), planning (56.9%), decision making (52.9%), forecasting (51.9%), looking for trend (44.1%), and finally problem solving and budgeting (43.1% each). Such results help in indicating that the computer is still majorly used in the Lebanese organizations to perform simple routine jobs (preparing reports, data entry, etc...) much more than it is used as efficient tools to help handling unstructured managerial activities and enhancing the effectiveness of the decision making process.

#### 4.5.1 Relationship Between Utilization and TTF

It is generally believed that a high fit perceived to exist between technology used and tasks performed would be reflected in higher levels of utilization. Based on this, a correlation analysis was conducted to examine the relationship between the utilization measures and the TTF factors. The results of this correlation analysis are shown in Table XIV.

**Table XIV- Correlation Analysis: TTF Factors with Utilization Measures**

Variable	EXTCOMU1	EXTCOMU2	TASKI_AV
Quality	-0.07	-0.04	-0.33 *
Locatibility	-0.02	0.02	-0.07
Reliability	-0.08	-0.01	0.03
Ease of Use/ Training	-0.24 *	0.02	-0.06
Relationship w/ users	-0.11	0.02	-0.13
Timeliness	-0.05	-0.16	-0.06
Compatibility	-0.04	0.01	0.08
Authorization	-0.08	0.07	0.02

\* Significant at  $p < 0.05$

As the results can show, significant and direct relationships exist between two of the utilization measures and two of the TTF factors (the negative signs are due to scale differences). The more the system is perceived as easy to use because of proper and effective training provided to users, the more would be the tendency of users to use the system for more hours during the day. Another significant relationship was found between the tasks included in computer use measure and Quality- TTF factor component. This could be interpreted as follows: The more users perceive that the system they are using is providing them with updated, relevant and adequately detailed data, the more would they tend to use it for the accomplishment of more tasks.

No significant correlations between any of the TTF factor components and the frequency of computer use. This could be attributed to the reasoning that almost all respondents are using computers as part of their job. So regardless of how they perceive the level of fit between the tasks performed and technology used, they will use it for several times a day.

Moreover, a crosstabulation analysis was conducted to study the variability of utilization measures along the TTF factors. The results displayed in Table XV show that there is a significant variability in TASKIA along the Authorization factor of TTF.

**Table XV- Chi-Square Analysis Results: TTF factors by Utilization Measures.**

Variable	Chi-Square	P-Level
TASKIA by AUTHORZN	22.6878	0.0305
EXTCOMU2 by TIMELNSS	26.4589	0.0092

This is supported by previously mentioned results. Some tasks, such as looking for trend, decision making, planning, and so on, require the use of certain software applications for e.g.: Modeling Systems, Statistical Packages, 4<sup>th</sup> Generation Language applications. These require access to certain kind of data, which in turn requires authorization to be taken. Thus, different levels of authorization will be reflected in a different number of tasks accomplished using the computer facilities. Another significant variability is that of the frequency of computer use measure along the Timeliness factor. The different capabilities of systems used to complete regular activities on time will be also reflected in different frequencies of use by various users.



#### 4.5.2 Relationship between Utilization and Other Variables.

It is believed that there are certain antecedents to Utilization. These include factors such as level of training, computer experience, beliefs about computer use, and others. The relationship between Utilization and these factors is examined in this section. The utilization relationship with user satisfaction is also investigated. These results are displayed in Table XVI.

**Table XVI- Correlation Analysis: Utilization with Antecedents to Utilization and User Satisfaction**

Variable	EXTCOMU1	EXTCOMU2	EXTCOMU3	COMPEXP2	COMPEXP3	COMPTA	BFPCUA	USTFAV
TASKIA	0.20 *	0.21 *	0.25 *	0.26 *	0.22 *	0.34 *	-0.07	-0.24 *

\* Significant at  $p < 0.05$

To start with, significant and positive correlations exist between TASKIA on one hand and the extent of computer use, frequency of computer use, and the length of the period during which the system has been used. The higher the extent and the frequency of use and the longer the time period of system use, the higher would be the experience level of users in using the system. This will enable them to learn more software applications, and thus use them to accomplish more tasks. In addition to this, the longer the period the user has been exposed to and has used personal computers and/or computers in general, the more would this give him/her the ability to try and know more software features and apply them on more tasks.

An interesting, highly significant, and direct relationship was found between the level of computer training and TASKIA. Of course, the higher the level of computer training, the more would the user be well equipped with computer information and better prepared to use

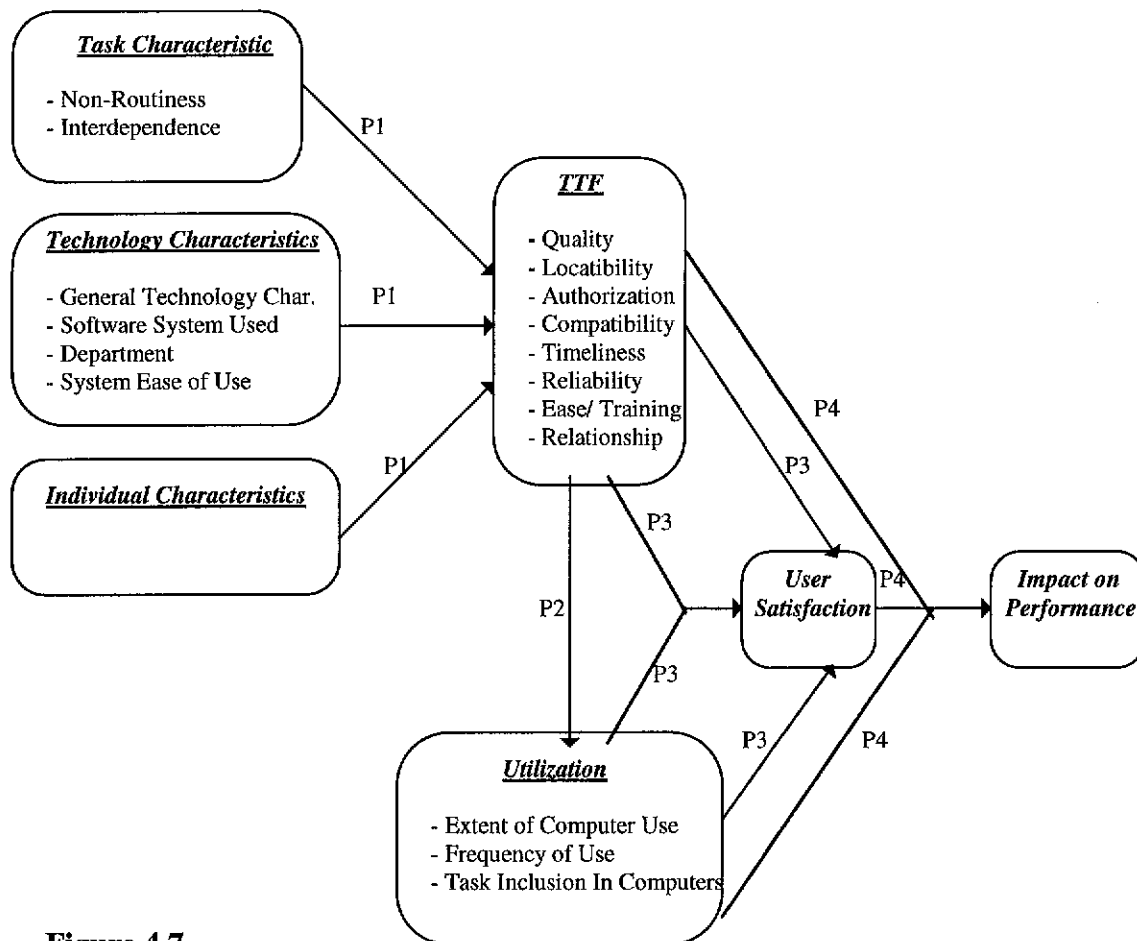
more software applications, and apply them on more tasks.

Surprisingly enough, no significant correlation was found between beliefs about computer usage and TASKIA- as a utilization measure. This could be attributed to the fact that the majority of, if not all, respondents showed positive beliefs about computer usage, and may be because of acquaintance of understanding of the computer capabilities. This was the reason beyond the lack of variability in BFPCUA, and thus no relationship showed here.

Finally, a significant and a direct relationship (negative significance is due to differences in coding) exists between TASKIA and the level of satisfaction reported by users. Of course, the higher the level of user satisfaction, the more would the user feel motivated to learn more about the system and apply it more on the tasks he/ she is performing and is responsible to accomplish.

#### **4.6 Testing the Model**

Reaching this stage, it is important now to test whether the model proposed in Chapter I has been proved. To recall, and to depict it visually in brief form, the model is now put showing the full propositions to be proved as Figure 4.7 reveals:

**Figure 4.7**

To test these four propositions, the following sections will be concerned with building and analyzing regression equations pertinent to each proposition.

#### 4.7 Do Task, Technology, and Individual Characteristics Predict TTF?

This equation answers proposition number 1. To start with, a multiple regression analysis was conducted where a set of variables representing the three characteristics: Individual characteristics (age, gender, education level, and organizational level), task characteristics (TASK\_AV), and general technology characteristics (TECCHA). The resulting

equation is shown in Table XVII.

**Table XVII- Regression Analysis with TTF AVG\_R being the Dependent Variable (n = 10)**

R =	0.64665	F( 4, 97) =	17.427
R <sup>2</sup> =	0.41815	p <	0.0000
Adjusted R <sup>2</sup> =	0.39416	Std. Error of estimate =	0.5224

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_97	P_LEVEL
Intercept			0.16438	0.31349	0.52436	0.60123
AGE	0.3284689	0.08024485	0.11443	0.02796	4.09333	0.00009
EDUCLEVEL	0.1813253	0.08275738	0.14499	0.06617	2.19105	0.03084
ORGLLEVEL	0.2732445	0.08216013	0.15547	0.04675	3.32576	0.00125
TECCHA_R	0.4441616	0.07976725	0.44431	0.07979	5.56822	0.00000

$$\text{TTF AVG} = 0.16438 + 0.11443 \text{ AGE} + 0.14499 \text{ EDUCLEVEL} + 0.15546 \text{ ORGLLEVEL} + 0.4443 \text{ TECCHA.}$$

(0.00008)                      (0.03084)                      (0.00124)                      (0.0000)

$$R^2 = 0.418 = 42\%$$

$$F(4,97) = 17.43 \quad p < 0.00000.$$

This equation has included individual characteristics and one of the technology characteristics measures: TECCHA. As could be noticed, the equation is significant since at a significance level of  $\alpha = 0.05$ ,  $F(4,97) = 17.43$  and  $p\text{-level} < 0.00000$ . Also, each of the independent variables has shown high significance in explaining the variability of the dependent variable holding other variables constant.

As for the interpretation of the equation, it is simple and straightforward. Keeping in mind the scale differences, the individual characteristics show negative relationships with TTF. Regarding age, as users become older, they are more apt to show resistance to change. This will inhibit them from understanding the system features in a better way, and in turn, they will not use the system in accomplishing their tasks. As a result, they will perceive the fit between the task and technology as a low one. The negative relationship between age and TTF

can be interpreted in another way. Older ages mean, most probably, higher organizational levels. Users at higher levels do not make use of the computer as a decision aid and as a tool that can enhance managerial activities. As a result, the perceived TTF will not be high in their conception. Moreover, the higher the education level of users, the greater would their expectations be in terms of what the system they are using can provide them with. The variance between the expected and the real performance will lead them to perceive that there is a low fit between the technology used and the task performed.

Finally, a positive relationship exists between the general technology characteristics (TECCHA) and TTF. The more the technology system being used is perceived to be up-to-date, dependable and well-supported, the more will they be motivated to use it properly in accomplishing their tasks and thus the higher would be their perceived TTF.

Now let's emphasize more on the task and the technological characteristics: Do they predict TTF? According to Goodhue and Thompson<sup>77</sup>, "Strong support would require that each of the eight regressions of TTF be significant and that in each regression at least some measure of task (none-Routiness, Interdependence, ...) and some measure of technology be a significant predictor." So results in Goodhue and Thompson's research show that the  $R^2$  values for the full regressions ranged from 0.14 to 0.33, with adjusted  $R^2$  values from 0.04 to 0.25. Moreover, they reported that "at least one task characteristics was significant in six out of eight regressions, and at least one technology characteristic was significant in four out of eight". This was considered as moderate support for proposition 1.

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<sup>77</sup> Dale L. Goodhue & Ronald L. Thompson, "Task-Technology Fit and Individual Performance", *MIS Quarterly*, (June 1995), pp. 216-218.

In this study, regression equations were built for each of the eight factors representing TTF. Following will be a presentation of the results reached.

#### 4.7.1 Quality

The first equation was built for the TTF factor Quality. Only one independent variable entered the equation for determining the variability in quality. This variable is one of technology characteristics measures, TECCHA. The equation is shown in Table XVIII. It could be noticed that the equation is significant, although not a really strong predictor of Quality. The coefficient of TECCHA is also significant.

**Table XVIII- Regression Analysis with QUALITY being Dependent Variable (n = 102).**

R =	0.37479	F( 7, 94) =	2.1945
R <sup>2</sup> =	0.14047	p <	0.0415
Adjusted R <sup>2</sup> =	0.07646	Std. Error of estimate =	0.6665

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_94	P_LEVEL
Intercept			1.63864	0.55168	2.97025	0.00378
TECCH_AV	0.3239509	0.1016758	0.37619	0.11807	3.18612	0.00196
SYSU_AVG	-0.095647	0.1027009	-0.10259	0.11016	-0.93132	0.35407
ROUTINSS	0.0781912	0.0990658	0.10384	0.13156	0.78929	0.43193

$$\text{QUALITY} = 1.638639 + 0.376187 \text{ TECCH\_AV} - 0.102595 \text{ SYSU\_AVG} + 0.103840 \text{ ROUTINSS}$$

(0.001957)                      (0.354073)                      (0.431931)

$$- 0.159730 \text{ INTERDPC} + 0.161968 \text{ SERVICES} + 0.371863 \text{ ENGINPRD} - 0.011387 \text{ SW\_SUM}$$

(0.086919)                      (0.432800)                      (0.360055)                      (0.716007)

$$R^2 = 14.04\% \qquad F(7, 94) = 2.1945 \qquad P < 0.04150$$

At a level of significance of  $\alpha = 0.05$ ,  $F(7,94) = 2.1945$  and  $p\text{-level} < 0.0415$ . Also, the  $p\text{-level}$  for the TECCHA coefficient is = 0.001957 implying high significance.  $R^2 = 14.05\%$ , meaning

that 14% of the variability in Quality could be determined by this equation. The more the system is perceived to be up-to-date, dependable, easily maintained, well supported, and up to what's expected, the more will users perceive that the system is capable of providing with updated, relevant, and sufficiently detailed data.

#### 4.7.2 Locatibility

The equation built for Locatibility also resulted in only one variable included in the equation: TECCHA, the general characteristics of the technology being used. Again here, as shown in Table XIX, the equation is significant and the coefficient of TECCHA is also significant in explaining the variability of LOCATBLT.

**Table XIX- Regression Analysis with LOCATBLT being Dependent Variable (n = 102).**

R =	0.44706	F( 6, 95) =	3.9549
R <sup>2</sup> =	0.19986	p <	0.0014
Adjusted R <sup>2</sup> =	0.14932	Std. Error of estimate =	0.7457

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_95	P LEVEL
Intercept			2.07139	0.54036	3.83333	0.00023
TECCH_AV	0.4305744	0.09668201	0.58286	0.13088	4.45351	0.00002
SYSU_AVG	-0.175036	0.09757439	-0.21886	0.12201	-1.79387	0.07601
ROUTINSS	-0.09808	0.09403514	-0.15184	0.14557	-1.04302	0.29959
SERVICES	-0.105967	0.09512692	-0.25565	0.22950	-1.11396	0.26811
SALE_MKT	-0.134323	0.09415429	-0.28997	0.20326	-1.42663	0.15696
ENGINPRD	-0.082255	0.094933	-0.39167	0.45204	-0.86645	0.38843

$$\text{LOCATBLT} = 2.0714 + 0.5828 \text{ TECCHA}$$

(0.000227)    (0.000023)

$$R^2 = 19.9\%$$

$$F(6, 95) = 3.9549$$

$$P < 0.00142$$

The more the system is perceived to be dependable and capable of providing the user with the expected processing services, the more it will be perceived to help the user easily locate and

clearly understand the meaning of any kind of data elements needed at the corporate or divisional level.

### 4.7.3 Reliability

A regression analysis was conducted to study the task and the technology factors that are most likely to be associated with the variability of the TTF factor, Reliability. The results of the regression analysis are shown in Table XX. At a significance level of  $\alpha = 0.05$ , the equation is significant, and the variables included here are also significant in determining the variability of Reliability. Again here, the two variables included belong to the technology characteristics: The general current technology characteristics (TECCHA) and the number of software applications being used (SW\_SUM).

**Table XX- Regression Analysis with RELIABLT being Dependent Variable (n = 102).**

R =	0.43631	F( 10, 91) =	2.1397
R <sup>2</sup> =	0.19037	p <	0.0289
Adjusted R <sup>2</sup> =	0.10140	Std. Error of estimate =	0.6586

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_91	P_LEVEL
Intercept			1.90798	0.55510	3.43720	0.00089
TECCH_AV	0.2290868	0.1003929	0.26650	0.11679	2.28190	0.02483
SYSU_AVG	0.1796196	0.1046846	0.19301	0.11249	1.71582	0.08960
ROUTINSS	-0.114941	0.0998869	-0.15292	0.13289	-1.15071	0.25286
INTERDPC	0.0183164	0.0966225	0.01755	0.09258	0.18957	0.85007
ACC_FIN	-0.037851	0.1049989	-0.06262	0.17371	-0.36049	0.71932
SERVICES	-0.006859	0.1046022	-0.01422	0.21687	-0.06558	0.94786
SALE_MKT	-0.08518	0.10151	-0.15803	0.18832	-0.83917	0.40357
HOSPHEARM	0.08819	0.10029	0.43976	0.50009	0.87935	0.38153
ENGINPRD	0.06986	0.09901	0.28589	0.40515	0.70563	0.48222
SW_SUM	-0.20921	0.09851	-0.06560	0.03089	-2.12371	0.03641

$$\text{RELIABLT} = 1.907982 + 0.266503 \text{ TECCH\_AV} + 0.193011 \text{ SYSU\_AVG} - 0.152918 \text{ ROUTINSS} \\ (0.024827) \quad (0.089598) \quad (0.252864)$$



$$- 0.017550 \text{ INTERDPC} - 0.062621 \text{ ACC\_FIN} - 0.014221 \text{ SERVICES} - 0.158031 \text{ SALE\_MKT}$$

$$(0.850071) \quad (0.719318) \quad (0.947860) \quad (0.403575)$$

$$+ 0.439758 \text{ HOSPHARM} + 0.285886 \text{ ENGINPRD} - 0.065596 \text{ SW\_SUM}$$

$$(0.381527) \quad (0.482220) \quad (0.036407)$$

$$R^2 = 19.04\%$$

$$F(10, 91) = 2.1397$$

$$P < 0.02890$$

As for TECCHA, the more the system is perceived to be up-to-date, dependable, and organization supported, the more it will be perceived as reliable by the users. This explains the positive coefficient of TECCHA. Coming to SW\_SUM, the number of software applications used by the user, it also has a positive correlation with Reliability (of course, the negative sign is due to scale differences). The greater the number of software applications used, the more acquainted will the user become with more system features that he/ she can use in accomplishing the required tasks. Consequently, the user will be more apt to perceive the system as more reliable.

#### 4.7.4 Ease\_Use/ Training

The user perceived system Ease of use resulting from proper training was found to be affected by three of the four measures of technology characteristics: Software system used, TECCHA, and department. This was the result of the regression equation that was built to investigate the factors that are most likely to be associated to Ease\_Use/ Training. These results are displayed in Table XXI. As could be noticed, the equation is significant in predicting the dependent variable, and the included variables are also significant in determining the variability in the users' perception about systems ease of use.

SFWUSE6, the use of word processing systems, has a positive correlation with the TTF factor: Ease\_Use/ Training (the negative sign is due to scale differences). The more users use word processing systems, the more they will perceive it as easy to use based on the training provided to them. Moreover, the more positive the users perception about system dependability, organizational support, and up-to-datedness, the more they will perceive it as easy to use provided that proper training is offered to them.

**Table XXI- Regression Analysis with EASE\_USE being Dependent Variable (n = 102).**

R =	0.52098	F( 7, 94) =	5.0027
R <sup>2</sup> =	0.27142	p <	0.0001
Adjusted R <sup>2</sup> =	0.21717	Std. Error of estimate =	0.8379

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_94	P_LEVEL
Intercept			2.56902	0.48798	5.26464	0.00000
SFWUSE6	-0.309185	0.09144255	-0.18279	0.05406	-3.38120	0.00105
SFWUSE7	-0.142518	0.09245658	-0.10236	0.06641	-1.54145	0.12657
TECCH_AV	0.3121449	0.09067705	0.49494	0.14378	3.44238	0.00086
INTERDPC	-0.1204	0.09014914	-0.15724	0.11773	-1.33557	0.18492
SERVICES	0.2010791	0.0916798	0.56822	0.25907	2.19328	0.03075
HOSPHARM	0.0988179	0.08993021	0.67164	0.61124	1.09883	0.27465
ENGINPRD	-0.19159	0.08909	-1.06862	0.49691	-2.15052	0.03408

$$\begin{aligned} \text{EASE\_USE} = & 2.56902 - 0.18279 \text{ SFWUSE6} - 0.10236 \text{ SFWUSE7} + 0.49494 \text{ TECCH\_AV} \\ & \quad (0.001053) \quad (0.126566) \quad (0.000862) \\ & - 0.15724 \text{ INTERDPC} + 0.56822 \text{ SERVICES} + 0.67164 \text{ HOSPHARM} - 1.06862 \text{ ENGINPRD} \\ & \quad (0.184916) \quad (0.030754) \quad (0.274649) \quad (0.034080) \end{aligned}$$

$$R^2 = 27.14\%$$

$$F(7, 94) = 5.0027$$

$$P < 0.00008$$

The department factor came to the picture in this equation. Users in the Services department are apt to consider the system as less easy to use if proper training is not provided to them. The

software system that could be used in such departments should be well tailored to the requirements of the jobs there. That's why they should match with the jobs performed, and users should be well trained on how to use it properly; otherwise, it would be perceived to be difficult, and the gap between this system and the task performed will get wider. Finally, users in the Engineering and Production departments will perceive the system as more easy to use based on the training they are provided with. In the Engineering and Production departments, there are people who are specialized in these fields. The software systems to be used here just reflect the areas of knowledge in those fields. Providing them with proper training sessions on how to use these systems will be enough to make them perceive the systems as easy to use. (Note that SERVICES and ENGINPRD, the signs of the coefficient should be inversed due to scale differences).

#### **4.7.5 Relationship of IS People with Users**

The results of the regression analysis conducted to examine the factors that are most likely to be associated to the TTF factor Relationship with users are shown in Table XXII. The variables included in the equation are also two of the measures of technology characteristics: TECCHA and SYSU\_AVG. The equation and the variables included are significant in predicting and explaining the variability of the dependent variable.

To start with TECCHA, the more positive is the perception of users about the system dependability and up-to-datedness, and the organization support provided to it, the more positive would be their idea about the effectiveness of the work of the IS people in showing interest, communicating request, and responding in a timely manner.

As for SYSU\_AVG, the more the system is perceived as easy to use and user friendly, the more positive will their conception be about the effectiveness of the relationship of IS people to users.

**Table XXII- Regression Analysis with RELTNUSR being Dependent Variable (n = 102).**

R =	0.55346	F( 5, 96) =	8.4783
R <sup>2</sup> =	0.30632	p <	0.0000
Adjusted R <sup>2</sup> =	0.27019	Std. Error of estimate =	0.5585

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_96	P_LEVEL
Intercept			0.69291	0.40396	1.71528	0.08952
TECCH_AV	0.41815784	0.088552	0.45772	0.09693	4.72217	0.00001
SYSU_AVG	0.18780469	0.0903658	0.18989	0.09137	2.07827	0.04035
ROUTINSS	0.09010108	0.0865663	0.11279	0.10837	1.04083	0.30057
ACC_FIN	0.09462447	0.0887983	0.14730	0.13823	1.06561	0.28927
SERVICES	0.15962379	0.0894098	0.31140	0.17442	1.78531	0.07737

$$\begin{aligned}
 \text{RELTNUSR} = & 0.692908 + 0.457722 \text{ TECCH\_AV} + 0.189887 \text{ SYSU\_AVG} + 0.112791 \text{ ROUTINSS} \\
 & \quad (0.000008) \quad (0.040353) \quad (0.300567) \\
 & + 0.147302 \text{ ACC\_FIN} + 0.311397 \text{ SERVICES} \\
 & \quad (0.289272) \quad (0.077370)
 \end{aligned}$$

$$R^2 = 30.63\%$$

$$F(5, 96) = 8.4783$$

$$P < .00000$$

#### 4.7.6 Timeliness

An interesting finding is that both task characteristics and technology characteristics were included in the regression equation that has Timeliness as a dependent variable. The results are shown in Table XXIII. As could be observed, both the equation and the variables are significant in predicting and determining the variability and Timeliness.

**Table XXIII- Regression Analysis with TIMELNSS being Dependent Variable (n = 102).**

R =	0.54239	F( 9, 92) =	4.2608
R <sup>2</sup> =	0.29419	p <	0.0001
Adjusted R <sup>2</sup> =	0.22515	Std. Error of estimate =	0.7705

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_92	P_LEVEL
Intercept			2.02911	0.64486	3.14659	0.00223
SFWUSE2	0.11005728	0.1023342	0.06533	0.06075	1.07547	0.28498
SFWUSE4	-0.3283233	0.1013998	-0.43113	0.13315	-3.23791	0.00168
SFWUSE5	0.19238505	0.0992849	0.11967	0.06176	1.93771	0.05573
SFWUSE6	-0.1342384	0.0955697	-0.07335	0.05222	-1.40461	0.16350
SFWUSE7	0.15019586	0.1019244	0.09970	0.06766	1.47360	0.14400
SYSU_AVG	0.25276999	0.0894494	0.34216	0.12108	2.82584	0.00578
ROUTINSS	-0.22947	0.09280	-0.38457	0.15553	-2.47263	0.01525
INTERDPC	0.28444	0.08875	0.34333	0.10712	3.20518	0.00186
ENGINPRD	-0.07362	0.09040	-0.37949	0.46598	-0.81440	0.41752

$$\begin{aligned}
 \text{TIMELNSS} = & 2.029110 + 0.065331 \text{ SFWUSE2} - 0.431127 \text{ SFWUSE4} + 0.119672 \text{ SFWUSE5} \\
 & \quad (0.284977) \quad (0.001675) \quad (0.055726) \\
 & - 0.073349 \text{ SFWUSE6} + 0.099705 \text{ SFWUSE7} + 0.342156 \text{ SYSU\_AVG} \\
 & \quad (0.163504) \quad (0.144003) \quad (0.005784) \\
 & - 0.384571 \text{ ROUTINSS} + 0.343333 \text{ INTERDPC} - 0.379492 \text{ ENGINPRD} \\
 & \quad (0.015250) \quad (0.001856) \quad (0.417521)
 \end{aligned}$$

$$R^2 = 29.42\%$$

$$F(9, 92) = 4.2608$$

$$P < 0.00012$$

Coming to the interpretation of the equation, the more the modeling system is used by respondents, the more will they sense its friendliness, quick response rate and interactive capabilities, and in turn the more would they perceive the system as being capable to provide them with quick processing of the required activities. (The negative sign is due to scale differences).

Moreover, the easier the use the user will be capable of mastering the features and the facilities offered by the system, use it more efficiently, and, consequently, perceive it to be

highly timely.

Coming to the task characteristics Routiness, it was found that (keeping in mind that the variable represents task complexity) the less the task complexity, the higher would be the perception of users about the timeliness of the system. This is because the system would be more capable to complete regular and structured tasks than complicated tasks on time.

#### **4.7.7 Compatibility**

The resulting regression equation for Compatibility has also included factors belonging to task and technology characteristics. This result is shown in Table XXIV. As it could be noticed, the equation and the included variables are significant in explaining the variability in the Compatibility factor of TTF.

The more DBMSs are used by respondents, the more they will find the system a compatible one (negative sign is due to scale differences). This is attributed to the nature of the DBMS environment. DBMSs provide different users with the ability to access data from a related, integrated, and shareable database. This preserves data consistency which enhance users to perceive the system as a compatible one.

Moreover, the more respondents use SFWUSE9, 4<sup>th</sup> Generation Languages, the more they will be in need to use estimation data and other data the access of which is in need for authorization. This might lead users to perceive the system as less compatible (positive sign is due to scale differences).

Moreover, the more easy to use will the user be capable of mastering the features and the facilities offered by the system, use it more efficiently, and, consequently, perceive it to be highly timely.

Coming to the task characteristics Routiness, it was found that (keeping in mind that the variable represents task complexity) the less the task complexity, the higher would be the perception of users about the timeliness of the system. This is because the system would be more capable to complete regular and structured tasks than complicated tasks on time.

Furthermore, the less complicated the task is, the more compatible will the system be perceived by users. This is well expected, since routine and structured tasks are based more upon facts and real figures than upon estimations as it is the case with complicated tasks. This of course enhances the user's perception about the complexity of the system.

Finally, users working in the services department (Training, maintenance, support and advice) are expected to deal with systems that cannot be fully tailored to the requirements of the tasks performed. This would lead the users to perceive the system as less compatible.

**Table XXIV- Regression Analysis with COMPATBL being Dependent Variable (n = 102)**

R =	0.50610	F( 8, 93) =	4.0029
R <sup>2</sup> =	0.25614	p <	0.0004
Adjusted R <sup>2</sup> =	0.19215	Std. Error of estimate =	0.9526

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_93	P_LEVEL
Intercept			3.58215	0.77150	4.64311	0.00001
SFWUSE2	-0.264699	0.10378443	-0.19027	0.07460	-2.55047	0.01239
SFWUSE4	0.0881275	0.10440124	0.14013	0.16601	0.84412	0.40077
SFWUSE7	0.120139	0.11102045	0.09658	0.08925	1.08213	0.28199
SFWUSE9	0.2286505	0.11417268	0.21252	0.10612	2.00267	0.04812
TECCH_AV	0.1506591	0.09385941	0.26736	0.16656	1.60516	0.11185
SYSU_AVG	-0.124048	0.0945114	-0.20334	0.15492	-1.31252	0.19258
ROUTINSS	-0.19143	0.09501	-0.38850	0.19283	-2.01477	0.04682
SERVICES	-0.30070	0.09587	-0.95103	0.30322	-3.13643	0.00229

$$\text{COMPATBL} = 3.582154 - 0.190274 \text{ SFWUSE2} + 0.140134 \text{ SFWUSE4} + 0.096577 \text{ SFWUSE7}$$

(0.012393)                      (0.400767)                      (0.281991)

$$+ 0.212516 \text{ SFWUSE9} + 0.267360 \text{ TECCH\_AV} - 0.203338 \text{ SYSU\_AVG}$$

(0.048124)                      (0.111850)                      (0.192576)

$$- 0.388505 \text{ ROUTINSS} - 0.951035 \text{ SERVICES}$$

(0.046817)                      (0.002290)

$$R^2 = 25.61\%$$

$$F(8, 93) = 4.0029$$

$$P < 0.00041$$

### 7.7.8 Authorization

This is the last TTF factor to be analyzed. A regression analysis was conducted to investigate the factors that are most likely to be associated to the variability in the Authorization factor, and it was found that only technological characteristics entered the equation. The results are listed in Table XXV.

**Table XXV- Regression Analysis with AUTHORZN being Dependent Variable (n = 102).**

R =	0.45454	F( 9, 92) =	2.6619
R <sup>2</sup> =	0.20660	p <	0.0086
Adjusted R <sup>2</sup> =	0.12899	Std. Error of estimate =	1.0477

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_92_	P_LEVEL
Intercept			1.81172	0.58483	3.09784	0.00259
ORGLLEVEL	-0.105052	0.09624766	-0.11225	0.10284	-1.09148	0.27791
SFWUSE3	-0.09942	0.12082488	-0.09061	0.11012	-0.82285	0.41272
SFWUSE4	0.2404977	0.12644099	0.40506	0.21296	1.90205	0.06029
SFWUSE6	-0.206244	0.0991462	-0.14455	0.06949	-2.08020	0.04029
SFWUSE9	0.226184	0.10510499	0.22267	0.10347	2.15198	0.03402
TECCH_AV	0.2117509	0.10015419	0.39802	0.18826	2.11425	0.03720
SYSU_AVG	-0.13172	0.10276	-0.22870	0.17842	-1.28178	0.20314
ACC_FIN	0.14344	0.09535	0.38343	0.25488	1.50434	0.13592
HOSPHEARM	0.19505	0.09521	1.57155	0.76717	2.04849	0.04336

$$\text{AUTHORZN} = 1.811723 - 0.112246 \text{ ORGLLEVEL} - 0.090609 \text{ SFWUSE3} + 0.405065 \text{ SFWUSE4}$$

(0.277913)                      (0.412724)                      (0.060293)

$$- 0.144548 \text{ SFWUSE6} + 0.222670 \text{ SFWUSE9} + 0.398023 \text{ TECCH\_AV}$$

(0.040288)                      (0.034017)                      (0.037199)



$$- 0.228699 \text{ SYSU\_AVG} + 0.383430 \text{ ACC\_FIN} + 0.767173 \text{ HOSPHARM}$$

$$(0.203140) \quad (0.135919) \quad (0.043361)$$

$$R^2 = 20.66\%$$

$$F(9, 92) = 2.6619$$

$$P < 0.00863$$

Unlike each other, the use of word processing systems (SFWUSE6) is not in need for Authorization to have an access to certain kinds of data as it is the case with the use of 4<sup>th</sup> GL systems. This explains the negative sign of the correlation coefficient of SFWUSE6 and the positive sign of that of SFWUSE9.

Moreover, the more users perceive the system as dependable, up-to-date, and well supported, the more will they perceive it as well controlled. Consequently, they will have the perception that having an access to certain portions of the data requires authorization. Finally, users working in Hospitals and Pharmacy departments in Hospitals have the perception that accessing data from various departments or organizational databases is in need for more authorization.

As could be noticed, one or more technology characteristics were included in all the eight equations, while one or two task characteristics were included in only two of the eight equations. Looking at the significance of the equations derived, and referring back to the previous analysis including correlations analysis and variability test results, one can safely conclude that proposition (P1) is proved.

#### 4.8 Does TTF Predict the Precursor of Utilization: BFPCU?

If the fit between the task performed and the technology used is perceived to be high, then it is assumed that it will enhance the positive beliefs a user might have about computer use.

A regression equation was built to examine whether one or more TTF factors can be used to predict beliefs about computer use. The results of the regression equation are shown in Table XXVI.

It is worth mentioning that this regression equation was built with a zero-intercept. It should be stated here that "for regression through the origin (zero intercept).  $R^2$  represents the proportion of the explained variability about the origin; this value cannot be compared to the  $R^2$  value when the intercept is included"<sup>78</sup>.

**Table XXVI- Regression Analysis with BFPCU\_AV being Dependent Variable (n = 102).**

R =	0.97578	F( 6, 96) =	318.37
R <sup>2</sup> =	0.95215	p <	0.0000
Adjusted R <sup>2</sup> =	0.94916	Std. Error of estimate =	0.4619

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_96	P_LEVEL
LOCATBLT	0.270822	0.0738118	0.20400	0.05560	3.66909	0.00040
RELIABLT	0.2733916	0.0864915	0.23560	0.07454	3.16091	0.00210
EASE_USE	0.2070526	0.0716538	0.15023	0.05199	2.88962	0.00477
TIMELNSS	0.0957114	0.0646187	0.08112	0.05477	1.48117	0.14184
COMPATBL	0.0360493	0.0665497	0.02458	0.04537	0.54169	0.58929
AUTHORZN	0.1315907	0.0552182	0.10350	0.04343	2.38311	0.01914

$$\text{BFPCU\_AV} = 0.204 \text{ LOCATBLT} + 0.23560 \text{ RELIABLT} + 0.1502 \text{ EASE\_USE}$$

(0.0004)                      (0.0021)                      (0.0047)

<sup>78</sup> Ibid. p. 4.

$$+0.1035 \text{ AUTHORZN} \\ (0.01913)$$

$$R^2 = 95.21\%$$

$$F(6, 96) = 318.37$$

$$P < 0.00000$$

As could be noticed the equation is highly significant, with three of the TTF factors included in the equation. The higher the system's reliability, ease of use based on providing more efficient training to users, and the more authorization given to users to have an access to needed data, the more positive would their attitude be towards computers. This relationship helped providing the direction of the arrow in the research model from TTF to precursors of computer utilization, namely believes about computer usage. (The basic research model is presented in Chapter I).

#### **4.9 Does TTF Predict Utilization?**

This question represents proposition (P2). To prove this proposition, another regression analysis was conducted in an attempt to find out whether a fit between the task performed and technology used can lead to higher system utilization levels by users.

Recalling that Utilization was measured along three dimensions, and referring to the previously mentioned correlation analysis results where it was found that the frequency of use showed no significant correlation with TTF because of its lack of variability, two regression equations were built. One of these was built to study the factors that are most likely to be associated to the extent of use of computers (EXTCOMU1), and the other for tasks depending on computers for completion (TASKI-AV).

#### 4.9.1 Building a Regression Equation for TASKI-AV

A regression equation was developed for determining the variables that could predict the variability in TASKI-AV. The results of this analysis are shown in Table XXVII.

As it could be noticed, although the equation is statistically significant, it cannot be considered as a strong predictor of TASKI\_AV. This is because  $R^2 = 13.8\%$  only; that is to say 13.8% of the variability of TASKI\_AV could be explained by the reported equation. Still, however, the included variable Quality, a TTF factor, is highly significant in explaining the variability of TASKI\_AV.

**Table XXVII- Regression Analysis with TASKI\_AV being Dependent Variable (n = 102).**

R =	0.37269	F( 4, 97) =	3.9116
$R^2$ =	0.13890	p <	0.0055
Adjusted $R^2$ =	0.10339	Std. Error of estimate =	0.7515

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_97_	P_LEVEL
Intercept			4.16782	0.41470	10.05017	0.00000
QUALITY	-0.351606	0.09863574	-0.40234	0.11287	-3.56469	0.00057
RELIABL	0.0913994	0.09811385	0.10440	0.11207	0.93156	0.35387
RELTNUSR	-0.075417	0.09845282	-0.09155	0.11952	-0.76603	0.44552
COMPATBL	0.132432	0.09620206	0.09916	0.07203	1.37660	0.17180

TASKI\_AV = 4.1678 - 0.40234 QUALITY  
(0.00000) (0.000567)

$R^2 = 13.80\%$

F (4, 97) = 3.9116

P < 0.0054

Quality is positively correlated to TASKI\_AV (negative sign is due to scale differences). This means that the more users perceive the system being used as dependable,

efficiently maintained and supported, and always updated, the more will be their tendency to learn the system more effectively and apply it to accomplish more tasks from them.

#### 4.9.2 Building a Regression for EXTCOMU1

Trying to build a regression equation for the other Utilization measure, extent of computer use, it was found that another TTF factor was indicated here as a predictor variable: Ease\_Use/ Training. These results are shown in Table XXVIII. Again here, the equation cannot be considered as a strong predictor for EXTCOMU1.  $R^2 = 0.06$ , which implies that only 6% of the variability in EXTCOMU1 could be explained by the reported equation. Still, because the included variable shows high significance, the equation will be considered.

**Table XXVIII- Regression Analysis with EXTCOMU1 being Dependent Variable (n=102).**

R =	0.24587	F( 3, 98) =	2.1018
R <sup>2</sup> =	0.06045	p <	0.1049
Adjusted R <sup>2</sup> =	0.03169	Std. Error of estimate =	1.0273

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_98_	P_LEVEL
Intercept			5.03206	0.44247	11.37271	0.00000
EASE_USE	-0.2295106	0.09891186	-0.25301	0.10904	-2.32035	0.02240
TIMELNSS	-0.0418304	0.09844098	-0.04989	0.11742	-0.42493	0.67182
AUTHORZN	-0.0497481	0.09911864	-0.04626	0.09217	-0.50190	0.61686

$$\text{EXTCOMU1} = 5.03206 - 0.253009 \text{ EASE\_USE}$$

(0.000000) (0.0224)

$$R^2 = 6.04\%$$

$$F(3, 98) = 2.102$$

$$P < 0.1049$$

Based on the results, it could be stated that the more the user perceive the system as easy to use based on the training he/she gets, the more time they will spend on using the computer. Easy to use systems and proper training will help users understand the system features in a better way, apply them more efficiently, and enjoy using them for longer time periods.

The results that have been just mentioned, along with the results of the correlation and Chi-Square analysis previously stated, give us an indication that proposition number 2 is proved.

#### 4.10 Does TTF and Utilization Predict User Satisfaction?

This question represents proposition number 3. Regression analysis was performed to study the effect of TTF and utilization factors upon predicting user satisfaction. In general, it is believed that higher levels of perception about TTF and high utilization levels will lead to higher level of user satisfaction.

The results of the regression analysis are presented in Tables XXIX, XXX and XXXI.

**Table XXIX- Regression Analysis with USTF\_AVG being Dependent Variable (n = 102).**

R =	0.60874	F( 7, 94) =	7.9056
R <sup>2</sup> =	0.37056	p <	0.0000
Adjusted R <sup>2</sup> =	0.32369	Std. Error of estimate =	0.3960

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_94	P_LEVEL
Intercept			1.00676	0.23255	4.32920	0.00004
QUALITY	0.2381606	0.09018908	0.16534	0.06261	2.64068	0.00969
LOCATBLT	0.0754185	0.09007608	0.04491	0.05364	0.83728	0.40456
EASE_USE	0.17946	0.08825321	0.09124	0.04487	2.03347	0.04482
REL TNUSR	0.2745161	0.09135478	0.20217	0.06728	3.00495	0.00341
TIMELNSS	0.2208102	0.08495398	0.12147	0.04673	2.59917	0.01085
COMPATBL	-0.139585	0.08935183	-0.06341	0.04059	-1.56219	0.12160
AUTHORZN	-0.18122	0.09058	-0.07772	0.03885	-2.00069	0.04831

$$\begin{aligned}
 \text{USTF\_AVG} = & 1.006761 + 0.165335 \text{ QUALITY} + 0.044914 \text{ LOCATBLT} + 0.091241 \text{ EASE\_USE} \\
 & \quad (0.009689) \quad (0.404561) \quad (0.044824) \\
 & + 0.202174 \text{ RELTNUSR} + 0.121469 \text{ TIMELNSS} - 0.063410 \text{ COMPATBL} - 0.077722 \text{ AUTHORZN} \\
 & \quad (0.003405) \quad (0.010851) \quad (0.121603) \quad (0.048311) \\
 R^2 = & 37.06\% \\
 F(7, 94) = & 7.9056 \quad P < 0.00000
 \end{aligned}$$

The first equation was built with the intention to study whether TTF factors can be used to predict user satisfaction. The result was a significant equation with significant coefficient path variables that can predict and determine the variability of users satisfaction. The better the user perception of the quality of the system used, the higher the perceived system ease of use, the better the relationship of IS people with user, the higher the system capability to complete regular activities on time, and the less difficult the authorization needed to have an access to certain kind of data, the higher would be the level of user satisfaction.

**Table XXX- Regression Analysis with USTF\_AVG being Dependent Variable (n = 102).**

R =	0.35900	F( 2, 99) =	7.3235
R <sup>2</sup> =	0.12888	p <	0.0011
Adjusted R <sup>2</sup> =	0.11128	Std. Error of estimate =	0.4539

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_99	P_LEVEL
Intercept			3.12858	0.25714	12.16679	0.00000
EXTCOMU1	-0.15822	0.0946415	-0.07297	0.04365	-1.67178	0.09773
TASKI_AV	-0.301935	0.0946415	-0.18318	0.05742	-3.19031	0.00190

$$\begin{aligned}
 \text{USTF\_AVG} = & 3.128579 - 0.072971 \text{ EXTCOMU1} - 0.183179 \text{ TASKI\_AV} \\
 & \quad (0.097726) \quad (0.001904)
 \end{aligned}$$

$$R^2 = 12.89\%$$

$$F(2, 99) = 7.3235$$

$$P < 0.00108$$

This second regression equation was built to find out whether utilization can be used to predict user satisfaction. It could be noticed that TASKI\_AV, a measure of Utilization was included in the equation. The higher the number of tasks for which computer systems are used, the more would users benefit from the computer system available, and thus the higher would be the level of user satisfaction.

**Table XXXI- Regression Analysis with USTF\_AVG being Dependent Variable (n = 102).**

R =	0.63564	F( 9, 92) =	6.9303
R <sup>2</sup> =	0.40404	p <	0.0000
Adjusted R <sup>2</sup> =	0.34574	Std. Error of estimate =	0.3895

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_92	P_LEVEL
Intercept			1.48548	0.31940	4.65083	0.00001
TASKI_AV	-0.1956025	0.0868604	-0.11867	0.05270	-2.25192	0.02671
QUALITY	0.16596974	0.0942273	0.11522	0.06541	1.76138	0.08150
LOCATBLT	0.08683659	0.089173	0.05171	0.05311	0.97380	0.33271
RELIABLT	0.04996892	0.0947086	0.03463	0.06563	0.52761	0.59904
EASE_USE	0.16516131	0.092997	0.08397	0.04728	1.77598	0.07904
RELTNUSR	0.25696461	0.090307	0.18925	0.06651	2.84546	0.00547
TIMELNSS	0.20720	0.08817	0.11398	0.04850	2.34987	0.02092
COMPATBL	-0.12059	0.08919	-0.05478	0.04052	-1.35208	0.17966
AUTHORZN	-0.17783	0.08927	-0.07627	0.03829	-1.99209	0.04933

$$\text{USTF\_AVG} = 1.485482 - 0.118669 \text{ TASKI\_AV} + 0.15219 \text{ QUALITY} + 0.051714 \text{ LOCATBLT}$$

(0.026707)                      (0.081497)                      (0.332710)

$$+ 0.034627 \text{ RELIABLT} + 0.083971 \text{ EASE\_USE} + 0.189248 \text{ RELTNUSR} + 0.113980 \text{ TIMELNSS}$$

(0.599042)                      (0.079042)                      (0.005467)                      (0.020918)

$$- 0.054780 \text{ COMPATBL} - 0.076270 \text{ AUTHORZN}$$

(0.179663)                      (0.049325)



$$R^2 = 40.40\%$$

$$F(9, 92) = 6.9303$$

$$P < 0.00000$$

This last equation intended to investigate the effect of the TTF factors and the Utilization factor upon user satisfaction. As could be noticed the resulting equations included variables that represent the two sets of factors under study.

These results that have just been reported provide the study with a good support for proposition (P3).

#### **4.11 Does User Satisfaction and TTF Predict Impact on Performance?**

This is the last question posed by this study. It represents proposition (P4). As previously done, a regression analysis was conducted, and two equations were built: one considering the TTF factors as the independent factors, and the other considering the user satisfaction as the interdependent predictor variable. The results of these regressions equations are presented in Table XXXII and Table XXXIII.

**Table XXXII- Regression Analysis with IMPER\_AV being Dependent Variable (n = 102).**

R =	0.40667	F( 5, 96) =	3.8045
R <sup>2</sup> =	0.16538	p <	0.0035
Adjusted R <sup>2</sup> =	0.12191	Std. Error of estimate =	0.4850

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_96	P_LEVEL
Intercept			1.44564	0.36061	4.00885	0.00012
EXTCOMU1	-0.134727	0.096136767	-0.06680	0.04767	-1.40141	0.16432
EASE_USE	0.1400531	0.102068219	0.07655	0.05579	1.37215	0.17321
RELTNUSR	0.2076761	0.099847456	0.16443	0.07905	2.07993	0.04020
TIMELNSS	0.1645524	0.093722967	0.09731	0.05543	1.75573	0.08232
COMPATBL	-0.129852	0.093643494	-0.06342	0.04573	-1.38667	0.16876

$$\begin{aligned} \text{IMPER\_AV} = & 1.445644 - 0.066799 \text{ EXTCOMU1} + 0.076549 \text{ EASE\_USE} + 0.164425 \text{ RELTNUSR} \\ & (0.164316) \quad (0.173214) \quad (0.040196) \\ & + 0.097314 \text{ TIMELNSS} - 0.063415 \text{ COMPATBL} \\ & (0.082324) \quad (0.168755) \end{aligned}$$

$$R^2 = 16.54\%$$

$$F(5, 96) = 3.8045$$

$$P < 0.00346$$

This equation indicates that one of the TTF factors, relationship of IS people with users, was included in a predictor of user satisfaction. The more is this relationship based on good and effective communication aspects, prompt response, and better understanding of the users' needs and requirements, the higher would be the level of performance impact.

**Table XXXIII- Regression Analysis with IMPER\_AV being Dependent Variable (n = 102).**

R =	0.52741	F( 1, 100) =	38.536
R <sup>2</sup> =	0.27817	p <	0.0000
Adjusted R <sup>2</sup> =	0.27095	Std. Error of estimate =	0.4420

CASENAME	BETA	ST. ERR.	B	ST. ERR.	T_100_	P_LEVEL
Intercept			0.60648	0.20377	2.97633	0.00366
USTF_AVG	0.52741422	0.08496083	0.56699	0.09134	6.20773	0.00000

$$\text{IMPER\_AV} = 0.606483 + 0.566991 \text{ USTF\_AVG} \\ (0.000000)$$

$$R^2 = 27.82\%$$

$$F(1, 100) = 38.536$$

$$P < 0.00000$$

This equation indicated that users' satisfaction can be considered as a significant predictor of impact on performance. It shows that the higher the level of user satisfaction, the more positive and the better will its impact upon performance be.

These results have proved proposition (P4). Consequently, the various parts of the model suggested by this study are proved.

In summary, this chapter presented the major findings that could be reached this study regarding the factors affecting TTF and the effect of TTF upon performance and user satisfaction. Some of the results conformed while others did not conform with the findings of other researches within the same area.

## **Chapter V**

### **Conclusions and Recommendations**

#### **5.1 Introduction**

IS is recognized today as a major force influencing business performance. Consequently, there has been increasing concern in most organizations regarding its management. This is essential since information is a competitive resource, and its successful management can provide organizations with competitive advantage.

IS is best described as the use of an IT resource. Such a system treats existing information as a resource that can be managed by the organization to increase profitability and decision making.

In fact, the success of information systems depends on interacting factors. The influence of these factors varies among different organizations and even among different units within an organization.

Many organizations had failed in implementing IT or in meeting its expectations regarding increased efficiency, effectiveness and mainly sustaining its competitive advantage. For this reason a lot of work has been conducted revealing the importance of not ignoring users attitudes and behaviors toward acceptance of technology and utilizing it. Considering users' attitudes, norms, and beliefs in implementing IS is of great importance to system success. Taking this into consideration will influence or direct users' behavior towards the system and its usage.

Most organizations are following the trend of making their operational, tactical, and strategic processes more efficient and effective so that they will gain a competitive means

among others. An increasingly attractive means of improving these processes lies in today's wide variety of information technologies<sup>79</sup>. The competitive use of information technology may provide easier access to markets, provide cost efficiencies, and may lead to increases in profitability and market shares.

Moreover, the fit between technology and task requirements has a substantial influence on whether to use it or not. Therefore, the basic need for this study stems from the importance of having an efficient, and effective computer based information system that is compatible with the tasks users perform, in a way that it meets the users as well as organization needs in order to have a positive impact on individual performance which consequently affect organization performance.

The major sources of information for this research were the Lebanese organizations that have EDP departments. Questionnaires were directed to managers, at all organizational levels, excluding IS people, who interact with the existing system and where decision making is part of their jobs. The valid response rate is 40.8%.

## **5.2 Major Conclusions**

The fundamental questions addressed by this research were whether task and technology characteristics affect users' evaluations of TTF and whether these evaluations influence system utilization with an explanatory power in predicting perceived performance impact. A hundred and two questionnaires were distributed to managers at all levels in order to

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<sup>79</sup> Darrell E. Owen, "IRM concepts: Building blocks for the 1990s", Information Management Review, (Fall 1989), pp. 19-27.

analyze and study their reporting. The major conclusions from this research work were as follows:

Results showed that one of the TTF elements, Compatibility, has a significant variability along Routiness, and another one, Relationship of IS people with users, has a significant variability along interdependence.

As for the variability test of 'Relationship with users' along the task characteristic interdependence, it also showed significance. One-way ANOVA was performed indicating a significant mean variance in TTF along TECCHA. Another One-way ANOVA was performed indicating a significant variability of TTF along the system ease of use measure (SYSUAV). Significant variability was also found in some of the TTF along the software system used.

Quality factor of TTF showed significant variability along using the Modeling System. Also, Locatability showed significant variability along the use of database management systems, modeling systems and spreadsheets. Reliability also showed significant variability along the use of spreadsheets, statistical packages and word processing. Moreover, significant variability was found in the Timeliness factor along the Services department.

Significant negative correlations between the users' perception about the TTF and individual variables like age, gender, education level, and organization level do exist. No significant correlations between any of the TTF factor components and the frequency of computer use. This could be attributed to the reasoning that almost all respondent are using computers as part of their job. So regardless of how they perceive the level of fit between the tasks performed and technology used, they will use it for several times a day. Significant and positive correlations exist between TASKIA on one hand and the extent of computer use, frequency of computer use, and the length of the period during which the system has been used.

An interesting, highly significant and direct relationship was found between the level of computer training and TASKIA.

Surprisingly enough, no significant correlation was found between beliefs about computer usage and TASKIA - as a utilization measure. This could be attributed to the fact that the majority of, if not all, respondents showed positive beliefs about computer usage. This was the reason beyond the lack of variability in BFPCUA, and thus no relationship showed here.

Finally, regression analysis was conducted in order to prove the models:

#### **Equation 1**

$$\text{TTF AVG} = 0.16438 + 0.11443 \text{ AGE} + 0.14499 \text{ EDUCLEVEL} + 0.15546 \text{ ORGLEVL} + 0.4443 \text{ TECCHA.}$$

(0.00008)                      (0.03084)                      (0.00124)                      (0.0000)

$$R^2 = 0.418 = 42\%$$

$$F(4,97) = 17.43 \quad p < 0.00000.$$

#### **Equation 2**

$$\text{QUALITY} = 1.638639 + 0.376187 \text{ TECCH\_AV}$$

(0.001957)

$$R^2 = 14.04\% \quad F(7, 94) = 2.1945 \quad P < 0.04150$$

#### **Equation 3**

$$\text{LOCATBLT} = 2.0714 + 0.5828 \text{ TECCHA}$$

(0.000023)

$$R^2 = 19.9\%$$

$$F(6, 95) = 3.9549 \quad P < .00142$$

**Equation 4**

$$\text{RELIABL} = 1.907982 + 0.266503 \text{ TECCH\_AV} - 0.065596 \text{ SW\_SUM}$$

(0.024827)                      (0.036407)

$$R^2 = 19.04\%$$

$$F(10, 91) = 2.1397$$

$$P < 0.02890$$

**Equation 5**

$$\text{EASE\_USE} = 2.56902 - 0.18279 \text{ SFWUSE6} + 0.49494 \text{ TECCH\_AV} + 0.56822 \text{ SERVICES}$$

(0.001053)                      (0.000862)                      (0.030754)

$$- 1.06862 \text{ ENGINPRD}$$

(0.034080)

$$R^2 = 27.14\%$$

$$F(7, 94) = 5.0027$$

$$P < 0.00008$$

**Equation 6**

$$\text{RELTNUSR} = 0.692908 + 0.457722 \text{ TECCH\_AV} + 0.189887 \text{ SYSU\_AVG}$$

(0.000008)                      (0.040353)

$$R^2 = 30.63\%$$

$$F(5, 96) = 8.4783$$

$$P < .00000$$

**Equation 7**

$$\text{TIMELNSS} = 2.029110 - 0.431127 \text{ SFWUSE4} + 0.342156 \text{ SYSU\_AVG} - 0.384571 \text{ ROUTINSS}$$

(0.001675)                      (0.005784)                      (0.015250)

$$+ 0.343333 \text{ INTERDPC}$$

(0.001856)

$$R^2 = 29.42\%$$

$$F(9, 92) = 4.2608$$

$$P < 0.00012$$



**Equation 8**

$$\text{COMPATBL} = 3.582154 - 0.190274 \text{ SFWUSE2} + 0.212516 \text{ SFWUSE9} - 0.203338 \text{ SYSU\_AVG}$$

(0.012393)                      (0.048124)                      (0.192576)

$$- 0.388505 \text{ ROUTINSS} - 0.951035 \text{ SERVICES}$$

(0.046817)                      (0.002290)

$$R^2 = 25.61\%$$

$$F(8, 93) = 4.0029$$

$$P < 0.00041$$

**Equation 9**

$$\text{AUTHORZN} = 1.811723 - 0.144548 \text{ SFWUSE6} + 0.222670 \text{ SFWUSE9} + 0.398023 \text{ TECCH\_AV}$$

(0.040288)                      (0.034017)                      (0.037199)

$$+ 0.767173 \text{ HOSPHARM}$$

(0.043361)

$$R^2 = 20.66\%$$

$$F(9, 92) = 2.6619$$

$$P < 0.00863$$

**Equation 10**

$$\text{TASKI\_AV} = 4.1678 - 0.40234 \text{ QUALITY}$$

(0.000567)

$$R^2 = 13.80\%$$

$$F(4, 97) = 3.9116$$

$$P < 0.0054$$

**Equation 11**

$$\text{EXTCOMU1} = 5.03206 - 0.253009 \text{ EASE\_USE}$$

(0.0224)

$$R^2 = 6.04\%$$

$$F(3, 98) = 2.102$$

$$P < 0.1049$$

**Equation 12**

$$\text{BFPCU\_AV} = 0.204 \text{ LOCATBLT} + 0.23560 \text{ RELIABLT} + 0.1502 \text{ EASE\_USE} \\
\begin{matrix} (0.0004) & (0.0021) & (0.0047) \end{matrix} \\
+ 0.1035 \text{ AUTHORZN} \\
(0.01913)$$

$$R^2 = 95.21\%$$

$$F(6, 96) = 318.37$$

$$P < 0.00000$$

**Equation 13**

$$\text{USTF\_AVG} = 1.006761 + 0.165335 \text{ QUALITY} + 0.091241 \text{ EASE\_USE} + 0.202174 \text{ RELTNUSR} \\
\begin{matrix} (0.009689) & (0.044824) & (0.003405) \end{matrix} \\
+ 0.121469 \text{ TIMELNSS} - 0.077722 \text{ AUTHORZN} \\
\begin{matrix} (0.010851) & (0.048311) \end{matrix}$$

$$R^2 = 37.06\%$$

$$F(7, 94) = 7.9056$$

$$P < 0.00000$$

**Equation 14**

$$\text{USTF\_AVG} = 3.128579 - 0.183179 \text{ TASKI\_AV} \\
(0.001904)$$

$$R^2 = 12.89\%$$

$$F(2, 99) = 7.3235$$

$$P < 0.00108$$

**Equation 15**

$$\text{USTF\_AVG} = 1.485482 - 0.118669 \text{ TASKI\_AV} + 0.189248 \text{ RELTNUSR} \\
\begin{matrix} (0.026707) & (0.005467) \end{matrix} \\
+ 0.113980 \text{ TIMELNSS} + 0.076270 \text{ AUHORZN} \\
\begin{matrix} (0.020918) & (0.049325) \end{matrix}$$

$$R^2 = 40.40\%$$

$$F(9, 92) = 6.9303$$

$$P < 0.00000$$

**Equation 16**

$$\text{IMPER\_AV} = 1.445644 + 0.164425 \text{ RELTNUSR} \\ (0.040196)$$

$$R^2 = 16.54\%$$

$$F(5, 96) = 3.8045$$

$$P < 0.00346$$

**Equation 17**

$$\text{IMPER\_AV} = 0.606483 + 0.566991 \text{ USTF\_AVG} \\ (0.000000)$$

$$R^2 = 27.82\%$$

$$F(1, 100) = 38.536$$

$$P < 0.00000$$

---

**5.3 Limitations of the Study**

As in any research work, this research has certain limitations to be mentioned. To begin with, is the sample size. The sample size was relatively small. Because of the approach followed, using a general approach of TTF in studying its impact upon performance, the size of the sample should be large enough to have variability.

The second limitation is the TTF measure itself. It considers tasks and technologies that are most likely to exist in most organizations. The fact that every organization has its own rules and procedures to be executed should not be ignored. Moreover, every organization has its philosophy in doing the job the way it finds most convenient. So there is no one single measure that can possess all organizational as well as the technological characteristics that companies acquire. Finally, it should be noted that in such research work involving users'

attitudes and perceptions, behavioral elements should be included. This could contribute in showing the links among the various model parts in a clearer manner.

#### **5.4 Recommendations**

Based on the results reported in chapter IV, and the above mentioned limitations, the following recommendations could be drawn:

To start with, since training as was shown was self done, companies should start giving their employees formal training in order to increase their performance. Also companies should try to come out from the traditional way of executing their functions. Results showed that computers are majorly used in executing non strategic level operations. Hence, they must let computers help them in executing the higher level management functions.

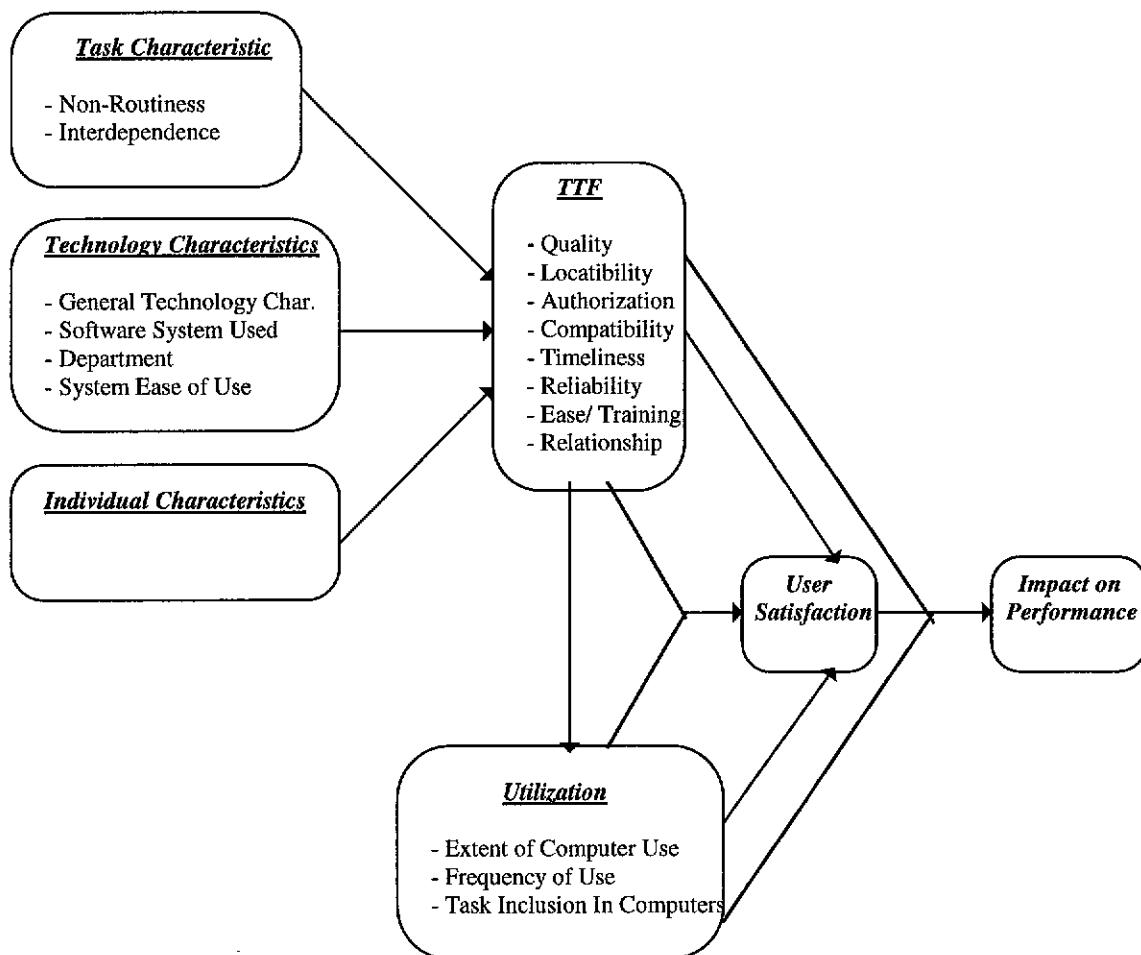
TTF has shown a significant impact on user satisfaction. Therefore, organizations should pay attention to TTF dimensions- Quality, Locatability, Authorization, Compatibility, Timeliness, Reliability, and ease of use and relationship between IS people and users. So paying attention to such attributes and features which their systems should possess, will increase the fit between technology utilized and tasks performed which in turn increase user satisfaction. At last, results indicated that beliefs play important roles in increasing utilization. Hence, organizations should consider user beliefs and try to encompass them in the process of system development or adoption.

Ultimately, a further research is recommended that would investigate only two or three companies that are related to the same sector is really interesting. Such a suggestion eliminates most of the differences related to sector and nature of job.

As a final word here, TTF has proved to be a critical factor in affecting individual productivity and effectiveness. So, such a factor should not be ignored nowadays. Organizations have to examine the features of new systems to be developed and adopted, and to what extent they help in meeting organizations' needs. Finally, companies should consider users' beliefs about the system in order to avoid low level of utilization later.

The proven model with the  $R^2$  and significance level paste on it is enclosed in Figure 5.1:

**Figure 5.1:**





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## ***APPENDICES***

<i>APPENDIX A</i>	SURVEY DESIGN.....	139
<i>APPENDIX B</i>	SURVEY VARIABLES.....	153

## **APPENDIX A**

### **SURVEY DESIGN**

**Task-Technology Fit - The Degree to Which  
a Technology Meets the Tasks Requirements and Needs**

The competitive use of information technology may provide easier access to markets, provide cost efficiencies, and may lead to increases in profitability and market shares.

Unfortunately, many information systems fail to meet their objectives, costing their companies thousands or even millions of dollars. Such failure can be contributed to the end users' resistance of utilizing the system, lack of user involvement and participation during the design and development of the system. Moreover, the fit between technology and task requirements has a substantial influence on whether to use it or not. Therefore, this questionnaire is being designed to show how compatibility between information systems and tasks users perform may contribute to the success of information systems which in turn may affect positively individual performance and decision making.

Your responses will be treated with complete confidentiality and will be discarded after data analysis is completed.

**Your time and effort are highly appreciated, thank you for cooperation.**  
**Yours sincerely,**

**Jamal El-Kari**  
**Student Masters Program**  
**Business Management**

## Demographic Variables

## Part I

### 1. Age

- |           |                       |           |                 |
|-----------|-----------------------|-----------|-----------------|
| <b>a.</b> | <b>&lt;= 25 years</b> | <b>e.</b> | <b>41 - 45</b>  |
| <b>b.</b> | <b>26 - 30</b>        | <b>f.</b> | <b>46 - 50</b>  |
| <b>c.</b> | <b>31 - 35</b>        | <b>g.</b> | <b>51 - 55</b>  |
| <b>d.</b> | <b>36 - 40</b>        | <b>h.</b> | <b>&gt;= 56</b> |

## 2. Gender

- a.** ----- Male                      **b.** ----- Female

### 3. Educational Level

- a.** ----- <= High School      **d.** ----- M.S. Degree  
**b.** ----- Some College      **e.** ----- Post Graduate Level  
**c.** ----- B.S. Degree

4. How long have you been employed in this organization?

- months ----- years

### 5. Years of experience

- years

**6. To what sector does your organization belong?**

- |           |                     |           |                             |
|-----------|---------------------|-----------|-----------------------------|
| <b>a.</b> | ---- Manufacturing  | <b>f.</b> | ---- Financial Institutions |
| <b>b.</b> | ---- Merchandising  | <b>g.</b> | ---- Public Sector          |
| <b>c.</b> | ---- Transportation | <b>h.</b> | ---- Consultancy-Research   |
| <b>d.</b> | ---- Educational    | <b>i.</b> | ---- Accounting & Audit     |
| <b>e.</b> | ---- Health Care    | <b>j.</b> | ---- Others, specify -----  |

7. In which department do you work?

- a. --- Accounting                      f. --- Sales  
b. --- Finance                        g. --- Marketing  
c. --- Personnel / HRD           h. --- Research & Develop.  
d. --- Information Systems / EDP i. --- Others, specify -----  
e. --- General Management

8. What is your organizational level?

- a. --- Top Management                      d. --- First level Supervisor  
b. --- Middle Management                e. --- Others, specify -----  
c. --- Operational Management

**9.** What is the number of yours subordinates?

- \*\*\*\*\*

## Organizational Characteristics

### Part II

1. What is the number of employees in your organization? ----

2. How would you describe the growth of the business activities in this market over the last three years?

- |    |                        |    |                       |
|----|------------------------|----|-----------------------|
| a. | ---- Large Contraction | d. | ----- Small expansion |
| b. | ---- Small Contraction | e. | ----- Large expansion |
| c. | ---- About the same    |    |                       |

3. What percentage of the main work activities being carried out here can be described as routine?

- |    |                  |    |                   |
|----|------------------|----|-------------------|
| a. | ---- < 20 %      | d. | ----- 61 % - 80 % |
| b. | ---- 20 % - 40 % | e. | ----- > 80 %      |
| c. | ---- 41 % - 60 % |    |                   |

4. As far as written rules, procedures, and communications are concerned, how formal is your organization?

1	2	3	4	5
very informal				very formal

5. How centralized is your organization in terms of decision making? ( reference is to top management for decision making).

1	2	3	4	5
highly decentralized				highly centralized

6. The market your company is operating in is

1	2	3	4	5
relatively not competitive		competitive		very competitive

7. How predictable are the customers' needs and preferences in your principal business?

1	2	3	4	5
easily predictable				very unpredictable

## Task Characteristics

### Part - III

Please read the following statements carefully and circle the number of the answer you find most convenient.

1. Strongly Agree    2. Agree    3. Uncertain    4. Disagree    5. Strongly disagree

- |   |                   |
|---|-------------------|
| 1. A major part of the tasks I perform could be considered as highly complicated                                | 1   2   3   4   5 |
| 2. The tasks I perform are highly interdependent with tasks performed by others in the same department.         | 1   2   3   4   5 |
| 3. The tasks I perform are highly interdependent with tasks performed by others in other departments.           | 1   2   3   4   5 |
| 4. The tasks involved in my job are simple and routine.   | 1   2   3   4   5 |
| 5. One should have a high level of expertise to be able to perform the various tasks in this job.               | 1   2   3   4   5 |
| 6. The data used to perform the job tasks are highly based on estimations rather than on real and factual data. | 1   2   3   4   5 |
| 7. There is no one single procedure that you can always apply to handle the tasks required in this job.         | 1   2   3   4   5 |
| 8. The tasks required in this job are simple and well-structured.   | 1   2   3   4   5 |
| 9. The tasks I perform require a lot of time and labor effort to be completed.                                  | 1   2   3   4   5 |
| 10. A great deal of mental effort is needed to have the required job tasks well completed.                      | 1   2   3   4   5 |
| 11. The tasks related to this job could be considered as unstructured and thus require a lot of judgment.       | 1   2   3   4   5 |
| 12. A great part of the tasks I perform are handled through the use of the computer.                            | 1   2   3   4   5 |
| 13. Tasks I perform require a lot of decisions in order to be performed.  | 1   2   3   4   5 |
| 14. In order to perform the tasks included in job, I resort to data majorly derived from remote sources.        | 1   2   3   4   5 |

- |  |   |   |   |   |   |
|--|---|---|---|---|---|
| 15. I frequently deal with ill-defined business problems.  | 1 | 2 | 3 | 4 | 5 |
| 16. I frequently deal with ad-hoc, non-routine business problems.  | 1 | 2 | 3 | 4 | 5 |
| 17. Frequently the business problems I work on involve answering questions that have never been asked in that form before. | 1 | 2 | 3 | 4 | 5 |
| 18. The business problems I deal with frequently involve more than one business function.                                  | 1 | 2 | 3 | 4 | 5 |

## Computer Use

### Part IV

#### Section (A)

- |   |                     |                                 |
|---|---------------------|---------------------------------|
| 1. Do you use a personal computer?            | ---- a. Yes         | ---- b. No                      |
| 2. If "No", do you use a                      | ---- a. Mainframe   | ---- b. Minicomputer            |
| 3. If "Yes", Is your PC?                      | ---- a. Stand-alone | ---- b. Connected to other PC's |
| 4. Do you have a free access to the computer? | ---- a. Yes         | ---- b. No                      |

## Software Use

### Section (B)

**In this section you are kindly required to identify the software applications you use, and the extent of this use.**

- |  | Not<br>at all |  |   |   | To a<br>great extent |   |
|--|---------------|--|---|---|----------------------|---|
| 1. Spread sheets (Excel, Quattropro, Lotus/123, ...)           | 1             |  | 2 | 3 | 4                    | 5 |
| 2. Database Management Systems (DbaseIII+, Foxpro, Access,...) | 1             |  | 2 | 3 | 4                    | 5 |



3. Statistical Packages (SPSS, Statistica,...)	1	2	3	4	5
4. Modeling Systems (IFPS,...)	1	2	3	4	5
5. Graphical Systems (Energraphics,...)	1	2	3	4	5
6. Word Processing (word, word-perfect,...)	1	2	3	4	5
7. Third Generation Languages (Cobol, Pascal, C,...)	1	2	3	4	5
8. Communication Packages (Electronic mail)	1	2	3	4	5
9. Fourth Generation Languages ( Focus,...)	1	2	3	4	5
10. Others, please specify -----					

### Task Inclusion in Computers

#### Section (C)

Please circle the number that most fits with the extent to which you use the computer to perform each of the following tasks.

	Not at all				To a great extent
1. Looking for trend -----	1	2	3	4	5
2. Planning -----	1	2	3	4	5
3. Forecasting -----	1	2	3	4	5
4. Decision making -----	1	2	3	4	5
5. Problem Solving -----	1	2	3	4	5
6. Budgeting -----	1	2	3	4	5
7. Preparing reports -----	1	2	3	4	5
8. Data entry & retrieval -----	1	2	3	4	5
9. Historical reference -----	1	2	3	4	5
10. Controlling -----	1	2	3	4	5
11. Keeping me up-to-date with current activities -----	1	2	3	4	5
-					
12. Helping me in adequately reporting to superiors -----	1	2	3	4	5
-					
13. Helping me in adding the productivity in the department	1	2	3	4	5

## Extent of Computer Use

### Section (D)

1. On an average working day, how long do you use the computer?

- |  |  |
|--|--|
| <p>a. ----- almost never</p> <p>b. ----- &lt; = half an hour</p> <p>c. ----- 1 - 2 hours</p> | <p>d. ----- 2 - 3 hours</p> <p>e. ----- &gt; 3 hours</p> |
|--|--|

2. How frequently do you use the computer?

- |   |   |
|---|---|
| <p>a. Almost never</p> <p>b. Once a month</p> <p>c. A few times a month</p> | <p>d. A few times a week</p> <p>e. About once a day</p> <p>f. Several times a day</p> |
|---|---|

. How long have you been using the computer system currently available in your organization?

----- months

----- years

## Computer Training

### Part V

In this section you are kindly requested to identify the level of training you have had in

	None		Frequently Extensive
1. General courses at college or university	1	2 3 4	5
2. Training provided by vendors or outside consultants	1	2 3 4	5
3. In house company courses	1	2 3 4	5
4. Through self study	1	2 3 4	5

## Computer knowledge and experience

### Part VI

The next set of questions assesses the actual experience you have working with computers and your knowledge about computers in general.

1. How many courses have you taken in computers? -----
2. How long have you used personal computers? ----- yrs
3. How long have you used computers in general? ----- yrs
4. How many courses have you taken in information systems (IS)? -----
5. How long have you participated in technical analysis & design of IS? ----- yrs
6. How long have you written programs in computer language? ----- yrs
7. How long have you used financial, statistical or other models on a microcomputer or mainframe system? ----- yrs

## Task-Technology Fit

### Part VII

1. Strongly Agree    2. Agree    3. Uncertain    4. Disagree    5. Strongly disagree

1. The details derived from the system up to date enough for my purposes.    1   2   3   4   5
2. The system always provides me with relevant and right data.    1   2   3   4   5
3. Sufficiently detailed data is maintained by the corporation.    1   2   3   4   5
4. It is easy to locate corporate or divisional data on a particular issue, even if I haven't used that data before.    1   2   3   4   5
5. On the reports or systems I deal with, the exact meaning of the data elements is either obvious, or easy to find out.    1   2   3   4   5
6. Getting authorization to access data that would be useful in my job is time consuming and difficult.    1   2   3   4   5

- |  |           |
|--|-----------|
| 7. There are times when I find that supposedly equivalent data from two different sources is inconsistent.                   | 1 2 3 4 5 |
| 8. The regular system activities (such as printed report delivery,...) are completed on time.                                | 1 2 3 4 5 |
| 9. I can count on the system to be "up" and available when I need it.  | 1 2 3 4 5 |
| 10. The computer systems I use are subject to unexpected or inconvenient down times which makes it harder to do my work.     | 1 2 3 4 5 |
| 11. The computer systems I use are subject to frequent problems and crashes.   | 1 2 3 4 5 |
| 12. There isn't enough training for me or my staff on how to find, understand, access, or use the company computer systems.  | 1 2 3 4 5 |
| 13. I am getting the training I need to be able to use company computer systems, languages, procedures and data effectively. | 1 2 3 4 5 |
| 14. I feel that IS personnel can communicate with us in familiar business terms that are consistent.                         | 1 2 3 4 5 |
| 15. IS takes a real interest in helping me solve my business problems.   | 1 2 3 4 5 |
| 16. It often takes too long for IS to communicate with me on my requests.  | 1 2 3 4 5 |
| 17. I generally know what happens to my request for IS services or assistance or whether it is being acted upon.             | 1 2 3 4 5 |
| 18. When I make a request for service or assistance, IS normally responds to my request in a timely manner.                  | 1 2 3 4 5 |
| 19. I am satisfied with the level of technical and business planning consulting expertise I receive from IS.                 | 1 2 3 4 5 |
| 20. IS delivers agreed-upon solutions to support my business needs.  | 1 2 3 4 5 |
| 21. Overall I am satisfied with the level of fit between the system used and the tasks I perform.                            | 1 2 3 4 5 |

## Beliefs about computer Usage

### Part - VIII

In this section we would like to find out what you believe are the advantages and disadvantages of your using computers in your job.

1= Strongly agree      4= Disagree  
2= Agree                5= Strongly Disagree  
3= Uncertain

1. Using a computer could provide me with information that would lead to better decisions.      1 2 3 4 5
2. Using a computer exposes me to vulnerability of computer breakdown and loss of data.      1 2 3 4 5
3. Using a computer allows me to be more innovative by providing the opportunities for more creative analysis and outputs.      1 2 3 4 5
4. Using a computer improves my productivity on the job.      1 2 3 4 5
5. Using computer gives me the opportunity to enhance my managerial image.      1 2 3 4 5
6. Using a computer would involve too much time doing mechanical operations (e.g. programming, inputting data) to allow sufficient time for managerial analysis.      1 2 3 4 5
7. Using a computer allows me to access, share, and retrieve information easily without difficulties.      1 2 3 4 5
8. I use a computer because my supervisor wants me to use it.      1 2 3 4 5
9. Using a computer will decrease the probability of committing errors.      1 2 3 4 5
10. Using a computer will make me depend less on my subordinates.      1 2 3 4 5

## **Current Technology Characteristics**

### **Part - IX**

The following sets of statements relate to your feelings and perceptions about the computer system you are currently using. For each statement, please show the extent to which you believe the system has the feature described by the statement.

1= Strongly agree  
2= Agree  
3= Uncertain  
4= Disagree  
5= Strongly Disagree

- |  |   |   |   |   |   |
|--|---|---|---|---|---|
| 1. The computer system I am using has up-to-date hardware and software.    | 1 | 2 | 3 | 4 | 5 |
| 2. The computer system I am using is dependable.                           | 1 | 2 | 3 | 4 | 5 |
| 3. The system is too difficult or expensive to maintain.                   | 1 | 2 | 3 | 4 | 5 |
| 4. The system adopted for my unit is not the expected one.                 | 1 | 2 | 3 | 4 | 5 |
| 5. Organizational priorities ceased to support system development and use. | 1 | 2 | 3 | 4 | 5 |

## **System Ease of Use**

### **Part X**

- |   |   |   |   |   |   |
|---|---|---|---|---|---|
| 1. I often become confused when I use the system.                           | 1 | 2 | 3 | 4 | 5 |
| 2. I make errors frequently when I use the system                           | 1 | 2 | 3 | 4 | 5 |
| 3. Interacting with this system is often frustrating.                       | 1 | 2 | 3 | 4 | 5 |
| 4. I find it easy to recover from errors encountered when I use the system. | 1 | 2 | 3 | 4 | 5 |
| 5. I find it easy to get the system to do what I want it to do.             | 1 | 2 | 3 | 4 | 5 |
| 6. The system I use provides helpful guidance in performing tasks.          | 1 | 2 | 3 | 4 | 5 |

## **Impact on Performance**

### **Part - XI**

- |   |           |
|---|-----------|
| 1. My job would be difficult to perform without this system.                        | 1 2 3 4 5 |
| 2. Using this system enhances my effectiveness on the job.                          | 1 2 3 4 5 |
| 3. Using this system improves my job performance.                                   | 1 2 3 4 5 |
| 4. Using this system saves me time.   | 1 2 3 4 5 |
| 5. Using this system enables me to accomplish tasks more quickly.                   | 1 2 3 4 5 |
| 6. Using this system enhances my effectiveness on the job.                          | 1 2 3 4 5 |
| 7. Using this system increases my productivity.                                     | 1 2 3 4 5 |
| 8. Using this system makes it easier to do my job.                                  | 1 2 3 4 5 |
| 9. Overall, I find this system useful and of positive impact on my job performance. | 1 2 3 4 5 |

## **User Satisfaction**

### **Part XII**

- |  |           |
|--|-----------|
| 1. The outputs provided by the system are relevant to the decisions I make.  | 1 2 3 4 5 |
| 2. The output I get contain information in the sequence I find to be useful. | 1 2 3 4 5 |
| 3. The system has been up and running whenever I have needed to use it.      | 1 2 3 4 5 |
| 4. Does the system provide sufficient information?                           | 1 2 3 4 5 |
| 5. Is the system accurate?   | 1 2 3 4 5 |
| 6. Is the information clear?   | 1 2 3 4 5 |

- |   |           |
|---|-----------|
| 7. Is the system user friendly?   | 1 2 3 4 5 |
| 8. Is the system ease to use?   | 1 2 3 4 5 |
| 9. Do you get the information you need in time?   | 1 2 3 4 5 |
| 10. Does the system provide up-to-date information?                                     | 1 2 3 4 5 |
| 11. Do you find the attitude of the electronic data processing (EDP) staff cooperative? | 1 2 3 4 5 |
| 12. Are you satisfied with the processing of requests for changes for existing changes? | 1 2 3 4 5 |
| 13. Do you find the degree of EDP training provided to you complete?                    | 1 2 3 4 5 |
| 14. Do you feel your participation in developing/revising the system sufficient?        | 1 2 3 4 5 |
| 15. Do you find the communication with the EDP staff harmonious?                        | 1 2 3 4 5 |
| 16. Overall, I am extremely satisfied with the system?                                  | 1 2 3 4 5 |



## ***APPENDIX B***

### **SURVEY VARIABLES**

## Survey Variables

AGE	Age
GENDER	Gender
EDUCLEVL	Educational Level
EMPNTPRD	Employment Period
YRSEXP	Years of Experience
SECTOR	What Sector does the organization belong to
SECOTHER	If sector is others (10)
DEPTMNT	Which department do you work
DPTOTHER	If other department
ORGLVL	Organizational level
ORGOTHER	If other organizational level
NBOFSUB	Number of Subordinates
ORGCHT1	Number of employees in organization
ORGCHT2	How would you describe growth of business activities in this market over the last 3 years
ORGCHT3	What percentage of the main work activities being carried as routine
ORGCHT4	How formal is your organization
ORGCHT5	How centralized is your org.
ORGCHT6	Market Competitiveness
ORGCHT7	Customers' needs and preferences' predictability
TASKCH1	Highly Complicated
TASKCH2	Highly Interdependent within same department
TASKCH3	Highly Interdependent in other departments
TASKCH4R	Tasks in my job simple and routine (negative)
TASKCH5	High Level of Expertise
TASKCH6	Data based on estimation rather than facts
TASKCH7	No single procedure to perform the task
TASKCH8R	The tasks are simple and well structured (negative)
TASKCH9	A lot of time and labor effort is needed to perform the task
TASKCH10	A great deal of mental effort is needed
TASKCH11	Tasks are unstructured
TSKCH12R	Tasks handled through computers (negative)
TASKCH13	Tasks require a lot of decisions
TASKCH14	Tasks require remote data
TASKCH15	Tasks related to ill-defined business problems
TASKCH16	Business Problems are ad-hoc and non-routine
TASKCH17	Business Problems involve answering questions not asked in the same form before
TASKCH18	Business Problems involve many business functions

USEPC	Use a personal computer
USEPCNO	Mainframe or minicomputer
PCCONNEC	Stand alone or connected
FREEACES	Free access to computer
SFWUSE1	Spreadsheet
SFWUSE2	DBMS
SFWUSE3	Statistical Packages
SFWUSE4	Modeling Systems
SFWUSE5	Graphical Systems
SFWUSE6	Word Processing
SFWUSE7	Third Generation Languages
SFWUSE8	Communication Packages
SFWUSE9	Forth Generation Languages
SFWUSE10	Others
SU_OTHER	If other software the subject uses
TASKIN1	Looking for trend
TASKIN2	Planning
TASKIN3	Forecasting
TASKIN4	Decision making
TASKIN5	Problem Solving
TASKIN6	Budgeting
TASKIN7	Preparing reports
TASKIN8	Data entry and retrieval
TASKIN9	Historical reference
TASKIN10	Controlling
TASKIN11	Up-to-date with current activities
TASKIN12	Adequately reporting to superiors
TASKIN13	Adding the productivity in the department
EXTCOMU1	How long do you use the computer
EXTCOMU2	Frequency of computer use
EXTCOMU3	Period of using current computer system
COMPTRN1	General courses at college
COMPTRN2	Vendor training
COMPTRN3	In house courses
COMPTRN4	Self study
COMPEXP1	Number of computer courses
COMPEXP2	Period of PC Use
COMPEXP3	Period of Computer use in general
COMPEXP4	Number of IS courses
COMPEXP5	Period of technical analysis and design participation
COMPEXP6	Period of writing pgms in computer languages
COMPEXP7	Period of using financial and statistical models

TSKTF1	Details are up to date
TSKTF2	System give relevant and right data
TSKTF3	Corporation maintains sufficiently detailed data
TSKTF4	Locating corporate or divisional data is easy
TSKTF5	Exact meaning of data element is obvious
TSKTF6_R	Authorization to access data is difficult (negative)
TSKTF7_R	Equivalent data from two sources is inconsistant (negative)
TSKTF8	Completion of regular system activities is on time
TSKTF9	System is up and available when needed
TSKTF10R	Computer systems are subject to unexpected down times (negative)
TSKTF11R	Computer systems are subject to frequent problems (negative)
TSKTF12R	No enough training is available (negative)
TSKTF13	The training needed to use company computer systems is available
TSKTF14	Communating familiar business terms by IS personnel is consistent
TSKTF15	IS helps in solving business problems
TSKTF16R	IS takes long time to communicate on request (negative)
TSKTF17	Knowledge about what happens to request for IS service
TSKTF18	IS response to request is timely
TSKTF19	Satisfaction with the level of IS technical expertise
TSKTF20	Delivery of agreed upon solutions by IS
TSKTF21	Satisfaction with system task fit
BFCUSE1	Computer provides information leading to better decisions
BFCUSE2R	Exposition to computer breakdown and loss of data (negative)
BFCUSE3	Provision of opportunities for creative analysis
BFCUSE4	Improving productivity on the job
BFCUSE5	Enhancing managerial image
BFCUSE6R	Involving too much time for mechanical operations (negative)
BFCUSE7	Allowing accessing, sharing and retrieving information
BFCUSE8R	Computer used because supervisor wants it (negative)
BFCUSE9	Decreasing the error probability
BFCUSE10	Depending less on subordinates
TECCH1	My computer has uptodate hardware and software
TECCH2	My computer is dependable
TECCH3_R	The system is too difficult or expensive to maintain (negative)
TECCH4_R	The system adopted is not the expected one (negative)
TECCH5_R	Organizational priorities ceased to support sys. dev. and use (negative)
SYSUSE1R	Confused when use the system (negative)
SYSUSE2R	Make errors frequently (negative)
SYSUSE3R	Frustrating (negative)
SYSUSE4	Easy to recover from error
SYSUSE5	Easy to get the system do what I want
SYSUSE6	Provides helpful guidance

IMPERFM1	Without the system my job difficult to perform
IMPERFM2	System enhances effectiveness on job
IMPERFM3	Improves my job performance
IMPERFM4	Save time
IMPERFM5	Enables to accomplish tasks more quickly
IMPERFM6	Increases my productivity
IMPERFM7	Makes it easier to do my job
IMPERFM8	Overall, useful and positive impact on my job performance
USATSF1	Relevant output to the decision making
USATSF2	I get output in the sequence i find to be useful
USATSF3	The system is always ready for my needs
USATSF4	The system provides sufficient information
USATSF5	System accurate
USATSF6	Information clear
USATSF7	User friendly
USATSF8	Easy to use
USATSF9	Do you get the information you need in time
USATSF10	Does the system provide upto date information
USATSF11	Do you find the attitude of the electronic DP staff cooperative
USATSF12	Are you satisfied with the processing of requests for changes for existing changes
USATSF13	Do you find the degree of EDP training provided to you complete
USATSF14	Do you feel your participation in developing the system sufficient
USATSF15	Do you find the communication with the EDP staff harmonious
USATSF16	Overall i am extremely satisfied with the system
TASK_AVG	Task Characteristic Average Calculation; $= (v20+v21+v22+v23+v24+v25+v26+v27+v28+v29+v30+v31+v32+v33+v34+v35+v36+v37) / 18;$
TASKAV_R	Task Characteristics Revised after average calculation
SWUSE_AV	Software Use Average; $= (v42+v43+v44+v45+v46+v47+v48+v49+v50+v51) / 10$
SWUSEA_R	Software Use Revised after Average calculation
TASKI_AV	Average of Task involvement; $= (v53+v54+v55+v56+v57+v58+v59+v60+v61+v62+v63+v64+v65) / 13$
TASKIA_R	Task involvement Revised after average calculation
COMPT_AV	Computer Training Average; $= (v69+v70+v71+v72) / 4$
COMPTA_R	Computer Training Average Revised
TTF_AVG	Task Technology Fit Average; $= (v80+v81+v82+v83+v84+v85+v86+v87+v88+v89+v90+v91+v92+v93+v94+v95+v96+v97+v98+v99+v100) / 21$
TTF AVG_R	Task Technology Fit Average Revised
BFPCU_AV	Beliefs about computer use Average; $= (v101+v102+v103+v104+v105+v106+v107+v108+v109+v110) / 10$
BFPCUA_R	Beliefs About computer use Average Revised
TECCH_AV	Technology Characteristics Average; $= (v111+v112+v113+v114+v115) / 5$

TECCHA_R	Technology Characteristics Average Revised
SYSU_AVG	System Use Average; $= (v116+v117+v118+v119+v120+v121)/6$
SYSUAV_R	System Use Average Revised
IMPER_AV	Impact Performance Average; $= (v122+v123+v124+v125+v126+v127+v128+v129)/8$
IMPERA_R	Impact Performance Average Revised
USTF_AVG	User Satisfaction Average; $= (v130+v131+v132+v133+v134+v135+v136+v137+v138+v139+v140+v141+v142+v143+v144+v145)/16$
USTFAV_R	User Satisfaction Average Revised
TTF_NEW	Task Technology Fit New Average; $= (v80+v81+v82+v83+v84+v85+v86+v87+v88+v89+v90+v100)/12$
TRAINING	Training TTF; $= (v91+v92)/2$
EDP_SUPP	EDP Support; $= (v93+v94+v95+v96+v97+v98+v99)/7$
UTILIZTN	0
TCH_EU	Average of the average of technology characteristics and the average of the ease of use; $= (v158+v160)/2$
QUALITY	0
QUALIT_R	Quality revised
LOCATBLT	Locatibility; $= (v83+v84)/2$
LOCATB_R	Locatibility revised
RELIABLT	Reliability; $= (v88+v89+v90)/3$
RELIAB_R	Reliability revised
EASE_USE	Ease of Use; $= (v91+v92)/2$
EASEUS_R	Ease of use revised
RELTNUSR	Rlationship with user; $= (v93+v94+v95+v96+v97+v98+v99)/7$
RELTNU_R	Relationship with user revised
TIMELNSS	Completion of regular system activities is on time
COMPATBL	Equivalent data from two sources is inconsistant (negative)
AUTHORZN	Authorization to access data is difficult (negative)
ROUTINSS	Routiness; $= (v20+v23+v24+v25+v26+v27+v28+v29+v30+v31+v32+v33+v34+v35+v36)/15$
ROUTIN_R	Routiness revised
INTERDPC	Interdependence; $= (v21+v22+v37)/3$
INTERD_R	Interdependence revised
ACC_FIN	Accounting, finance, auditing, billing, and credit
SERVICES	Training & services, operations, technical, and maintenance
GEN_MGT	General management, consultancy, hrd, research and development
SALE_MKT	Sales, marketing, warehouse
HOSPHEARM	Hospital, pharmacy, life insurance
ENGINPRD	Engineering, production, developing/manufacturing
TESTSUM	0
SPREADSH	Spreadsheets
DBMS	Database management systems softwares

STATISTC	Statistical Packages
MODELING	Modeling Systems Softwares
GRAPHICS	Object programming, graphical systems, presentations and Multimedia
WORDPRO	Word processing
THIRDGEN	Third generation languages
COMMUNCT	Communication packages
FOURTHGL	Fourth generation languages and utility software
SPECIALS	Auditing, accounting, production and sales, inventory
BANKING	Banking software
SW_SUM	Software summation; =(v188+v189+v190+v191+v192+v193+v194+v195+v196+v197+v198)