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**THE EFFECTS OF VARIOUS TRAINING  
METHODS AND COMPUTER INTERFACE  
ON LEARNING PERFORMANCE  
AND EASE OF USE**

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**A Research Topic  
Presented to Business School  
Beirut University College**

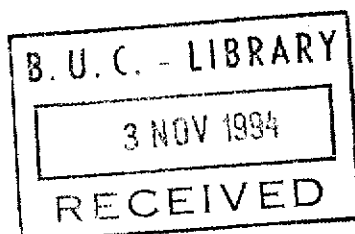
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**In Partial Fulfillment  
of the Requirements for the Degree  
Master of Science in Business  
Management**

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**BY  
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**JULY, 1994**



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BEIRUT UNIVERSITY COLLEGE

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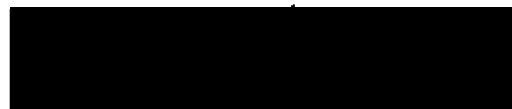
TITLE OF RESEARCH TOPIC     : THE EFFECTS OF VARIOUS  
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INTERFACE ON LEARNING PERFORMANCE  
AND EASE OF USE.

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**DEDICATION**

**TO..**  
**MY MOTHER**  
**&**  
**MY FATHER**  
**WITH ALL MY LOVE**

## ACKNOWLEDGMENT

I would like to extend my sincere gratitude to all those who participated in this research.

I would like to express my deep and sincere gratitude to Dr. Tarek Mikdashi who, by his generous cooperation, continuous assistance and guidance, has supervised the research through to completion. I would like also to extend my particular appreciation and gratitude to Dr. Hussin Hejase for his big assistance in providing sound remarks and advice.

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# CHAPTER I

## INTRODUCTION

### 1.1 General Overview.

During the past several years, the overall business environment and the information technology included within it have undergone tremendous changes. Information has grown highly in terms of computing capacity and speed. The increasing speed and capacity of hardware technologies pave the way for broader application of software in the areas of database management, distributed data processing, expert systems, and electronic communication. Moreover, the sharply reduced cost of computer technology and rapid improvements in the availability of software applications for business and of useful new technology in the fields of telecommunication and office automation have created a real opportunity to improve the effectiveness of management in corporate and non-profit organizations through improved use of information.

The environment of information processing is dynamic in nature. Whenever new technologies or ideas are introduced, a profound impact on the work environment and behavior of the personnel involved will result. In fact, the technologies of end user computing have produced such an impact. End user computing - the direct, hands-on use of computers by end users - has become an area of major importance to organizations over the past several years. End users include executives, managers, professional staff, secretaries, office workers, salespeople,

and others. A subset of end user computing is end user programming. Here, end users create procedures that they store and use over and over. For example, building a spreadsheet with Excel or Quattropro is end user programming. For example, as end users become more accustomed to using computers directly, such types of computer "programming" will increase.

One of the most important aspects of end user computing is its huge growth rate. It is the most rapidly growing segment of the information systems in many organizations. A study conducted at Xerox Corporation and described by Robert Benjamin<sup>1</sup> presented some surprising growth projections for end user computing. "In 1970, end user computing at the Xerox business unit was a negligible amount of the roughly 3.5 million instructions per second (MIPS) total capacity. By 1980, end user computing had grown to almost 40 percent of the 70 MIPS installed capacity". That represented a twenty fold increase in total capacity over the decade. The estimates in the study predicted would grow by a factor of twelve from 1980 to 1990, while end user computing would grow by a factor of forty, i.e., representing about 75 percent of the total workload.

The emergence and increasing importance of end user computing (EUC) has created several new challenges for the information systems (IS) department. "The new roles that IS departments are adopting to manage EUC include planning, acquiring hardware / software, training

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<sup>1</sup> R.I. Benjamin, "Information Technology in the 1990s: A Long Range Planning Scenarios", MIS Quarterly, (June 1982), pp. 11 - 31.



end users, providing consultation for designing and developing software, and giving ongoing support in the form of information centers.

Managing EUC is a critical and serious process. Panko<sup>2</sup> lists two factors to highlight the difficulties facing the IS department: diversities among applications and diversities in activities. Both are critical in defining IS roles. Yet, perhaps the most important factor that needs to be taken into consideration is the diversity among users. In fact, this factor is very important, and it assumes even more importance when the question of training arises.

## 1.2 Importance of Training.

With the increasing number of people using computers directly, information systems management faces a gigantic training and education task. For example, corporate executives who review organization wide plans for computer and communication systems need to know enough to make proper and efficient decisions concerning these new technologies. Middle managers need to learn how to manage in companies depending upon the computer processing power, because they will have much of the local responsibility for making sure the use of the systems is successful. End users need to learn data processing concepts and how to use specific computers, software applications, and on-line services.

The subject of training is particularly important because of the continuing shift of responsibility for information systems development

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<sup>2</sup> R.R. Panko, "Directions and Issues in End User Computing", quoted in Robert B. Bostrom, "The Importance of Learning Style in End-User Training", MIS Quarterly, (March 1990), p. 101.

and use. Educating executives on new technology is important since this will give them the ability to make decisions necessary to guide their companies in this technology-driven world. Specifically, executives who are knowledgeable about computer and communication technologies will be able to make better decisions in the following areas<sup>3</sup>:

1- *Allocating Resources.*

Probably the most important decisions top executives will make in the information systems area will be the allocation of corporate resources. Of course, methods such as the rules of thumb are no longer adequate as companies develop competitive strategies and products based on technology.

2- *Guiding Planning.*

Educated executives are more able to see the need for high-level guidance of the company's information resources from a global or company wide perspective. Moreover, they are more likely to see the need to coordinate the diverse efforts of information systems, office automation, corporate planning and so on.

3- *Setting the Tone of the Organization Toward Technology.*

Top management's reaction to new information systems ideas will be reflected throughout the organization. Because of this, executives knowledgeable in the new technologies are more likely to foster an attitude that promotes the type of employees' work to increase productivity.

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<sup>3</sup> Ralph H. Sprague and Barbara C. McNurlin, Information Systems Management in Practice, (N.J.: Prentice-Hall Inc., 1986), p. 421.

4- *Evaluating Implications.*

Executives who have learned something about the information technology will be more likely to consider the company wide implications of such a new technology. They will have already heard about some of the benefits and possible pitfalls of its use.

5- *Being Supportive During the Introduction of Technology.*

An important role that top management can play in introducing large information systems is being supportive. Without supportive management, the experimentation may stop before it really gets started.

6- *Evaluating Offers.*

Executives with some knowledge of the new technologies will be better able to evaluate the claims and advertisements concerning new product offerings.

### 1.3 Computer-Based End User Training.

While education deals with concepts and understanding, training emphasizes skills. End user training focuses on the skills required for non technical users to interact with a computer directly. But in order to use a computer competently, end users need to understand some basic data processing concepts. Thus end user training involves both education and training.

To start with, end users need five types of training<sup>4</sup>:

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<sup>4</sup> Ibid, pp. 435-436.

1- *Data Processing Concepts:*

Although training is skills-oriented, some conceptual background is usually needed before the skills can be learned. A major focus of concepts training is data processing literacy - learning how things are done in data processing. Examples include data and file concepts and understanding file creation, backup and maintenance.

2- *Quick Start:*

End Users need a way of quickly learning how to use a new machine, application, or service. Traditionally, they either have had to read through a manual (and learn a lot of unneeded information) or wait for the next scheduled training class. Even some computer-based training courses do not permit quick start, because they impose a certain curriculum on students. For educational purposes, this approach may be fine, but many experts agree that forcing end users to follow a rigid curriculum is not desirable<sup>5</sup>. Quick start training should proceed in small steps, with each step, reinforcing prior learning. Users should be required to repeat operations they learned in processing lessons so that the operations become familiar. Learning only comes through practice, says Grey. So quick start should encourage practice.

3- *Refresher Aids:*

Since many end users will not be using each computer application everyday, they are likely to forget how to perform some operations. So they will need some means of refreshing their

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<sup>5</sup> Gloria Grey, quoted in Sprague and McNurlin, Information Systems Management in Practice, p. 435.

memory, quickly and on line. This facility should be easy to start with and should allow the user to choose the topics he / she wants to review. A common approach is the computer-based training (CBI) tutorial that provides users with the facility of having a quick overall scan of the key features or commands of a system.

4- *Help in Overcoming Difficulties:*

Sometimes, users run into a situation for which they cannot find an explanation. Therefore, some type of on-line help is needed, preferably available without aborting one's on-line work. One example is the familiar help facility found in many end user products. Some facilities provide users with levels of help. The first level could be an explanation of how to enter a command correctly, the second level could explain how to use the various options, and the third level could be a tutorial.

5- *Explanation of Model Assumptions:*

As users become more experienced with computers, they might want to create forecasts and projections using modeling packages. In order to use such packages properly, these users need to understand the assumptions underlying the models, or else they may use them incorrectly.

1.4 The Need for the Study.

The rapid spread of end user computing has had a dramatic impact on the information processing in organizations. Aspects such as the rising rate of PC (personal computer) use and the availability of a wide variety of software applications for business reinforce the

importance of gaining a more thorough understanding of the factors related to efficient computer usage and end user satisfaction.

Today, with competitive pressures in most economic sectors, especially the service sector including banking, insurance and airline reservation sectors, sophisticated computer systems should be available to support managers in the decision making process and to ensure proper functioning there. However, organizations will not be able to enjoy the technical benefits of computerization unless they address the disfunctional side effects stemming from the human component. In this respect, user satisfaction or user acceptance should be considered as the key element determining the success or failure of the acquired information system. If end users learn and understand the appropriately selected information system properly, they will be satisfied, and this will enable the organization to achieve high cost reduction, improve product quality, increase productivity, efficiency and effectiveness in work output.

Thus, as a matter of fact, companies should realize the importance of today's end user systems and decide how best to manage and protect them. To manage them effectively, an organization's management must know how to control and support end users. This means that there should be increased interest in methods of giving sufficient attention to end users in order to aid and guide their activities. The importance of this study lies in that it will cast a light upon an area that information system executives should take into consideration in order to render this trend successful and productive - the area of providing end users with proper training through selecting an efficient and effective training method.

### 1.5 Statement of the Problem.

As end user computing emerged as a serious and rapidly growing effort in organizations, some problems were encountered when large numbers of non technical users began taking on more responsibility for information systems. On the one hand, personal computing encouraged innovation by putting computer support in the hands of a wide variety of knowledge workers. On the other hand, the lack of experimentation, learning and proliferation of the different EUC products<sup>6</sup> created incompatibility problems in both technology and training, i.e., technical incompatibility and lack of adequate and proper training.

User training can be considered as one of the critical factors responsible for ensuring the success of end user computing. A survey of senior information system (IS) executives found that "organizational learning and use of IS technologies" ranked fifth out of a list of 20 items considered to be critical IS management issues<sup>7</sup>. Another study points out that "basic and advanced training should be integral elements of any strategy designed to enhance end user efficiency and

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<sup>6</sup> Stephen K. Kuwan and Kathleen Foley Curley, "Corporate MIS/DP End User Computing", Database, (Summer 1989), p. 31.

<sup>7</sup> Fred Niederman and James C. Brancheau, "Information Systems Management Issues for the 1990s", MIS Quarterly, (Vol. 15, No. 4, December 1991), pp. 475 - 495.

effectiveness".<sup>8</sup>

In spite of the importance, it still appears that very little is known about how to design effective end user training. Examples of the problems that many trainees still encounter may include "overextending non-computer experience to computer systems, inability in recalling and using command syntax, difficulty in applying software packages to specific tasks, frustration with the complexity of training materials, and confusion about how to recover from errors".<sup>9</sup> While such problems could be attributed to inappropriate and ineffective training, another important factor should also be considered, namely, the computer interface design. In fact, such a factor can determine the difference between an easy to learn and easy to use system and a difficult and confusing system that may not be used. This urged interface designers to depend on the tactics on human engineering. "The goal of the human engineering approach is to create designs based on thorough understanding of the cognitive aspects underlying computer use".<sup>10</sup> Understanding these cognitive issues along with an increased understanding of training design will most probably lead to effective end user training programs.

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<sup>8</sup> C.E. White and D.P. Christy, "The Information Center Concept: A Normative Model and a Study of Six Installations", quoted in Sid A. Davis and Robert P. Bostrom, "Training End Users: An Experimental Investigation of the Roles of the Computer Interface and Training Methods", MIS Quarterly, (March 1993), pp. 61 - 85.

<sup>9</sup> Sid A. Davis and Robert P. Bostrom, "Training End Users: An Experimental Investigation of the Roles of the Computer Interface and Training Methods", MIS Quarterly, (March 1993), p. 61.

<sup>10</sup> *Ibid*, p. 62.



### Research Hypotheses.

The study intends to investigate the validity of the following hypotheses:

- 1- *Training outcomes (user perception of the system and learning performance) are most likely to be influenced by factors such as: characteristics of the system, training approaches (Instruction-based and Exploration), and trainee characteristics.*
- 2- *The variability of the computer interface design will have a direct effect upon end users' performance.*
- 3- *There is a combined learning effect of the computer interface and training method selected.*

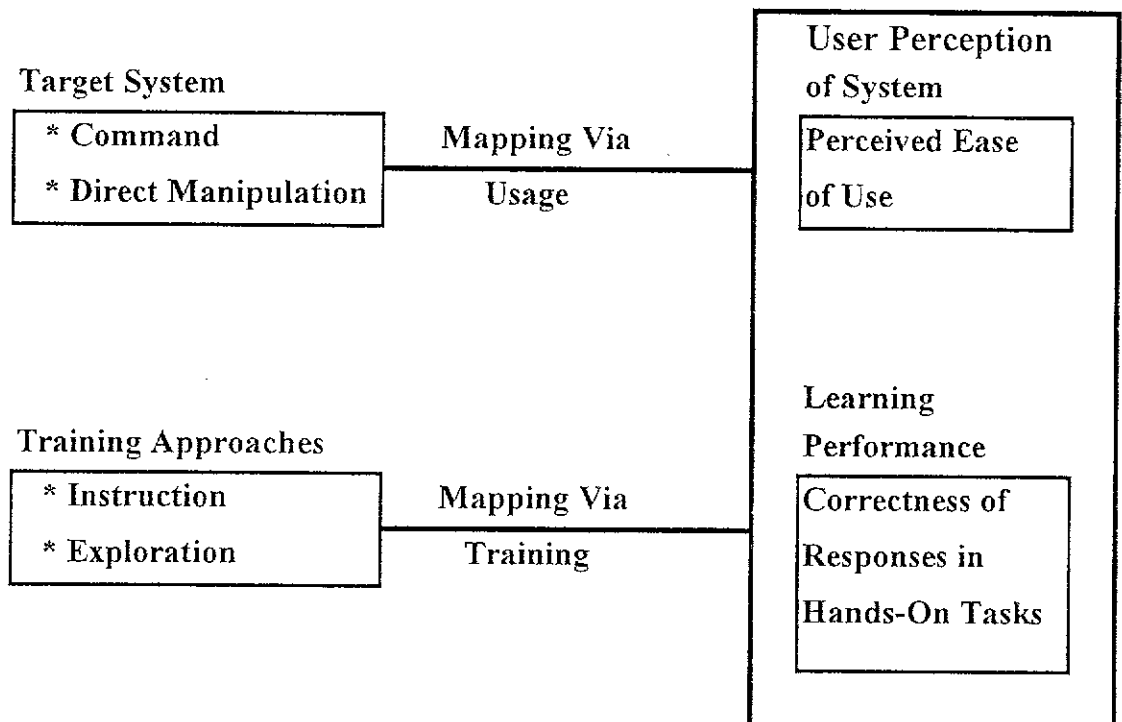
### 1.6 Statement of Purpose.

The purpose of the study is to investigate the impact of specific types of computer interfaces and training methods on novice users' learning performance and on their perceptions of the ease of using a system. Two types of interfaces will be compared: a direct or menu-based manipulation interface and a command-based interface. Also, two training methods will be compared: exploration training and instruction-based training. User performance will be measured through hands-on use of a computer system, and perceptions of its ease of use will be measured through a certain set of questions. Certain statistical methods

provided with the SPSS (Statistical Package for Social Sciences) facilities will be used to predict and explain the relationships between training methods, computer interfaces and training outcomes.

In fact, the study will be based on the model depicted in Figure 1.1.<sup>11</sup> It focuses on the influences of the target system to be learned, training approaches, and, added to them, trainee characteristics on training outcomes. Training outcomes include perceived ease of use of the system and task learning performance. The relationships or linkages between interface and training variables will be referred to as "Mappings".

**Figure 1.1 The Model of the Study**



<sup>11</sup> Ibid, p. 62 - 63.

Chapter II will be a review of the previous literature that dealt with the subject of end user training. Chapter III will be a description of the design and methodology followed and applied in the study. Chapter IV will present the study findings with an explanation to these findings along with a comparison to previous research findings. Finally, Chapter V will be a presentation of a conclusion for the study along with certain suggested recommendations.

## CHAPTER II

### REVIEW OF LITERATURE

#### 2.1 Introduction.

In this increasingly competitive world, management is becoming more and more concerned with improving employee productivity. Many of the new computer and communication technology sales claim promise to achieve a significant raise in the productivity of employees. These technologies themselves, however, probably cannot provide gains that are so much the center of attention. Management should not be led to expect this of technology. Instead, it is the employees, perhaps with the help of technology, that can provide the big gains. The key to increased productivity is people. Technology can help people do their jobs better if they are willing and if they are well prepared to use it.

In the previous chapter, it was mentioned that one of the critical keys of the success of any information management function lies in the effectiveness of end user operations. However, despite its great potential, end user computing needs to be managed and guided in order to avoid many of the problems which plagued information systems development during its early years.<sup>1</sup> In fact, of all the resources that an organization has, the human resources are the most important. Historically, Computer-Based Information System (CBIS)

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<sup>1</sup> James C. Brancheau, Douglas R. Vogel and James C. Wetherbe, "An Investigation of the Information Center from the User's Perspective", Database, (Fall 1985), p. 4.

implementation has tended to focus on the computer. This view continues in most organizations using the computer technology today, as is reflected in Kroeber and Watson's definition of implementation of information systems.<sup>2</sup> As these authors note, implementation consists of site preparation, hardware installation, software testing and debugging, and personnel training. Even personnel training, as it is typically conducted, focuses on adapting people to fit the design of the computer.

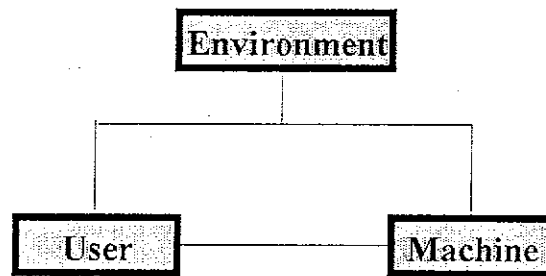
## 2.2 Moving Towards the Systems Context View in Adopting a CBIS.

This focus on the computer portion of the system is myopic. It has led the condition of placing the hardware and software at the center of the organization's universe and adapting the people to fit the CBIS. This symptom is highly widespread. However, it should be recognized that such a view, the machine oriented view, is too limited. What should be emphasized instead are the user's functions and needs. In ergonomics, or human factor engineering - the field that deals with the design of things for human use, such a view is better emphasized. It recognizes that the machine is only one of three subsystems in a well defined social systems context (Figure 2.1).

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<sup>2</sup> D.W. Kroeber and H.J. Watson, Computer-Based Information Systems: A Management Approach, (New York: Macmillan, 1984).

**Figure 2.1 The Systems Context of an Organization  
Adopting a CBIS**



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Source : Alan F. Dowling, "Implementation of Computer Based Information Systems in the Ambulatory Health Care Setting", quoted in Gordon B. Davis and Margerthe H. Olson, *Management Information System* (N.Y: McGraw-Hill Book Company, 1985), p. 15.

The other two subsystems are the users, the humans who use or are affected by the system, and the environment (both internal and external) in which the system is used. Ergonomics thus indicates that an organization, while adopting and implementing a CBIS, must be developed so that its people, work environment, and machine components are harmonically integrated to execute the organization's functions. This integration which is supposed to be directed towards the goal of achieving or implementing the organization's functions should ensure that the technology component - the hardware, software, and so forth - is supportive of and optimized for human use in a given work environment.

Thus the care for users is an important issue that should be taken into consideration in the development of an information system. This is because as it is stated by Doll:<sup>3</sup>

**"If the masses who are potential users of technology are not educated sufficiently to appreciate what it can do for them, you will find it going to waste".**

Here comes the importance of providing users with adequate and efficient educational and training programs. According to Stoll, "training is teaching users how to use a software to do a particular job. Education is teaching them to use the PC, so that they can apply the technology to the area in which they have the most knowledge"... in fact, however, ... "we get a better return on our investment by just

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<sup>3</sup> Dixon Doll as quoted in Brad Schultz, "Interview with Dixon Doll", Computer World, (March 18, 1981), p. 14.

teaching them how to use applications"<sup>4</sup> - i.e. by training them. Today, with so many end users needing knowledge about computer technology to do their jobs more effectively, training has become a major priority - and a major expense. It is one of the major services offered by an information center. Information center (IC) training can be provided on an individual, department wide, or company wide basis. It may be directed to a specific need or a specific application, such as training the purchasing department to use dBase to store and access purchasing records, or be aimed at increasing overall company literacy in a general or specific area of computing, such as instructing managers in the variety of end user tools that could facilitate their information processing requirements.

### **2.3 How Far an Organization Should Go in Training Users?**

It is often said that there is no substitute for good training. It is important that the information center providing training services devotes time to training users in areas other than purely technical ones. For example, a user trained about the need for requirements analysis will be less likely to hastily get a certain computer system or software package just because everyone else has it. Training is invaluable for communicating potential problems or issues such as "data integrity, technological versus functional obsolescence, compatibility among product technologies, proper care of microcomputer systems, and

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<sup>4</sup> Marilyn Stoll, "Teaching Users to Teach Themselves", PC Week, (September 1, 1987), p. 59.



security".<sup>5</sup> Some of the issues relating to just how far an organization should go in training users are presented by Stoll in her evaluation for training programs, how much users are really learning, and what they do really need to know, it was mentioned that one of the major roles of the information center is to train users, and many of them do a pretty good job of it. But often trainers concentrate on teaching users in a very narrow way how to use technology resources to perform a specific job. When this is the case, important skills sometimes "fall through the cracks". Taking the case of a California user who wanted to add an application to the system menu on his PC disk, Stoll found out that he had wound up placing a call to a trainer because he had not known how to access the 'A' drive. Similarly, Stoll continues, there are many PC users who do not have the least idea of how to copy a file or disk, format a disk, or even explain the difference between secondary and primary memory. But when one draws the line between essential literacy and nonessential ones - given the wide variety of different, contingency-based situations - becomes the main issue. For example, does a data-entry clerk in a high-turnover job need to know how to copy a disk? Would the case be different if it were a low-turnover job? Moreover, the problem in many training classes is compounded because attendees often have different backgrounds and different requirements.<sup>6</sup>

As it is reported by Stoll, according to some professional trainers, "some companies have a philosophy of teaching users only what they

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<sup>5</sup> Charles S. Parker, Management Information Systems, Strategy and Action. (N.Y: McGraw-Hill publishing company, 1989), p.

<sup>6</sup> Stoll, "Teaching Users to Teach Themselves", ref (4), p. 59.

need"... however, "users need to know a lot", companies are not "aggressive selling training... Because they are so busy being reactive, they do not take time to be proactive". Moreover, corporate training programs that go beyond extremely basic applications tutorials claim benefits in the areas of greater worker productivity, fewer calls to their IC support staffs, and putting the full potential of technology in the hands of the people "who should be the primary catalysts for innovation in the organization". Some companies are moving from training to education. But many trainers and managers ascribe more to training. As it is stated by an end user manager in the insurance industry, "I do not want users getting too adventurous... I would not want them blowing up the files because they got curious". Also, "some department managers are holding out on training because they have seen others getting too caught up in the technology". In many of these firms, the response has been to have the IC staff build powerful front-ends to systems and applications software, so users will have the advantages of the sophisticated power afforded by technology without any of the implementation problems.<sup>7</sup>

The importance of effective training in ensuring the success of end user computing (EUC) has been emphasized by several researchers in information systems. The following section presents a framework for investigating the computer learning process. It describes prior research related to the effects of the computer interface and training methods on learning outcomes.

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<sup>7</sup> Ibid, p. 59.

## 2.4 Roles of the Computer Interface and Training Methods.

User training has been identified as one of the key factors responsible for ensuring the success of end user computing (EUC). As non-professional computer users come to rely on computer systems to perform more and more of their basic tasks, MIS managers need to ensure that those individuals learn to use software packages effectively. In a study to measure user satisfaction with EDP / MIS<sup>8</sup>, it was found that technical support, including trouble shooting, training, and documentation, was ranked among the most important ones (above the midpoint) on the list. The list included items concerning user expectations, system usage, technical support, type of computer, power and control, user involvement, and communication. Documentation and training were seen as important issues by a significant majority of the respondents, but they do not make the top ten. A recent survey of senior information system (IS) executives found that the internal effectiveness issues have made a strong comeback after being ignored in 1986. IS human resources, software development, and the applications portfolio - issues that make up the core of the IS function - all increased in importance. Here, "organizational learning and use of IS technologies" ranked fifth out of a list of 20 critical IS management issues.<sup>9</sup> Another study points out that basic and advanced training should be integral

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<sup>8</sup> David W. Cornath and Olivier P. Mignen, "What Is Being Done to Measure User Satisfaction with EDP / MIS", Information and Management, (Vol. 19, No. 10, 1990), pp. 7-19.

<sup>9</sup> Fred Niederman, James C. Brancheau, and James C. Wetherbe, "Information Systems Management Issues for the 1990s", MIS Quarterly, (Vol. 15, No.4, Dec. 1991), pp. 475 - 495.

elements of any process designed to enhance end user efficiency and effectiveness.<sup>10</sup>

A study conducted by Davis and Bostrom<sup>11</sup> concerning end user training used the experimental design method to investigate the roles of the various computer interface and training methods. The researchers stated that for individuals to learn to use software packages effectively, two common, and often complementary, approaches for achieving this goal have been to develop in-house training programs and to utilize computer systems that are "user friendly". Using Assimilation Theory as a basis for this study, the author investigated the impacts of two types of training methods and two computer interfaces on users' learning performance and attitudes toward a computer system. The theory argues that in order to achieve meaningful learning, "an individual must integrate new knowledge with knowledge that already exists in long-term memory".<sup>12</sup> In order to achieve this integration, however, the individual first must possess an appropriate assimilative context which provides a basis for thinking about and reasoning with the new knowledge.

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<sup>10</sup> C.E. White and D.P. Christy, "The Information Center Concept: A Normative Model and a Study of Six Installations", MIS Quarterly, (Vol. 11, No. 4, December 1987), pp. 451-458.

<sup>11</sup> Sid A. Davis and Robert P. Bostrom, "Training End Users: An Experimental Investigation of the Computer Interface and Training Methods", MIS Quarterly, (March 1993), p. 61.

<sup>12</sup> Ibid, p. 73.

### 2.4.1 Computer Interfaces.

Today's computing environment includes three major types of interfaces: command-based, direct manipulation, and menu-based . Command-based interfaces use a conversational metaphor that requires users to enter and read English-like commands, e.g., DOS-based systems. Direct manipulation interfaces (DMI) allow users to enter commands by "pointing" to icons, objects, words or cells on the screen. Finally, menu-based interfaces require users to select command options from lists or menus. Each of these interfaces presents a model of the computer either directly - in the form of objects to be manipulated, or indirectly - through the use of a command language or menu driven system. The interface model suggests that individuals learn systems by actually using them.<sup>13</sup>

The study conducted by Davis and Bostrom focused on DMI and command-based designs with the consideration that they represent basically different views of how users should interact with systems. Previous literature presented by the two researchers shows that emphasizing the superiority of each of these two types of interaction - especially for the direct manipulation interfaces - has been common.<sup>14</sup> However, other empirical studies have compared DMI with command-based interfaces in terms of their ease of learning, performance, or impact on user perceptions of computer systems. The literature review

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<sup>13</sup> Ibid, p. 62.

<sup>14</sup> B. Shneiderman, "The Future of Interactive Systems and emergence of direct Manipulation", Behavior and Information Technology. (Vol. 1, No. 3, July-September 1982), pp. 237 - 256.

showed that several studies that have compared direct manipulation with command-based interfaces lack a theory base, and thus the findings tend to be unclear and contradictory.<sup>15</sup> For example, some studies suggest that DMI aids learning,<sup>16</sup> while others show no benefits or even decreased learning performance.<sup>17</sup> Although these studies provide useful information regarding the relative learning effects of DMI versus command-based systems, they offer few explanations as to the reasons beyond the results obtained. To overcome such a limitation, Davis and Bostrom used the Assimilation Theory as a basis for explaining the differences between these interfaces.

Assimilation theory defines two types of learning - meaningful learning and rote learning.<sup>18</sup> As defined by Ausubel,<sup>19</sup> meaningful learning occurs when an individual connects new information with knowledge that already exists in the memory in a substantive manner. Thus individuals who experience meaningful learning will have a very good understanding of concepts underlying the newly acquired knowledge and an ability to apply those concepts to new situations. Rote learning, however, relates new knowledge to existing knowledge in an arbitrary form. Rote learners thus simply memorize information

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<sup>15</sup> Davis and Bostrom, "Training End Users: An Experimental Investigation of the Roles of the computer Interface and Training Methods", p. 63.

<sup>16</sup> H.S. Woodgate, "The Use of Graphical Symbolic Commands (Icons) in Application Programs", quoted in Davis and Bostrom, "Training End Users", ref (11), p. 63.

<sup>17</sup> J.M. Carroll and S.A. Mazur, "Lisa Learning", IEEE Computer, (Vol. 19, No. 11, November 1986), pp. 35 - 49.

<sup>18</sup> Davis and Bostrom, "Training End Users", ref (11), p. 63.

<sup>19</sup> D.P. Ausubel, Educational Psychology: A Cognitive View, (N.Y: Holt, Reinchart and Winston, 1968).

without an emphasis on its meaningful connection to prior knowledge. Ausubel argues that knowledge that is learned by memorizing, or rote, is retained for only short periods of time because it is related to short-term memory rather than connected to existing knowledge in long-term memory. Moreover, information that is simply memorized is more susceptible to interferences from other arbitrarily stored information than is the case with meaningful learning.

According to Mayer, the process of meaningful learning (shown in figure 2.2) is described as follows:<sup>20</sup>

1. *Reception:*

The learner here receives new information and transfers it to short-term memory (Arrow 1).

2. *Availability:*

The learner then searches long-term memory for appropriate matching ideas or concepts (Arrow 2).

3. *Assimilation:*

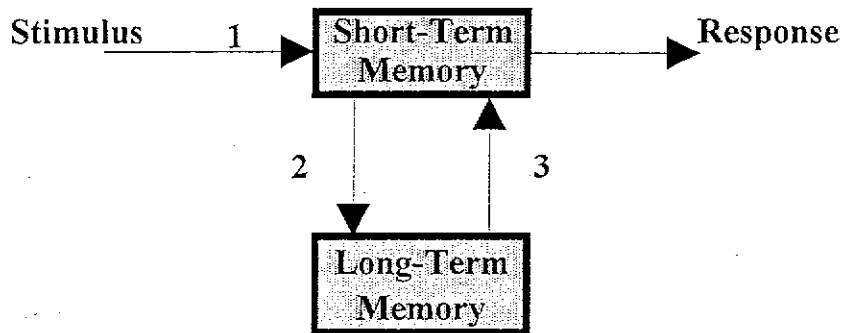
This prerequisite knowledge is transferred to short-term memory where it is actively used in order to connect it to the new information (Arrow 3).

Assimilation theory suggests that meaningful learning can occur only if all these three conditions are met. It thus provides a basis for understanding why a given type of interface may be more effective than

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<sup>20</sup> R.E. Mayer. "The Psychology of how Novices Learn Computer Programming", Computer Surveys, (Vol. 13, No. 1, March 1981), pp. 121 - 141.

Figure 2.2: The Process of meaningful learning.



Source : Mayer, 1981.



another in training new users. An important point is that in order to achieve meaningful learning, individuals must search the long-term memory for matching ideas or contexts (Availability). Certain studies<sup>21</sup> suggest that learners must be provided with cues to help them retrieve appropriate concepts. This can suggest that DMI may be more effective than command-based systems in promoting meaningful learning since they provide models with which to assimilate new information. Another important point of Assimilation Theory is that learners must work with prerequisite knowledge drawn from long-term memory in order to integrate it with the new information available in the short-term memory. Again here, "DMI extends the traditional notion of static conceptual models to include dynamic models that allow learners to work directly with prerequisite knowledge".<sup>22</sup> On the other hand, learners using a command-based system will use static conceptual models and / or mental models which lack either the dynamic or concrete properties of their DMI counterparts.<sup>23</sup> Thus, they would be expected to play a less significant role in meaningful learning. Moreover, command-based systems also introduce the abstraction of a command language between the system and the user. Hutchins argues that this added requirement "increases cognitive processing demands by

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<sup>21</sup> M.L. Gick and K.J. Holyoak, "Schema Induction and Analogical Reasoning", Cognitive Psychology, (Vol. 15, No. 1, January 1983), pp. 1 - 38.

<sup>22</sup> Davis and Bostrom, "Training End Users", ref (11), p. 65.

<sup>23</sup> Ibid, p. 65.

first requiring users to translate their intentions into a form that the system recognizes".<sup>24</sup>

#### 2.4.2 Training Approaches.

Davis and Bostrom examined the impacts of exploration versus instruction-based training. Some researchers have suggested that exploration training is more effective than instruction-based training in facilitating the process of meaningful learning.<sup>25</sup> reviewing the literature on exploration and instruction-based training would define two general classes of training features - process features which describe the mechanisms by which individuals carry out learning activities, and structural features which refer to the organization of training materials.<sup>26</sup> Process features include: reasoning process, level of programming, and control of learning.

\* **Reasoning Process:**

This is characterized by two processes - induction and deduction. Induction is a key factor of exploration learning, and it implies that the learner works from exemplars to discover general underlying propositions. On the other hand, deduction involves reasoning from

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<sup>24</sup> E.L. Hutchins, J.D. Hollan, and D.A. Norman, "Direct Manipulation Interfaces", in User System Design-New Perspectives on Human-Computer Interaction, (N.J: Lawrence Erlbaum Associates, 1986), pp. 87 - 124.

<sup>25</sup> J.B. Black, J.M. Carroll, and S.M. McGuigan, "What Kind of Minimal Instruction Manual is the Most Effective", in Proceedings: Human Factors in Computing Systems, (N.Y: Association for Computing Machinery, 1987), pp. 159 - 162.

<sup>26</sup> Davis and Bostrom, "End User training", ref (11), p. 66.

general rules to specific facts, and it is a fundamental feature of instruction-based learning.

\* **Level of Programming:**

This refers to the amount of structure available in the learning process. Exploration learning involves trial-and-error. Whereas instruction-based learning with its programmed format minimizes the occurrence of trials and reduces, but does not eliminate, the number of error occurrences.<sup>27</sup>

\* **Control of Learning:**

In the exploration learning, much of the control of the learning process is within the hands of the learner. Instruction-based learning, on the other hand, defines and controls almost all aspects of learning. The learner thus has to follow the instruction as it is presented.<sup>28</sup>

The structural features include level of completeness and learning orientation.

\* **Level of Completeness:**

Completeness refers to the amount of task-relevant information provided to the learner. In exploration learning, materials provide only generalized frameworks. Instruction-based materials, however, provide

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<sup>27</sup> J.M. Carroll et al., "Exploring a Word Processor", Human-Computer Interaction, (Vol. 1, No. 3, 1985), pp. 283 - 307.

<sup>28</sup> J.D.W. Andrews, "Discovery and Exploring Learning Compared: Their Effects on Independent and Dependent Students", Journal of Educational Research, (Vol. 78, No. 2, November - December 1984), pp. 80 - 89.

specific rules and examples that require only that the learner read and work through them step by step.<sup>29</sup> Such materials can be considered relatively complete.

\* **Learning Orientation:**

Exploration learning focuses on broad outcomes such as modifying a document or building a spreadsheet. Instruction-based learning, however, tends to emphasize specific features of a task domain, such as copying the contents of spreadsheet cells.<sup>30</sup>

The various features of instruction and exploration learning are shown in figure 2.3.

Keeping the Assimilation Theory in mind, one can say that exploration training offers advantages over instruction-based training in facilitating the active orientation of the theory. Studies comparing exploration and instruction-based training have focused primarily on their effects on rote and meaningful learning. (It is worth mentioning that rote learning is measured by performance in near-transfer tasks, or tasks that require retention of concepts similar to those presented during training, and meaningful learning by far-transfer performance).<sup>31</sup> Recently, as reported in the review of literature presented by Davis and Bostrom, several studies that have evaluated the effect of exploration and instruction-based training on learning computer systems have been

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<sup>29</sup> Carroll et al., 1985, quoted in Davis and Bostrom, "End user Training", ref (11), p. 66.

<sup>30</sup> Ibid, p. 67.

<sup>31</sup> Ibid, p. 68.

conducted. For example, Carroll et al.<sup>32</sup> found that exploration training was more effective than instruction-based training in teaching individuals how to use a word processor. Advantages they report include reduced learning and task performance times. Similar findings are reported by Raban<sup>33</sup> using a different word processing system.

**Figure 2.3: Features of Instruction and Exploration Training**

Exploration - Based		Instruction - Based
<i>Process Features</i>		
Induction	(Reasoning Process)	Deduction
Trial and Error	(Level of Programming)	Programmed
High Learner Control	(Control of Learning)	Low Learner Control
<i>Structural Features</i>		
Incomplete Learning Materials	(Level of Completeness)	Complete Learning Materials
Task Focus	(Learning Orientation)	Features Focus

Source : Davis and Bostrom, "End User Training", ref (11), p. 67.

<sup>32</sup> J.M. Carroll et al., "The Minimal Manual", Human-Computer Interaction, (Vol. 3, No. 2, 1987), pp. 123 - 153.

<sup>33</sup> A. Raban, "Word Processing Learning Techniques and User Learning Preferences", quoted in Davis and Bostrom, "End User Training", p. 68.

Furthermore, as is also reported by Davis and Bostrom, a study was conducted by Olfman<sup>34</sup> to investigate the effect of exploration and instruction-based training on users learning the Lotus 1-2-3 spreadsheet package. Unlike other researchers, he found that learning groups exhibit little differences in their performance. Although there is no complete agreement among researchers, the major evidence suggests that exploration training is more effective than instruction-based training in helping users learn certain types of software. The lack of agreement of studies in computer learning field could be attributed to differences in the ways that tasks have been defined. For example, some researchers (e.g. Carroll et al., 1987) described tasks as being "basic" or "advanced", while others (Olfman, 1987) made no such distinctions. Davis and Bostrom, in their study concerning end user training, clarified distinctions between task types using the definitions of task complexity, i.e., near-transfer and far-transfer tasks.<sup>35</sup>

#### 2.4.3 Interactions Between Interfaces and Training Approaches and Their Effect upon Users' Perceived Ease of Use.

Assimilation Theory also suggests that there may be a combined learning effect between the computer interface and the training method.

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<sup>34</sup> L. Olfman. "A Comparison of Applications-Based and Construct-Based Training Methods for DSS Generator Software", 1987, quoted in Davis and Bostrom, "End User Training", pp. 68 - 69.

<sup>35</sup> Davis and Bostrom. "End User Training", ref (11), p. 69.

Such a combined learning effect could provide users with great enhancements to ease of use.<sup>36</sup> In their study, "User Acceptance of Computer technology", Davis et al.<sup>37</sup> addressed the ability to predict people's computer acceptance from a measure of their intentions, and the ability to explain their intentions in terms of their attitudes, subjective norms, perceived ease of use, perceived usefulness, and related variables. Using the Technology acceptance Model, two particular beliefs - perceived usefulness and perceived ease of use - were considered of primary relevance for computer acceptance behaviors. Perceived usefulness is defined as the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context. Perceived ease of use refers to the degree to which the prospective user expects the target system to be free of effort.<sup>38</sup> The Technology Acceptance Model (TAM) postulates that computer usage is determined by behavioral intentions, and views behavioral intentions as being jointly determined by the person's attitude toward using the system and perceived usefulness. The TAM is shown in figure 2.4. The model implies that perceived usefulness can be affected by various external variables over and above ease of use. For example, if one graphics program produces higher quality graphs than its equally easy-to-use counterparts, it should be considered more useful. Similarly, educational

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<sup>36</sup> Ibid, p. 69.

<sup>37</sup> Fred B. Davis, Richard P. Bagozzi, and Paul R. Warshaw, "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models", Management Science, (Vol. 35, No. 8, August 1989), pp. 982 - 1002.

<sup>38</sup> Davis et al., "User Acceptance of Computer Technology", ref (37), p. 985.

programs designed to persuade potential users of the power offered by a given system and the degree to which it may improve users' productivity could well influence usefulness. Thus, learning based on feedback is another type of external variable apt to influence usefulness beliefs.<sup>39</sup>

The model also shows that perceived ease of use is determined by external variables. Many system features such as menus, icons, mice and touch screens are specifically intended to enhance the perceived ease of use and usability measures. Moreover, training, documentation and user support consultants are other external factors which may also influence ease of use, and in turn influence the level of system usage. In a study conducted by Mawhinnery and Lederer concerning personal computer utilization by managers,<sup>40</sup> it was reported that higher use times were associated with more training. Persons with more computer training use PCs to a greater extent. Viewed as a traditional part of system implementation, it is expected that the vast majority of users will require formal training in order to gain proficiency in use. Mawhinnery and Lederer assessed computer training through: (1) number of computer courses completed, (2) the number of different languages in which a computer program has been written, (3) hours of computer training in the previous six months, and (4) satisfaction with the availability of training.

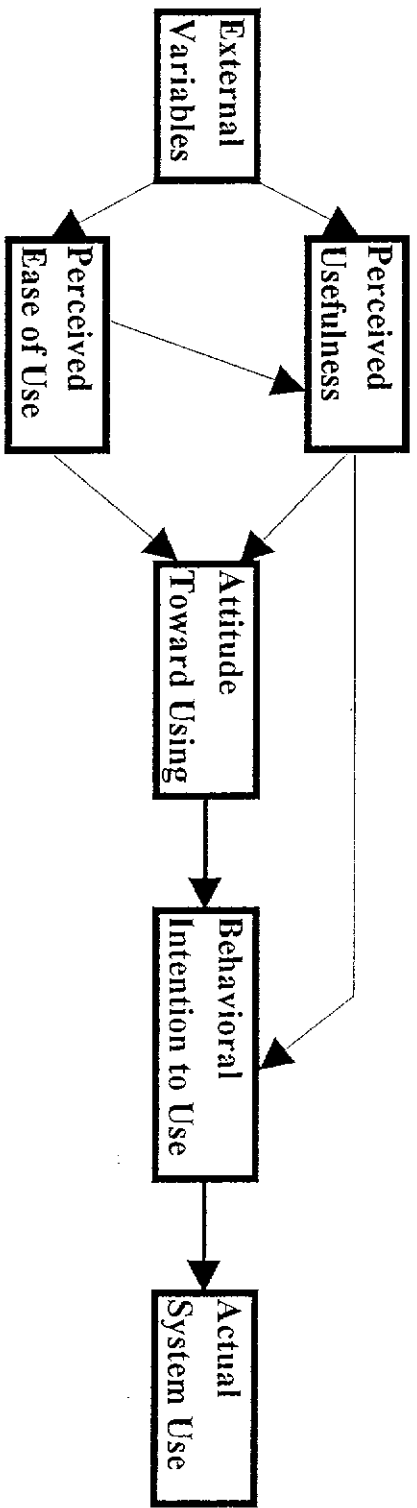
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<sup>39</sup> Ibid, p. 987.

<sup>40</sup> Charles H. Mawhinnery and Albert L. Lederer, "A Study of Personal Computer Utilization by Managers", Information and Management, (Vol. 90, No. 18, 1990) pp. 243 - 253.



Figure 2.4 : Technology Acceptance Model (TAM).



Source : Davis et al., "User Acceptance of Computer Technology", p. 985.

Keeping the TAM in mind, and coming back to the various computer interfaces and training approaches investigated by Davis and Bostrom, one could reach to the following conclusions:

(1) DMI can provide users with the opportunity to work directly with a model of the system instead of indirectly through a command language. Therefore, one would expect users to rate DMI systems as being easier to use than command-based systems.

(2) By matching DMI with the type of learning that it supports, trainers could add to the system level of ease of use. "This extends the proposition by Davis et al. (1989) that certain individual external factors can be used to influence ease of use. It suggests, in particular, that synergistic relationships exist between an interface and training method".<sup>41</sup>

To test their set hypotheses, a laboratory experiment was conducted, and 2\*2 multiple analysis of variance (MANOVA) was used (with follow-up ANOVAs) with the interface and training method as the two factors. To start with, two types of manuals were created to operationalize the training treatments: an exploration manual and an instruction-based manual. The exploration manual encouraged an inductive approach to learning by requiring subjects to first work through examples provided to them, then create examples of their own. Subjects also were encouraged to explore the computer system through leaving the exploration manual incomplete. The instruction-based manual encouraged a deductive approach to learning. First, it presented subjects with general rules for performing commands or operations.

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<sup>41</sup> Davis and Bostrom, "Training End Users". ref (11), p. 69.

Then it followed these rules with specific examples. Unlike the exploration manual, the instruction-based manual was relatively complete. That is, it left little control to the learner. In addition, it emphasized specific features of the system rather than overall tasks.

The research framework of Davis and Bostrom's study identified two measurable outcomes of computer learning - learning performance and users' perceptions of the system. In their study, learning performance was measured by subjects' overall performance in hands-on tasks. Users' perceptions of the system were measured by a questionnaire that evaluated perceived ease of use (adopted from Davis, 1989).

A 12-item computer task set was provided to each of the interface / training groups. Nine of the tasks, defined as near-transfer (NT), were similar to the tasks presented in the training manuals. These were designed specifically to measure subjects' recall of information, and each required only one or two operations to complete. Near-transfer tasks included: displaying the contents of directories, making or removing directories, changing the current directory, copying files, and displaying file contents. The remaining three tasks were far-transfer (FI). For example, one far-transfer task asked subjects to create a simple, multi-level directory structure. It described the appearance of the desired structure, but gave no clues about how to create it. Thus, subjects had to determine which simple operations to use in order to accomplish the task, then figure out how to apply them. The second far-transfer task asked subjects to remove a directory, but first to save the file that it contained into a second directory. The third task required them to reverse a simple directory hierarchy.

The Perceived Ease of Use questionnaire was used by Davis and Bostrom to measure users' perceptions of the ease of learning a specific software package and their expectations that they could become skillful in its use. The researchers measured this factor in order to determine the extent of the relationships between ease of use and the interface by training combination.

### Experimental Procedure and Data Analysis.

Eighty undergraduate students from an introductory computer course volunteered to participate in the study. They were selected on the basis of having had little or no previous experience with personal computers, and of having no knowledge of operating system commands. Eight training sessions of ten subjects each were held in one Macintosh (for DMI) and one PC (for Command-Based Interface) laboratory. The format of each session was the same. That is, the experimenter first presented an overview of the study and a description of subsequent activities. Next, subjects worked through the training manuals then completed the perceived ease of use questionnaire. Finally, subjects worked through the set of hands-on computer tasks and were given a disk and a task sheet to work with and record the solutions on. For this phase, subjects were allowed 30 minutes to complete the 12 tasks. Davis and Bostrom reported that DMI subjects finished the tasks within about 20 minutes (mean = 19.6 minutes, standard deviation = 3.48 minutes). Command-based subjects, however, generally took the entire 30 minutes (mean = 29.2 minutes, standard deviation = 2.57 minutes).

As for data analysis, three judges reviewed the computer disks and task sheets and assigned scores for each of the 12 computer tasks. A score of 3 was given for solutions that were completely correct and a score of 0 for those that were incorrect. A score of 2 was given for partially correct solutions and 1 for those that were incorrect but contained elements of the correct solutions. Interrater reliability estimates were calculated for the computer tasks. They were 0.98 for near-transfer and 0.98 for far-transfer, indicating that the grading procedures were well defined. Reliability estimates were also calculated for the two kinds of tasks, and results indicated that each scale was within an acceptable range - near-transfer = 0.74 and far-transfer = 0.85. Concerning the instrument which measured perceived ease of use (four 7-point Likert-scaled items), Cronbach's Alpha was calculated. The result was 0.92, which is almost the same as the value reported by Davis et al.<sup>42</sup> (1989).

The experimental groups were also compared with regard to several background variables: frequency of PC use, sex, grade point average (GPA), and number of prior computer classes. Results of these tests indicated that there were no significant differences between the groups with regard to number of computer classes or sex. However, the interface groups differed with respect to GPA, where the command-based group was slightly higher than DMI, and with respect to frequency of use, where the instruction-based group was marginally higher than the exploration group.

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<sup>42</sup> Davis and Bostrom, "Training End Users", ref (11), p. 72.

A correlation analysis of the dependent variables revealed that they were significantly correlated at a level of significance,  $p < 0.01$ -far-transfer with near-transfer = 0.74; far-transfer with perceived ease of use = -0.36; and near-transfer with perceived ease of use = -0.32. results of the multiple analysis of covariance and analysis of covariance showed that the covariates frequency of use and GPA were not significant. Therefore, to analyze the data, MANOVA and ANOVA were used.

Results of the statistical tests conducted in the study provide strong evidence to support the use of a direct manipulation interface for training novice computer users in basic concepts of operating system structure and function. The performance advantages of DMI subjects in hands-on tasks were substantial. This occurred regardless of the training method used. The inability to show the advantage of exploration training was attributed by the researchers to two factors. One factor was the backgrounds of subjects who were all college sophomores, most of whom were in the 19 to 20 year old age range. It is highly probable that most of them were accustomed to very structured learning environments, and, as a result, they may have been more comfortable with training that provided all the steps for them, as the instruction-based training did. This, in turn, may have reduced the effects of exploration training. A second possible explanation was that, as the researchers stated, the tight time constraints. The advantages of exploration training may only be realized when subjects are given longer periods of time to use the system.

## 2.5 Factors Leading to the Success in End User Training.

In a research conducted about "the Importance of Learning Style in End User Training", Bostrom, Olfman, and Sein<sup>43</sup> report that there is a vast amount of evidence from research in related areas such as educational psychology that individual differences, such as learning style, may affect users learning about a new EUC software package. The review of literature conducted by the researchers shows that previous research work has developed a framework for end user training arguing that individual differences are important.<sup>44</sup> The research findings were derived from four studies that utilize the Bostrom et al. (1988) framework to examine different software training methods. This multiple study approach was used by the researchers to test specific variables that could predict learning outcomes for end user training given different software and training contexts. A common individual difference variable in all four studies is learning style.

A research framework was developed to study the computer learning process that integrates research from cognitive psychology and educational psychology and information systems and computer science.<sup>45</sup> This research model is shown in figure 2.5. The model shown

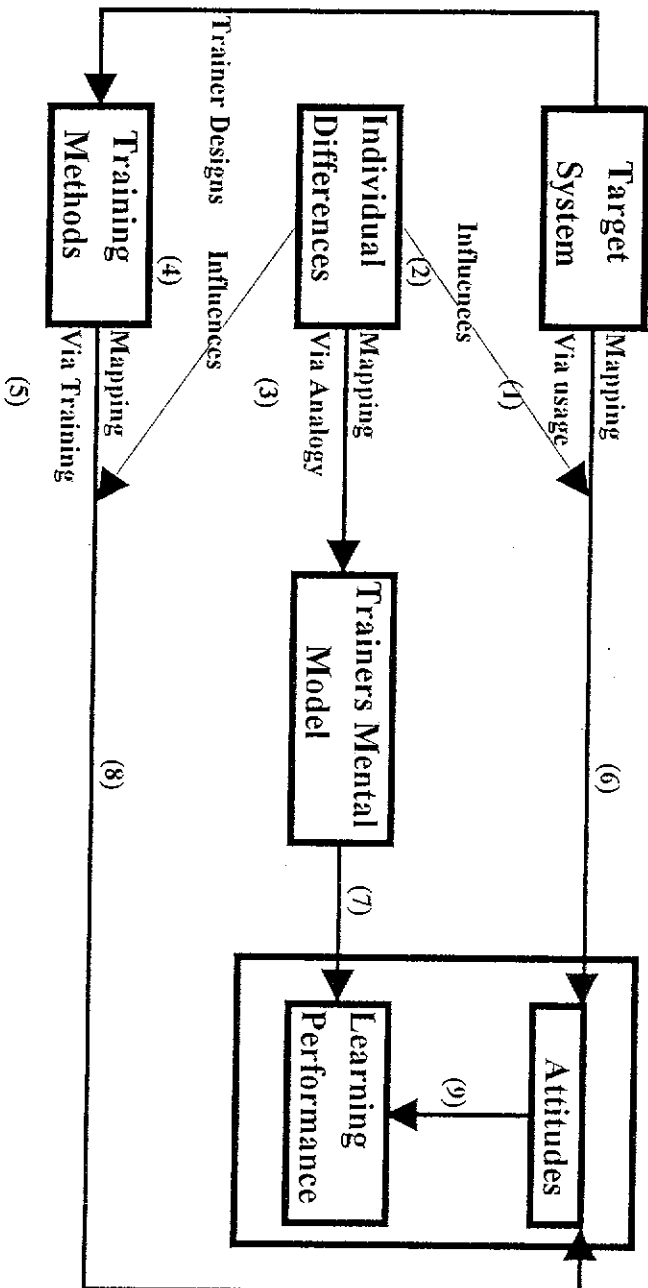
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<sup>43</sup> Robert P. Bostrom, Lorne Olfman, and Maung Sein, "The Importance of Learning Style in End User Training", MIS Quarterly, (Vol. 14, No. 1, March 1990), pp. 101 - 119.

<sup>44</sup> R.P. Bostrom et al., "End User Computing: A Framework to Investigate the Training / Learning Process", quoted in Bostrom et al., "The Importance of Learning Style in End User Training", p. 101.

<sup>45</sup> Bostrom et al., "The Importance of Learning Style in End User Training", p. 102.

Figure 2.5 : The Research Model for End User Training



Source : Bostrom et al., 1990, p. 102.





that individual differences interact with the target system and / or training method to influence training outcomes.

\* Mental Model:

The notion that users form mental models of systems with which they interact was used. "A user's mental model is his / her internal representation of the system structure and function that provides explanatory and understanding power".<sup>46</sup> The researchers reported that studies of several computer systems such as on-line retrieval systems, programming languages, electronic mail systems, word processors, and other computer software have shown that correct mental models are consistently related to accurate interaction and subsequently, high task performance. In fact, the framework postulates that a novice user can form a mental model of the system in three different ways:

1. *Mapping Via Usage:*

Users Here can acquire a mental model of the system merely through using it (relationship 1). The system interface plays a very important role in this mapping process which is influenced by the user characteristics (relationship 2).

2. *Mapping Via Analogy:*

This means that users can acquire a mental model of a new system

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<sup>46</sup> Ibid, p. 103.

by referring to prior experience drawn from similar systems that are familiar to them (relationship 3).

3. *Mapping Via Training:*

Users can acquire a mental model of the system through training (relationship 5). User's characteristics will influence this mapping process (relationship 4).

\* Training outcomes:

There are two types of training outcomes: understanding (measured through learning performance) and motivation to use (measured through attitudes towards the system). Three of the studies reported by Bostrom et al. (1990) focused on learning performance, and the fourth focused on both outcomes.

\* Training Method:

Training can expedite the formation of mental models through the three mapping routes mentioned above. Hands-on training was used by researchers for the purpose of their study. Another important dimension of training is the method employed. One major component of method is training approach. Two main approaches are the exploration oriented and the instruction oriented. "In the context of hands-on group workshops, a key issue is whether to utilize a relevant task focus or a features focus. Application-based training is an exploration-oriented approach that uses a relevant task focus. Construct-based training is an

instruction-oriented approach that uses a features focus".<sup>47</sup> The use of conceptual models is another component of the training method. Conceptual models are depictions of the basic concepts of the target software. The two types of conceptual models are analogical models (representing the target software in terms of another system) and abstract models (synthetic representations of the target software).

The findings reported by the study suggest that the same training may not be suitable for every novice. Another finding is that some individuals can adapt to any training method. Trainers thus should consider tailoring training methods to individual needs.

The above literature showed the various training approaches and computer interfaces dealt with by various researchers to achieve better training outcomes. The next chapter will deal with the methodology that will be adopted to gather and analyze the data pertinent to this study. As a result, this study will be able to show how much the findings confirm with the literature in this area.

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<sup>47</sup> Ibid, p. 103.

## CHAPTER III

### RESEARCH DESIGN AND METHODOLOGY

#### 3.1 The Basic Approach.

This study has been conducted as a result of an interest in examining specific types of computer interfaces; direct or menu-based interface and command-based interface, as well as the various training methods that could be applied in Lebanese organizations. Moreover, the study intends to examine the effect of various training methods upon users' performance and their perceptions of the systems' ease of use. The measures used and the type of analysis followed were selected according to the model proposed in Chapter I. (Refer to page 47).

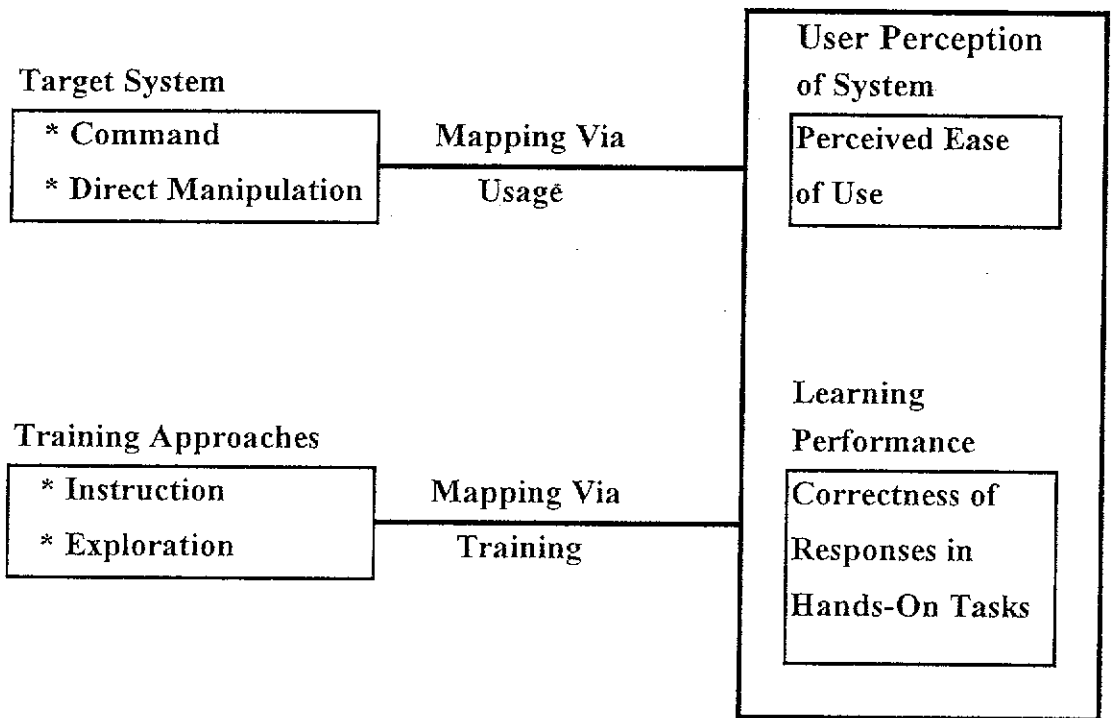
#### 3.2 Sources of Information and Research Design.

A laboratory experiment was conducted to test the two types of interfaces; menu-based and command-based interfaces, and the two training methods; exploration and instruction-based methods. Following the methodology used by Bostrom and Davis, four manuals were prepared:

- 1- Exploration manual for menu-based interface.
- 2- Exploration manual for command-based interface.
- 3- Instruction-based manual for menu-based interface.
- 4- Instruction-based manual for command-based interface.

Each interface's manuals included the same tasks and operations.

## The Model of the Study



However, the exploration manuals are too summarized; or in other words incomplete, where general guidelines and instructions are given to the trainee who will have to explore the system himself to solve certain operations. While the instruction-based manuals were complete, and detailed, they also include step by step instructions for the operations to be performed where the trainee should follow these steps without putting any effort to explore the system.

The first interface that trainees were exposed to is the (Disk Operating System) DOS, as a command based interface, where they were supposed to type commands at the keyboard without having a visual illustration of what is to be or what is done.

The second interface, the menu-based interface, used is the QUATRO PRO. The QUATRO PRO, unlike DOS, consists of a list of menus each having a set of commands or options from which the trainee can choose an option to perform the operation. And the result of this operation will be illustrated on the screen in the form of changes to the target objects.

In addition to the manuals used in this experiment, a test, for each interface/training group, entailing trainees to perform certain operations, similar to those done during the training, was given to trainees to measure their learning performance, which is defined in the model of the study. Some of the tasks included in the test were defined as near-transfer tasks and others as far-transfer tasks.

Furthermore, a questionnaire was distributed to trainees after each session. This questionnaire was designed to measure "users' perceptions of the ease of learning a specific software package", taking into consideration the Demographic and Personal Data.

### 3.3 Experimental Procedure.

Fifty-eight trainees volunteered to participate in the study. And following the methodology of Bostrom and Davis, they were selected on the basis of having no or very little experience in DOS and QUATRO PRO and no or little experience in computer softwares in general. The sample actually included: some undergraduate students (from various universities and with different majors); trainees from the business sector (such as banking, insurance, sales...); engineers, doctors, professors and others with different organizational and educational backgrounds. The majority of trainees reported that they had no knowledge of operating system commands.

Twenty-nine training sessions of four subjects each, almost five sessions for each interface were conducted in the computer lab. At the beginning of each session, the experimenter, who was the same person in all session, used to present a general overview about the study and its purpose. Then trainees were given manuals, randomly, to work with for a maximum of ninety minutes. The manuals were fully explained so that no or a few number of questions would be asked to the experimenter whose role was to guide them to the proper section in the manual which can solve their problem. Moreover, the exploration group of trainees was allowed to continue on exploring the system, by creating some examples of their own, if they finished before the allocated time; while the instruction-based were not allowed to work on the computer after they finished the manual - they were only allowed to read some sections in the manual. This was done in order not to give the chance for both groups of trainees: the exploration trainees and the command based



trainees, to explore the system and to inhibit the interference of additional factors. It is worth mentioning here that, for command-based interface, each user had his/her own diskette on which the files that will be needed are and saved to be checked later for completed or not-completed tasks. And for menu-based interface, trainees work was saved under different names on the task sheet. Besides, a time recorder was available to record the time spent by each trainee on each manual application.

After finishing the manual, each trainee was given a questionnaire, The Perceived Ease of Use Questionnaire, to test his or her attitudes towards the system he/she was using.

At the end of the session each trainee was given a test including twelve tasks to be performed. Nine of these tasks were near-transfer tasks, which require only remembering newly acquired or memorized information. The other three tasks were far-transfer tasks which requires the correlation between newly acquired information, in a substantive manner, with already existing information. In addition, each trainee was given a commands' and operations' summary as a reference, each according to the method he / she was using ( exploration, or instruction-based). Examples of near-transfer tasks given to Quattro Pro trainees are: open a file, name a file, input labels and numbers, use simple formulas involving addition, subtraction and multiplication, erase labels or numbers, change column width and save a file. Other examples given to DOS trainees are: create a directory, copy files from one directory to another, rename certain files, erase files, list files and change directory. While examples on far-transfer tasks were more developed for both interfaces; such as use sophisticated formulas involving sum, average

and other applications, format a group of numbers and copy formulas, for Quattro Pro, and, create low level directories and remove directories for DOS trainees. Also, the work of each trainee was saved according to the previous description. The time spent on the test by each trainee was recorded and the maximum time limit given was thirty minutes - which is an adequate amount of time based on findings from an earlier pilot study. Trainees finished their manuals with a maximum time of 90 minutes, a minimum time of 18 minutes and a mean time of 51.034 minutes.

### 3.4 Research Variables.

As depicted in the Model of the study presented in Chapter I, we have two measurable outcomes of computer learning: learning performance and perceived ease of use.

#### 3.4.1 Learning Performance.

Learning performance was measured by the trainees' overall performance in Hands-on tasks; the correctness of responses in Hands-on tasks, the time spent on the training manual. Moreover, by evaluating the correctness of the near-transfer tasks and the far-transfer tasks of the test and the time spent on this test. It is worth mentioning here that scores ranging from 0 to 3 were given to all tasks and for both interfaces as well as training methods. 3 was given to completely correct answers, 2 to answers having minor mistakes (such as forgetting a space), 1 to

answers having some parts of the correct format, and 0 to completely wrong answers.

### **3.4.2 Perceived Ease of Use.**

The instrument developed by Davis (1989) was used in this research to measure whether the system being used is perceived by the user as an easy to use system or not. The questionnaire developed to measure this variable was divided into two parts.

#### **3.4.2.1 Demographic or Personal Data.**

The demographic part which included some single item questions to specify the employment type, sex, nationality, whether the trainee had ever had computer training before and on which softwares. Also, another question was included to specify the occupation of the trainee; this latter was divided into eight categories: executive or managerial, professional, government or military, sales, student, homemaker, retired, and other. To specify the educational level, a question of five categories was put and that included: no formal diploma, High school diploma, Bachelor's degree, Master's degree, or Doctoral degree. Moreover, a five-category question was included to specify the range within which the trainee's age fall.

#### 3.4.2.2 Ease of Use.

The ease of use was measured by asking trainees to indicate their agreement and disagreement with statements related to the computer system they have used. The scale included statements about the beliefs of the trainees concerning the system - acceptability, satisfaction, easiness, flexibility, understandability, clearness. Each statement responded according to a five-point Likert-type scale ranging from (1) strongly disagree to (5) strongly agree.

#### 3.5 Data Analysis.

The computer disks and the saved task sheets, for each trainee, were reviewed by one judge who assigned scores to each task performed. Data gathered was analyzed using the facilities of the statistical package SPSS (Statistical Package for Social Sciences). Using this facility, a descriptive analysis was used to :

1- Assess learning performance taking into consideration the demographic variables, interface, kind of training, scores on tasks performed and time spent on both training manuals and the tests. To achieve this, the frequencies, one-way ANOVA, Cross tabulation, and Correlation facilities were used.

2- Also, a correlation analysis was used to assess the use taking into consideration the demographic variables, the ease of use concepts, the training kind, the interface, and the time spent on training as well as on the test.

Regression equations were built to explain the variations among these variables.

Having identified the experimental design and the research methodology, the variables to be included, and the analysis tools to be used, it is an important step now to list the findings and the implications of the study and to evaluate them in the light of the hypotheses to be tested. This is in fact the objective of the following chapter.

## CHAPTER IV

### STUDY FINDINGS

Because end user computing has become an area of major importance to organizations, and because non-professional users have come to rely on computer systems to perform more and more of their basic tasks, MIS managers are becoming more and more aware of the necessity to ensure that those individuals learn how to effectively use these software packages. Now after presenting the methods followed and tools used for analyzing the data collected for the study, it is the intent of this chapter to present the findings obtained and to analyze them. In Chapter I, the hypotheses were stated as follows:

*1- Training outcomes (user perception of system and learning performance) are most likely to be influenced by factors such as: characteristics of the system, training approaches (Instruction-based and Exploration), and trainee characteristics.*

*2- The variability of the computer interface design will have a direct effect upon the end users' performance.*

*3- There is a combined learning effect of the computer interface and training method selected.*

This chapter intends to test these hypotheses in the light of the results obtained and the findings analyzed.

#### 4.1 Profile of the Experiment Subjects.

As was mentioned in Chapter III, fifty-eight persons volunteered to participate in the study. They were selected on the basis of having had little or no previous experience with personal computers. Also, all subjects reported that they have no knowledge of operating system commands, or of the Quattro operations, although few of them reported that they had training sessions on spreadsheet softwares (such as Lotus or Excel).

Coming to their general characteristics, of the 58 volunteers, 36.2% were females and 63.8% were males. The subjects belonged to various occupations: executive or managerial, professional, governmental or military, sales, student, homemaker, and others, or could be retired. The average age of the respondents was within the range of 25 - 34 (median = 3.00, i.e. the age range 25 - 34). As to their educational level, volunteers had a high educational level (median = 3.00; i.e. B.S. degree) with 79.3% having a B.S. and higher degrees. Moreover, 62.1% of volunteers reported that they had a little previous computer training, while others (37.9%) reported that they had no previous training or experience in working with computers. Table I shows a profile of end users in the experiment.

**Table I**  
**General Characteristics of Subjects**

Characteristic	Range	Percentage
<b>Subject Characteristics</b>		
Age	< 18 years	3.4
	18 - 24	34.5
	25 - 34	43.1
	35 - 49	15.5
	50 and above	3.4
Sex	Male	63.8
	Female	36.2
Education	No formal diploma	1.7
	High School diploma	19
	Bachelor's degree	53.4
	Master's degree	20.7
	Doctoral degree	5.2
<b>Training Characteristics</b>		
Previous Computer Training	Yes	62.1
	No	37.9
Software Training	Spreadsheet or operating System	27.6
	Others	72.4

#### 4.2 Factors Leading to Better Training Outcomes.

Human resources are the most crucial part of any computer system. Depending upon their skills, the level of motivation they have,



and the perception they have about the flexibility and easiness of the system, the resulting performance, and thus the success of the implementation of computer based information systems will be determined. From here, the importance of not foregoing the necessity of training and providing end users with an efficient and effective type of training impose themselves on critical factors to achieve better application of end user computing.

It could be expected that better performance and better attitudes and beliefs towards a computer system are the most likely to be determined by the type of training provided along with other factors. This research has used two types of training: instruction-based training and exploration-based training. Moreover, the two mentioned training methods were applied along two different computer softwares representing two different computer interface designs. Two measurable outcomes of computer learning - learning performance and users' perceptions of the system were identified as training outcomes. In this study, learning performance was measured by subjects' overall performance in hands-on tasks. For far-transfer tasks (FTTASK) and near-transfer tasks (NTTASK) the time spent by users on training and on accomplishing the hands-on tasks was also used as a measure of learning performance. Users' perceptions of the system were measured by a questionnaire that evaluated the perceived ease of use.

Table II shows the mean scores for each of the training outcome measures for each of the training methods applied along each of the interface types used. As could be noticed, the performance of subjects in near-transfer tasks (NTTASK) and far-transfer tasks (FTTASK) was relatively higher in the exploration kind of training that it was in the

instruction-based training. As to training time, subjects have relatively spent the same time on training in the two types of training. As to test time, subjects belonging to the exploration group spent a little more time in their test than did those of the instruction-based group.

**Table II**  
**Training Outcome Measures-**  
**Mean Scores**

	Exploration		Instruction	
	DOS	QuattroPro	DOS	Quattro Pro
NTTASK (max score = 81)	50.6	72.3	50.7	68.6
FTTASK (max score = 27)	15.2	15.8	12.1	13.03
TRTIME	48.7	49.17	53.3	45.5
Testime	20.5	21.3	18.4	20.8
XEU (max = 5)	3.24	3.6	3.4	3.65

Since the two training methods were applied on subject using two different interfaces ( command - based interface -DOS , and menu - based interface - Quattro pro ), the following section will examine the features of each method along each type of interface and along individual variable .

#### **4.2.1 Command-Based Interface-DOS.**

As it is well known, this interface uses a conventional style that requires users to enter and read English-like commands. Of course, the model presented by this interface has its own conventions and formats that should be followed and applied to be accepted and executed by the computer. Here users view the system through a collection of abstractions that constitute the command syntax, and thus rely purely on verbal feedback in their interaction with the system.

To start with, 29 of the 58 participants were trained on DOS using the exploration method and the other 29 were trained on DOS using the instruction-based approach. Referring back to table II, one could notice that the exploration group in DOS had performed the same as the instruction-based group in near transfer tasks, but performed better than the instruction-based group in far-transfer tasks. As expected, the perceived ease of use of DOS was higher for the instruction-based group than for the exploration group. Time spent by exploration group on DOS training was less than that of the other group. However, the test-time spent by the exploration group was, however, less than that spent by the instruction-group.

##### **4.2.1.1 Features Related to and Affecting the Dependent Variables.**

Training outcomes were represented by users' perception about the ease of use (XEU) and their learning performance - including both performance in near-transfer tasks and far-transfer tasks. These

variables, considered as dependent variables, along with other variables such as training time and test time are studied in terms of their relationships with each other. A correlation analysis of the dependent variables is shown in Table III. This revealed that there is a significant correlation between some of them - far-transfer with near-transfer = 0.4597, XEU with test time = -0.8749. However, contrary to the findings reached by Davis and Bostrom, no correlation was found between far-transfer tasks and ease of use or between near-transfer tasks and ease of use.

**Table III. Pearson Correlations between the dependent variables, Training time, and Test time.**

	XEU	NTTASK	FTTASK	TRTIME	TESTIME
XEU	1	0.0252	0.1013	-0.0389	-0.8749**
NTTASK	0.0252	1	0.4597**	0.004	-0.1774
FTTASK	0.1013	0.4597**	1	0.0861	-0.1706
TRTIME	-0.1389	0.004	0.0861	1	0.0171
TESTIME	-0.8749**	-0.1774	-0.1706	0.0171	1

\*  $p < 0.01$

\*\*  $p < 0.001$

The above mentioned resulting correlations could be explained by the following. The negative sign of the correlation coefficient between ease of use and test time in the DOS computer interface implies that as the users' perception of the system's ease of use becomes higher, the less would be the time they consume to finish the tasks given to them. The positive and significant correlation coefficient between near and far transfer tasks implies a direct and strong relationship between

the performance of the two types of tasks. As volunteers perform better in near-transfer tasks, the better they would perform in far-transfer tasks and vice versa. This could be attributed to the fact that far-transfer tasks are related to long term memory where a person can combine the knowledge or information he is getting now with the information already stored in his long term memory. The volunteers did not have previous knowledge about the system with which the newly acquired information could be related. Also, the experiment time was limited and did not allow for differences to appear.

Another correlation analysis shown in Table IV was conducted between the dependent variables, training time and test time, and the individual variables. Results show that no relationships could be reported between training time, test time and XEU and any of the individual variables. The negative correlation coefficient between education and test time could be attributed to the fact that as the level of education increases, the mental ability of volunteers to memorize, analyze and link the system aspects with each other would increase, and thus the time taken by the user to finish the required tasks would be less. On the other hand, NTTASK and FTTASK had high correlation coefficients with education. The positive sign of these coefficients means that there is a direct relationship between these two dependent variables and education. As education increases, the ability to understand matters and apply them on various tasks, whether near or far transfer tasks would also be higher. NTTASK had no significant relationship with age. But the negative sign of the correlation coefficient between NTTASK and age indicates that as age increases, the performance in near-transfer tasks would be less. This could be

attributed to the assumption that people with older age lose the ability to remember than younger people do. FTTASK had a significant and positive relationship with age. As age increases, the person would have better time to analyze things, make use of and recall information available in long-term memory.

**Table IV. Pearson Correlations between the Dependent Variables Trtime and Testime and Individual Variables.**

	XEU	TRTIME	TESTIME	NTTASK	FTTASK
Education	-0.1094	0.1144	-0.0453	0.4145**	0.4598**
Age	-0.1264	-0.0285	0.1832	-0.142	0.3096*
Sex	-0.0638	0.0243	0.0507	-0.178	0.0604

\*  $p < 0.01$

\*\*  $p < 0.001$

To examine the availability of significant differences in each of the dependent variables along the various individual variables, a one-way ANOVA was used. To start with, the availability of significant differences in the test time along age. Table V shows the result of the One-Way ANOVA test conducted for this purpose. This result was obtained at a significance level of 0.05 ( $p \leq 0.05$ ). When using One-Way ANOVA, the observed significance level is obtained by comparing the obtained  $F$  to the values of  $F$  distribution with  $K-1$  and  $N-K$  degrees of freedom, where  $K$  is the number of groups and  $N$  is the number of cases in the entire sample. The observed significance level is the probability of obtaining an  $F$ -Statistic at least as large as the one calculated when all the population means are equal. If this probability is

small enough, the hypothesis that all population means are equal is rejected. In other words, if  $F_{\text{statistic}} < F_{\text{calculated}}$ , then there is a significant difference between the means. Since in this case  $F_{\text{prob.}}$  is = 0.0057 and since it is less than  $F_{\text{significance}} = 0.05$ , then one can say that there are significant differences in time taken by volunteers to complete the tasks required from them. This is expected, and when accompanied with the positive sign of the correlation coefficient between test time and age (0.1832) shown in Table IV leads to the conclusion that as age increases, the readiness of the user to accept new information, analyze it, and apply it in a short time period would be less, and thus the time taken to finalize tasks would be longer.

Table V. One-Way ANOVA: Test Time By Age

Source	D.F	Sum of Squares	Mean Squares	F Ratio	F Probability
Between Groups	4	377.02	94.25	4.1036	0.0057
Within Groups	53	1217.33	22.97		
Total	57	1594.34			

The results of the other One-Way ANOVA tests are shown in Table VI. As could be noticed, the dependent variables; training time and near-transfer task performance did not show any significant differences along age. This could be attributed to the fact that most volunteers belonged to the same age category which did not allow the variability aspect to show. Significant differences are about to show in the performance of far-transfer tasks along age. This could be attributed

to the assumption that with older ages, people will more likely relate newly obtained information with previous information, i.e., the tendency to make use of stored information and experience would be more. Coming to the independent variable education, training time and test time did not show any variability along this variable. This was expected since the majority of subjects (79.3%) had a high educational level, the thing that reduced the variability factor to appear here. However, in near-transfer and far-transfer tasks showed high variability (significant differences) along education. This is natural since the higher the level of education is, the better would be the ability to memorize, analyze, and relate aspects to each other. Moreover, no significant differences were obtained in the four dependent variables being studied along the previous training factor. This is expected since although a high majority of volunteers reported having previous computer training, that was only confined to certain courses in third generation languages and Excel which does not have any relationship with the features of DOS. This result is also demonstrated by the One-Way ANOVA test studying the variability of the dependent variables along the type of software volunteers had previous training on.



**Table VI. One-Way ANOVA: Dependent Variables By Individual Variables.**

Variables	F Ratio	F Probability
TRTIME By Age	0.3596	0.8362
NTTASK By Age	0.8794	0.4826
FTTASK By Age	2.49	0.0541
TRTIME By Education	0.793	0.535
TESTIME By Education	2.0424	0.1016
NTTASK By Education	3.1507	0.0214
FTTASK By Education	4.1973	0.005
TRTIME By Prevtrn	0.0123	0.9119
TESTIME By Prevtrn	0.678	0.4138
NTTASK By Prevtrn	0.1589	0.6917
FTTASK By Prevtrn	0.4898	0.4869
TRTIME By Softtrn	0.0956	0.7583
TESTIME By Softtrn	0.0042	0.9488
NTTASK By Softtrn	0.8114	0.3716
FTTASK By Softtrn	0.5838	0.448

#### 4.2.1.2 Regression Analysis: Building Regression Models for the Various Dependent Variables.

Now, in an attempt to investigate the factors that are most likely to affect major dependent variables, regression models were built. To start with, a regression equation was established to study the factors that could explain variations in the performance of near-transfer tasks (NTTASK). This section will describe the various steps followed in order to reach a regression equation that is most likely to form a

reasonable fit for the variable NTTASK. A correlation matrix and a stepwise method were implemented to select the most appropriate variables. In order to avoid multicollinearity among independent variables which could substantially affect the results of multiple regression analysis, preparing a correlation matrix for all variables was an important step. The resulting correlation matrix is shown in Table VII showed relatively low correlation coefficients among variables.

Table VII. Correlation Coefficients among Variables.

	NTTASK	TRNKIND	PREVTR N	XEU	EDUC	AGE	SEX
NTTASK	1.000	0.068	0.053	0.025	0.415	-0.142	-0.178
TRNKIND	0.068	1.000	-0.284	0.100	-0.106	-0.381	0.108
PREVTR N	0.053	-0.284	1.000	0.132	0.257	0.117	-0.293
XEU	0.025	0.100	0.132	1.000	-0.109	-0.126	-0.064
EDUC	0.415	-0.106	0.257	-0.109	1.000	0.122	-0.008
AGE	-0.142	-0.381	0.117	-0.126	0.122	1.000	0.042
SEX	-0.178	0.108	-0.293	-0.064	-0.008	0.042	1.000

After preparing the correlation matrix, the regression analysis was started. The stepwise method was selected to follow the inclusion of the independent variables one by one into the equation according to their significance as possible indicators of NTTASK. The regression function worked on six variables: EDUC (education), TRNKIND (training kind), PREVTRN (previous training), XEU (perceived ease of use), AGE, and SEX. In step number one, the regression function in SPSS included Education as a one and only variable that could possibly

be used as an indicator of NTTASK. The regression output in step one shown in Table VIII resulted in a factor of determination,  $R^2=0.17$  which means that 17% of the variation in the performance in near tasks could be explained by the level of education the person has.

**Table VIII**  
**Regression Output- Dependent Variable = NTTASK**

Equation Number1	Dependent Variable .....NTTASK		
Variable(s) Entered on Step Number			
1... EDUC			
Multiple R	0.41454		
R <sup>2</sup>	0.17185		
Adjusted R Square	0.15706		
Standard Error	14.42045		
Analysis of Variance			
	DF	Sum of Squares	Mean Square
Regression	1	2518.04	2518.04
Residual	56	12134.7	216.69
F = 11.620.38		Sig. F = 0.0012	

The F-Ratio in the output was computed as:

F-Ratio = Sum of Squares/Mean Square=11.6204. In fact, no other variable was included as a factor explaining variations in NTTASK. A

list of the variables, its coefficient Beta, Test statistic, T, and the P-value or the critical T (Sig. T) is presented as follows:

Variable	Beta	T	Sig. T
EDUC	8.08	3.409	0.0012
(Constant)	26.74	3.534	0.0008

The regression output, along with the information about the variable coefficient just listed, helped in deriving a regression model equation as follows:

$$\text{NTTASK} = 26.74 + 8.08 \text{ EDUC.}$$

(0.0008)    (0.0012)

$$R^2 = 0.172 = 17.2\%$$

$$F = 11.6204 \qquad \text{Sig. } F = 0.0012$$

#### A. Significance of the Regression Equation:

$R^2$ , the coefficient of determination, is equal to 17.2%. This implies that 17.2% in NTTASK could be explained by this variable.

By the use of the analysis of variance, the usefulness of the regression equation can be tested by using the f-distribution. From the output presented,  $F = 11.6204$ , and P-value (Sig. F) = 0.0012 is  $< 0.05$ , level of significance. As a result, it could be concluded that there is a relationship between NTTASK and this variable included in the equation. This result shows that the regression model, although not

highly significant - statistical wise - it is significant qualitatively and has certain implications.

### **B. Significance of the regression coefficients:**

The significance of the correlation coefficient could be derived by examining the P-value of the T-statistic. This P-value is listed above under Sig. T. Taking into consideration that the level of significance (alpha) is = 0.05, then one could conclude that a statistically significant relationship exists between the included variable, Education (EDUC), and the dependent variable NTTASK.

### **C. Interpretation of the equation:**

The interpretation of this equation is quite straightforward. The value of Beta, 8.08, indicates that for each added value in Education, the performance in the near transfer tasks would directly vary by the value of 8.08. The positive sign shows that there is a positive and direct relation between the education level the subject has and NTTASK. The higher the volunteer's educational level is, the better would be his/her performance in near transfer tasks. This could be attributed to the fact that the more educated the person is, the better would be his ability to understand things and retain them in memory.

### **Building a Regression Model for FTTASK**

The same procedure followed with NTTASK would be followed here to derive a regression equation that could help in explaining variations in the dependent variable performance in far transfer tasks.

The independent variables selected were: TRNKIND, PREVTRN, XEU, EDUC, AGE, and SEX. After preparing the correlation matrix, a step wise regression method was used to examine the forward selection of variables, and the extent of each variable's influence on FTTASK. The variables that were included in the equation were EDUC and AGE. The final regression output came to be as follows:

Dependent Variable..... FTTASK	
Multiple R	0.52606
R <sup>2</sup>	0.27674
Adjusted R Square	0.25044
Standard Error	7.13665
F = 10.52243	Sig. F = 0.0001

The Variables included, their Beta Coefficients, T-value and Sig. T are listed in Table IX. As a result, The regression equation that could be built for predicting FTTASK is:

$$\text{FTTASK} = -6.47104 + 4.29417 \text{ EDUC} + 2.44579 \text{ AGE}$$

(0.1584)
(0.0005)
(0.0300)

$$R^2 = 0.276 = 27.6\%$$

$$F = 10.5224$$

$$\text{Sig. F} = 0.0001$$

**Table IX: Beta Coefficients Test for Significance of the Independent Variables.**

Variable	Beta	T	Sig. T
EDUC	4.29417	3.709	0.0005
AGE	2.44579	2.228	0.0300
(Constant)	-6.47104	-1.430	0.1584

**A. The Significance of the equation**

The R Square (multiple coefficient of determination) is given in the computer printout as 27.6%. This means that almost 28% of the variations in performance in far-transfer tasks could be explained by the two independent variables included in the model.

Moreover, to test the model's significance, the F-value is calculated and it came to be 10.5224. Sig. F = 0.0001 and since it is less than 0.05, one could conclude that the model established is significant; although it is not statistically highly significant, this result has important implications.

**B. The Significance of the Individual variables.**

Using the T-test, the significance of each independent variable could be tested through comparing the Sig. T value with the level of significance, P-value = 0.05. Looking at Sig. T values presented in Table I will lead to the conclusion that the two variables education and age are significant in explaining the variation in FTTASK.

### C. Interpretation of the equation

This equation is also straightforward. The positive signs of the Beta coefficient indicate the existence of direct relationships between age and education and FTTASK. As the level of education increases, the ability of a person to analyze matters, understand them and link them to previous information already available in memory would be better. Concerning age, the direct relationship it has with FTTASK could be attributed to the assumption that as age increases and the experience of a person in certain fields increases, the ability of a person to make use of previously stored information with newly acquired ones would be better.

### Building a Regression Model for the Dependent Variable Test Time (TESTIME).

Finally, a regression equation was established to investigate factors that are most likely to be associated with the variations in test time. The result was that two variables were included: XEU, Ease of Use, and SELFEMP, Self Employment. The final regression output, as derived from the computer printout was as follows:



Dependent Variable..... TESTIME.	
Multiple R	0.88964
R <sup>2</sup>	0.79147
Adjusted R Square	0.78388
Standard Error	2.45865
F = 104.374	Sig. F = 0.0000

The Beta coefficients, the T-value and the Sig. T are listed in Table X. These along with the regression output lead to the formation of the following regression equation:

$$\text{TESTIME} = 44.4521 - 7.467 \text{ XEU} - 2.337 \text{ SELFEMP}$$

(0.0000)    (0.0000)    (0.00114)

$$R^2 = 0.49147 = 79.14\%$$

$$F = 104.37$$

$$\text{Sig. F} = 0.0000$$

Table X

Beta Coefficients, T-value and Sig. T for Independent Variables

Variable	Beta	T	Sig. T
XEU	-7.46705	-14.299	0.0000
SELFEMP	-2.33684	-2.619	0.0114
(Constant)	44.4521	25.201	0.0000

### **A. Significance of the Equation.**

As was previously mentioned, the insignificance of the equation can be measured by the value of  $R^2$  and F-value.  $R^2$ , the coefficient of determination has a high value = 0.7914, implying that 79.14% of variations in TESTIME could be determined by the factors Ease of Use and, surprisingly, Self Employment.

The F-value here was calculated to be 104.37, Sig. F = 0.0000 which is considerably less than 0.05, the level of significance. This leads to the conclusion that the significance of the regression model is proved.

### **B. Significance of the Regression Coefficients.**

Comparing the value of Sig. T with the level of significance, tests the significance of the individual variables included in the regression model equation. Taking into consideration that the level of significance (alpha) is = 0.05, then one would conclude that a statistically significant relationship exists between each of the included variables (holding the other constant) and the dependent variable TESTIME.

### **C. Interpretation of the Equation.**

Both variables, XEU and SELFEMP had a negative correlation coefficients with TESTIME, meaning that the relationship is an inverse one. Coming to Ease of Use, the interpretation is simple and straightforward. That is, as the system is perceived by the user as being easy to use, the better would be the user's understanding and familiarity with the system, and the less would be the time he/she takes to finalize certain tasks.

Concerning Self Employment, the negative correlation implies that as the kind of employment moves towards self employment, the less would be the time taken to complete the required tasks. This will be explained by drawing an assumption. The assumption is that self employed people run their own business. They are responsible for setting plans, analyzing situations, and making decisions. Understanding matters from a global point of view and taking all factors related to a certain problem or issue into consideration are the major responsibility. This could be reflected in the case being dealt with - understanding the software features. This somehow better understanding will lead to better performance reflecting itself in less time being taken to complete the required tasks.

#### 4.2.2 Menu-Based Interface - Quattro Pro.

Quattro Pro is an electronic spreadsheet representing an application software. The user here interacts with the system through a set of menus, each with a list of options, and with an explanation for the function of each option on the screen. Users here thus do not deal with the system through merely a collection of abstractions that constitute the command syntax. Rather, a sort of an interactive dialogue will be available between the system and the user.

As it was the case with DOS, out of the fifty-eight participants, twenty-nine were trained on Quattro Pro using the exploration method and the other twenty-nine were trained using the instruction-based approach. Referring back to Table II, one could notice that the exploration group in Quattro Pro had performed better than the

instruction-based group in both far and near transfer tasks. The perceived ease of use was reported to be the same for both approaches of training. Time spent by exploration group on Quattro Pro training was greater than that of the other group. The test time spent by the exploration group was also greater than that spent by the instruction-based group.

#### 4.2.2.1 Features Related to and Affecting the Dependent Variables.

The same approach followed with DOS will be applied here. To examine the relationship of dependent variables among each other, a correlation analysis was performed. This is shown in Table XI. Results reveal that there is a significant correlation between some of them - far-transfer with near-transfer = 0.5918, XEU with near-transfer = 0.3947, and XEU with far-transfer = 0.3234. Moreover, a significant correlation is available between near-transfer tasks and test time = -0.4044, and unsurprisingly, between training time and test time = 0.5380. The explanation of these correlations along with the signs of the coefficients could be a straight forward task. The positive and significant correlation coefficient between near and far transfer tasks implies a direct and strong relationship between the performance of the two types of tasks. The more volunteers perform in near-transfer tasks, the better would they perform in far-transfer tasks and vice versa. This result could be attributed to the fact that there was reduced variability in performance along the two types of tasks caused by the limited time imposed upon the two groups. In the exploration approach, trainees need a longer time

to explore the system and know its features; however, the same time was given to all subjects, and thus no time variability was shown. Concerning the positive and significant correlation between ease of use and NTTASK and FTTASK, one could easily attribute it to the reasoning that the more the system is perceived as being easy to be used and applied, the better would be the performance in tasks related to short-term memory (NTTASK) and those related to long-term memory (FTTASK). Moreover, the negative and significant correlation between NTTASK and test time implies that the better the task performance related to short term memory, the less would be the time taken to complete the required tasks. Finally, the positive and significant correlation between training time and test time is not an odd finding. With some exceptions, the longer is the time taken for training, the longer would it be to complete the required tasks. This could be true in cases where a long time was needed for finishing the training task because participants found difficulty in understanding the system features, and thus they needed a longer time to complete the tasks.

Table XI. Pearson Correlations between the dependent variables, Training time, and Test time.

	XEU	NTTASK	FTTASK	TRTIME	TESTIME
XEU	1.000	0.3947*	0.3234*	-0.0906	-0.1108
NTTASK	0.3947*	1.000	0.5918**	-0.1385	-0.4044**
FTTASK	0.3234*	0.5918**	1.000	-0.2187	-0.2436
TRTIME	-0.0906	-0.1385	-0.2187	1.000	0.5380**
TESTIME	-0.1108	-0.4044**	-0.2436	0.5380**	1.000

\*  $p < 0.01$

\*\*  $p < 0.001$

Another correlation analysis was done to study the relationship between the dependent variables (training & test time) and the individual variables (education, age, and sex) are shown in Table XII. Results show that there is a significant and positive relationship between the two dependent variables and age. This is expected, and it could be explained by saying that as a person becomes older, his tendency to accept, understand, and apply new materials or concepts would be less.

**Table XII: Pearson Correlation: Training time & test time and independent variables.**

	TRTIME	TESTIME
EDUC	0.0465	-0.1091
AGE	0.4026**	0.4286**
SEX	-0.0107	-0.2377

\*  $P < 0.01$

\*\* $P < 0.001$

This means that more time will be taken to understand the manuals, and then applying what was newly acquired on certain tasks. As could be noticed, no significant correlations were available between the two dependent variables and education and sex.

To test for significant differences in the dependent variables along the various independent individual variables; a One-Way ANOVA test was conducted. The results for this test are shown in Table XIII.

Results show that there are significant differences in training time along various age categories. This, illustrates the results of the correlation analysis discussed above, and that is older-age people are expected to take more time getting trained to use the system and to apply what they learned to perform certain tasks. No variability, however, was found in the performance of near or far transfer tasks along the age variable. This could be attributed to the nature of the data dealt with where the majority of participants belonged to the age category ranging between 26 and 34. This prevented variability in performance to show up.

Moreover, no variability in the four dependent variables was found along the various educational levels. Again, this could be attributed to the fact that the majority of participants have a B.S or higher degrees.

An interesting finding was reached concerning the variability of the dependent variables along previous training. No variability was found in training and test time along the previous training factor. This is because participants were chosen on the basis that they have little or no previous knowledge about computers. The computer training they might have had before was not concerned with the Quattro Pro software, and thus they were being introduced to the characteristics of a new software. Variability however showed in the performance of near and far transfer tasks along previous training. Participants with previous training (whatever the training is) did not deal with the computer for the first time during the experiment. They were familiar with the concept of what a computer is and had used a keyboard before.

Table XIII. One-Way ANOVA Tests: Dependent Variables By Individual Variables.

Variable	F-Ratio	F-Prob.
TRTIME BY AGE	3.5514	0.0202
TESTIME BY AGE	4.4175	0.0075
NTTASK BY AGE	0.5792	0.6312
FTTASK BY AGE	0.2783	0.8408
TRITIME BY EDUC	1.1527	0.3422
TESTIME BY EDUC	2.0690	0.0979
NTTASK BY EDUC	0.6837	0.6064
FTTASK BY EDUC	0.3792	0.8225
TRITIME BY PREVTRN	0.8681	0.3555
TESTIME BY PREVTRN	0.3687	0.5462
NTTASK BY PREVTRN	11.7665	0.0011
FTTASK BY PREVTRN	11.1782	0.0015
TRITIME BY SOFTTRN	2.5444	0.1163
TESTIME BY SOFTTRN	3.2474	0.0769
NTTASK BY SOFTTRN	4.1135	0.0473
FTTASK BY SOFTTRN	5.9616	0.0178

This helped them in the performance of near and far transfer tasks.

Finally, the variability of the dependent variables along the kind of software training, was investigated, and it was found that training time and test time did not show any significant differences along this variable.



Quattro pro was considered a new software by participants. The requirements for Quattro pro training were well defined in the training manual, and participants were required to execute all the mentioned steps. This could be the reason beyond the lack of variability in training time along software training. The other dependent variables showed significant differences along the type of software training. The variability here could be explained by the fact that the type of software participants reported that they had training on was in some cases an electronic spreadsheet (Excel, Lotus) or a programming language. Knowing a software application similar in concept to Quattro Pro will facilitate the process of memorizing certain features in the program (NTTASK) and will facilitate more the process of recalling previous information and linking it to what is newly learnt (FTTASK).

#### **4.2.2.2. Regression Analysis: Building Regression Models for the Various Dependent Variables.**

In this section, the study intends to investigate the factors that are most likely to be associated with better Quattro Pro training outcomes. Regression analysis was conducted to build equations that would explain the variations in the various dependent variables. To start with, a regression analysis was done to build a regression model for the dependent variable NTTASK. TRNKIND, PREVTRN, XEU, EDUC, AGE and SEX were used in the analysis. The regression equation included two variables only: PREVTRN and XEU. The final regression output was shown as follows:

Dependent Variable..... NTTASK.

Multiple R                    0.52301

R<sup>2</sup>                                0.27354

Adjusted R Square        0.24712

Standard Error            5.91664

F = 10.35487

Sig. F = 0.0002

The variables included, their Beta coefficients, the T-test and Sig. T are shown in Table XIV. These values along with the regression output lead to the following regression equation:

$$\text{NTTASK} = 50.51080 + 4.89422 \text{ PREVTRN} + 4.66531 \text{ XEU}$$

(0.0000)

(0.0042)

(0.0089)

$$R^2 = 0.27354 = 27.3\%$$

F = 10.35487

Sig. F = 0.002

Table XIV. Beta Coefficients, T-test & Sig. F for Independent Variables. (Dependent = NTTASK)

Variable	Beta	T	Sig. T
PREVTRN	4.89422	2.986	0.0042
XEU	4.66531	2.714	0.0089
Constant)	50.51080	8.228	0.0000

As to the significance of the equation, it could be tested through the values of  $R^2$ , F-value and Sig. F. Results show that the equation has significant implications, although statistically not highly significant ( $F = 10.3548$ ; Sig.  $F = 0.002$ ; and  $R^2 = 0.27354$ ).  $R^2 = 27.3\%$ ; this means that 27.3% of the variations in NTTASK could be explained by previous training and perceived ease of use.

Moreover, the significance of each independent variable included in the equation is proved since Sig. T for each is less than the level of significance,  $P\text{-value} = 0.05$ .

Coming to the interpretation of the equation, it could be said that the positive coefficients of the independent variables indicate a direct relationship with NTTASK. The availability of previous training, or let's say, the better the previous training is, the better would be the performance of users in near transfer tasks. Also, the higher the participants' perception of the software's ease of use, the better would their performance in near transfer tasks be.

**Building a regression Model with FTTASK being the  
Dependent Variable.**

Following exactly the same procedure as above, the resulting regression equation explaining variations in FTTASK came to be as follows:

$$\text{FTTASK} = 1.42595 + 3.98093 \text{ PREVTRN} + 2.90805 \text{ XEU}$$

(0.7811)      (0.0051)      (0.0468)

$$R^2 = 0.224$$

$$F = 7.97$$

$$\text{Sig. } F = 0.0009$$

This equation is similar to the one built for the NTTASK variable; however, it is less significant.  $R^2 = 0.224$ , meaning that 22.4% of FTTASK variations could be attributed to PREVTRN and XEU.  $F = 7.97$  and  $\text{Sig. } F = 0.0009$  which is  $< 0.05$ , the level of significance. The individual variables included are also significant since each  $\text{Sig. } T$  is  $<$  level of significance = 0.05.

The interpretation of this equation is very simple. The positive coefficients of the two individual variables imply a direct relationship with FTTASK. If the participants have had previous training, that would be expected to help them in the process of recalling previously stored information (long-term memory) and linking it to what is newly learnt or acquired. Moreover, if the software is easy to use, then this would enhance the recalling ability of users, and thus their performance in far transfer tasks would be better.

### Building a Regression Model with TESTIME Being the Dependent Variable

The regression model established here intended to investigate the factors affecting the variation in Test Time. The model included three variables:

Training time, sex, and age. The resulting regression equation was as follows:

$$\begin{aligned} \text{TESTIME} = & 7.16350 + 0.20364 \text{ TRTIME} - 3.46217 \text{ SEX} \\ & (0.0200) \quad (0.0005) \quad (0.0159) \\ & + 2.17936 \text{ AGE} \\ & (0.0160) \end{aligned}$$

$$R^2 = 0.41078 = 41\%$$

$$F = 12.54888$$

$$\text{Sig. } F = 0.0000.$$

First of all, the above equation is significant with the possibility of having 41% of the variations in TESTIME being explained by TRTIME, AGE and SEX.  $F = 12.54888$  and  $\text{Sig. } F = 0.0000 < \text{level of Sig} = 0.05$ . This means that the equation is significant. As to the individual variables, each one of them (holding the others constant) is significant in determining TESTIME since the  $\text{Sig. } T$  is  $< 0.05$ .

As to the interpretation of the equation, it is also very simple. TRTIME with its positive coefficient implies a direct relationship with TESTIME. The larger the time period spent or needed by volunteers on training, the larger would be the time period they spent to complete the

required tasks. Sex has a negative correlation coefficient, implying that females reported less time being spent on completing the tasks than that spent by males. This could be explained by the fact that most female participants were highly skilled in typing, the factor that helped them implement the steps (especially in the instruction-based approach) faster. Finally, concerning age, the positive coefficient implies that old-aged participants took more time to complete the steps required to perform the test tasks.

#### 4.3 Interactions Between Interfaces and Training Approaches.

As was previously mentioned, the assimilation theory suggests that there may be a combined learning effect between the computer interface and training method. Assuming that the assimilation of a new knowledge is facilitated by encouraging a learner to work with the knowledge, interfaces such as Quattro Pro (menu-based) that provide users with interactive dialogues should have distinct advantages over traditional command-based interfaces.

In this research, the expected outcome would be better performance in far-transfer tasks by the Quattro/exploration group than by all other interface/training groups. To test for this assumption, the ANOVA test was used.

The results of the ANOVA shown in Table XV indicate that the computer interface effect was significant for both near transfer tasks ( $F = 73.956$ ,  $P = 0.000$ ) and perceived ease of use ( $F = 9.926$ ,  $P = 0.002$ ). The training kind was significant for far-transfer tasks ( $f = 5.487$ ,  $P =$

0.021). The combined effect of training method and interface kind was significant for near-transfer tasks ( $F = 16.382$ ;  $P = 0.000$ ).

These results did not really conform with Davis and Bostrom's study where only the computer interface effect was significant for near and far-transfer tasks.

Regression analysis for each dependent variable reveals the nature of the interface effect (INTRFAC), the training effect (TRNKIND), and the training by interface interaction effects (INTERAC).

The interface on NTTASK had an  $R^2 = 0.368$ ; i.e.  $R^2 = 36.8$  ( $F = 66.64087$ , Sig.  $F = 0.0000$ ), meaning that 37% of NTTASK variations could be explained by interface effects. The training kind on FTTASK had an  $R^2 = 4.592$  ( $F = 5.48667$ , Sig.  $F = 0.0000$ ), meaning that only 5% of FTTASK variations could be explained by training kind effects. Finally, the interface effect on XEU had an  $R^2 = 0.0801$  ( $F = 9.92641$ , Sig.  $F = 0.0021$ ).

This somehow demonstrates the results derived from the ANOVA test.

This chapter presented a detailed description of all the findings obtained from the experiment conducted. As was noticed, some of the findings were consistent, while others did not conform with other researchers' findings of surveys conducted within the same field.

Table XV. ANOVA Results for Training Outcomes.

ANOVA			
Near-Transfer Tasks	Mean Square	F	P(Sig. of F)*
Interface (INTRFAC)	102.422	73.956	0.000
Training (TRNKIND)	19.862	0.082	0.775
INTRFAC*TRNKIND			
(INTERAC)	29.254	16.382	0.000
-----			
Far-Transfer Tasks	Mean Square	F	P(Sig. of F)*
Interface (INTRFAC)	15.207	0.306	0.581
Training (TRNKIND)	261.000	5.487	0.021
INTRFAC*TRNKIND			
(INTERAC)	100.707	2.076	0.130
-----			
Far-Transfer Tasks	Mean Square	F	P(Sig. of F)*
Interface (INTRFAC)	3.015	9.926	0.002
Training (TRNKIND)	0.261	0.795	0.374
INTRFAC*TRNKIND			
(INTERAC)	0.388	1.189	0.308

\*alpha = 0.05



## CHAPTER V

### CONCLUSION AND RECOMMENDATIONS

With the extensive use of computers in corporate and non-profit organizations, more consideration should be given to end-user computing to improve his / her performance and effectiveness. The training methods used have a relatively high effect on end users performance, from which emerge the new roles of information systems departments who are responsible to design and implement training programs on user-friendly systems.

In this study, learning performance and users' perceptions about the system's ease of use were investigated. An experiment was conducted, to examine and measure the learning performance and perceived ease of use. The two training methods; instruction-based method and exploration-based method that were applied on two types of computer systems; menu-based interface (Quattro Pro) and command-based interface (DOS), were used, in hands-on tasks, to measure the learning performance; in near transfer tasks as well as far transfer tasks, and the ease of use. The first critical finding was that the more people are given the opportunity to explore the system following some general guidelines the more they will learn the system and they will be able to acquire the new information and make better analysis, though the longer period that will be required for training and finishing tasks.

Another finding was that subjects when given instructions based manuals, in the command based interface, perceived the system relatively easier than those given exploration based manuals; however,

the time spent by exploration group was relatively less on training as well as test while perception of the subjects, in the menu based interface, about the system's ease of use did not differ from one to the other; however, the time spent on training and the tasks completion by the exploration group was longer.

Moreover, it was found that near-transfer tasks and far-transfer tasks are highly interrelated for both groups; in the meaning that the better subjects perform in near-transfer tasks, the better they perform in far-transfer tasks and vice versa. Besides, when subjects perceive the system as an easy to use system, they would perform better in both far as well as near-transfer tasks, and accordingly the test time would be shorter. Similarly, as the educational level of subjects increases, the better would be their performance in both tasks. Also, it was noticed that when performance in near-transfer tasks is good, the test time would be less. While the test time would increase if the training time is long.

Another finding was that as age increases the readiness of the user to accept new information, analyze it and apply it in a short period of time would be longer. In addition, as education and age increase, the tendency of people to make use of stored information and experience would be higher and accordingly their performance in far-transfer tasks would be better. Participants who had previous training on the computer performed better in near as well as far transfer tasks due to the fact that these are used to some computer concepts, and had used the keyboard before.

#### **Limitations of the Study.**

The first limitation is the assumption that DOS represented the command-based interface while QUATTRO PRO represented the menu-based interface.

The second limitation could be the time given to the experiment, which was relatively limited to reach better results.

Another limitation could be the sample size which was very small, fifty-eight subjects for both Quattro Pro and DOS, and twenty-nine for exploration-based approach as well as twenty-nine for instruction-based approach. This could be attributed to the fact that a small number of people volunteered to participate in the experiment. Also to the fact that, because it is a lab experiment which requires people to come to the lab, many people did not accept to participate and others volunteered but actually did not come.

Also a limitation could be that there was no variability since most participants were university students or above.

### **Recommendations.**

Further researches are recommended to study the long term impact of training methods on learning performance and ease of use, in order to assess whether people's performance and perceptions change over time.

Also it is recommended that further research would be conducted including manuals involving both instruction-based and exploration-based approaches.

Moreover, it is recommended that, in further research, attitudes of participants would be examined and included in the research to study their effects on the experiment's output.

Another recommendation could be to improve the ease of use perceptions by matching Quattro Pro with the type of learning that it supports, trainers could provide users with better enhancements to ease of use.

APPENDIX A

## TRAINING MANUAL USING DOS

Dear Trainee,

This training manual is designed to show you the importance of operating systems software to your microcomputer system. You will understand how to use some fundamental DOS commands in order to effectively manage both the files you create and your disk storage devices. This manual covers the fundamentals of operating systems software and the use of some important operating systems software commands.

### COMPETENCIES

When you have completed this manual, you will be able to:

- \* Describe the disk drive - naming conventions used on most microcomputers.
- \* Describe the conventions for naming the files you create when using a microcomputer.
- \* Boot a microcomputer.
- \* List, Copy, Rename, and Erase files.
- \* Create, Change and Use directory structures.
- \* Remove a directory structure.

## **PART A: DISK DRIVE NAMING CONVENTIONS.**

Most microcomputers have one of the following disk drive configurations:

- a- Two diskette drives [Figure A(1)].
- b- One diskette drive and one hard disk [Figure A(2)].
- c- Two diskette drives and one hard disk [Figure A(3)].

Figure A - Disk Drives.

When using a DOS, the first diskette drive, which is usually located to the left or above the second disk drive [Figure A(3)] is referred to as **drive A**. The second diskette drive is referred to as **drive B**. If there is a hard disk, it is referred to as **drive C**. When referring to a drive, the drive letter should always be followed by a colon (:) to represent the drive designation.

For example:

When you are using DOS to copy a file from the hard disk to the first diskette drive, your command will include the instruction to copy from **C:** to **A:**

## **PART B: NAMING THE FILES YOU CREATE.**

When you want to save your work (such as a document you have created) into a file stored on a disk, you must tell the computer where the data file should be saved (for example, **A:**, **B:**, or **C:**) and what you want to name the file you wish to save.

To name a file using DOS, you must use the following naming conventions.

1. The **filename** can have between one and eight characters.
2. A file must have a name, but it does not have to have a **filename extension** - characters added to the name to aid in file identification.
3. An extension can have between one and three characters.
4. The filename and the extension are separated by a dot (.). Both of the following, for example are valid filenames: **BUDGET** and **BUDGET.JAN**.

5. If a filename has an extension, you must refer to both parts of the name when telling DOS about the file.
  6. Not all characters can be used when naming files. The following characters can be used: A - Z; 0 - 9; !, @, #, \$, ^, &, ( ), ~, {, }, ", \_ , -.
  7. Spaces are not allowed in filenames or filename extensions.
  8. to save a file onto a certain disk, make sure to put the appropriate drive designation before the name of the file. Do not include any spaces between the drive designation and the name of the file.
- Examples of valid and invalid filenames, along with stating the reason, are listed in Figure B.

**Figure B: Filenaming Conventions.** Examples of some of the valid and invalid filenames that relate DOS operating system.

Filename and Extension	Status	Reason
1. QUARTER1	Valid	Contains 8 characters in filename.
2. QUARTER1.BUD	Valid	Contains 8 characters in filename. and 3 characters in extension.
3. SAMPLEBUD	Invalid	Contains more than 8 characters in the filename.
4. QUARTER1.BUD2	Invalid	Contains more than 3 characters in extension.
5. A	Valid	Contains 1 character in filename.



## **PART C: BOOTING YOUR COMPUTER.**

Booting your computer means loading DOS into the memory so that the computer will be ready to accept your commands and execute them.

To load DOS into the computer's memory, perform the following steps:

### **\* For Hard Disk System Users.**

1. Make sure that the disk drive gate for drive **A** is open and that a diskette is not clicked in place.
2. Turn the computer on.
3. The computer will look for DOS on the hard disk.
4. The system prompt, which looks similar to this: **C>** should now be displaying on the screen.

Your computer is now waiting for you to issue a command.

## **PART D: FUNDAMENTAL DOS COMMANDS.**

In this section you are going to learn certain basic DOS commands. DOS allows you to perform many different file management tasks - such as listing, copying, erasing, and renaming, along with other things.

**Keep in mind to put a space after each DOS command, and to press ENTER whenever you finish typing it.**

### **The DIR Command.**

This command is the most widely used one. It allows you to see what files are stored on a disk and gives you descriptive information about each file (Figure C). Using the DIR command is like looking in a file drawer to see what files are stored there.

Figure C: Typical Directory Listing.

QUARTER	BUD	23210	3-07-92	1:43p
filename	extension	size in bytes	date	

There are various forms for using the DIR command. The following steps will lead you through using them.

### DIR

This command allows you to list all the files stored on the current disk drive (the drive whose prompt appears on the screen).

To display information about the files stored on the current disk, use the DIR command. Do not forget to press the ENTER after it.

The general format is:

**C:\>DIR**

A list of all the files on the current disk should have scrolled quickly up the screen - too quickly. Shortly, you will learn how to slow down the screen's scroll. Note that at the bottom of the directory listing, a message is displayed relating to the number of bytes free, or still available, on the disk.

You can use various switches along with the DIR command.

**DIR/P:** this is the pause switch. It causes the screen to pause when it becomes full.

**DIR/W:** this the width switch. It causes the screen to list all the files on the disk across the width of the screen.

### DIR [Drive Designation].

To display the files on a drive other than the current drive, the following procedure is used.

- 1- To display the files stored on the Student Data Diskette in drive **A:**

The general format is: **DIR** (write the drive name here).

2- Use the /P and the /W switches along with the above command and see how they would affect the display of files on the screen.

### DIR [Drive Designation][Wildcard Character].

With what you know now, you can only list *all* the files stored on a disk. But what if you want to see a list of a *group* of files stored on a disk? when a disk becomes full with files, you might, for example, want to list only the files that you created with a certain applications program or that relate to a common task (such as files related to a budget you are working on). With DOS's global, or **wildcard**, characters - the asterisk (\*) and the question mark (?) - you will be able to list selected files on the screen at a time. These **global** characters represent whatever you want them to. The \* can be used to represent more than one character, whereas the ? is used to represent one character. Figure D provides examples of using the DIR command with these wildcard characters. As you will learn shortly, wildcard characters are especially useful when copying files.

**Figure D: Using the DIR command with Wildcard Characters to List Groups of Files.**

DIR Command	Description
C:\>dir A:*.wk1	Lists all the files on the Student Work Diskette that have an extension of wk1.
A:\>dir B:W*.*	Lists all the files on the Student Work Diskette that begin with the letter W.
A:\>dir B:?O*.*	Lists all the files on the Student Work Diskette that have "O" their second letter whatever the first letter is.

How to work it out?

Try to use the above mentioned characters to:

List only those files that have an extension WK1 and are stored on the diskette in disk drive A..

You can go ahead and ask the computer to list to you files with various characteristics.

### **\* CHANGING THE CURRENT DISK DRIVE.**

Often you will find that you need to issue a series of commands on a drive other than the current one. In order not to have to type in the drive designation each time you issue a series of commands on another disk, DOS lets you change the current drive.

1- The Student Work Diskette should be in drive A.

2- To change the current disk drive to drive A, you only have to type A: at the system prompt and press ENTER.

The system prompt should now indicate that drive A is current.

3- To list the files stored on the Student Work Diskette, use the DIR command.

Note that you did not need to type "A:" as you did in the previous section. Because you have changed the current drive, all commands you type will affect drive A unless you specify otherwise.

4- Now change the current disk drive back to drive C using the same method.

### **Exercise**

Use what you have learned above to do the following:

A- List the files stored on your data diskette across the width of the screen.

B- List all the files on your data diskette that have an extension of DOC.

C- List all the files on your data diskette after changing the current drive to the drive including the files you want to list.

D- List all the files for which you are sure that the second letter is "e", but you do not remember or you do not care what the first letter is.

### **The COPY Command.**

The COPY command, an internal command, allows you to make copies of files onto the same disk (but under different names) or onto another disk. Figure E provides examples of the COPY command.

#### **To COPY a file onto the same disk.**

The following steps will lead you through making two copies of a file available on your Student Data Disk called STUDENT1.DBF. Copying it onto the same disk means giving the copies different names. To copy the file onto the same diskette under the name STUDENT2.DBF and STUDENT3.DBF, follow the steps listed below.

First change the current drive to drive A if it is otherwise.

Second make a copy of the file called Student1.dbf under another name Student2.dbf using the following general format:

**Copy (source file name) (destination file name).**

Third make another copy of the file under the file name Student3.dbf using the above mentioned format.

Use the DIR command to see the 2 copies you made.

#### **To Copy a File Onto a Different Disk.**

To copy a file called Grade.Doc from the disk drive C: onto the Student Disk Drive A: , follow the general format stated below:

Note: You can give the file the same name or a different name.

General format:

Copy (source drive name)(file name) (destination drive name).

Use the DIR command to see the result of the copy command you used.

Figure E: The Copy Command.

Command	Purpose
<b>COPY TEXT1.DOC BUDGET TEXT1.DOC</b>	Copy the file named stored on the current disk onto the disk giving it the name BUDGET.
<b>COPY C:DATA A: A. The copied</b>	Copy the file named DATA from hard disk to disk drive file still
<b>COPY A:*.wk1 B: extension WK1</b>	Copy all files with an from
<b>COPY C:C*.* A: disk</b>	Copy all files stored on hard which begin with the diskette
<b>COPY REPORT.MAN B: REPORT.MAN</b>	Copy the file named from the
<b>current drive to drive B.</b>	

**Excercise:**

A- Copy the file called Admsions.Wk1 from the data drive onto the Student Disk Drive.

B- Copy the File Relation.Doc from the Student Disk Drive onto the same disk, giving it the name Newrd.Doc.

## The RENAME Command.

The RENAME command allows you to change the name of a file stored on a disk. In the following steps, you will rename the file Student1.DBF stored on your Student Data Diskette to INFORM.DBF. Fig. F. provides examples on the Rename command.

- 1- Drive A should be the current drive. If this is not the case, make sure to change the current disk drive.
- 2- The general format to follow is:  
**Rename (old file name) (new file name).**
- 3- see the result through using the DIR command.

Figure F: The RENAME Command

Command	Purpose
<b>RENAME STUDENT1.DBF INFORM.DBF</b>	<b>Rename</b>
STUDENT1.DBF stored on the current disk INFORM.DBF.	
<b>RENAME C:BUDGET.JAN BUDGET.FEB</b>	<b>Rename</b>
BUDGET.JAN stored on the hard disk BUDGET.FEB.	
<b>RENAME A:TEXT1.DOC DATA</b>	<b>Rename</b>
TEXT1.DOC stored onto the diskette DATA.	

### The ERASE Command.

Sometimes, you need to discard old unnecessary files stored on your data disks. The ERASE, or DEL, Command is used for this purpose. Examples are provided in Fig. G.

To erase the file named Students.cbf from your student data diskette, perform the following steps.

1- Drive A should be the current drive. If this is not the case, make sure to change the current disk drive.

2- The general format to follow is:

**Erase (file name) or**

**Del (file name)**

3- Use the DIR command to confirm that the file Student3.dbf no longer exists on the student Data Diskette:

Figure G: The Erase (DEL) Command.

Command	Purpose
<b>ERASE BUDGET</b> current	Erase <b>BUDGET</b> from the diskette.
<b>ERASE B:BUDGET</b> diskette in	Erase <b>BUDGET</b> from the drive B.
<b>ERASE A:*.WK1</b> extension of in drive A.	Erase all the files with an <b>WK1</b> from the diskette
<b>ERASE A:W*.*</b> with the the diskette in drive A.	Erase all the files that begin letter <b>W</b> from

### EXERCISE

Before doing the exercise, change your drive to C.

1- Copy all files starting with the letter F from the current disk drive to the student disk drive.

2- Rename the file called Find.BUD stored on the student data diskette Find.REP



3- Erase a file called Faraj.DBF stored on your student data  
diskette.

\*\*\*\*

After the training manual is completed, subjects were asked to complete the Perceived Ease of Use questionnaire.

Finally, subjects will work through the set of hands-on tasks.

12-item computer task set provided to each of the interface / training groups.

9 tasks = Near transfer tasks similar to these presented in the training manuals requiring only one or two operations to complete including: listing, making or removing directories, changing the current directory, and copying files.

3 tasks = far- transfer tasks including: requiring combining individual commands or operations in new ways including: creating a simple, multi level directory structure, removing a directory but first saving the file it contained into a second directory, and reversing a simple directory hierarchy.

## **PART A: PARTS OF A SPREADSHEET.**

The screen display that appears when you load the QUATTRO PRO program has three major sections: the Border Area, the Worksheet, and the Console.

### **1- The Border Area:**

The border area displays the column letters (across the top of the screen) and the row numbers (down the left side of the screen).

### **2- The Worksheet:**

The worksheet consists of over four million cells, each of which falls at the intersection of a column and a row. The letters and numbers in the border identify each cell; for example cell A1 is the intersection of column A and row 1.

### **3- The Console:**

This is the area at the top of the screen. It includes the worksheet menu (File, Edit, Style, Graph, Print, Database, Tools, Options, Window), the current active cell, under the menu, (A1), the formula bar.

### **\* Important keys to be used:**

- a- The cursor keys; i.e the up, down, left and right arrow keys ( $\uparrow$ ,  $\downarrow$ ,  $\leftarrow$ ,  $\rightarrow$ ) to move around the spreadsheet.
- b- The Tab key which allows you to move to the next right cell.
- c- The slash key, /, to activate the menu.
- d- The Enter key to select a certain option from the menu and to confirm the input of a certain label or number in a cell.

\* To select a certain item from the menu we either

- Press the slash key and move by the right or left arrow keys to go to the needed item and then press Enter so that the list of commands appears, or
- Press the slash key and then the letter highlighted of the needed menu.

e- The **Escape** key, **Esc**, to leave the menu.

f- The **Shift** key:

Some keys have two symbols. The **Shift** key is used to select the labels or letters of the upper part of the key. It is also used to change small letters to capital letters.

*N.B: To select a certain command or option means that you should go to the menu by pressing the slash (/) key, then going to the needed menu by using the arrows, after that going to the option needed and pressing **Enter**.*

## **PART B: NAMING YOUR FILE.**

Before starting to work on your file you better name it, so that no one can access it. To name the file you should:

1- Select the **Save As** command from the *File* menu. ( **Save As** is used when you want to name a file for the first time).

2- Type the name you want; press **Enter**.

\* The file name should not exceed 8 characters.

\* The file name could be numeric, alphabetic or alphanumeric.

\* The QUATTRO PRO will automatically put an extension (**WQ1**) for your file.

\* The name of the file will appear on the down-left corner of your sheet.

## **PART C: FILLING YOUR WORKSHEET.**

In this section we will learn how to just type items into the worksheet. The illustration will be done on a simple balance sheet. (after typing each item you should press **Enter**)

1- Type **Assets** in cell **A2**.

2- Type **Cash** in **A3**.


3- Type **Accounts Receivable** in **A4**.

4- Type **Notes Receivable** in **A5**.

3- Type **Equipment** in **A6**.


4- Type **Building** in **A7**.

- 5- Type **Total Assets** in A9.
- 6- Type **Liabilities** in A11..
- 7- Type **Accounts Payable** in A13.
- 8- Type **Notes Payable** in A14.
- 9- Type **Total Liabilities** in A16.
- 10- Type **Owners' Equity** in A18.


 As you have noticed, many of the entered items did not fit properly in the assigned cells, because QUATTRO PRO columns are automatically set at 9 characters wide. So we have to increase the column width.

#### **PART D: INCREASING COLUMN WIDTH.**

- 1- Select the **Column Width** option from the *Style* menu.

 A message will appear up on the screen asking you to specify the width you need.


- 5- Type **25**; press *Enter*.

 As you will notice, the width of column **A** has increased to 25 characters, and all items are now inside the assigned cells.

#### **PART E: FILLING THE NUMBERS.**

In this section you are going to learn how to fill numbers into your worksheet, use some percentages, additions, subtractions and multiplications, and mainly you will learn to copy formulas from a cell or group of cells to another cell or group of cells.

- 1- Type **Year 1** in Cell C1.
- 2- Type **3000** in C3.

 The **Accounts Receivable** are 35% of the **Cash**. So a formula should be used here to calculate the **Accounts Receivable**.

➡ In QUATTRO PRO, whenever you want to type a formula you should Type the  $\dagger$  sign before it, so as the computer will take the function you will type as a formula and then do the necessary calculations.

The general format is:  $\dagger(\text{Cell no.}) * 35 / 100$ .

3- Type the necessary formula in C4.

☞ As you will notice, in cell C4 the number 1050 will appear (which is the 35% of 3000) while the formula will remain on the Formula Bar on the top of the sheet.

4- Type 2500 in C5.

5- Type 7000 in C6.

6- Type 8500 in C7.

⇒ In cell C9 we want to add all the assets which are available from cell C3 till cell C7 by using a formula. The general format is:

$\dagger \text{Sum}(\text{1st cell number}.. \text{last cell number})$ .

7- Type the necessary formula in C9.

8- Type 4000 in C13.

9- Type 2300 in C14.

⇒ In cell C16 we want to add the liabilities available in cells C13 and C14, using the same formula format you have used to add total assets.

10- Type the necessary formula in C16.

⇒ In cell C18 we want to calculate the value of owners' equity which is the result of subtracting **Total Liabilities** from **Total assets** found in cells C9 and C16 respectively. The general format is:  $\dagger \text{1st cell number} - \text{2nd cell number}$

11- Type the necessary formula in C18.

12- Type Year 2 in D1.

13- Type 1000 in D3.

14- Type 2000 in D4.

15- Type 3300 in D5.

16- Type 4800 in D6.

17- Type 6700 in D7.

⇒ In cell **D9** we want to add the assets which are available from cell **D3** to **D7**. But since we already added the assets of year 1 (from cell **c3** to **c7**) which fall in the same range as assets for year 2, we will just copy the formula from **C9** to **D9**. To copy a formula follow these steps:

18- Select the **Copy** command from the *Edit* menu.

☞ A message will appear asking you to specify the cell from which you want to copy. Choose the **Source Block** you want.

☞ Another message will appear asking you to specify the cell to which you want to copy. Choose cell **D9** as **destination block** by going to it and then pressing *Enter*.

\* The formula will be copied and assets of year 2 will be added.

19- Type **2200** in **D13**.

20- Type **4100** in **D14**.

☞ Now we want to *add* the **liabilities** and then *subtract* them from the **Total Assets** to get the **Owners' Equity**. The procedures for both operations are already done for year 1 using formulas, we will copy (duplicate) the formulas to respective cells in year 2.

21-Select the **Copy** command from the *File* menu.

22-To select the **source block** from which we want to copy, go down to cell **C18**, to get **C16..C18**. Because we will copy the formula that will add the **Liabilities** and the formula that will calculate **Owners' Equity** at the same time, so not to repeat the copy procedure twice.

23-To specify the **destination block**, go to cell **D16**.


☞ Both formulas will be copied from cells **C16** and **C18** to **D16** and **D18** respectively.

## PART F: FORMATTING THE NUMBERS.


In this section you will learn to add to a group numbers the dollar sign (\$).


Before you start this section you should go to cell C3.

1- Select the **Numeric Format** command from the *Style* menu.


 A small box will appear with different options.

2- Select the **Currency** option.

 Another box will appear asking you to specify the number of decimal numbers, here we do not want decimal numbers, so this answer should be 0.

 A message will appear asking you to specify the cells whose numbers you want to format.


3- Because we want to add \$ to all the numbers at the same time for the sake of not repeating the procedure several times and consequently losing a lot of time shade the area from C3 to D18 by using the arrows right and down and then pressing *Enter*.

 As you will notice a (\$) and a (,) will be added to all the numbers on the worksheet.

## PART G: SAVING YOUR WORK.

After you have finished a big part of your work you will need to save your work (in the memory), in order not to lose what you have done, which you have already given a name when you started the session.

1- Select the **Save** command from the *File* menu.

 The **Save** command is used when you want to save a file already named.

A box will appear having the three options: - **Cancel**, - **Replace**, and - **Backup**.

2- Choose **Replace**.




☒ After saving the file we will learn how to close it.

- 1- Select the **Close** command from the *File* menu.  
\* The file will be closed and an empty sheet will appear.

#### **PART H: OPENING A FILE.**

In this section, you will learn how to open a file that already exists in the memory. It is worth mentioning that two commands can be used to open a file the **Retrieve** command and the **Open** command; but in this training session we will use the **Open** command.

- 1- Select the **Open** command from the *File* menu.  
 A dialog box will appear.
- 2- Type the name of the file.  
\* And your file will be displayed again on the screen.

#### **PART I: DOING A SMALL EXERCISE.**

After opening the file we will do a small exercise as an application for what we have learned.

In cell **C20** we want to calculate the current ratio which is the result of dividing the Total Liabilities by the Total Assets of year 1, and then to copy this formula from cell **C20** to cell **D20** so as to have the current ratio for year 2 without repeating the formula. Follow the steps already used before during the session.

\*\*\*

APPENDIX B

## TRAINING MANUAL USING DOS

Dear Trainee,

This training manual is designed to show you the importance of operating systems software to your microcomputer system. You will understand how to use some fundamental DOS commands in order to effectively manage both the files you create and your disk storage devices. This manual covers the fundamentals of operating systems software and the use of some important operating systems software commands.

### COMPETENCIES

When you have completed this manual, you will be able to:

- \* Describe the disk drive - naming conventions used on most microcomputers.
- \* Describe the conventions for naming the files you create when using a microcomputer.
- \* Boot a microcomputer.
- \* List, Copy, Rename, and Erase files.
- \* Create, Change and Use directory structures.
- \* Remove a directory structure.

## PART A: DISK DRIVE NAMING CONVENTIONS.

Most microcomputers have one of the following disk drive configurations:

- a- Two diskette drives [Figure A(1)].
- b- One diskette drive and one hard disk [Figure A(2)].
- c- Two diskette drives and one hard disk [Figure A(3)].

Figure A - Disk Drives.

When using a DOS, the first diskette drive, which is usually located to the left or above the second disk drive [Figure A(3)] is referred to as **drive A**. The second diskette drive is referred to as **drive B**. If there is a hard disk, it is referred to as **drive C**. When referring to a drive, the drive letter should always be followed by a colon (:) to represent the drive designation.

For example:

When you are using DOS to copy a file from the hard disk to the first diskette drive, your command will include the instruction to copy from **C:** to **A:**

## PART B: NAMING THE FILES YOU CREATE.

When you want to save your work (such as a document you have created) into a file stored on a disk, you must tell the computer where the data file should be saved (for example, **A:**, **B:**, or **C:**) and what you want to name the file you wish to save.

To name a file using DOS, you must use the following naming conventions.

1. The **filename** can have between one and eight characters.
2. A file must have a name, but it does not have to have a **filename extension** - characters added to the name to aid in file identification.
3. An extension can have between one and three characters.
4. The filename and the extension are separated by a dot (.). Both of the following, for example are valid filenames: **BUDGET** and **BUDGET.JAN**.

5. If a filename has an extension, you must refer to both parts of the name when telling DOS about the file.
  6. Not all characters can be used when naming files. The following characters can be used: A - Z; 0 - 9; !, @, #, \$, ^, &, (, ~, {, ", \_ , -.
  7. Spaces are not allowed in filenames or filename extensions.
  8. to save a file onto a certain disk, make sure to put the appropriate drive designation before the name of the file. Do not include any spaces between the drive designation and the name of the file.
- Examples are valid and invalid filenames, along with stating the reason, are listed in Figure B.

**Figure B: Filenaming Conventions. Examples of some of the valid and invalid filenames that relate DOS operating system.**

Filename and Extension	Status	Reason
1. QUARTER1	Valid	Contains 8 characters in filename.
2. QUERTER1.BUD	Valid	Contains 8 characters in filename. and 3 characters in extension.
3. SAMPLEBUD	Invalid	Contains more than 8 characters in the filename.
4. QUARTER1.BUD2	Invalid	Contains more than 3 characters in extension.
5. A	Valid	Contains 1 character in filename.

## **PART C: BOOTING YOUR COMPUTER.**

Booting your computer means loading DOS into the memory so that the computer will be ready to accept your commands and execute them.

To load DOS into the computer's memory, perform the following steps:

### **\* For Diskette System Users.**

1. Put your DOS diskette in drive A.
2. Close the disk drive gate.
3. Turn the computer on.
4. After DOS has been loaded into the memory, it might prompt you to enter the current date and time. To enter the date, use the following format: MM-DD-YY. For example, if today's date is March 14, 1994, you would type: 3-14-94.
5. Press **ENTER** after typing the date.
6. To enter the current time, use the military, or 24-hour, time clock. For example, if the current time is 11:40 in the morning, type 11:40. If it is 2:20 p.m., type 14:20.
7. Press **ENTER** after typing the time.
8. The system prompt - which designates the disk you booted from - should now be displaying on the screen. It would look similar to this: **A>** .

Your computer is now waiting for you to issue a command.

### **\* For Hard Disk System Users.**

1. Make sure that the disk drive gate for drive A is open and that a diskette is not clicked in place.
2. Turn the computer on.
3. The computer will look for DOS on the hard disk.
4. If you are prompted to enter the current date, follow the steps 4 - 7 above. The system prompt, which looks similar to this: **C>** should now be displaying on the screen.

Your computer is now waiting for you to issue a command.

## PART D: FUNDEMENTAL DOS COMMANDS.

In this section you are going to learn certain basic DOS commands. DOS allows you to perform many different file management tasks - such as listing, copying, erasing, and renaming, along with other things.

### The DIR Command.

This command is the most widely used one. It allows you to see what files are stored on a disk and gives you descriptive information about each file (Figure C). Using the DIR command is like looking in a file drawer to see what files are stored there.

Figure C: Typical Directory Listing.

QUARTER	BUD	23210	3-07-92	1:43p
filename	extension	size in bytes	date	

There are various forms for using the DIR command. The following steps will lead you through using them.

### DIR

This command allows you to list all the files stored on the current disk drive (the drive whose prompt appears on the screen).

To display information about the files stored on the current disk:

1. Type: DIR
2. Press: ENTER

A list of all the files on the current disk should have scrolled quickly up the screen - too quickly. Shortly, you will learn how to slow down the screen's scroll. Note that at the bottom of the directory listing, a message is displayed relating to the number of bytes free, or still available, on the disk.

## **DIR/P**

The DIR / P command allows you to list all the files stored on the current disk drive using the PAUSE switch (/P). This option causes screen to pause when it becomes full. Pressing any key will cause the screen to continue its scroll.

- 1- To display the names of the files on the current disk using the PAUSE switch:  
- Type: dir/p  
- Press: ENTER

If you have many files on your disk, the screen should be full of information, and a message saying "*Press any key when ready*" should display at the bottom of the screen.

- 2- To continue the screen's scroll, press any key.

## **\* DIR / W.**

The DIR/W command allows you to list all the files stored on the current disk drive using the WIDE switch (/W). This option causes the screen to list all the files on the disk across the width of the screen. With this switch, only filename and filename extension information are displayed.

To display the names of the files on the current disk using the WIDE switch:

- 1- Type: DIR/W
- 2- Press: ENTER

The files should be listed across the width of the screen.

## **DIR [Drive Designation].**

To display the files on a drive other than the current drive, the following procedure is used.

### **For Diskette System Users.**

- 1- To display the files stored on the Student Data Diskette in drive **B:**  
Type: dir B:  
Press: ENTER
- 2- To display the files stored on the Student Work Diskette in drive B using the / W option:



Type: DIR B:/W

Press: ENTER

- 3- To display the files stored on the Student Work Diskette in drive B using the /P option:

Type: Dir B:/P

Press: ENTER

### **For Hard Disk System Users.**

- 1- To display the files stored on the Student Data Diskette in drive A:

Type: dir A:

Press: ENTER

- 2- To display the files stored on the Student Work Diskette in drive A using the / W option:

Type: DIR A:/W

Press: ENTER

- 3- To display the files stored on the Student Work Diskette in drive A using the /P option:

Type: Dir A:/P

Press: ENTER

### **DIR [Drive Designation][Wildcard Character].**

With what you know now, you can only list *all* the files stored on a disk. But what if you want to see a list of a *group* of files stored on a disk? when a disk becomes full with files, you might, for example, want to list only the files that you created with a certain applications program or that relate to a common task (such as files related to a budget you are working on). With DOS's **global**, or **wildcard**, characters - the asterisk (\*) and the question mark (?) - you will be able to list selected files on the screen at a time. These **global** characters represent whatever you want them to. The \* can be used to represent more than one character, whereas the ? is used to represent one character. Figure D provides examples of using the DIR command with these wildcard characters. As you will learn shortly, wildcard characters are especially useful when copying files.

**Figure D: Using the DIR command with Wildcard Characters to List Groups of Files.**

DIR	Description
Command	
C:\>dir A:*.wk1 Diskette	Lists all the files on the Student Work Diskette that have an extension of wk1.
A:\>dir B:W*.* Diskette	Lists all the files on the Student Work Diskette that begin with the letter W.
A:\>dir B:?O*.* Diskette	Lists all the files on the Student Work Diskette that have "O" their second letter whatever the first letter is.

How to work it out?

**For Diskette System Users.B**

- 1- The Student Work Diskette should still be in drive B.
- 2- To list more than one file, use the wildcard character. For example, to list only those files that have an extension wk1 that are stored on the diskette in drive B:

Type: dir B:\*.wk1

Press: ENTER

Here, you are instructing DOS to do the following: "list on the screen all the files that have an extension of wk1.

**For Hard Disk System Users.**

Follow the preceding instructions for diskette system users; however, substitute A for all references to drive B.

### \* CHANGING THE CURRENT DISK DRIVE.

Often you will find that you need to issue a series of commands on a drive other than the current one. In order not to have to type in the drive designation each time you issue a series of commands on another disk, DOS lets you change the current drive.

#### For Diskette System Users.

1- The Student Work Diskette should be in drive B.

2- Type: B:

Press: ENTER

The system prompt should now indicate that drive B is current.

3- To list the files stored on the Student Work Diskette:

Type: DIR

Press: ENTER

Note that you did not need to type "B:" as you did in the previous section. Because you have changed the current drive, all commands you type will affect drive B unless you specify otherwise.

4- To change the current disk drive back to drive A:

Type: A:

Press: ENTER

#### For Hard Disk System Users.

1- The Student Work Diskette should be in drive A.

2- Type: A:

Press: ENTER

The system prompt should now indicate that drive A is current.

3- To list the files stored on the Student Work Diskette:

Type: DIR

Press: ENTER

Note that you did not need to type "A:" as you did in the previous section. Because you have changed the current drive, all commands you type will affect drive A unless you specify otherwise.

4- To change the current disk drive back to drive C:

Type: C:

Press: ENTER

### Exercise

A- List the files stored on your data diskette across the width of the screen.

\* Steps to do this:

You have to use the /W switch.

#### **For a Diskette System User.**

1- Type: dir B:/W

2- Press: ENTER

#### **For a Hard Disk System User.**

1- Type: dir A:/W

2- Press: ENTER

B- List all the files on your data diskette that have an extension of DOC.

\* Steps to do this:

*All files* can be represented by the wildcard character (\*).

Keep in mind that the drivename designation should be **B:** if you are a diskette system user; whereas, it should be **A:** if you are a hard disk system user.

1- Type: dir <drive name>\*.DOC

C- List all the files on your data diskette after changing the current drive to the drive including the files you want to list.

\* Steps to be followed:

1- The current drive is either A: or C:, and the target drive would be B: or A: respectively depending on whether you are using a diskette system or a hard disk system

2- At the prompt,

Type: B: or A: depending on your system as mentioned in step

#1.

Press: ENTER

Type: DIR (to list all the files available on your data diskette).

3- Although this is not necessary, please go back to the original disk drive you have been in before changing the drive in step #2. Do this by trying C: or A: and press ENTER.

D- List all the files for which you are sure that the second letter is "e", but you do not remember or you do not care what the first letter is.

\* Steps to be followed:

1- Type: DIR<drive name>?e\*.\*

[drive name is B: or A: depending on whether you are using a data diskette system or a hard disk system].

2- Press;ENTER.

### **The COPY Command.**

The COPY command, an internal command, allows you to make copies of files onto the same disk (but under different names) or onto another disk. Figure E provides examples of the COPY command.

#### **To COPY a file onto the same disk.**

The following steps will lead you through making two copies of a file available on your Student Data Disk called STUDENT1.DBF. Copying it onto the same disk means giving the copies different names. To copy the file onto the same diskette under the name STUDENT2.DBF and STUDENT3.DBF, follow the steps listed below.

#### **\* For Diskette System Users.**

Drive B should be the current disk drive. If it isn't:

1- TYPE: B:

2- PRESS: ENTER

#### **\* For Hard Disk Users.**

Drive A should be the current disk drive. If it isn't:

1- TYPE: A:

2- PRESS: ENTER

#### **\* For both System and Hard Disk Users.**

Perform the following steps:

1- TYPE: COPY Student1.DBF Student 2.DBF

- 2- PRESS: ENTER
- 3- TYPE: COPY Student1.DBF Student3.DBF
- 4- PRESS: ENTER

To see that the 2 copies were made:

- 1- TYPE: DIR
- 2- PRESS: ENTER

### **To Copy a File Onto a Different Disk.**

To copy a file called Grade.Doc from the disk drive (A: or B:) onto the Student Disk Drive (B: or A:), perform the following steps.

Note: You can give the file the same name or a different name.

#### **\* For diskette System Users.**

1. TYPE: COPY A:Grade.Doc B:
2. PRESS: ENTER

To see the file, use the DIR command to list the files available on Drive B: and Press ENTER.

#### **\* For Hard Disk System.**

1. TYPE: COPY C:Grade.Doc A:
2. PRESS: ENTER

To see the file, use the DIR command to list the files available on Drive A: and Press Enter.

Figure E: The Copy Command.

Command	Purpose
<b>COPY TEXT1.DOC BUDGET</b> <b>TEXT1.DOC</b>	Copy the file named stored on the current disk onto the disk giving it the name <b>BUDGET</b> .
<b>COPY C:DATA A:</b>	Copy the file named <b>DATA</b> from the hard disk to disk drive A. The copied file still has the same name.
<b>COPY A:*.wk1 B:</b> extension <b>WK1</b> drive A to drive B.	Copy all files with an from
<b>COPY C:C*.* A:</b> disk letter C onto the in drive A.	Copy all files stored on hard which begin with the diskette
<b>COPY REPORT.MAN B:</b> <b>REPORT.MAN</b> current drive to drive B.	Copy the file named from the

**Excercise:**

A. Copy the file called Admsions.Wk1 from the data drive onto the Student Disk Drive.

To do this,

TYPE: COPY <source drive name> Admissions.WK1 <target drive name>.

PRESS: ENTER>

B. Copy the File Relation.Doc from the Student Disk Drive onto the same disk, giving it the name Newrd.Doc.

To do this,

TYPE: COPY <drive name> Relation.Doc Newrd.Doc

PRESS: ENTER.

### **The RENAME Command.**

The RENAME command allows you to change the name of a file stored on a disk. In the following steps, you will rename the file Student1.DBF stored on your Student Data Diskette to INFORM.DBF. Fig. F. provides examples on the Rename command.

1. Drive B should be the current drive for diskette users, and drive A should be the current drive for hard disk users. If this is not the case, make sure to change the current disk drive.

2. TYPE : RENAME Student1.DBF INFORM.DBF

PRESS: ENTER

3. To ensure that the file name was changed,

TYPE: DIR

PRESS: ENTER



Figure F: The RENAME Command

Command	Purpose
<pre>RENAME STUDENT1.DBF INFORM.DBF</pre>	Rename
<pre>STUDENT1.DBF stored on the current disk INFORM.DBF.</pre>	
<pre>RENAME C:BUDGET.JAN BUDGET.FEB BUDGET.JAN</pre>	Rename
<pre>stored on the hard disk BUDGET.FEB.</pre>	
<pre>RENAME A:TEXT1.DOC DATA TEXT1.DOC</pre>	Rename
<pre>stored onto the diskette DATA.</pre>	

#### The ERASE Command.

Sometimes, you need to discard old unnecessary files stored on your data disks. The ERASE, or DEL, Command is used for this purpose. Examples are provided in Fig. G.

To erase the file named Students.cbf from your student data diskette, perform the following steps.

1. Drive B should be the current drive for diskette users, and drive A should be the current drive for hard disk users. If this is not the case, make sure to change the current disk drive.

2. Type: ERASE Student3.dbf

or : DEL Student3.dbf

Press: ENTER

3. To confirm that the file Student3.dbf no longer exists on the student Data Diskette:

Type: DIR

Press: ENTER

**Figure G: The Erase (DEL) Command.**

Command	Purpose
ERASE BUDGET current	Erase BUDGET from the diskette.
ERASE B:BUDGET diskette in	Erase BUDGET from the drive B.
ERASE A:*.WK1 extension of in drive A.	Erase all the files with an WK1 from the diskette
ERASE A:W*.* with the the diskette in drive A.	Erase all the files that begin letter W from

### EXERCISE

Before doing the exercise, change your drive. If you are a hard disk system user, change it to C , and if you are a diskette system user, change it to B .

1. Copy all files starting with the letter F from the current disk drive to the student disk drive.

\* To do this:

Type: COPY <current drive designation> F\*.\* <student data diskette>

Press: ENTER

2. Rename the file called Find.BUD stored on the student data diskette Find.REP

\* To do this:

Type: RENAME <drive name> Find.BUD Find.REP

Press: ENTER

3. Erase a file called Faraj.DBF stored on your student data diskette.

\* To do this:

Type: DEL <drive name> Faraj.DBF

Press: ENTER

### Creating and Using Directory structures

When you first boot your computer and see the prompt ( A> or C> ), you are in the root directory. The root directory is similar in the concept to the frame of a file cabinet. Just as file cabinets are composed of drawers that contain folders that in turn contain other folders or files, the root directory can contain subdirectories ( drawers ) that can contain other subdirectories and other files. Please note that the ( \ ) key is used to symbolize the root directory and the reference of the path to a subdirectory in a DOS command.

#### A- MKDIR ( MD ) Command: Making a subdirectory.

The MD command is used to make a subdirectory. Now you are going to follow certain steps that would help you create the directory structure available in Fig. 1.

First of all, you have to change the current disk drive to the drive designating the student data disk drive.

To change the current disk drive,

Type: A:

Press: *ENTER*

#### Creating Subdirectories Within The Root Directory.

The first subdirectory you will create is called Student. To do this, follow these steps:

1. Type: md \student  
Press: *Enter*

2. C> has again appeared on the screen. You have just created a subdirectory below the root directory. To see if the directory really exists:

Type: **DIR**

Press: *Enter*

Note that the directory has an extension of <Dir>.

3. To complete the first level of the directory structure by creating the Adminst and the Account subdirectories:

Type: **md \adminst**

Press: *Enter*

Type: **md \Account**

Press: *Enter*

### **Listing the contents of a subdirectory**

To see what the contents of an empty subdirectory look like, you can use the DIR command. However, you must specify the path to the subdirectory. To list the contents of the Account subdirectory ( and not the root directory ):

Type: **dir \Account**

Press: *Enter*

As you have found out, there are no data files currently stored in this subdirectory.

### **Creating Subdirectories Within Subdirectories.**

Now, you will create the Course and the Data subdirectories, which are located two levels below the root directory - that is, within the Student subdirectory.

1. To create the Course subdirectory:

Type: `md \Student\Course`

Press: *Enter*

2. To see the Course subdirectory, you need to use the DIR command to list the contents of the Student subdirectory:

Type: `dir \student`

Press: *Enter*

3. To create the Data subdirectory:

Type: `md \Student\Data`

Press: *Enter*

At this point, you have an empty directory structure on your data diskette. ( You will copy files into the directory structure shortly ). Just think of it as a filing cabinet that has empty drawers in it. In addition all the drawers in this filing cabinet are closed, and if you need to use the information in a particular drawer, you should first open it, right? Now we will lead you through opening and closing the drawers or subdirectories.

#### **B- CHDIR ( CD ) Command: Changing the Current Directory.**

The CD command allows you to change the current directory. Until now in this lesson, the root directory has been the current directory. To practice moving around the directory structure you have created, perform the following steps.

- 1- To make the Account drawer (subdirectory) the current drawer (subdirectory):

Type: `cd \Account`

Press: *Enter*

Note that the system prompt has changed to reflect the current subdirectory.

2- Because you have made the Account drawer, any command you type right now will affect this drawer unless you specify otherwise. Therefore, if you use the DIR command, you should see the contents of the the Account subdirectory.

Type: **DIR**  
Press: *Enter*

3- To change the Data subdirectory (available under Student subdirectory)

Type: `cd \Student\Data`  
Press: *Enter*

The Data drawer is now the current drawer.

4- To change the Adminst drawer:

Type: `cd \Adminst`  
Press: *Enter*

5- What do you think you need to type to make the root directory the current directory again? Try the following:

Type: `cd\`  
Press: *Enter*

### Copying Files to Subdirectories.

To start with, make sure that you still have drive **A:** as the current drive, and the root directory as the current directory. The system prompt should therefore now be:

Now to copy files into subdirectories, do the following:

(a) Copy from the root directory (\).

(b) Copy all the files that have the extension wk1 (\*.wk1),  
and

(c) Copy them into the Account subdirectory (\Account)

To do this:

1- Type: **copy** \*.wk1 \Account

Press: *Enter*

2- To confirm that the files were copied, list the contents of  
the Account directory on the screen:

Type: **dir** \account

Press: *Enter*

**Exercise:**

**Copying into the \Student subdirectory.**

Here, you are going to: (a) copy from the root directory (\), (b)  
copy all the files that start with student (student \*.\*), and copy them  
to the Student subdirectory (\student).

To do this, Follow these steps:

1- Type: **Copy** \Student \*.\* \Student

2- PRESS: *Enter*

To see the files just copied on the screen, use the DIR command:

1- Type: **Dir** \Student

2- PRESS: *Enter*

**Copying files into the \Data subdirectory available under \Student  
subdirectory.**

Here you are going to copy the file called Inform.dbf available  
under the root directory into the \Data subdirectory .

1- TYPE: **Copy** \INFORM.DBF \Student\data.

2- PRESS: *Enter*

To see it,

- 1- Type: **DIR** \Student\data
- 2- Press: *Enter*.

### Copying Files from one Subdirectory to Another.

Now, to copy a file called Acctg.wk1 from the Account subdirectory to the \data subdirectory available under the \Student subdirectory, do the following:

- 1- TYPE: **Copy** \Account\Acctg.wk1 \Student\data.
- 2- PRESS: *Enter*.

### C. RMDIR (RD) Command: Removing a Directory.

This command enables you to remove directories that you no more need.

Keep the following in mind about the directory you are removing:

- (a) The subdirectory must be empty of files and other subdirectories.
- (b) The subdirectory cannot be the current directory.

In this step you will try to remove the \data subdirectory.

- 1- TYPE: **RD** \Student\Data  
PRESS: *Enter*

Since files are stored in this directory, DOS will display an error message.

- 2- To erase the files from the \Data subdirectory:

TYPE: **Del** \Student\Data\\*.\*

PRESS: *Enter*

When asked if you are sure you want to delete all the files,

Type: **Y**

PRESS: *Enter*.



To make sure that files were erased,

TYPE: **DIR** \Student\Data  
PRESS: *Enter*.

TO remove the subdirectory:

TYPE: **rd** \Student\data  
PRESS: *Enter*.

4. To make sure:

TYPE: **dir** \Student  
PRESS: *Enter*.

\*\*\*\*

After the training manual is completed, subjects were asked to complete the Perceived Ease of Use questionnaire.

Finally, subjects will work through the set of hands-on tasks.

12-item computer task set provided to each of the interface / training groups.

9 tasks = Near transfer tasks similar to these presented in the training manuals requiring only one or two operations to complete including: listing, making or removing directories, changing the current directory, and copying files.

3 tasks = far- transfer tasks including: requiring combining individual commands or operations in new ways including: creating a simple, multi level directory structure, removing a directory but first saving the file it contained into a second directory, and reversing a simple directory hierarchy.

## **PART A: PARTS OF A SPREADSHEET.**

The screen display that appears when you load the QUATTRO PRO program has three major sections: the Border Area, the Worksheet, and the Console.

### **1- The Border Area:**

The border area displays the column letters (across the top of the screen) and the row numbers (down the left side of the screen).

### **2- The Worksheet:**

The worksheet consists of over four million cells, each of which falls at the intersection of a column and a row. The letters and numbers in the border identify each cell; for example cell A1 is the intersection of column A and row 1.

### **3- The Console:**

This is the area at the top of the screen. It includes the worksheet menu (File, Edit, Style, Graph, Print, Database, Tools, Options, Window), the current active cell, under the menu, (A1), the formula bar.

### **\* Important keys to be used:**

- a- The **cursor** keys; i.e the up, down, left and right arrow keys ( $\uparrow$ ,  $\downarrow$ ,  $\leftarrow$ ,  $\rightarrow$ ) to move around the spreadsheet.
- b- The **Tab** key which allows you to move to the next right cell.
- c- The **slash** key, /, to activate the menu.
- d- The **Enter** key to select a certain option from the menu and to confirm the input of a certain label or number in a cell.

\* To select a certain item from the menu we either

- Press the **slash** key and move by the **right or left arrow** keys to go to the needed item and then press **Enter** so that the list of commands appears, or
- Press the **slash** key and then the letter **highlighted** of the needed menu.

e- The Escape key, Esc, to leave the menu.


f- The Shift key:

Some keys have two symbols. The Shift key is used to select the labels or letters of the upper part of the key. It is also used to change small letters to capital letters.

## **PART B: NAMING YOUR FILE.**

Before starting to work on your file you better name it, so that no one can access it. To name the file you should follow these steps:

- 1- Press the / key; so that the *File* menu will be highlighted.
- 2- Press Enter to display the commands of the file menu so that you can choose a command.
- 3- Go down using the down arrow key to the *Save As* command.
- 4- (The Save As command is used when you want to name the file for the first time).
- 5- Press Enter.

 A small box (called the dialog box) will appear on the screen.


- 6- Type the name you want provided that it will not exceed 8 characters.
- \* The file name could be numeric, alphabetic or alphanumeric.
  - \* The QUATTRO PRO will automatically put an extension (WQ1) for your file (for example: Balance. WQ1).
  - \* The name of the file will appear on the down-left corner of your sheet.

## **PART C: FILLING YOUR WORKSHEET.**

In this section we will learn how to just type items into the worksheet. The illustration will be done on a simple balance sheet.


- 1- Go to cell A2, by using the arrow keys.
- 2- Type Assets.
- 3- Press Enter.
- 4- Go down to cell A3 by pressing the down arrow key.

- 5- Type **Cash**; press *Enter*.
- 6- Go down to cell A4.
- 7- Type **Accounts Receivable**; press *Enter*.
- 8- Go down to cell A5.
- 9- Type **Notes Receivable**; press *Enter*.
- 10- Go down to cell A6.
- 11- Type **Equipment**; press *Enter*.
- 12- Go down to cell A7.
- 13- Type **Building**; press *Enter*.
- 14- Go down to cell A9.
- 15- Type **Total Assets**; press *Enter*.
- 16- Go down to cell A11.
- 17- Type **Liabilities**; press *Enter*.
- 18- Go down to cell A13.
- 19- Type **Accounts Payable**; press *Enter*.
- 20- Go down to cell A14.
- 21- Type **Notes Payable**; press *Enter*.
- 22- Go down to cell A16.
- 23- Type **Total Liabilities**; press *Enter*.
- 24- Go down to cell A18.
- 25- Type **Owners' Equity**; press *Enter*.


 As you have noticed, many of the entered items did not fit properly in the assigned cells, because QUATTRO PRO columns are automatically set at 9 characters wide. So we have to increase the column width.

#### **PART D: INCREASING COLUMN WIDTH.**

- 1- Press the Slash key, / .
- 2- Go to the *Style* menu by pressing the *right arrow* key twice.
- 3- Press *Enter*.
- 4- Go down to the **Column-width** command; press *Enter*.

 A message will appear up on the screen asking you to specify the width you need.


5- Type **25**; press *Enter*.


 As you will notice, the width of column **A** has increased to 25 characters, and all items are now inside the assigned cells.

## **PART E: FILLING THE NUMBERS.**

In this section you are going to learn how to fill numbers into your worksheet, use some percentages, additions, subtractions and multiplications, and mainly you will learn to copy formulas from a cell or group of cells to another cell or group of cells.

- 1- Go to cell **C1**.
- 2- Type **Year 1**; press *Enter*.
- 3- Go to cell **C3**.
- 4- Type **3000**; press *Enter*.
- 5- Go to cell **C4**.


 The Accounts Receivable are 35% of the **Cash**. So a formula should be used here to calculate the Accounts Receivable.

 In QUATTRO PRO, whenever you want to type a formula you should Type the **+** sign before it, so as the computer will take the function you will type as a formula and then do the necessary calculations.

6- Type this formula: **+C3\*35/100**.

\* We used **C3** because the value of cash is found in cell **C3**.

7- Press *Enter*.

 As you will notice, in cell **C4** the number 1050 will appear (which is the 35% of 3000) while the formula will remain on the Formula Bar on the top of the sheet.

8- Go down to cell **C5**.

9- Type **2500**; press *Enter*.

10-Go down to cell C6.

11-Type 7000; press *Enter*.

12-Go down to cell C7.

13-Type 8500; press *Enter*.

14-Go down to cell C9.

⇒ Here we want to add all the assets which are available from cell C3 till cell C7 by using a formula, so:

15-Type this Formula:  $+Sum(C3..C7)$ ; Press *Enter*.

16-Go down to cell C13.

17-Type 4000; press *Enter*.

18-Go down to cell C14.

19-Type 2300; press *Enter*.

20-Go down to cell C16.

⇒ Here we want to add the liabilities available in cells C13 and C14, so:

Type this formula  $+Sum(C13..C14)$ ; press *Enter*.

Go down to cell C18.

⇒ Here we want to calculate the value of owners' equity which is the result of subtracting Total Liabilities from Total assets found in cells C9 and C16 respectively.

21-Type this formula:  $+C9-C16$ ; press *Enter*.

22-Go up and then right to cell D1.

23-Type Year 2, press *Enter*.

24-Go down to cell D3.

25-Type 1000; press *Enter*.

26-Go down to cell D4.

27-Type 2000; press *Enter*.

28-Go down to cell D5.

29-Type 3300; press *Enter*.

30-Go down to cell D6.

31-Type 4800; press *Enter*.

32-Go down to cell D7.

33-Type 6700; press *Enter*.

34-Go down to cell D9.

⇒ Here we want to add the assets which are available from cell **D3** to **D7**. But since we already added the assets of year 1 (from cell c3 to c7) which fall in the same range as assets for year 2, we will just copy the formula from **C9** to **D9**.

35-Go to cell **C9**.

36-Press / key.

37-Go right to the *Edit* menu; press *Enter*.

38-Go down to the **Copy** command; press *Enter*.

☞ A message will appear asking you to specify the cell from which you want to copy (**Source Block: C9..C9**).

38-Press *Enter*.

☞ Another message will appear asking you to specify the cell to which you want to copy (**Destination Block:**).

39-Go by the **right arrow** key to cell **D9**; press *Enter*.

\* The formula will be copied and assets of year 2 will be added.

40- Go down to cell **D13**.

41- Type **2200**; press *Enter*.

42- Go down to cell **D14**.

43- Type **4100**; press *Enter*.

➡ Now we want to *add* the **liabilities** and then *subtract* them from the **Total Assets** to get the **Owners' Equity**. The procedures for both operations are already done for year 1 using formulas, we will copy (duplicate) the formulas to respective cells in year 2.

44-Go to cell **C16**.

45-Press / key.

46-Go right to the *Edit* menu; press *Enter*.

47-Go down to the **Copy** command; press *Enter*.

48-To specify the source block from which we want to copy, go down to cell **C18**, to get **C16..C18**. Because we will copy the formula that will add the **Liabilities** and the formula that will calculate **Owners' Equity** at the same time, so not to repeat the copy procedure twice.


49-Press *Enter*.

50-To specify the destination block, go to cell **D16**.



51-Type • sign.

52-Go down to cell **D18**; press *Enter*.


 Both formulas will be copied from cells **C16** and **C18** to **D16** and **D18** respectively.

## **PART F: FORMATTING THE NUMBERS.**


In this section you will learn to add to a group numbers the dollar sign (\$).

Go up to cell **C3** by using the **up** arrow key.


- 1- Press / key.
- 2- Go right to the *Style* menu; press *Enter*.
- 3- Go down to **Numeric Format**; press *Enter*.

 A small box will appear with different options.

- 4- Go down to **Currency** option; Press *Enter*.


 Another box will appear asking you to specify the number of decimal numbers.

- 5- Type **0**; press *Enter*, because we do not have any decimal numbers.

 A message will appear asking you to specify the cells whose numbers you want to format.

- 6- Go right by pressing the *Right* arrow key Once to reach **D3** and then go down by using the *Down* arrow key to **D18**, so that all the area from **C3** to **D18** will be shaded. Because we want to add \$ to all the numbers at the same time for the sake of not repeating the procedure several times and consequently losing a lot of time.


- 7- Press *Enter*.

 As you will notice a (\$) and a (,) will be added to all the numbers on the worksheet.

## PART G: SAVING YOUR WORK.

After you have finished a big part of your work you will need to save your work (in the memory), in order not to lose what you have done, which you have already given a name when you started the session.

- 1- Press / key.
- 2- Press *Enter* to display the *File* menu.
- 3- Go down to the **Save** command.

 The **Save** command is used when you want to save a file already named.

- 4- Press *Enter*.

A box will appear having the three options: - **Cancel**, - **Replace**, and - **Backup**.

- 5- Go down to **Replace**; press *Enter*.

After saving the file we will learn how to close it.

Press / key.

Press *Enter*.

Go down to **Close** command.


Press *Enter*.

\* The file will be closed and an empty sheet will appear.

## PART H: OPENING A FILE.

In this section, you will learn how to open a file that already exists in the memory. It is worth mentioning that two commands can be used to open a file the **Retrieve** command and the **Open** command; but in this training session we will use the **Open** command.

- 1- Press / key.
- 2- Press *Enter*.
- 3- Go down to **Open**; press *Enter*.

 A dialog box will appear.

- 4- Type the name of your file; press *Enter*.

\* And your file will be displayed again on the screen.

## **PART I: DOING A SMALL EXERCISE.**

After opening the file we will do a small exercise as an application for what we have learned.

In cell **C20** we want to calculate the current ratio which is the result of dividing the Total Liabilities by the Total Assets of year 1, and then to copy this formula from cell **C20** to cell **D20** so as to have the current ratio for year 2 without repeating the formula.

\* To do this you should follow the following steps:

1- Go to cell **C20**.

2- Type this formula:  $+C9/C16$ ; Press *Enter*.

☞ Now we want to calculate the ratio for year2, by copying the formula from **C20** to cell **D20**.

3- Press / key.

4- Go to **Edit** menu; press *Enter*.

5- Go down to **Copy**; Press *Enter*.

6- Press *Enter* another time to specify the source block: **C20..C20** (the cell from which you want to copy).

7- Go by the **right arrow** key to cell **D20** to specify the destination block (the cell to which you want to copy).

8- Press *Enter*.

\*\*\*

APPENDIX C

## Command Summary - DOS.

### DIR

- To have a list of files, use the DIR command and specify the name of the drive where the files are available unless it is the current drive. You can use /p and /w switches for a display with a pause or a display along the width of the screen. You can also use \* and ? to display files with specific characteristics.  
The general format is: **DIR <drive name>**

### COPY

To copy a file from one drive to another, or from one directory to another, you have to specify the source and the destination. The general format is: **COPY <source drive name or directory> <destination drive name or directory>**.

### RENAME

To rename a file, specify the old name first then put the new name. The general format is: **Rename [old file name] [new file name]**

### ERASE

To erase a file, use the command del and the name of the file. Do not forget to specify the name of the drive and the directory where the file is available, unless the file is available in the current drive and the current directory. The general format is:

**DEL <drive name or directory> filename**

### Working With Directories

To create a directory, use the MD command. The general format is:

**MD <drive name>\directory name.**

To move around subdirectories, use the CD command. The general format is: **CD <drive name>\\directory name\directory name**

To Remove a subdirectory,

- delete the files available in it.
- Make sure you are not within the same subdirectory.
- remove the subdirectory : The general format is: using the **RD**

**Command:**

**RD\directory name**  
or **RD\directory name\directory name.**

\* \* \*

## Summary - DOS.

### DIR

- To have a list of files, use the DIR command and specify the name of the drive where the files are available unless it is the current drive.
- If at the current drive,  
TYPE: DIR
- If at a different drive,  
TYPE: DIR , and specify the drive name.
- Use /P and /W switches to have files listed with a pause ( /P ) or along the width of the screen ( /w ).
- Use wildcard characters ( \* and/or ? ) to have a list of specific files.  
Ex: DIR A: \*.wk3

### COPY

To copy a file from one drive to another, or from one directory to another, you have to specify the source and the destination.

EX: Copy C: ?e\*.Doc A:  
or Copy C: ?e\*.Doc A:\Forms  
or Copy C:\users\EMP1\Salary.dbf\personel

### RENAME

To rename a file, specify the old name first then put the new name.

EX: Rename Memo.Doc Note.Doc

### ERASE

To erase a file, use the command del and the name of the file. Do not forget to specify the name of the drive and the directory where the file is available, unless the file is available in the current drive and the current directory.

EX: Del Employee.dbf  
or Del A:\users\Employee.dbf.

### Working With Directories

To create a directory, use the MD command

EX: MD A:\Budget.

To move around subdirectories, use the CD command

EX: CD \Budget

To Remove a subdirectory,

- delete the files available in it.

Del \Budget\\*.\*

- Make sure you are not within the same subdirectory.

- remove the subdirectory :

RD \Budget.

\* \* \*



**The Effect of Computer Interface and  
Various Training Methods on Learning Performance**

**Dear Trainee,**

**This questionnaire is being designed for you to assess the flexibility and ease of use of the softwares which you had training sessions on. It is believed that various training methods and computer interfaces have an effect upon the performance of the computer user. Your opinion about the flexibility and easiness of the system you used is of high importance to this study. 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 your cooperation; it is highly needed for this study.**

**Yours Sincerely,**

**Hala Ghutmy  
Student, Master Program  
Business Management  
School of Business  
Beirut University College**

## DEMOGRAPHIC AND PERSONAL DATA

- 1- Occupation:  
--- 1. Executive or Managerial    --- 5. Student  
--- 2. Professional                --- 6. Homemaker  
--- 3. Government or Military    --- 7. Retired  
--- 4. Sales                         --- 8. Other ----- (Please Specify)
- 2- Are you self-employed?  
--- Yes                                --- No
- 3- Educational Level:  
--- 1. No formal diploma         --- 4. Master's degree  
--- 2. High school diploma       --- 5. Doctoral degree  
--- 3. Bachelor's degree
- 4- Age:  
--- 1. Under 18 years               --- 4. 35 - 49 years  
--- 2. 18 - 24 years                 --- 5. 50 - 64 years  
--- 3. 25 - 34 years
- 5- Sex:  
--- Male                               --- Female
- 6- Nationality: -----
- 7- Have you ever had computer training before?  
--- Yes                                --- No
- 8- If Yes, name softwares you had training on:  
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## EASE OF USE

Please answer the following questions by choosing one of the following answers:

1 = Strongly Disagree

2 = Disagree

3 = Uncertain

4 = Agree

5 = Strongly Agree

1- I felt confused when I used the computer system.	1	2	3	4	5
2- When I use the computer system, I make errors frequently.	1	2	3	4	5
3- Using a computer system is frustrating.	1	2	3	4	5
4- I believe that using a computer system requires a lot of help and reference to manuals.	1	2	3	4	5
5- I believe that using a computer system requires a lot of mental effort.	1	2	3	4	5
6- The system I used is inflexible and rigid to react with.	1	2	3	4	5
7- I find it easy to remember how to perform a given task using the computer system.	1	2	3	4	5
8- The system behaves sometimes in unexpected ways.	1	2	3	4	5
9- The features learned in the system are understandable.	1	2	3	4	5
10. The features in the system are easy to learn.	1	2	3	4	5
11. Overall, I find the information system easy to use.	1	2	3	4	5

**Tasks to be accomplished :**

1. Create a directory in your student diskette and call it "REGISTER".

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2. Copy the file ZEIN1 with extension DOC from the root directory to the subdirectory "REGISTER".

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3. Copy all the files with extension .WK1 from the root directory to the subdirectory "ACCOUNT".

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4. Rename the file ZEIN1 with extension DOC in subdirectory "REGISTER" Form with extension APR.

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5. Erase the file ZEIN1 with extension DOC from the root directory.

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6. Open subdirectory STUDENT

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7. List the files available in subdirectory STUDENT.

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8. Go back and open the root directory.

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9. List the files that have 'e' as their second character whatever the rest of the characters are, and whatever the extension name is.

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10. Create a two-level directory structure. The first is \FACULTY under root directory, and the seconde is \TEACHER under subdirectory FACULTY.

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11. Remove the subdirectory \"REGISTER\", but first save the file it includes under the subdirectory \TEACHER.

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