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THE USE OF DECISION SUPPORT SYSTEMS IN MAKING STRATEGIC DECISIONS IN LOCAL AUTHORITIES: A COMPARATIVE STUDY OF EGYPT AND THE UK

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Abstract

The application of a modified Technology Acceptance Model (TAM) to determine the factors affecting the use of Decision Support Systems (DSS) in strategic decision-making in local authorities in both the UK and Egypt was the main core of this research. Although the use of DSS has become widespread in recent years for operational control its use in strategic decision-making has only rarely been seen. This research explores the problems which cause decision-makers not to use DSS effectively in making strategic decisions. Both the UK and Egypt have long histories of implementing IT in general and DSS in particular in local government. Although the UK has longer experience in adopting IT, both countries have failed to achieve the goals from this technology in a strategic context; however its operational use is quite good.

The results of this research showed that the percentage of DSS usage in both the UK and Egypt were 40% and 30% respectively which means more than half of the investments in this kind of technology have not yet been used properly. This research has examined the strategic use of DSS and defined the most severe problems that could face decision makers when they use DSS strategically.

To define the factors that affect DSS usage in making strategic decisions the researcher used the TAM which was first introduced in 1986 by F. Davis. This model enjoys a rich base of academic acceptance. Many subsequent studies have proven reliability of the measures and validity of the constructs and overall model. This study argues that TAM could be applicable to the context of the strategic use of DSS in local government in developing countries as it is successfully applied in developed countries in different kinds of technologies.

This dissertation outlines a framework for the different factors that affect the strategic use of DSS in both the UK and Egypt. Also this research tries to find answers to the following questions:

1. What are the problems related to DSS usage in making strategic decisions?
2. What is the relative severity of these problems in both the UK and Egypt?
3. What are the differences between the UK and Egypt relating to the problems that decision-makers encounter?

The hypotheses of this research were tested using a questionnaire as the main data-gathering instrument in addition to interviews made mainly to validate and support the results of the quantitative approach. Rigorous validation procedures and statistical analysis methods were performed on the data, including face and content validity, alpha Chronbach and Factor analysis. The questionnaire was tested for reliability and validity and proved to be highly valid and reliable. The results of the analysis supported all hypothesised relationships.

The results of this research showed that Perceived Usefulness (PU) made a significant direct effect on DSS usage in the UK group while Perceived Ease of Use (PEU) showed no significant effect in both countries in all variables apart from the internal support which was significant in the UK group. Also the results of this research showed that there was some similarity in both countries regarding the problems of strategic use of DSS, which were: absence of training for decision-makers to use DSS and failure to commit the required resources. These results indicate that if DSS is to be effectively used strategically by decision makers, local government in both developed and developing countries needs to apply greater funds to training, to making top-level decision makers comfortable with the use of DSS in hybrid (quantitative/qualitative) problem contexts and to providing those decision makers with DSS which target mainly strategic problems.

DEDICATIONS

To the memory of my father Mohamed Elbeltagi and my two brothers Anis and Galal Elbeltagi to whom I owe all that I am. They dreamed for years to see their dreams about me come true but they passed away before this could happen. God bless their souls.

To my mum who showed me true respect. She taught me the value of life, family and, most importantly, religion.

To my lovely wife, our daughters Hadir, Nada, Rewaa and Mennah and to my son Abdelrahman. This thesis would never have been completed if it weren't for Amira's unconditional support throughout my studies. Much gratitude is owed to my family members for their support and encouragement during this life changing course who endured countless weekends and nights without me while I spent so much time away from home on this research. Their dedication, devotion and good humour was truly inspirational.

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Chapter 1 Introduction

1.1 Introduction

"Practitioners and researchers require a better understanding of why people resist using computers in order to devise practical methods for evaluating systems, predicting how users will respond to them, and improving user acceptance by altering the nature of the systems and the process by which they are implemented." Fred Davis 1989

The rapid global growth of Information Technology (IT) has inspired IT practitioners, researchers, developers and innovators to seek new, more sophisticated and more effective acceptance and usage methods (Davis, Bagozzi et al. 1989; Moore and Benbasat 1991; Taylor and Todd 1995; Agarwal and Prasad 1998a). This interest in the subject has been manifested in the abundant research and studied carried out to identify the factors that lead to the successful adoption and use of IT in general and DSS in particular (DSS) (Davis 1989; Davis, Bagozzi et al. 1989; Thompson and Rose 1994; Rose and Straub 1998; Agarwal and Prasad 1998a). In fact, the last two decades have generated a multi-disciplinary research body that expands over the field of technology, Human Computer Interaction (HCI), and social psychology to shed light on user acceptance of technology (Davis 1989; Davis, Bagozzi et al. 1989; Rogers 1995; Agarwal and Prasad 1998b). As a result of the rich research findings, many models have been developed to predict the relationship between user perception and technology acceptance and use. The Technology Acceptance Model (TAM), initially developed in 1986 by Fred Davis, is the best known and respected in the industry (Davis 1989; Davis, Bagozzi et al. 1989; Moore and Benbasat 1991; Thompson and Rose 1994; Taylor and Todd 1995).

Computing technology and information systems represent substantial investments for organisations; investments on which they hope to realise a return in areas such as making effective Strategic Decision Making (SDM) and improving efficiency. Simply acquiring the technology, however, is often not sufficient; in order to obtain the anticipated benefits, it must be used appropriately by its intended users. There are many factors affecting the utilisation of IT in supporting effective SDM. These factors range from the systems themselves, the organisations that use the systems, the decision-makers and even the environment. Yet, the recent vogue to study technology acceptance and usage has only been concentrated in the technologically developed world. Certainly, of the large number of IT acceptance and usage studies covered in recent literature review, few, if any, took place in the developing world (Thompson and Rose 1994; Rose and Straub 1998). Of course, the developing countries have their own unique characteristics, therefore, conducting research in developing countries in comparison to developed countries is, indeed, required to enhance our understanding of DSS acceptance and usage.

This dissertation is important to researchers; it extends a widely used model of TAM (Davis 1986) to different contextual dimensions in a more realistic organisational setting than has been previously observed. Conceivably, such professional settings may differ from students or other subjects commonly studied by previous research due to a host of factors, including general competence, intellectual and cognitive capacity, specialised training, and professional work and accomplishments. In addition, the research will look beyond ordinary MIS tools and into more complicated tools used for making strategic decisions. This dissertation can be seen as an initial step in the area of cross-cultural studies of DSS and its use in making strategic decisions.

For practice, this dissertation provides some findings that are useful to CEOs in local governments in multinational environments. In general this study has shown that there are different factors affect the usage of DSS in making strategic decisions and there are different categories of problems that CEO in local governments encounter when they use DSS in making their strategic decisions. Mangers should be aware of this finding and should take these different factors into consideration in the planning, design, introduction, and usage of DSS in making strategic decisions.

1.2 Research Objectives

The purpose of this research is to examine and define the factors that influence DSS usage in making strategic decisions and define the main problems that CEOs encounter when they use DSS in making strategic decisions in local governments in both the UK and Egypt.

By understanding the factors that affect CEOs DSS usage in making strategic decisions and the problems that they encounter when they using the systems, managers can develop strategies to sort out these problems and increase the utilisation of the DSS. The main objectives of this study were:

- Extended the TAM in terms of specification of a number of external factors that are believed to influence the acceptance and actual usage of DSS in SDM.
- Empirically test the extended model in a developing country (Egypt) in comparison to a developed country (UK), to provide a scientific proof to its validity as it applies not only to the technically advanced world but also to developing countries such as Egypt and countries of similar characteristics like other Arab countries.
- The study sheds light and defines the possible problems that the decision makers encounter when they use DSS in making their strategic decisions in both countries and difference between the UK group and the Egypt group about the problems that decision makers encounter when they use DSS in making strategic decisions.
- The study highlights the direct and indirect relationships between DSS usage and the different possible variables without and with using the mediation of the main two constructs of TAM which they are PEU and PU.

1.3 Problem Statement

Past research in IT acceptance has concentrated on the discretionary use of simple MIS application such as word processing, spreadsheets and electronic mail, in largely academic settings. No study has been undertaken which addresses DSS acceptance and usage in making strategic decisions in local governments across cultures where the use of complex technology is mandatory for users for completion of job tasks. In addition, little or no use of DSS has been documented in most of the environments by some researchers (Avgerou and Land 1992; Moussa and Schware 1992; Odedra, Lawrie et al. 1993). Providing a better understanding for the nature of the problems that hinders the utilisation of DSS in making strategic decisions will help to increase the utilisation of DSS. Davis (1989) and Taylor and Todd (1995), among others, have called for

TAM-based models and their constructs to be examined in more complex settings before a final general statement of the relative importance of these constructs and their interrelationships can be made. Previous research also only examines IT usage in general and the contextual factors were limited but this research will put a framework for all the possible variables that can affect DSS usage in making strategic decisions by examining a more detailed model of technology acceptance relevant to organisational users.

In general, the research in user acceptance is of value to local authorities for four reasons:

1. Understanding the factors affecting user acceptance of DSS: knowledge of the factors affecting user acceptance of DSS, how they can be measured and how they relate to each other is crucial in the development, implementation and managing successfully DSS. Knowing these factors, interventions during implementation (such as training or involving user in development) can be used to increase user acceptance and usage.
2. Prediction of user acceptance of DSS: before investing a large amount of money in a technology, an organization must be able to predict whether or not the investment will be accepted and used.
3. Selection of alternatives: relative measures of user acceptance can be used to choose between alternative technologies.
4. Guiding development: measurement of specific aspects or elements of a technology which affect user acceptance can be used to provide guidance to system/software developers as to which of these aspects or elements are important to the user or need to be improved to utilise the system effectively. This knowledge can also be used in the early stages of software development to prevent potential problems before they occur or if they already have happened they could be sorted easily.

1.4 Research Model

Figure 1 depicts the research model employed in the study. It is a reduced TAM model, excluding attitude and intention to use, because this research targeted only the local authorities that already adopted DSS systems in their organisations. The basic idea for the model is DSS usage in making strategic decisions as a dependent variable, can be predicted by both perceived ease of use and perceived usefulness with the different contextual variables. In this context the model hypotheses that DSS usage can be explained, accurately predicted, by means of a host of relevant contextual factors and the degree to which DSS usage in making strategic decisions is easy and useful as perceived by decision makers.

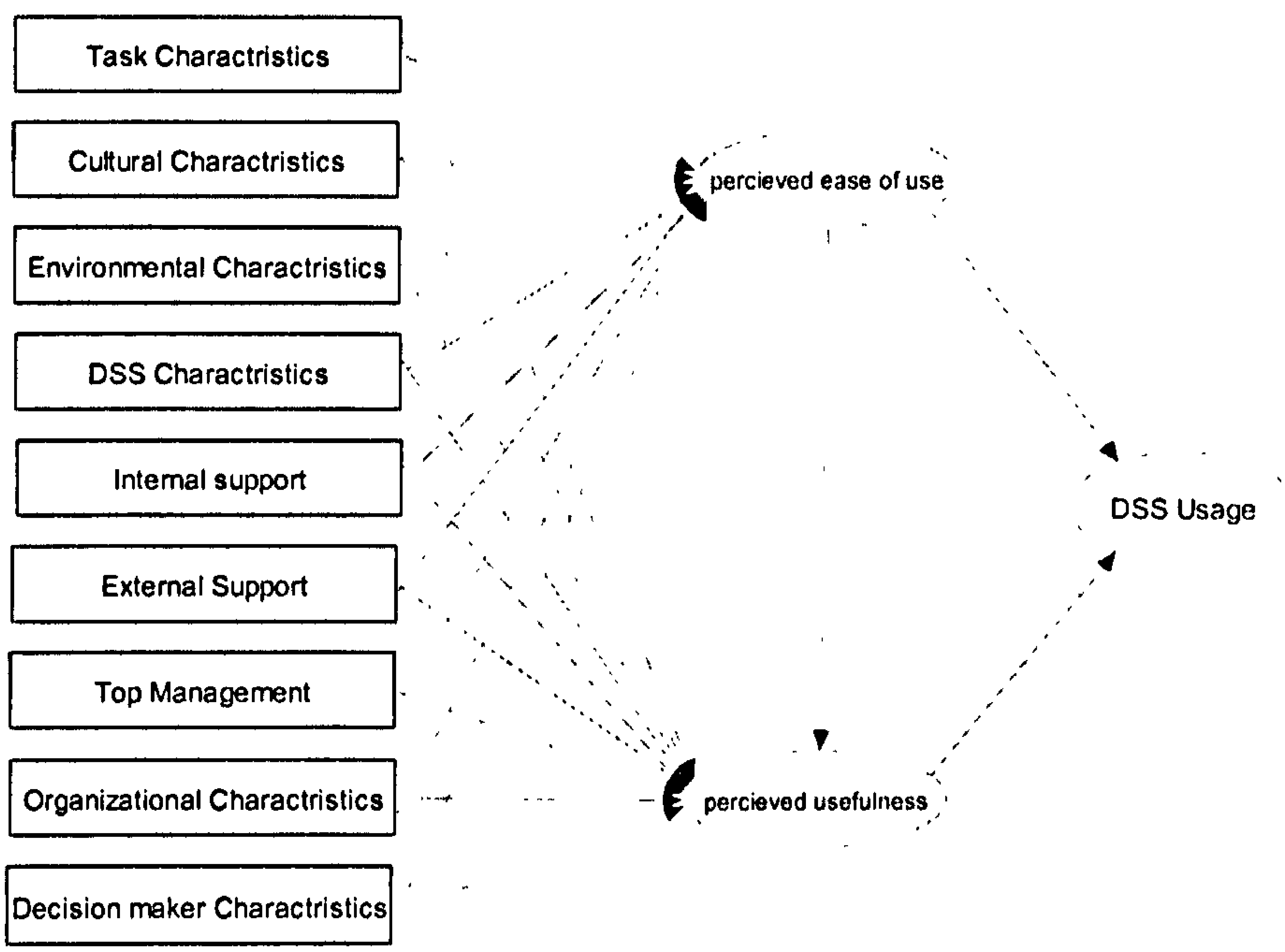

Figure 1.1 Research model

1.5 Study Focus

The targeted technology was DSS in general, rather than specific DSS programs/technologies. The reason behind this was that the DSS softwares are wide in number and characteristics, which makes it difficult to conduct large-scale investigation for decision maker usage of DSS in making strategic decisions based on a specific DSS technology. Nevertheless, the findings of the study can provide insights and implications relevant to DSS acceptance and usage in making strategic decisions in general. Quite a few prior studies have adopted this 'broad' technology approach.

Recent examples include Chau and Tam's (1997) study on open systems and Arunachalam's (1997) work on electronic data interchange (Arunachalam 1997; Chau 1997).

Decision maker acceptance in this study was examined by the actual use of DSS in making strategic decisions rather than the intention to use. This decision was made because of its warranted from both research and managerial perspectives. On the research side, self-report usage may not be an appropriate surrogate measure for actual usage (Szajna 1996). On the management side, both Egypt and the UK have a long history of adopting IT in general and DSS in particular (El Sherif and El Sawy 1988; Hackney and McBride 1995). In addition to that, investigations of decision makers acceptance and usage by using a well established theoretical foundation is of obvious importance and the use of actual usage as a dependent variable can be justified as a fast growing number of local authorities in both the UK and Egypt have already adopted DSS or planning to adopt the technology.

As investments in IT in general and DSS in particular, by organisations all over the world continue to grow at a rapid pace, user technology acceptance and usage has become an increasingly critical technology implementation and management issue (Cooper and Zmud 1990; Markus and Keil 1994). However, regardless of potential technical superiority and promised merits, an unused or under-utilised DSS cannot be effective (Markus and Keil 1994). So, determining the problems that encounter decision makers will be a critical issue to increase the utilisation of DSS in making strategic decisions.

1.6 Contribution of the Research

This study presents, as far as is known, one of the few in-depth analyses of the use of DSS in SDM comparing one of the developing countries (Egypt) with another developed country (UK). The research extended the TAM in terms of specification of a number of external factors that are believed to influence the acceptance and actual usage of DSS in SDM. In addition to that, the study sheds light and defines the possible problems that the decision makers encounter when they use DSS in making their strategic decisions. Besides, the study highlights the direct and indirect relation between DSS usage and the different possible variables without and with using the mediation of the main two constructs of TAM which they are PEU and PU.

1.7 Research Hypotheses

The hypotheses to be tested here are as follow:

H 1.1: perceived ease of use and perceived usefulness of decision support systems fully mediate the influence of task characteristics variables on the usage of DSS in making strategic decisions in both the UK and Egypt;

H 1.2: there is no significant difference between the UK group and the Egypt group about the effect of task characteristics on DSS usage on making strategic decisions;

H 1.3: there is no direct relationship between DSS usage and task characteristics variables in both the UK and Egypt;

H 2.1: perceived ease of use and perceived usefulness of decision support systems fully mediate the influence of cultural characteristics variables on usage of DSS in making strategic decisions in both the UK and Egypt.

H 2.2: there is no significant difference between the UK group and the Egypt group about the effect of cultural characteristics on DSS usage on making strategic decisions;

H 2.3: there is no direct relationship between DSS usage and cultural characteristics variables in both the UK and Egypt;

H 3.1: perceived ease of use and perceived usefulness of decision support systems fully mediate the influence of DSS characteristics variables on usage of DSS in making strategic decisions in both the UK and Egypt;

H 3.2: there is no significant difference between the UK group and the Egypt group about the effect of DSS characteristics on DSS usage in making strategic decisions;

H 3.3: there is no direct relationship between DSS usage and DSS characteristics variables in both the UK and Egypt;

H 4.1: perceived ease of use and perceived usefulness of decision support systems fully mediate the influence of environmental characteristics variables on the usage of DSS in making strategic decisions in both the UK and Egypt;

H 4.2: there is no significant difference between the UK group and the Egypt group about the effect of environmental characteristics on DSS usage in making strategic decisions;

H 4.3: there is no direct relationship between DSS usage and environmental characteristics variables in both the UK and Egypt;

H 5.1: perceived ease of use and perceived usefulness of decision support systems fully mediate the influence of organisational characteristics variables on usage of DSS in making strategic decisions in both the UK and Egypt;

H 5.2: there is no significant difference between the UK group and Egypt group about the effect of organisational characteristics on DSS usage in making strategic decisions;

H 5.3: There is no direct relationship between DSS usage and organisational characteristics variables in both the UK and Egypt;

H 6.1: perceived ease of use and perceived usefulness of decision support systems fully mediate the influence of internal support characteristics variables on usage of DSS in making strategic decisions in the both UK and Egypt;

H 6.2: there is no significant difference between UK group and Egypt group about the effect of internal support characteristics on DSS usage on making strategic decisions;

H 6.3: there is no direct relationship between DSS usage and internal support characteristics variables in both the UK and Egypt;

H 7.1: perceived ease of use and perceived usefulness of decision support systems fully mediate the influence of external support characteristics variables on usage of DSS in making strategic decisions in both the UK and Egypt;

H 7.2: there is no significant difference between the UK group and Egypt group about the effect of external support characteristics on DSS usage in making strategic decisions;

H 7.3: There is no direct relationship between DSS usage and external support characteristics variables in both the UK and Egypt;

H 8.1: perceived ease of use and perceived usefulness of decision support systems fully mediate the influence of decision maker characteristics variables on the usage of DSS in making strategic decisions in both the UK and Egypt;

H 8.2: there is no significant difference between the UK group and Egypt group about the effect of decision maker characteristics on DSS usage in making strategic decisions;

H 8.3: there is no direct relation between DSS usage and decision maker characteristics variables in both the UK and Egypt;

H 9.1: perceived ease of use and perceived usefulness of decision support systems fully mediate the influence of top management characteristics variables on usage of DSS in making strategic decisions in both the UK and Egypt;

H 9.2: there is no significant difference between the UK group and Egypt group about the effect of top management characteristics on DSS usage in making strategic decisions;

H 9.3: there is no direct relationship between DSS usage and top management characteristics variables in both the UK and Egypt;

H10: there is no significant difference between the UK group and the Egypt group about the problems that decision makers encounter when they use DSS in making strategic decisions.

Chapter 2 Review of the Literature

2.1 Introduction

This chapter provides the conceptual foundations and structure of the thesis by presenting the current status of knowledge in areas of interest.

While advanced technologies seem to be changing business markets and organisations on an almost daily basis, the strategic decision making in many organisations has remained strangely resistant to the application of new technology. These organisations continue to rely primarily on the experience and judgement of senior executives. Top managers are expected to interpret a broad range of both qualitative and quantitative information correctly and then, based on their experience, chart an appropriate course of action for the organisation. This way of doing strategic decisions can be problematic given that the environments in most of the markets are becoming more volatile and unpredictable (Townsend, DeMari et al. 2000).

The initial literature review for this study was conducted to:

- search for relevant studies related to local government usage of IS/DSS,
- search for relevant studies related to the use of DSS in making strategic decisions,
- search for relevant studies related to TAM and its application on DSS usage in developing countries,
- search for relevant studies related to the different factors that affect DSS usage and the problems that hinder the decision-maker from using DSS strategically,
- define a framework for the research model that this thesis tries to test through the coming chapters.

The literature review has been organized into the following topics:

a) review of the early studies in developed countries relating to IT in local government,
b) technology Acceptance Model to DSS usage in making strategic decisions.
c) factors influencing DSS implementation and use,
d) problems relating to DSS implementation and use.

These topics were arranged in this order for the following reasons. First, it is important to see how far the IT studies in local authorities go before examining the literature related to the core theme of this research. Secondly, the TAM posits that an individual perception of a technology's usefulness and ease of use explains and predicts his or her acceptance and actual use of the technology. So, this model will be the basis for understanding the contextual variables that might affect the usage of DSS in making strategic decisions. Thirdly, literature related to factors influencing DSS implementation and use was conducted to gain understanding of the exogenous variables that could directly or indirectly affect the DSS usage in making strategic decisions. Finally, after going through the previous points it will be important to find out the different types of problem that decision makers encounter in their usage of DSS.

2.2 Information Technology in Local Government

In developed countries, research on computing in governments began in the mid 1960's. At the early stage the research was mainly focused on how governments, at the national or local level, were using computing and how information systems, aimed to automate a large volume of data handling, should be developed, operated and managed in governmental organisations. Thus, most of this research was focused on procurement polices, organization of data processing capabilities, management of data processing activities and the financial aspects of computing.

In general, however, knowledge was scarce and inconclusive. Researchers felt that there was much to be gained from organising the data handling activities of the various departments to satisfy most government-wide information needs by sharing data among departments (Hearle and Mason 1963; Mitchel 1967; Kraemer 1969) but, how to do it successfully, the magnitude of the benefits and costs associated with computerisation and what others impacts computerisation might have, were not clear.

Among the issues for local government, size was recognised as a key factor in determining both the need for computerisation and the choice between in-house and outside computing (Luing 1969). The existence of departments, such as police, with distinctive data processing needs, was recognised. Decentralisation of task specific applications to users' departments was suggested (Colton 1972), but in the light of the prohibitive costs, it was usually deemed unrealistic (Kraemer and King 1977). Also, Hoos (Hoos 1961) and Faunce et al. (Faunce, Harden et al. 1962) found that the social relationships within governmental organisations were sometimes different from those in private organisations, in terms of the behaviours of employees influenced by computerisation.

In general, during the 1960's and early 1970's researchers gave little attention to the unique characteristics of governmental organisations with respect to IT usage and its management (Bozeman and S. 1986). A strong indication of this is the fact that Kraemer and King's comprehensive review of the state of the knowledge on computers in local governments, an overwhelming majority of the citations were taken from research done in the private sector (Kraemer and King 1977). Table 2.1 presents a sample of early empirical research on IT in local government.

Table 2.1 Early emprical research on IT in local government

Title	Author/Date	Method	Major Contribution
Police and computer	Colton (1972)	Survey and interviews in 498 police departments	The technology is being successfully used to aid police work but it requires changes in some jobs, skills and practices. Most difficulties are behavioural not technological particularly between users and providers of computer services.
A survey of municipal automated data processing	Watlington (1970)	Mail survey of 472 cities	Use of EDP by municipalities is increasing with most applications routine in nature. A shift in locating EDP from finance departments to independent EDP departments is observed.
Automation and the bureaucratic structure	Meyer (1968)	Field study of 253 cities, states, and counties.	EDP departments have different structures and job requirements than non EDP departments. The bureaucratic structure has implications for the administration of EDP.
Automated data processing in municipal government: a survey	Kraemer & Howe (1968)	Mail survey of 419 cities	Municipal usage of EDP is increasing. Larger cities own their own installations while smaller ones use service bureau. EDP is located in the finance department.

Automation and the middle manager	American foundation on automation and employment (1966)	Field study in 22 private, public, and academic organisations	Middle managers are not fully utilising capabilities of computers because of their resistance. With computerisation, middle managers' job will change and so will the organisational structure and hiring practices.
The status of EDP in city government	Willis (1965)	Mail survey of 231 cities	Most cities are in their infancy in computer utilisation with large cities predominating. Most applications are routine.

Since the mid 1970's, research on IS in local governments has acquired a more distinctive identity. There was a stream of research focused on the adoption of computer innovations by local governments (Danziger and Dutton 1977; Perry and Kraemer 1979), the adoptability of innovations, the probability that an innovation will be incorporated by an organisation (Perry and Danziger 1980), and organisational change with respect to computerisation (Kraemer, King et al. 1989). It found that factors related to the external environment within which the organisation operates, such as financial assistance, supportive professional infrastructure, reporting relationships and proximity of supplies, influence the adoption of IT. Research also found that size, slack resources, the complexity of the problems that the organisation faces and the technical and functional properties of the IT strongly influence government's decision to adopt or not adopt an IT innovation. Perry and Danziger focused on inter-organisation factors and found that complex systems that benefit a broader range of internal actors have a higher probability of being adopted and used (Perry and Danziger 1980). Dutton and Kraemer (1985) and Kraemer et al. (1987) also suggest that the political motivations influence the perceived organisational need for adopting and using IT more than rational managerial need for the information.

Also, research highlights the positive link between top management support and the adoption and usage of IT innovations (Danziger and Dutton 1977; Perry and Kraemer 1979; Danziger, Dutton et al. 1982). Furthermore, Kraemer et al. (1989) maintains that management actions are the key factor to understand changes in IT in local governments especially the manager's orientation towards IT (Kraemer, King et al. 1989). From another side, King and Kraemer found significant variance in benefits realised across cities. They found that large cities reported more benefit than smaller ones and that external environmental factors were only weakly related to the outcomes of IT usage. Overall, however, those external factors explained only a small portion of the variance in IT utilisation. The authors suggested that internal factors might explain better why some cities use computers more extensively than others (King and Kraemer 1985). These studies shows the lack of research of the strategic use of IS in general, and DSS in particular, in developed countries and up to this stage IT implementation and use in developing countries was in its early stage not only on the strategic side but also on the technical and operational one.

2.3 Overall Review of DSS Research Methodologies

Research methodologies used for the study of DSS can be classified into three general categorizes: (1) studies in natural behaviour settings, including case studies, field studies, and field experiments, (2) studies in contrived and created settings, including person-computer experiments and judgment tasks and (3) setting-independent studies, such as sample surveys (Benbasat and Nault 1990). A review of the research methodologies used to investigate DSS revealed that most DSS studies were not conducted in natural settings with typical users. The majority of early DSS research was in lab experiments (Jessup and Valacich 1993). In Pinsonneault and Kraemer's (1989) review, which covered published work from 1970 to 1988, approximately 65% of the DSS and/or Group Support Systems (GSS) studies were lab experiments. The current breakdown of DSS and GSS studies published in selected information systems journals is 30% lab experiments, 17% field studies and 13% design and development papers (Jessup and Valacich 1993). Early research on DSS use conducted by Keen & Morton, 1978; Sprague, 1980; Sprague & Watson 1979 was based on theories of decision making proposed by Herbert Simon and his colleagues (Simon 1960; Simon 1976). Simon's theories were used as the basis to create models for computerised DSS (Jessup and Valacich 1993). DSS based on these theories were designed to optimise the decision-making process through the use of decision models that enabled the user to conduct systematic problem solving.

Bennett (1983) performed a meta-analysis of DSS research related to human-computer interaction. A major conclusion of Bennett's analysis was that little is known about the science of human and computer interactions. Bennett based his conclusion on three questions that were not well answered in the literature: (1) what are the characteristics of the user that affect the interaction between humans and DSS? (2) what do users need to operate DSS? and (3) how are DSS used to support decision-making? These questions served as a framework for a rigorous review of the empirical DSS literature. Specifically, the objective of the literature review was to understand the relationship between decision maker related factors, internal and external factors, and the rest of other variables and their impact on DSS use in making decisions in general and strategic decisions in particular.

Decision support systems have grown at an accelerating rate over the last decade, in response to the increasing of complexities in decision environments. For example, in the five- year period between 1981 and 1985, the number of reported DSS implementations more than doubled from the pervious five-year period (Alavi and Joachimsthaler 1992).

While studies regarding human decision making processes and the effects of DSS are few in number, some evidence-based conclusions were drawn. A number of studies indicated that DSS help decision makers communicate to each other more effectively and efficiently (DeSanctis and Gallupe 1991; Nunamaker, Dennis et al. 1991). These results were attributed to the communication processes that took place when individuals interfaced with the DSS, and the efficient communication processes that develop over time. Individuals perceived improved efficiency as (1) reduced decision time, (2) organised structuring and use of information and (3) labour cost savings as a result of reduced decision maker time. In accordance, DeSanctis et al., (1991) findings suggested that DSS allowed decision making process, reason more thoroughly, reach consensus more effectively and attain greater satisfaction with the final decision. Desanctis (1991) states, "Ultimately, it will the individual's perceived benefits of using a DSS that will determine their effectiveness in the decision making process"

(DeSanctis and Gallupe 1991).

Moreover, Sharada, Barr and McDonnell (1988), in their study, reviewed past studies involving individual and group decision-making and concluded that there was no evidence that the use of computer-based DSS produces more effective decisions.

While some authors (Benbasat and Dexter 1982; Robey 1983; Davis 1984; Isenberg 1984; Huber 1990) have argued that the use of information technology will affect strategic decision-making performance, others (Dearden 1983; Wildavsky 1983; Aldag and Power 1986; Goslar, Green et al. 1986) have argued that the use of information technology will have little, if any, effect on senior management activities. King (1985) went so far as to argue against the use of information technology by chief executive officers (King 1985). In the same stream, Alavi and Joachisthaler (1992) conducted a review of the empirical DSS implication literature; they used meta-analysis of 144 findings from 33 studies. This review has revealed that implementation studies have yielded conflicting and somewhat confusing findings. Also, they added that, as a voluntary system, "*DSS implementation failures result in the system not being used or being under-utilised*". Consequently, organisational return on DSS investment tends to be low to marginal and, at times, negative (Alavi and Joachimsthaler 1992).

As it has been noticed that the research of organisational impact of IS/DSS 'has produced conflicting results and few reliable generalisations' (Markus and Robey 1988). In spite of the lack of evidence about effectiveness, many firms have been investing in IT 'essentially on faith' under the impression that the only alternative is 'losing competitiveness and going out of business' (Harris, Levine et al. 1987).

While Molloy and Schwenk (1995) studied the effect of information technology on the phases of strategic decision-making, the type of decision they studied was not in governmental or business types of organisation (buying a car). In addition to that, they did not indicate what the information systems look like in this study (Molloy and Schwenk 1995).

Pai-Cheng Chu in his study (1991), investigated the impact of spreadsheet programs (Lotus 1-2-3) on a decision process. This study focused only on two decision processes, alternative generation and alternative valuation over two level of task complexity, but it did not examine the impact of DSS on the rest of decision processes, such as problem identification, goal generation and prioritising of goals. Also, this study was confined to spreadsheet programs (Lotus 1-2-3) as a DSS, but a DSS can be thought as having database (internal and external data), model base, user interface and knowledge base components (Chu 1991).

Hammond et al. (1995) found that DSS can enhance managerial decision-making, but the nature of the managerial decision-making that they studied was not strategic (choice of automobile type) and, also, this study did not concentrate on the factors that affect the use of DSS on making effective decisions (Hammond, Clark et al. 1995).

CH Chung et al. (1989), in their seminal article, discussed the general requirements of a strategic decision support system (SDSS), but they did not examine the different factors that affect the utilisation of their proposed SDSS framework on strategic decision-making (Chung, Lang et al. 1989).

By definition, the purpose of DSS is to aid decision-making processes in semi-structured and unstructured tasks. However, in practice, DSS almost invariably supports decision-makers dealing with moderate to well-structured problems using, for example, financial, decision theoretic or logistical models. Very seldom do DSS support less structured decisions (Cats-Baril and Huber 1987). Roland states the case appropriately: "*if the organisational task is composed of well-structured problems, there will be minimal need for DSS*" (Roland, R. J., 1980). But Sanders and Cortney said that the previous assumption is often made in the literature, but it has no empirical support (Sanders and Courtney 1985). Also, some other researchers mention that many of the successful information systems technology applications had their origins not in sophisticated decision support systems, but in already existing transaction processing systems or information reporting systems (Snitkin and King 1986; Kim and Michelman 1990). The researcher expects this problem to be clearer in the developing countries. So, this research will examine why some managers are reluctant to use DSS in making effective strategic decisions and the factors affecting the use of DSS in making effective strategic decisions. In addition, if computer technology is perceived to have impact on the decision making process, then it is important to find out specific problems which managers encounter when they use, or plan to use, DSS in making strategic decisions.

2.4 Technology Acceptance Model to DSS Usage in Making Strategic Decisions

Research into information technology adoption and use has been motivated by the desire to predict the factors which lead to IT use (Thompson and Rose 1994). Under a general assumption of a positive relationship between IS/IT utilisation and performance, numerous individual, organisational and technological variables have been investigated in efforts to identify key factors affecting IS/IT behaviour. Saga and Zmud (1994) identified twenty empirical studies aimed at investigating the nature and determining factors of IT acceptance (Saga and Zmud 1994). Also, a literature review by Prescott and Conger (1995), for instance, included 70 IT adoptions and use articles based on the diffusion of innovation paradigm alone (Prescott and Conger 1995).

The overwhelming majority of information technology adoption and use research has been carried out in the technologically developed world. In fact, of the one hundred IT adoption and use studies covered in two recent literature reviews (Thompson and Rose 1994; Prescott and Conger 1995), non of the studies took place in lesser-developed countries or conducted on DSS usage on making strategic decisions across cultures. Perhaps this is understandable in that the majority of academic institutions and IT users are located in the industrialised world. The consequence, however, is that study of these phenomenon in the less developed world, where IT has thus failed to transfer effectively (Knight 1993; Odedra, Lawrie et al. 1993; Goodman and Press 1995; Mahmood, Gemoets et al. 1995), has been severely limited. Mutual understanding between decision-makers from different parts of the world and cultural backgrounds is essential to ensure smooth interaction between these two parties and mutually beneficial relationships. Currently, the developing countries invest a lot of money in the IT relating enterprises but the return on these investments is still in the lower level of the expectations from these investments. The need for understanding how and why DSS has, or has not, been used by the decision makers in both developing and developed countries are important to get a return on the investment. Many students from developing countries attend western universities and go back to their home countries. Students from developing countries who study abroad do so not only to apply technical and business knowledge but also to bring back some understanding of the western culture they experienced while they were living abroad. A transfer of cultural knowledge in the opposite direction is not necessarily happening (Rose and Straub 1998).

While information technology, specific adoption and use, has not been evaluated across cultures of varying technological development levels, diffusion of non-IT innovations has been tested successfully (Rogers 1995). Although these studies do suggest that information technology adoption and use of models tested in developed nations may be applicable to less developed countries, no hard evidence presently exists. Of the 70 IT- based studies which either confirmed or extended the Roger's Diffusion of Innovation (DOI) model evaluated by Prescott and Conger (1995), none were conducted within developing nations (Rose and Straub 1998).

A suitable first model for testing across cultures would be one which has shown robustness across the spectrum of IT application. This robust model should have the highest probability of success in future transfers across economic and cultural boundaries (Rose and Straub 1998). Davis' TAM is a model closely related to Rogers' DOI model which has demonstrated this robustness. For this reason, TAM was selected as an appropriate model for studying DSS usage in making strategic decisions across the two cultures, Egypt and the UK.

2.4.1 Constructs in Technology Acceptance Model (TAM)

Davis' TAM is a well-respected model of IT adoption and use. Based on the more general Theory of Reasoned Action (Fishbein and Azjen 1975), TAM has been tailored to explain computer usage. The two antecedents to computer technology use are:

1- Perceived Ease of Use, defined as "*the degree to which a person believes that using a particular system would be free of effort*" (Davis 1989) and
2- Perceived Usefulness, defined as "*the degree to which a person believes that using a particular system would enhance his or her performance*" (Davis 1989).

While not based on a DOI model, per se, TAM is a close analogue of traditional DOI models (Moore and Benbasat 1991). TAM does not use Rogers' constructs, but perceived ease of use and perceived usefulness are meaningfully related to Rogers' constructs relative advantage and complexity and lead to similar results regarding diffusion outcomes (Moore and Benbasat 1991; Karahanna 1993). Rogers defined relative advantage as the degree to which an innovation was perceived as being better than its precursor (Moore and Benbasat 1991). Davis operationalized perceived usefulness by six items that were basically the advantages of using a particular technology, such as perceived increases in productivity, effectiveness, and performance. The six items included:

a) using A (a technology) in my job would enable me to accomplish tasks more quickly,
b) using A would improve my job performance,
c) using A in my job would increase my productivity,
d) using A would enhance my effectiveness on the job,
e) using A would make it easier to do my job and
f) I would find A useful in my job.

While Tornatzky and Klein criticised the relative advantage construct for being poorly explicated and poorly measured (Tornatzky and Klein 1982), Moore and Benbasat criticised the perceived usefulness construct as suffering from the same problem, that is, it was rather broadly based (Moore and Benbasat 1991).

TAM can be viewed as a parsimonious form of Rogers's model, with adaptations of constructs specific to IT. With support from various theories and models, such as expectancy theory, self-efficacy theory, cost –benefit research, innovation research and the channel disposition model, TAM postulated that computer usage was determined by a behavioural intention to use a system, which was jointly determined by a person's attitude toward using the system and its perceived usefulness. This attitude is determined by perceived usefulness and perceived ease of use. Perceived usefulness is influenced by perceived ease of use and external variables, which could be system features, training, documentation and user support (Chau 1996).

2.4.2 Robustness of TAM

The validity of TAM tested in Mathieson, who compared TAM with another model based on the Theory of Planned Behaviour (TPB) which predicted an individual's intention to use an IS (Mathieson 1991). Following the guidelines by Cooper and Richardson (1986) for ensuring a fair comparison, and using 262 students in an introductory management course as the subjects, the study found that both TAM and TPB predicted the intention to use an IS quite well, with TAM having a slight empirical advantage. Also, the author commented that TAM was easier to apply in practice, as it only supplied very general information about users' opinions of a system, while TPB provided more specific information that could better guide development.

The validity of the measurement scales of the two constructs (i.e., perceived usefulness and perceived ease of use) in Davis's model was re-examined in a number of other studies. Adams et al. (Adams, Nelson et al. 1992) replicated Davis's (1989) study with focus on evaluating the psychometric properties of the two scales, while they examined the relationship among ease of use, usefulness and system usage. Two studies were conducted and the results generally demonstrated the reliability and validity of the two scales. However, a factor analysis in the second study showed that two of the usefulness items were loaded with both the ease of use scale and the usefulness scale. Although the authors explained this result (i.e., the respondents' limited experience with Harvard Graphics), it also revealed the complexity of the construct (Adams, Nelson et al. 1992).

Another test of the reliability of the perceived usefulness and perceived ease of use scales was reported by Hendrickson et al. (Hendrickson, Glorfeld et al. 1994). Using two software packages, the authors demonstrated that Davis's instrument exhibited a high degree of test –re-test reliability.

A third study of the reliability and validity of the two scales is that of Segars and Grover (1994). Instead of using classical approaches (their term for Campbell and Fiske's (1959) MTMM technique and common factor analysis) to establish construct validity, the authors adopted a contemporary approach that included a variety of confirmatory factor models utilising maximum likelihood estimation.

As is true with most IT adoption and use models, TAM has not been studied outside the industrialized world. In fact, it has only been studied in two countries outside North America (Straub 1994; Straub, Keil et al. 1997). However, within the industrialized world, it has proven to be applicable across a wide variety of IT applications but not specifically to DSS and its usage in making strategic decisions (see table 2.2 for examples).

Table 2.2 The studies that used TAM in different applications

Study	Computer technology Examined
(Adams, et al., 1992)	E-mail, voice-mail, graphics, spreadsheets, word processing
(Davis, 1986; Davis, 1989)	E-mail and graphics
(Karahanna, 1993)	E-mail and voice-mail
(Goette, 1995)	Adaptive technology for the disabled
(Hendrickson, et al., 1993)	Spreadsheet, DBMS
(Mathieson, 1991)	Spreadsheet software

Although TAM has not been studied in developing countries, it has been a consistently good predictor of IT use in technologically advanced countries. Also, it has not been studied in the western countries in the context of DSS usage in making strategic decisions. As a result, it is an important choice for testing TAM in the context of the industrialized country (UK) in comparison to a developing country (Egypt). This is because technologies have built-in designers' assumptions on how people work. Since these assumptions may be culturally determined, it becomes dangerous to assume that research findings concerning the use and acceptance of technology can be unconditionally transferred across cultures (Hofstede 1980).

So, this study will generate insight into the contextual issues surrounding the effective use and acceptance of DSS technology in making strategic decisions. This research will build on the work of Davis et al. (1989) concerning the TAM. TAM posits that an individual perception of a technology's usefulness and ease of use explains and predicts his or her acceptance and actual use of the technology. TAM also indicates that other external factors may influence a person's perception of usefulness and ease of use.

In the coming section the researcher will cover the different factors that might affect the DSS usage or the usefulness and ease of use of DSS in making strategic decisions.

2.5 Factors Influencing DSS Implementation and Use

The MIS area provided a wealth of research streams in which to gather information relevant to the factors influencing DSS implementation and use. The streams included IT infrastructure, database, IS success, and IS planning. All of these areas identified factors that potentially could impact DSS implementation and use in making decisions. The literature review identified ten factors that affect IS implementation (see table 2.3).

Table 2.3 Key factors identified in IS implementation literature

No.	Factor
1	Management support
2	Having the right resources
3	Planning for DSS implementation
4	Having the right skills
5	User expectation
6	Having the right development tools
7	Quality of the data resources
8	Champion
9	User participation
10	Prototyping

The following section describes the various factors that could affect IT/IS in general and DSS in particular using the literature from the various research streams.

2.5.1 Management Support

Previous studies have identified management support as one of the key recurring factors affecting systems success (Lucas 1981; Cerveny and Sanders 1986; Kwon and Zmud 1987; Igbaria and Guimaraes 1994). Management commitment to DSS development, utilisation and maintenance has been recognised as a critical factor for DSS success (Leonard-Barton and Deschamps 1988). Large, complex systems (e.g., DSS implementation) induce change within the organization and likely cause resistance through redistribution of organisational power or from the uncertainty among employees (Keen 1981; Markus 1983; Franz and Robey 1984). Management support is able to ensure sufficient allocation of resources and act as a change agent to create a more conducive environment for DSS success. The support can come in various forms, including rewards, appreciation and positive feedback (Hoover and Alexander 1992). A high level of support conveys the belief that DSS will make a valuable contribution to improve the process of making strategic decisions in the organisation and that necessary resources will made available (Newman and Sabherwal 1996). Therefore, management support is associated with greater system success and lack of it is considered a critical barrier to the effective utilisation of information technology (Igbaria, Zinatelli et al. 1997). So, management support for using DSS in making strategic decisions will be much more important.

2.5.2 Internal Support

In developing countries, little internal support is available to users of DSS; this may be due to lack of resources. Resources include money, people, facilities, and information (Edelman 1981; Beath 1991; Elam, Prescott et al. 1996). As a result, some decision-makers rely on help from non-specialist people (i.e. their colleagues), manuals, books and help screens. So, inadequate internal support appears to threaten the implementation and use of DSS in making strategic decisions even if other necessary factors are in place.

2.5.3 The Degree of Centralisation

Following Montazemi (1988) and others (i.e. Miller, 1983), the number of managers in the organisation was used as a measure of the degree of centralisation of decision-making. End users have been found to be more satisfied in less centralised organisations (Montazemi 1988). Justification for this finding is based on the need for less centralised organisations for integration. An effective use of computer -based information systems is perceived as a strategic tool for accomplishing this integration, leading the way to a more supportive organisational climate. Abdul-Gader in his study (1992) found the opposite of Montazemi's finding in relation to end-user computing (Abdul-Gader 1992). In developing countries the degree of centralisation has a great effect on using DSS in making effective strategic decisions. To prove the previous arguments, further research is needed.

2.5.4 Decision-Maker Variables

a) User experience

Fuerst and Cheney (1982) found a positive relationship between user experience with the system and its success (Fuerst and Cheney 1982). However, these findings have been contradicted by (Guimaraes, Igbaria et al. 1992). Zmud (1987) indicated that more educated and experienced users are less satisfied with their systems.

b) Decision maker characteristics

Some studies regard motivation as the key to MIS success (DeSanctis 1982). Others find a positive relationship between user attitude and the successful use of information systems (Toubkin and Simis. 1980). Therefore, the researcher expects that the characteristics of decision makers, including user age, educational level, years of experience on the job and attitude toward DSS, will affect the use of DSS in making strategic decisions.

c) Decision-maker style

A large body of DSS implementation studies have investigated the relationship between user related factors and implementation success (Alavi and Joachimsthaler 1992). Very few of these studies were conducted in developing countries context. Four sets of decision maker (user) related factors are believed to influence DSS implementation success: cognitive style, personality, demographics and user situational variables. The consensus among theorists from a variety of disciplines who have studied cognitive style is that cognitive style relates to the characteristics ways individuals process and utilise information and how they solve problems and make decisions (Driver and Mock 1981). Most DSS research has focused on the analytic/heuristic dimension of decision making which reflects an individual's preference for either utilising abstract models and systematic process, or reliance upon the experience, common sense, and programmatic approach (Zmud 1979).

d) Cognitive style

The conceptualisation of cognitive style in the DSS literature is based on the Jungian problem solving style as operationalised by the Myers-Briggs Type Indicator (MBTI) (Myers 1975). The MBTI used most frequently in cognitive style research consists of four scales that measure: (1) extraversion-introversion, (2) judging-perceiving, (3) thinking-feeling, and (4) sensing-intuition. The thinking, feeling and sensing-intuition scales define individual problem solving and decision making process.

In a meta-analysis of predictive DSS performance and cognitive style conducted by Alavi and Joachimsthier (1992), the impact of cognitive style, including thinking, feeling and sensing-intuition styles on DSS use and implementation success, was relatively small. Cognitive style affects user attitudes toward DSS more strongly than it affects DSS performance. The validity of these findings was questioned by (Schweiger, Robey et al. 1983; Hogue and Watson 1985) in the context of how cognitive style was measured. They contend that the most logical and valid measure of cognitive style would be that measures the decision-making process and its stylistic aspects. The MBTI frequently used in DSS research does not measure the individual's decision-making process and thus may be a highly valid and reliable measure of cognitive style. Measurement problems associated with the analysis of cognitive style and the implications on DSS use will require more study before associations between cognitive style and DSS performance can be established.

Additional empirical evidence indicates that a decision maker's perception of a decision problem and search for information and evaluation of alternatives is based on cognitive style, cognitive process, knowledge and experience (Simon 1987). This study described differences in cognitive style and suggested that an understanding of these differences could potentiate improvements in DSS design and use. For example, DSS should be sufficiently flexible to compliment users' cognitive styles and support their preferred cognitive decision making style. Design flexibility solves the problem of fitting DSS to a particular user's style by making DSS adaptable to many styles (Robey 1983). However, Huber (1983) contends that cognitive style accounts for only a minimal amount of the variance in performance and behavioural measures. These findings imply that users adjust their style preferences to meet the demands of DSS. This human flexibility may be an essential predictor of DSS use, since many DSS are inflexible (Huber and Robey 1983). One point not well reported is the idea of users and designers collaborating in DSS creation and implantation. The concept of system design as a socio-technical process relates directly to this issue. If knowledge of cognitive style is incorporated into the design process, the overall perceived value of DSS might be increased, leading to greater DSS use.

Other studies have focused on differences in cognitive behaviour and their relationship to DSS use (Huber and Robey 1983; Robey 1983). These studies propose that DSS design and function be made compatible with decision-making behaviour. By studying decision-makers' cognitive styles along a decision complexity continuum and using that information for DSS design, the compatibility between decision makers' cognitive behaviour and DSS design may be enhanced.

e) Personality Characteristics

Another user factor examined in regards to DSS performance is personality. Personality was defined as the cognitive and effective structures maintained by individuals to facilitate adjustment to events, people and situation. Personality traits believed to impact DSS implementation success include: need for achievement; degrees of defensiveness; locus of control; dogmatism; risk taking propensity (Zmud 1979). These studies conclude that risk-taking behaviour is the personality trait most positively associated with DSS use. Zmud (1979) contends that these personality traits have a major role in determining a decision support system's success but that there is little known about the specific relationships involved.

f) Demographic Characteristics

A number of demographic characteristics of users, such as age, gender and education, have been studied to identify potential relationships that may influence DSS implementation success in terms of system use, decision performance and decision-making time (Benbasat and Dexter 1982; Zinkhan, Joachimsthaler et al. 1987; Newman and Robey 1992). The studies indicate that age is the demographic characteristic that has the strongest positive correlation with DSS use. Older decision makers demonstrated a greater propensity to seek additional information when making decisions and may be more inclined to obtain that information from an information system (i.e. a DSS). Similarly, years of decision making experience was positively related to the desire for more decision-making information although there are some researchers have reported no relationship between age and attitudes toward information systems (Gardner and Lundsgaarde 1994).

g) Decision-Maker- Situational Variables

Decision-maker or user-situational variables, like training, experience and user involvement, have been studied and the results demonstrate a relationship to DSS use (Keen 1981; Ives and Olsen 1984; Zinkhan, Joachimsthaler et al. 1987; Tait and Vessey 1988; Mallach 1991). Training refers to the provision of hardware and software skills sufficient to enable effective interaction with the DSS that is being implemented. Experience refers to prior exposure to decision support systems as well as the individual's work history. Decision maker or user involvement refers to decision-makers participation in DSS related activities (Alavi and Joachimsthaler 1992). Training, experience and involvement variables have a relatively larger impact on DSS use than do cognitive style variables related to personality and demographics.

h) Decision maker training

Decision-maker training accompanied by user experience has been found to have strong effects on microcomputer usage (Cheney, Mann et al. 1986). The importance of user training has long been proposed as a critical component of MIS success, in general, and for microcomputer usage in particular (Igbaria 1992). The researcher expects that the computer experience and user training to have a great effect on the use of DSS in making strategic decisions.

i) Decision maker experience

Prior DSS experience was found to have the greatest impact on DSS implementation success and use (Alavi and Henderson 1981; Benbasat and Dexter 1982; Adams, Nelson et al. 1992; Barki and Hartwick 1994). DSS experience was also found to be enhanced by training programmes designed to educate users about DSS concepts, operation and applications.

j) Decision maker involvement

User involvement increases the likelihood of successful DSS systems use. Investigators conclude that knowledge and understanding of DSS may increase decision maker (user) commitment which, in turn, may increase decision maker involvement. These studies address both the normative model of organisational change (Schein 1972) and the diffusion of innovation models (Cooper and Rosenthal 1980) of implementation. Both models emphasise the importance of user involvement as a means of stimulating user acceptability. Some researchers have studied a more specific aspect of involvement known as "prior involvement" which can be defined as the amount of input users have during the design of DSS and the implementation plan (King and Rodriguez 1981). Their results indicate a strong positive relationship between prior user involvement and DSS implementation and use.

k) Decision-maker attitudes and satisfaction related to DSS

In addition to affecting DSS implementation and use, training, experience and involvement, variables were found to influence users' attitudes toward DSS when comparing the association of cognitive style, personality and demographic variables, user-situational variables demonstrated a stronger influence on users' attitudes toward DSS. It is interesting to note that, although the effect size is relatively small, analytic decision-makers had the most positive attitudes toward DSS (Tait and Vessey 1988). Firby, Luker and Caress corroborated these studies with their findings that a lack of understanding of DSS resulted in a lack of positive experiences which potentiated negative attitudes toward DSS. Gore, Persaud and Dawe (1994) found that a thorough pre-implementation education and utilisation plan fostered positive user attitudes toward DSS. These findings imply that a lack of knowledge and understanding of DSS typically results in negative attitudes toward DSS.

The variables in these studies which contributed most to the development of a positive attitude toward a DSS were: (1) perceived ease of access to DSS information and effort minimisation to obtain information, (2) absence of technical problems and (3) timely supply of DSS information following data entry.

Many investigators have researched user satisfaction with DSS (Adams, Nelson et al. 1992; Newman and Robey 1992; Lawrence and Low 1993; Doll and Torkzaseh 1994; Gardner and Lundsgaarde 1994; McKeen, Guimaraes et al. 1994). These studies found that user satisfaction with DSS was present when: (1) user participation levels were high, (2) users perceived top management support for DSS use, (3) an extensive pre-implementation education program was provided, (4) end-users were involved in DSS development and (5) users were faced with unstructured and ambiguous decisions.

More recent studies have focused on DSS use as a social process over time, seeking to understand how the characteristics of that process affect system use (Markus and Robey 1988; Newman and Robey 1992). These studies provided insight into factors deemed important to the social process of using DSS, and use over time.

Process research models used to study information systems focused on the dynamics of social change to explain the events that lead to user outcomes over time (Markus and Robey 1988). This social change model can be characterised by the following sequence of events. First, a role differentiation occurs within the organization to define the relationship between user and system. Second, a series of episodes and encounters occurs over time. An episode is defined as a sequence of interactions with the system.

Encounters refer to the beginning and end of episodes. Encounters evoke one of three general responses by users: system acceptance, rejection or equivocation. As the social process continues, users move through a series of encounters and episodes. Encounters were found to determine user outcomes. Acceptance leads to use. Rejection leads to no use. Equivocation leads to uncertainty of use. According to Newman & Robey (1992), the success or failure of the information system may be dependent on the quality and timing of encounters and that the sequence of encounters and episodes may be examined to predict patterns in user outcomes. The phenomena of information system use may be better understood by studying the psychosocial dynamics.

Studies investigating user satisfaction over time found three major variables that may have an effect. First, when users became highly dependent on computer-based information systems, system malfunctions were extremely disruptive. Threats to continuing computer operations became more of an organisational risk over time as user dependency increased (Meall 1996). Second, user concern with DSS security may increase over time causing user dissatisfaction. A particular security concern was access to internal data by external sources (e.g. competitors and computer hackers) (Loch, Carr et al. 1992). Third, a significant finding of Diekman, Metoff, Wanzer and Zwicky's study showed that satisfaction toward DSS decreased over time when the user encountered negative experiences with the DSS. Negative experiences were defined as technical problems with the DSS, system downtime and time delays with information retrieval. This finding was consistent with prior research.

The qualitative properties of DSS (e.g. information quality, imaging quality and reasoning quality) and their relationship to user satisfaction were studied by (Brafman and Tennenholtz 1996) Tan-Wah, 1995, and Wang Jyun, 1996. These studies reached four general conclusions. First, users rated the information and imaging quality provided by DSS as highly satisfactory. Second, the quality of reasoning by DSS and user satisfaction were largely dependent on the type of decision to which DSS information was applied. Third, users perceived the quality of reasoning and satisfaction higher when DSS was used for semi-structured decision making.

The literature suggests that decision-makers have various styles for using computer-based information. The first style is the *knowledge executive* (Cleveland 1985) for whom Computer Based Information (CBI) is indispensable. This type of decision-maker has extensive CBI at his or her fingertips, actively searches files, performs ad hoc analysis and generates reports, all of which provide information leading to insight and guiding action. This type of decision-maker typically places particular importance and credibility in CBI relative to other types of information. Beginning with such classic works as those by Leavitt and Whiler (1958) and Simon (1960), up through the enthusiasm for management information systems in the 1970s (Gorry and Scott Morton 1971; Keen and Scott Morton 1978) to more recent observations about the "control revolution" (Beniger 1986), the image of the knowledge executive, an active and direct user of information technology, has been widespread and, perhaps, dominant (Kraemer, Danziger et al. 1993).

A second style is the decision-maker as a *CBI consumer* -an indirect user of computer-based information that has been generated and interpreted by staff. This decision-maker is primarily interested in a few key data measures and in overall trends from the vast array of CBI that might be available in the organisation. This decision-maker relies on the information-filtering and analytical skills of staff who are directly involved with systems and CBI. These "information brokers" anticipate the decision-maker's information needs and attempt to provide no more data than are essential (Kraemer, Danziger et al. 1993). The researcher expects that these two types of decision-maker, in dealing with DSS, will have some effect on making strategic decisions.

2.5.5 Innovation

In any organisation some individuals will have a more positive attitude toward change and a greater willingness to implement new ways of doing things. Innovative decision-makers are more eager to try new ideas, have more favourable attitudes toward change, are less dogmatic and are more able to cope with uncertainty and ambiguity (Brancheau and Wetherbe. 1990; Rogers 1995).

Researchers have concluded that innovative individuals begin using an innovation before less innovative people. So, this individual(s) is needed to provide information, material resources and political support (Beath 1991), and to induce the commitment of others using emotional meaning and energy (Howell and Higgins 1990). So, because of strategic decision-making is an ill-structured and ill-defined category, the innovative decision-maker may begin to use DSS in making strategic decisions to overcome the subjectivity of his own decision process before their less innovative colleagues.

2.5.6 Decision Support Systems Variables

Previous studies have found that certain DSS characteristics and perceived usefulness seem to have an important influence on the effectiveness of the systems: user-friendliness; ease of use; size (cost) of DSS; range of alternatives; timeliness, accuracy and relevancy of output (Udo and Davis 1992a). So, it is expected that DSS attributes will have a great effect on using DSS in making effective strategic decisions.

Davis (1989) defines perceived usefulness, as "the degree to which a person believes that using a particular system would enhance his or her job performance". The researcher thinks that, if the decision-maker realised the value of using DSS in his strategic decision, this, of course, will affect his usage of this system. Some studies have reported that perceived usefulness is positively associated with systems usage (Thompson, Higgins et al. 1991; Igbaria and Guimaraes 1994).

2.5.7 Environmental Variables

Understanding the political complexities of using DSS in making effective strategic decisions especially in developing countries is an important factor. Information technology is a resource many people value and it seems likely that the gatekeepers of information systems would be able to extract some rewards from those individuals who depend on it (Pettigrew 1972). Given the high involvement of MIS departments in an organisation's work flow and dependence on computing operations, the theory of strategic contingencies suggests that the MIS department is likely to be a powerful player in organisational politics. In addition, it is said that he who controls information controls the power. Thus, the decision-makers [to keep their positions in the organisation and to keep the secrecy of their strategic decisions] may become locked in a struggle with information specialists. In addition to that, the political barriers facing using DSS in making effective strategic decisions in developing countries stem from a number of factors. The most important of which is *nationalism*. Most countries view information as a national resource that should be supervised / governed by rules and regulations (Matta and Boutros 1989). Also the benefits of using DSS in making effective strategic decisions may be intangible. Its use is thus viewed politically, to avoid increasing investment in this system. So, this may have an effect on using DSS in making effective strategic decisions.

2.5.8 External Support

In developing countries, and because of lack of resources and insufficient internal technical expertise, the availability and quality of external support could be considered an important determinant of DSS usage. The researcher expects that the decision-makers will be reliant, in making their strategic decisions, on advice and support from external sources.

2.5.9 Task Variables

The structure of the problem in strategic decisions is an important variable because most strategic decision is characterised by uncertainty and equivocality (Kivijarvi and Zmud 1993). Equivocality, i.e., the existence of multiple and conflicting interpretations of the problem definition, is particularly troublesome for the decision-maker in using DSS. With highly equivocal decision situations, 'the answers are obtained through subjective opinions rather than from objective data'(Daft and Lengel. 1986). So, rules, standard operating procedures and limited decision-making discretion may hinder the decision-maker from taking advantage of DSS. Thus, characteristics of the task (strategic decisions) which include subjectivity, complexity and criticality of the problem, are seen to be important elements likely to affect using DSS in making strategic decisions.

It is clear that, during the past two decades, a number of researchers have been involved in studying the effectiveness of DSS and the factors that may affect its implementation. However, little of this research focused on studying these factors or its relative importance in the environment of developing countries in comparison to the developed countries where this system is designed. Lack of knowledge of these factors and its relative importance make it difficult to use DSS effectively in making strategic decisions.

The inventories of items from prior research which can affect DSS usage are contained in the following list.

1- Variables related to organisational characteristics:

1.1. degree of centralisation

1.2. information intensity

1.3. complexity of analysis in strategic decisions.

2. information security and secrecy:

2.1. computer facilities in the organization

2.2. financial resources

2.3. internal support

2.4. integration among departments in relation to data/information exchange and sharing experience

2.5. planning integration between using DSS and overall planning process

2.6. collaboration / individualism behaviour in the organization

2.7. DSS usage in organization is compulsory / voluntary

2.8. priority for DSS usage strategically

2.9. position of DSS staff in the organisational structure.

3.0 Characteristics of decision maker:

3.1 confidence in DSS usage

3.2. fear from using DSS in making strategic decisions

3.3. familiarity with DSS usage

3.4. ability to interpret DSS output

3.5. ability to change

3.6. innovation

3.7. fit between DSS and decision maker requirements

3.8. attitude toward DSS usage

3.9. information security and secrecy

3.10. DSS revolution

3.11 experience of DSS Staff

4.0 DSS Characteristics:

4.1 reliability of DSS

4.2 ease of use

4.3 cost of acquiring DSS

4.4 technical support from the vendors of DSS

4.5 ease of finding the required data

4.6 perceived importance of DSS usage

4.7 tangible/intangible benefits of DSS usage.

5.0 Variables related to environmental characteristics:

5.1 government policies

5.2. uncertainty in environment

5.3. competition

5.4. market conditions

5.5. internal support and consultant's recommendation.

2.6 Problems of DSS Usage in Making Strategic Decisions

While advances in hardware and software capabilities continue at an unprecedented pace, the problem of under-utilised systems remains (Weiner 1993; Johansen and Swigart 1996). Importantly, low usage has been listed as one of the underlying causes behind the so called "productivity paradox" (Landauer 1995; Sichel 1997). Understanding the problems that make decision-makers don't use DSS effectively continue to be important issue.

There are general problems that limit utilising IT in Africa; Egypt shares some of these characteristics as an African country. These problems are as follows:

1. a lack of sound legislation and policy guidelines
2. inadequate finances for investment in IT
3. the need for education, research and an IT development structure
4. lake of skilful manpower resources

5. poverty and illiteracy prevalent in African society
6. curtailed freedom of handling information owing to political and bureaucratic reasons
7. lack of regional integration and co-operation.
8. Need for IT cultural ethics
9. reduced access to knowledge and information (Shibanda and Musisi-Edebe 2000).

Some other recent research conducted in Saudi Arabia, which is similar to a great extent to Egypt in relation to cultural, political and social environmental conditions, the results showed that the primary problems during their implementation of IT were lack of professional MIS staff and inadequate training programmes (Al-Sudairy and Tang 2000). Other researchers found other factors that hindered IT implementation in developing countries. Among these factors are the lack of hardware and software (Abdul-Gader and Alangari 1995) and technical support by IT suppliers (Al-Sudairy 1994).

Despite the significant progress which has occurred since the advent of computer-based decision support systems, IT in general, and DSS in particular, is impeded by such barriers as lack of "top management support," poor quality IS design, inadequately "motivated and capable" users (Kwon and Zmud 1987) or restricted access to the system (Poon and Wagner 2001). In developing countries equivalent barriers appear to be often insurmountable (Knight 1993; Nidumolu and Goodman 1993; Danowitz, Nassef et al. 1995; Mahmood, Gemoets et al. 1995). While dysfunctional behaviour, such as little or no use of DSS, has been documented in both environments, it seems most troublesome in developing countries, in general, with little difference in the severity of these problems among these countries (Odedra, Lawrie et al. 1993). Other researchers go so far as to say that the diffusion of IT in most developing countries contrasts sharply with the experiences in industrialised economies (Avgerou and Land 1992; Moussa and Schware 1992; Odedra, Lawrie et al. 1993; Jain 1997). Some researchers outline the environmental characteristics of developing countries which influence IS management (Hanna, Guy et al. 1995). A large number of these studies follow the success approach in relating IS management to organisational contexts, such as size, IS development approach, user participation, management structures, styles, etc. By following the same approach some others (Rockart and De Long 1988; Paller and Laska 1990) define the conditions that need to be met to assure the usage and success of the information systems, in general. So if the researcher considers the lack of the availability of these conditions, it might be an explanation to the low usage of DSS in making strategic decisions. These conditions can be summarised as follows:

a) the lack of commitment of senior executives,
b) inappropriate IS staff,
c) inappropriate technology,
d) lack of management of data,
e) lack of clear link to the organization strategy,
f) organisational resistance,
g) inappropriate system design.

Other studies relate the dependence of IS management to external factors, such as shortage of skilled manpower, government policies, infrastructure availability, socio-cultural aspects, etc. Ein-Dor. Segev and Orgad (1993), in a review of international and cross-cultural studies, categorised different factors as cultural (e.g. economic, demographic etc.), environmental (e.g. organisational, extra-organisational), structural or the operating characteristics consisting of behavioural or socio-psychological and procedural, relating to plans, strategies, projects and operations of the organization (Ein-Dor, Segev et al. 1993). Moussa and Schware (1992) identified five core problems contributing to failures of information systems projects in Africa: institutional weaknesses, human resources, funding, local environment and technology and information changes. Obviously, some of these barriers are common to developed countries; however, developing countries have less capacity to overcome the constraints to development (Jain 1997).

Some of these problems are attributable to a lack of national infrastructure (Odedra, Lawrie et al. 1993), capital resources (Goodman and Press 1995), or government polices set in place to prevent technology transfer (Goodman and Green 1992). However, some other researchers focus on the behavioural dimension of these problems because the introduction of any information system causes change in the organization, i.e. to individual, responsibilities, socio-political structure, etc. (Krovi 1993). Other researchers see the political barriers as a significant factor to affect the use of information technology as a strategic weapon (Kim and Michelman 1990). Political barriers negatively affect the integration of the existing isolated systems. The integration may lead to significant organisational changes in workflow, communication patterns, reporting relationships and internal control processes (Kim and Michelman 1990).

Although there are a number of implemented and useful DSS, progress toward the strategic use of DSS has been slow (Belardo, Duchessi et al. 1994). Among the reasons for low deployment of these types of systems are the complexity of strategy and the low credibility of computer-based approaches. With regard to the latter, some executives feel that information systems have little to offer them and have been reluctant to accept the systems in their offices (Lederer and Mendelow 1988).

Bringing together the problems mentioned earlier, the researcher will try to build a frame for the potential problems that could affect using DSS in making strategic decisions.

1.0 Problems relating to top management

1.1 lack of senior management leadership for DSS implementation efforts,

1.2 top management insufficient understanding about DSS,

1.3 lack of strategic vision for decision makers.

2 Problems relating to DDS characteristics and design

2.1 qualitative information which is important in making strategic decisions is not available in the DSS software used,

2.2 DSS provide decision-makers with more information/ reports than they need to make strategic decisions effectively,

2.3 difficulty in financially justifying benefits of DSS usage,

2.4 unreasonable expectations attributed to DSS as a solution for all organisational problems,

2.5 difficulty in modelling and simulating the strategic decisions by DSS usage,

2.6 lack of flexibility in the DSS software to meet decision makers' changing data needs, 2.7 the available DSS software does not support learning and creativity,

2.8 the available DSS software does not actively participate in my strategic decisions,

2.9 it is not easy to learn how to use the DSS software.

3 Data related problems

3.1 insufficient understanding about existing data and applications across the organization,

3.2 lack of accuracy of output (information / data),

3.3 irrelevant information or data for the different decisions I usually make,

3.4 incompleteness of information or data,

3.5 lack of reliability of information or data,

3.6 lack of timeliness of information or data,

3.7 inappropriate managing of the process of DSS implementation,

3.8 rushing of DSS adoption and implementation,

3.9 lack of appropriate planning for adopting DSS,

3.10 failure to assess DSS effectiveness in early stages of implementation,

3.11 failure to continually assess emerging DSS capabilities,

3.12 senior managers did not get involved in the development of the DSS software that they use,

3.13 lack of alignment between corporate strategy and DSS.

4.0 Lack of trained and expert DSS staff

4.1 absence of appropriate training for decision makers to use DSS,

4.2 absence of appropriate training for DSS staff,

4.3 lack of experience to be able to use DSS in making strategic decisions,

4.4 difficulty in finding DSS staff who have the required skills and knowledge,

4.5 lack of expertise in DSS in the organization.

5.0 Environmental related problems

5.1 insufficient telecommunication infrastructure capabilities,

5.2 failure to commit the required resources to DSS usage,

5.3 lack of external consultant support for DSS implementation and use, 5.4 difficulty of changing the legacy of making strategic decisions because of rigid regulations.

6.0 Organisational related problems

6.1 lack of authority given to DSS team, so they cannot get access the data / information they need to make strategic decisions,

6.2 lack of internal support for DSS implementation

6.3 poor communication between decision makers and DSS staff unit,

6.4 when it is necessary to compare or aggregate data / information from two or more different sources, there may be unexpected or difficult inconsistencies,

6.5 the database that would be useful is unavailable because it is centralised.

This study builds on the existing knowledge to shed light on yet one more aspect of the phenomenon of IT utilisation, specially the strategic use of DSS, by local government. There are a few points where this study departs from the approach taken be most previous researchers.

First, most previous research which focuses on understanding IT in local governments is descriptive in nature. It observes the patterns of IT in the cities and tries to see which conceptual perspective best fits the prevailing process. As such, they seem to follow the "emergent perspective" (Markus and Robey 1988). Since most of these studies are concerned with explaining how outcomes (IT) develop over time, they also tend to follow the "process theory" approach which holds that "causation consists of necessary conditions in sequence, chance and random events play a role, outcomes may not occur, even when conditions are present" (Markus and Robey 1988). Furthermore, this study is interested in exploring levels of outcome, which is DSS usage, in making strategic decisions and how they relate to levels predictor variables, which is the different variables that affect the strategic use of DSS, including TAM variables. Thus, as Markus and Robey (1988) suggest, the "variance theory" approach is more appropriate. Hence, this research chooses based on the existing literature, the different problems which seem to have impact on strategic use of DSS and explores how and to what extent, those problems relate to the organisational goals from adopting DSS.

Second, previous research links the different factors to IS/DSS adoption. The motivations to use this technology (TAM) which intervene between these factors and the actual strategic usage of DSS were often left unidentified. Dutton et al. (1985) suggest that, at a general level, IT in most local governments is governed by the pulling and hauling among various participants (Dutton and Kraemer 1985). This research aims to explore the link between the different factors and DSS usage with and without TAM.

Third, previous research tends to adopt a more neutral position, describing what local government is doing and fitting it into conceptual framework, without taking normative stand (Dutton and Kraemer 1985; King and Kraemer 1985). Kraemer et al. (1989) specifically claim that cities should not necessarily pursue more IT implementation, or move to the strategic state where computers support managerial concerns and the goals of organisation, as long as they decide which state they wish to be in and structure their IT/IS accordingly. Once again there is more normative flavour to many studies (Bozeman and S. 1986; Frantzich 1987; Miewald, Mueller et al. 1987; Caudle, Gorr et al. 1991). This study follows this trend by trying to measure to what extent the problems of DSS usage are related to improving the quality of strategic decision making in local government in both the UK and Egypt.

Lastly, most of the data on which the previously mentioned studies are based was collected in the USA. So, it is expected that major differences (in the factors which influence the strategic use of DSS and the type of problems) between these studies and Egyptian local government, while the local government in the UK may present a slightly different picture.

Chapter 3 An Overview of Decision Support Systems Usage in Local Government

3.1 Introduction

Fifteen years ago UNESCO defined IT as: "The scientific, technological and engineering disciplines and the management techniques used in information handling and processing; their applications; computer and their interaction with men and machines; and associated social, economic and cultural matters."

It is a subject that cuts across a whole range of "social, economic and cultural maters." The trouble is that, because it encompasses such a range of disciplines, it is a term more discussed than understood. For some time, the "experts" have presented IT as being all about automation of office activities, or have talked excitedly about the coming together of technological developments and computer related technology (Catanese 1967). IT is very often seen as a set of tools. Only recently, more and more people have appreciated the IT as an "information/knowledge systems" which would not only change an organization structure, products or services, but also influence decision making process, if it is properly implemented and used.

Firstly, information was often defined as the communication or reception of knowledge or intelligence. Now it is treated as the fourth of the economy, just as people, money and equipment are resources for manufacturing goods. Information cannot only be sold as a commodity (products/services) but can also be treated as raw material to generate new products. Secondly, IT has become a big specialised industry/business. It employs millions of people working on the development of hardware/software and databases which have commercial value. Local government IT in general and DSS in particular, provides an easy way of accessing massive amounts of information, according to this promise IT introduced to local authorities and, thereby, it may improve work efficiency in general, and improve the decision process in particular. This promise, largely unfulfilled generally the reality is that decisions are still based on questionable data (Wagstaff 1996).

In this chapter the researcher will cover a historical background for the IT development in both the UK and Egypt till it reached the climax by adopting and implementing DSS in local authorities.

3.2 Information Technology in Local Government in the UK

IT has been implemented in local government a long time after it started in manufacturing and trade sector, because of concern that it would make offices "peopleless" as well as "paperless". In 1957 Norwich Treasurer's Department bought LAMSAC's first mainframe computer (FRED) (cost about £ 34,300). From then until 1962 only 24 local authorities in Britain ordered or acquired computers (Computer Survey, 1962; 1972). After that, the figure showed about 50% increase rate every year. By 1972 the figure had become 324. Later, the survey became inadequate. The editor of the journal mentioned, "the computer has become office equipment just like a telephone" (Eagle 1982).

In general, computers came to local authorities in four waves: the first was usually the installation in the Treasure's Department for payroll and financial analysis (Long 1986). The second was land use and transport planning (sometimes associated with property management (DoE 1975); the third was the housing system for processing applications on Council Tenants, Welfare and Housing Benefit, etc. (LGTB 1982); the fourth was in almost all department as desk-top-systems (LAMSAC 1986).

In spite of massive "hype" about new technology over many years, there is still a long way to go before DSS is adopted in all local authorities and used to its full capacity by decision makers. Although this is the case, the development of computer hardware (microchips, networking, satellite communication, etc.) and software, the user accessibilities, has been improved significantly. The "IT revolution" is definitely an important economic threshold crossed in the use of this technology because it has changed the ways local authorities operate. Therefore, from the point of view of the use of computers, the development of IT in local government can be described in five stages as follows:

3.2.1 Calculation and Automation (1950's -- 60's)

It was implemented within local government firstly as a big calculator (Brown 1966), and so the treasurer and accountant offices were the first few organisations that installed computers for data processing, such as pay roll and rating. In the beginning, IT was a labour-intensive business because computers required people to input data through punch cards (Long 1986). After magnetic tap was used for computer storage, data processing became much faster and information became more readily retrievable. With the help of programmers, computers began to handle large financial and administrative database and, because of the existence of retrievable database, computer started to save working time.

In the late 1950s central government set up a "Local Authorities Management Services and Computer Committee" (LAMSAC), which was responsible for early IT initiative in local government. LAMSAC also acted as a partnership with ICL (International Computer Limited, UK largest computer company) in developing specific information systems for local government.

In the 1960s, when computers were mainly pursued and used by the Finance (Treasurer's) Departments for payroll or rates billing purposes, those mainframe computers were big in physical size, but unreliable in performance. They contained only specially-designed programs (fixed software) for specific batch processing. They dealt with mathematical processes for fixed data structures. One of their objectives was to replace paper work, in other words at storing financial and personal information, therefore, they were sometimes known as transaction-based systems. These early systems were very unfriendly and had very limited user access.

Later, computers were used to manage administrative records, such as council housing, welfare and benefits application, and so on. While there was an automation innovation in manufacturing industry, the call for office automation in local government had started. Since there was no general-purpose database management software, any changes in database had to be made by computer experts. Therefore, local authorities were obliged to establish a central data processing department, called Computer Services Department". In general, computer facilities were accessible to only few a departments. This centralised structure was the model for local authorities throughout the 1970s.

3.2.2 Modelling and Planning Information Systems (1970s)

In 1968 the new Town and Country Planning Act further defined the statutory duty of a local authority in providing planning information services. In 1969 the Centre for Environmental Studies in London held the first conference on "Information and Urban Planning" which brought the two issues together for the first time. After that more and more people, including urban planners, mathematicians and transport engineers, started to write their own programs in high-level computer languages, such as Fortran, for solving their planning problems. Throughout the 1970s urban and regional modelling was one of the areas facilitated by the implementation of information technology.

During the 1970s, computer hardware was based on mainframe or mini-computers configured around a centralised network. Although the terminals, called Visual Display Units (VDUs) in local authorities, had made the centrally held data more accessible to the users, the contents of information the mainframe system provided were restricted to tabular form.

Recognised as powerful tools by the politicians, computers had been mobilised into policy planning units for processing administrative and statistical data. In some local authorities, planners had developed programs for population projection, land use and transportation planning (Batey 1976). The use of computers has accelerated modelling development and made these models more practicable. Some new heuristic modelling techniques could not have been developed or implemented without computers. Because of this modelling work, local authorities brought more computers in the late 1970's. These modelling techniques formed the core of later DSS analytical modules.

Begun in the late 1960's, the GISP (General Information Systems for Planning) study was staffed and guided jointly by local authorities, the Department of Environment and the Scottish Development Department. A DoE GISP report was concluded in 1972 which represented an attempt to tackle the general problem of hoe to organise information. It recommended the creation of what was referred to as a fairly comprehensive Management Information Systems (MIS) that would require a corporate to data collection, recording and supply within a Local Authority in order to help it meet new information needs created by the 1968 Town and County Planning Act which put considerable emphasis on monitoring activities.

3.2.3 Microcomputers and Database Solutions (early 1980's)

At the beginning of the 1980's there were two dramatic developments in IT. One was the advent of micro-computers (Macintosh BBC and IBM Personal Computers). The other was the development of Database Management Systems (DBMA) and other general-purpose software, including spreadsheets and graphics (Aronoff 1989). These brought a fall in computer prices and users the full freedom to control and manage their own databases and work procedures. "The local governments moved to a situation in which relatively few departments do not make some of use of computers" (Barrett 1981). The main issues then became how the computers could help local government in policy planning, operational management and service delivery. Accordingly the central government designed 1982 as the year of Information Technology for promoting the use of computers. Many educational programmes were launched by both central and local government to disseminate IT in all governmental agencies during that period.

By the middle of 1980's various general-purpose software packages were available for database management, spreadsheet and graphics making on microcomputers. With these packages, the users could create databases themselves and design applications most suitable for their practical needs. Users could easily update their database structures without changing the systems software. There have been many planning models developed by local authorities within existing DBMS, such as population models in Lotus 1-2-3. This merger between models and DBMA, especially on the PC, has made the modelling techniques more accessible to the end-user, and has also given the DBMS new functions applicable to policy planning. For this reasons, microcomputer and DBMS were the most important components of the IT revolution in the early 1980's.

3.2.4 Decision Support Systems (1980's -- 1990's)

The notion of DSS arose in the early 1970 in the USA (Grrity 1971; Scott Morton 1971). Within a decade, DSS had been identified as distinguished from both electronic data processing and MIS by the following characteristics (Keen and Scott Morton 1978; Alter 1980):

- A DSS includes a body of knowledge that describes some aspects of decision maker's world, that specifies how to accomplish various tasks, that indicates what conclusions are valid in various circumstances, and so forth.
- A DSS has an ability to acquire and maintain descriptive knowledge (i.e., record keeping) and other kinds of knowledge as well (i.e., procedure keeping, rule keeping, etc.).
- A DSS has ability to present knowledge on an as hoc basis in various customised ways as well as in standard report.
- A DSS has an ability to select any desired subset of stored knowledge for either presentation or driving new knowledge in the course of problem recognition and/or problem solving.
- A DSS can interact directly with a decision maker or a participant in a decision maker in such a way that the user has a flexible choice and sequence of knowledge management activities.

In that period, various DSS were proposed or implemented for specific decision making application such as those for corporate planning, water quality planning (Alter 1980). By 1980's new technological developments were emerging that would prove to have a tremendous impact on the DSS field. These included the management science packages and ad hoc query interfaces. Beside microcomputer and electronic spreadsheet, management scientists invent and apply procedures for solving complex quantitative problems faced by managers. Such procedures are often called solvers. A management science package is software that incorporates one or more solvers. With such a package, a computer can issue a response to user requests that state problems covered by the package's solvers. Another software advance that ushered in today's decision support systems was the creation of query languages and the accompanying software to process requests stated in such languages (Sprague and Carleson 1982). For these characteristics more and more local authorities found DSS irresistible, despite the high costs of purchasing and maintenance. Because of their wide range of power, DSS have been recognised as "potentially powerful tools" for "better management, use of resources, planning and decision making" for local government (Chorley and Buxton 1991).

3.2.5 Web-Based DSS (present)

DSS based on the web and the Internet are being developed to support decision making, providing on-line access to various databases and information pools along with software for data analysis. Some of these software are targeted toward management, but some have been developed to attract customers by providing information and tools to assist their decision making as they select products and services. In this direction most of the local authorities in England, Scotland, Wales, and Northern Ireland making information available electronically via the internet. But the quantity and quality of the available information still have a long way to go to reach the level of expectations from both decision makers and customers.

3.3 Information technology in local government in Egypt

3.3.1 Historical Background

In many ways Egypt is a typical developing country. It faces the common problems of developing countries such as heavy foreign debt, a balance of payments deficit, a high illiteracy rate, poor technological infrastructure, lack of financial resources, and high unemployment. It has been striving to implement a nation wide IS strategy to support the realisation of its targeted socio-economic development programme to deal with these problems. From another side developing countries in general face in addition to these local problems international problems related to liberalisation of trade and intensive global competition. Many developing countries and organisations in these countries view the exploitation of IS as instrument to achieve the goals development and overcome these different problems.

In the mid 1980s, Egypt as a developing country, adopted a computer-based information systems strategy for the introduction, implementation and institutionalisation of large information and decision support systems intended to improve strategic decision making process by increasing rationality and overcome knowledge and skill deficiencies at the Cabinet level and the governorates with respect to cope with managing socio-economic development. The strategy had to be tailor-made to the decision-making needs of the Egyptian Cabinet and the governorates, which addresses a variety of socio-economic development issues. These issues include public sector reform, administrative reform, debt management, privatisation, and managing educational and health problems.

The following characteristics were noticed in *Egypt as a developing country* in both cabinet and governorates in relating to decision-making process:

- The investment in IT, while necessary, is not sufficient to bring about improved organisational performance (McKersie and Walton. 1991; C. and Markus 1995),
- Overestimation of the IT's short-term value and underestimation of its longer-term impact.
- It was data rich but information poor,
- Data mobility was invariably upwards without any horizontal or downward flow of information.
- Information systems and management specialists were isolated from the decision makers, and
- Computer systems were not viewed as tools that could support decision-making process.
- The focus of improvements was more on technical issues than on decision outcomes.

Despite these undoubted obstacles, a project was initiated to support Cabinet-level and then extended to support the 27 governors in making their strategic decisions through state-of-the-art IT tools and techniques.

3.3.2 The Information and Decision Support Center (IDSC)

In 1985, the Cabinet of Egypt established the Information and Decision Support Centre (IDSC) whose mission was and is to provide information and decision support services to the Cabinet and the governorates for socio-economic development. The objectives of IDSC include (El Sherif and El Sawy 1988; El Sherif 1990):

- To develop information and decision support systems for the Cabinet and top policy makers in different governorates in Egypt;

- To support the establishment of decision support systems/centres in different ministries and governorates making more efficient and effective use of available information resources;
- To initiate, encourage and support informatics projects that could accelerate managerial and technological development of Egyptian ministries, sectors and governorates; and
- To participate in international co-operation activities in the areas of information and decision support.

IDSC's work is divided into three levels

- The first level represents the Cabinet base where information and decision support systems are developed to support strategic policy and decision-making processes.
- The second level represents the national nodes, where IDSC links the Cabinet with existing information sources within ministries, national organisations and agencies, and academic institutions and research centres.
- The third level represents the international nodes where IDSC extends its activities by accessing major databases world-wide through information technology and telecommunications facilities.

The operational environment which IDSC must support necessitated a special organisational structure. Managerial and technical human resources having the knowledge, experience and ability to cope with such a dynamic and turbulent environment also had to be available. The *organisational structure for IDSC* includes:

- Crisis management, priority assessment, and quality control teams which prioritise strategic issues in the Cabinet agenda and assure the production and delivery of high quality information and decision support services.
- A decision support services department, which deals with information and decision support requests from various ministries, governorates and local organisations. Its role is the identification of user needs, issue formulation, definition of information and decision support requirements, and identification of possible alternative solutions to these issues.

- A project development department, which responds to the needs of the different ministries and governorates. The department staffs are project account executives whose role is to develop, implement and monitor various projects.
- An information resource management department, which represents the technical staff of the organisation. Its role is to respond to different user needs with respect to systems design, development, installation and maintenance.
- An information technology tracking department, which continuously tracks and diffuses state-of-the-art information technology internally within IDSC and externally within different ministries and governorates through different projects.
- A human resource development department, which deals with the training of IDSC staff as well as the staff of various organisations with which IDSC has joint projects. The training includes a set of programmes and courses in management, information systems and computer applications. The main objective of these training programmes is to diffuse IT knowledge and skills, thereby increasing the effective use of new technology.
- A finance and administration department, which deals with financial, administrative, and legislative issues regarding both internal and external operations. It is also responsible for the development of steps and procedures to be adopted during the implementation of different informatics projects.
- A communications and internetworking department that is responsible for maintaining and supporting all local and wide area networks in the organisation as well as managing internet access for various departments.
- An organisational library, which is considered one of the key functions due to the continuous need for IDSC staff to have access to various types of socio-economic studies and documentation as well as reference to technical issues relevant to the activities of IDSC.

In addition, there is the international co-operation department, which deals with IDSC's external interactions with international organisations and which works on formulating joint informatics projects with various countries.

3.3.3 The Governorates Project in Egypt:

In late 1987, the Cabinet IDSC launched the Governorates project, which represent a significant administrative and technological innovation for Egypt from the perspective of the central government. The project sought to implement 27 IDSCs, one for each governorate (including the city of Luxor). See table 3.1 for the current situation of number of DSS units, number of employees and number of computer in each unit.

Table 3.1: Profile of DSS units in local Governorates

No.	Governorate	DSS Unit	Employees	Computers
1	Ministry of village development	3	17	21
2	Trustee of Local Management.	1	10	10
3	Cairo	41	386	146
4	Giza	44	352	167
5	Kalubya	60	363	94
6	Alexandria	25	208	124
7	Beheira	96	624	191
8	Matrough	18	86	39
9	Menouffia	35	300	77
10	Gharbeya	79	512	45
11	Kafr El Sheik	59	373	98
12	Damietta	24	197	68
13	Dakhlia	76	616	146
14	North Sinai	33	142	92
15	South Sinai	20	84	57
16	Port Said	20	82	67
17	Ismailia	40	163	116
18	Suez	18	80	65
19	Sharkia	73	371	155
20	Bani Suef	31	192	45
21	Fayoum	29	186	79
22	Menia	39	232	114

23	Assiut	97	477	169
24	New Valley	22	137	49
25	Red Sea	13	62	55
26	Souhag	76	411	199
27	Kena	67	344	101
28	Aswan	48	232	120
29	Luxor	15	61	38
Total		1202	7300	2668

Source: IDSC in 1/11/1998

These centres were expected to enhance the administrative effectiveness of each governorate by providing information and decision support to the governors and their administrative staff (Kamel 1995). The governorates projects presented a distinct departure from the projects that the Cabinet IDSC had considered to date: its central purpose was to diffuse the use of IT to administrators outside of Cairo and Alexandria. The use of computers in many of the areas outside these to cities was virtually non-existent. The economic and political changes taking place in the country had exerted considerable pressure on the governors to be more responsive to their public, and the Cabinet IDSC was convinced that the governorate IDSCs would assist significantly in this effort (Nidumolu, Goodman et al. 1996).

3.3.4 Structure of the Governorate IDSC:

The governorate project consists of five different units in each governorate- the computer resources unit, the decision support unit, the library unit, and the publication unit and the statistics unit. The heads of these five units report to the centre director, who is responsible for co-ordination the activities of the different units, prepare the annual plans for the centre, and interacting with external entities such as the governor (frequently through an aide such as the secretary general), the project staff from the Cabinet IDSC and the heads of local ministry offices in the governorate.

The responsibilities of each of the five units are as follow:

- The statistics unit in each centre is responsible for collecting data about the governorate for each of the sectoral databases (such as education, health, roads etc.) or for other databases developed by the centre.

- The decision support unit is responsible for analysing and solving the problems presented to the centre by the governor or other users. It is also expected to undertake problem analysis on its own initiative
- The computer resources unit is responsible for sorting and maintaining information in the sectoral databases and for developing and maintaining any new software programs used by the centre.
- The library unit is responsible for storing manuals and procedures of the centre and for keeping a record of the work accomplished by the centre. In addition to that it keep hard copies of the data stored in the computer resources unit's databases.
- The publications unit describe the centre's activities to its users, other centres and the Cabinet IDSC. It responsible for publishing the monthly news letter, which describes the activities of each unit in the centre.

From this description of how IT in general and DSS in particular adopted and used in local governments in both the UK and Egypt, it seem that there are some differences related to the beginning of using IT in local authorities and the political and economical conditions surrounding the implementation process. Also there are some differences relating to how far this technology reaches and the level of utilisation in local authorities. These different factors that affect the utilisation will be examined in this research and the differences between the two experiences will be highlighted in details in the results and the discussion of these results through this research.

Summary

This chapter presented an array of topics related to the literature review that draw the main structure of this research. The topics included review of the early studies in developed countries relating to IT in local government, how TAM could be linked to DSS usage in making strategic decisions, frame work of factors influencing DSS implementation and use and problems relating to DSS implementation and use. Thorough coverage of these topics establishes a strong foundation for the structure of the thesis and indicates the logic behind the flowing of the topics in the order showed in the chapter.

Chapter 4 Strategic Decision-Making and Its Relation to DSS

4.1 Introduction

There is a lack of critical understanding within paradigms of research into DSS usage within managerial Strategic Decision Making (SDM) in general and in developing countries in particular. Therefore the following topics will be discussed in this chapter:

1. Strategic decision making theory.
2. Characteristics of strategic decision problem.
3. Definitions of DSS.
4. Types and components of DSS.
5. Characteristics of DSS.
6. Relation between SDM and DSS.

These topics were arranged in this order for the following reasons. First, it was important to review a variety of decision theories since key elements of these theories have been incorporated in DSS design. Second, a review of DSS characteristics, definitions, will provide a clear understanding of DSS design and any potential relationships to strategic decision-making theories. Finally, to use DSS in making effective strategic decisions there is a need to understand the relationship between SDM and DSS.

4.2 Human Decision Making

In order to understand how DSS may enhance human decision making, it is first necessary to understand the human decision making process and define the concept of a decision. A decision process is concerned with the whole range of activities involved in making a decision. There are some common threads that can be found in nearly any decision- making process regardless of the decision's context, type and maker. There is general agreement in the management literature that a decision is a choice. It is variously regarded as a choice of strategy for action, or a choice leading to a certain desired objective. A decision also was defined as an episode, beginning when the organization first became aware of a motivating concern or difficulty and ending with a successful, or an unsuccessful, implementation attempt. After a failure, a recycle would be viewed as a new decision, if new alternatives were uncovered (Nutt 1998). These definitions suggest that we can think of decision making as an activity culminating in the selection of one of multiple alternative courses of action. This activity includes the work of awaring the problem or the opportunity, the available alternative to sort this problem or using the opportunity, efforts to understand the implications of the alternatives and the act of selecting one of the alternatives (Holsapple 1995).

Because it is difficult to incorporate the entire strategic management process under one framework or model, the researchers who study the human decision-making process discuss it in terms of a number of phases. Simon (1960) viewed the decision-making process as four phases:

1- intelligence;

2- design;

3- choice;

4- review.

Intelligence Phase

The environment is searched for conditions calling for decisions. Mintzberg et al. called it the identification phase which we have just discussed. Also, decision recognition and diagnosis are referred to as problem finding and formulation.

Design Phase

Possible courses of action are invented, developed and analysed. This phase consists of a search routine for ready-made solution and a design routine which is invoked in the absence of appropriate ready-made solutions (Mintzberg, Raisinghani et al. 1976).

Choice Phase An alternative course of action is selected from those available. The screening routine eliminates some of the alternatives generated during search. The valuation routine evaluates each of the remaining alternatives. The authorisation routine grants the final approval.

Review Phase

This phase organises and performs the evaluation of decisions prior to execution.

Simon's model assumes a downward flow of activities through the different phases identified. Nutt, (1984) criticized Simon's model for this downward flow and suggested that human decision-making is an iterative process. According to Nutt, several levels of iteration may occur at any phase during the decision making process. Data gathered may be insufficient, requiring a return from the design phase to the intelligence stage (Nutt 1984). Similarly, this may require a return from the choice phase to the design phase may be required. Nutt's model includes five stages, the first four coincide with the main three stages outlined by Simon: (1) formulation, (2) conceptualisation, (3) detailing, (4) evaluation and implementation. The implementation phase is an additional layer to Simon's model which involves consideration of strategies for gaining plan acceptance. If decision-makers are dissatisfied with the strategies used for arriving at a decision, Nutt suggests that they will return to an earlier phase or phases of decision-making. This iterative process continues until the decision-maker is satisfied with the decision. Also Mintzberg, et al., identified three major phases with subroutines within. These phases include the following: 1) the identification phase, 2) the development phase, 3) the selection phase (Mintzberg, Raisinghani et al. 1976). Basically, each model offers a systematic way to arrive at a decision.

4.3 Types of Decisions

Herbert Simon. (1960) classified decisions into a continuum, with highly programmed (structured) decisions at one end and highly unprogrammed (unstructured) decisions at the other. Decisions are programmed if they are well structured, repetitive and routine, and can be solved by standard procedures. Unprogrammed decisions (strategic decisions are from this type) are ill structured, novel and consequential. There is no cut and dried method for handling the problem because it has not arisen before, or because its precise nature and structure are elusive or complex, or because it is so important that it deserves a custom-tailored treatment (Simon 1960).

Anthony (1965) classified decisions into four types as follow:

- <u>Strategic Planning Decisions</u>: decisions related to choosing highest level polices and objectives, and associated resource allocation;
- <u>Management Control Decisions:</u> decisions made for the purpose of assuring

effectiveness in the acquisition and use of resources;

- Operational Control Decisions: decisions made for the purpose of assuring effectiveness in the performance of operations;
- Operational Performance Decisions: day-to-day decisions made while performing operations (Anthony 1965).

Some other researchers have categorised decisions into three general types (Keen and Scott Morton 1978; Mallach 1991; Tan and Sheps 1998). This categorisation of decision types has been useful in identifying which DSS model most effectively supports individuals with specific problems. The first type of decision is the structured decision. This type of decision has a well-defined decision making procedure. All three decision phases discussed earlier (intelligence, design, and choice) can be specified. DSS easily supports structured decisions. However, the decision maker may not need DSS support because each phase of the decision is well understood, resulting in little, if any, decision uncertainty. Unstructured decision, the second type, is a decision where all three-decision phases are unknown or unstructured. The decision may be new, infrequent, or have many variables in the decision phases which cause a high level of decision uncertainty. DSS can still support the decision-maker, but only with a low level of support. The third type of decision is semi-structured. This type of decision has both structured and unstructured phases. DSS were design to assist decision-makers with semi-structured or unstructured decisions. However, all decisions, whether they are structured, semi-structured or unstructured, require human judgement to make the decision (Tan and Sheps 1998).

Strategic decision-making process

A strategic decision was defined as one that had considerable importance due to the magnitude of the resources required or the expected impact (Mintzberg, Raisinghani et al. 1976). These decisions are important organization decisions and can be characteristically described as unique and risky, with the information needed to solve them often unavailable.

Henry Mintzberg explored the way in which managers make strategic decisions. After examining the strategic decision making process in twenty-five organisations, Mintzberg concluded that the strategic decision making process consisted of three phases.

Phase 1. The identification phase is made up of two processes. First, managers have to recognise that something is occurring that will create a problem or opportunity. They refer to this phenomenon as recognition of changes in the environment of an organization. Second, managers have to be sure information that pertains to the issue of change is being collected so the events can be better understood.

Phase 2. The development phase also contains two processes. In the development stage managers have to search, both internally and externally, for alternate solutions to the events occurring. Second, managers have to design potential solutions or modify existing solutions to fit the new circumstances.

Phase 3. The selection phase of strategic decision-making in which three processes take place.

1. Managers screen the alternatives generated in the development phase. This process is required because only a few alternatives can be examined in detail.
2. Managers go through an evaluation-choice process in which the remaining alternative solutions are analysed and judged.
3. A final decision is made as to which of the particular strategic alternatives to pursue.

Other researchers described strategic decisions as committing substantial resources, setting precedents, creating waves of lesser decisions (Mintzberg, Raisinghani et al. 1976) as ill-structured, non-routine and complex (Schwenk 1988) and as substantial, unusual and all-pervading (Hickson 1986). Although researchers have not reached consensus as to what constitutes a strategic decision, managers had no trouble in identifying them.

4.4 Characteristics of the Strategic Decision Problem

Power and Meyeraan identified four basic components of less structured decision problem which in the researcher opinion will not differ from the strategic decision problem (Power, Meyaraan et al. 1994).

(a) Objectives and criteria: not all are known at the outset and the trade-offs or relative utilities of objectives are largely unknown.

(b) Variables affecting outcomes: knowledge of all important controllable and uncontrollable variables is incomplete.

(c) Casual relationships: relations are not well understood in advance or may vary according to different plausible assumptions.

(d) Alternatives: alternatives are generally unknown and / or have not been specified.

4.5 Strategic Decision-Making Theory

A strategic decision was defined as one that had considerable importance due to the magnitude of the resources required or the expected impact (Mintzberg, Raisinghani et al. 1976). These decisions are important organization decisions and can be characteristically described as unique and risky, with the information needed to solve them often unavailable. Decision making models, as employed in DSS, can be characterised as individual or organisational models. Individual models employed include those based on rational principle (Cyert, Simon et al. 1956; Simon 1959), as embodied by normative theories of choice displayed in micro-economic theory, game theory, decision analysis and multi-attribute utility theory; satisficing models, representing bounded rationality through the use of heuristics to arrive at a solution that is acceptable, though not necessarily optimal, (Simon 1960; Simon 1969) descriptive models based on limitations of human decision makers, as illustrated by behavioural decision theory (Slovic, Fischoff et al. 1977; Wright 1985) and psychology based models that utilise cognitive style characteristics of the decision makers to prescribe support system characteristics (Zmud 1979). The researcher will discuss the different models of decision making in the following section.

4.5.1 Normative Decision Theory

Effective decision making, as defined by modern decision theorists, is a process by which individuals identify facets of a problem, carefully delineate alternatives, weigh the associated gain and losses of each and freely make a choice (Matteson and Hawkins 1990). This normative decision making model is based on classical micro economic concepts and contains two primary assumptions. First, the objective of all decisions is to maximise satisfaction and, second, in any given situation calling for a decision, all possible choices and the consequences and potential outcome of each are known (Duncan 1973). Based on this assumption, the decision maker in the normative model of decision making is a rational, all-knowing, hedonistic calculator who begins with a predetermined desire value and approaches decisions in the following sequence of steps: (1) defines and analyses the problem, (2) identifies all available alternatives, (3) evaluate the benefits and disadvantages of each alternative, ranks all alternatives in the order in which they are likely to meet the desired value, (5) selects the alternative that maximises satisfaction, (6) implement the decision and (7) follows up the decision (Lancaster and Lancaster 1982).

This logical normative process is not universally accepted. Some theorists and researchers argue that, although the normative model is analytically precise, its assumptions have been criticised as being unrealistic (Tversky and Kahneman 1981). The principal criticism of this normative model for decision-making is that few people actually know all the possible alternatives. Despite this criticism, the normative model is recognised as the primary analytical approach to decision making.

4.5.2 Descriptive Decision Theory

Herbert Simon (1960) recognised the limitations of the normative model and developed a descriptive model based on a set of alternative assumptions (Simon 1976). The descriptive model assumes that decision-makers are subjectively rational people who make decisions on the basis of incomplete information and are more likely to be satisfiers than optimisers. Satisfiers tend to look for an acceptable solution, while optimisers seek the best possible solution (Simon 1976). This view emphasised that decision problems are not always clearly and correctly defined, that people do not always make the one best choice and that it is not always possible or feasible to try to secure complete information because of limitations of time, money, or people (Simon 1976). Simon contended that, if people always attempted to arrive at optimal solutions, they would make few decisions. They would expend too much time and money in gathering information about the problem to arrive at a solution efficiently. Instead of seeking optimal solutions, people tend a set of minimal objectives that they will seek to accomplish and that they can comfortably consider as acceptable alternatives.

4.5.3 Prescriptive Decision Theory

A combination of the normative model's analytical process and the descriptive model's assumptions is called the prescriptive model of decision-making. This model emphasised the importance of individual preference and the associated weight or value placed on preferences by individual involved in the decision process.

4.5.4 Bayesian Decision Theory

Bayesian decision theory is a theory about what counts as rational choice in a decision problem (Winterfeldt and Edward 1986). Bayes' theorem is a mathematical decision model based on conditional probability that relates to the condition, state of nature and the decision risk. The condition can be defined as the circumstances related to the decision, while state of nature refers to any situation beyond the control of the decision maker that affects a decision process (Scariano 1995). The decision maker's knowledge of the possible consequences of various decisions are quantified for the loss or gain potential of each possible and each state of nature, called Bayes' risk. These average risks are then compared and the decision having the smallest average loss is regarded as the best (Shortliffe 1991; Scariano 1995). Because strategic decisions involve uncertainty, Bayes' decision theory can reduce uncertainty by offering treatment outcome probabilities which has prompted many authors to advocate for Bayesian theory as the model for DSS when the level of uncertainty and risk are high which is the case in strategic decision (Shortliffe 1991).

4.5.5 Judgmental Bias Theory

Theories and research regarding judgmental bias, where decisions are based on beliefs about the likelihood of an uncertain event occurring, are common in the psychology literature (Tversky and Kahneman 1981; Simon 1987). Loomes and Sugden (1982) expanded the judgmental Bias Theory adding the concept of regret. They suggested that, after a decision people compare the outcome of the alternative they chose with the outcome that might have been if they had chosen another alternative, and experience either regret or rejoicing. Individuals anticipate experiencing these findings, therefore, they take them into account when making a decision (Tymstra 1989).

4.5.6 Conflict Model Decision Theory

Decision-making under stress and time pressure, known as conflict model of decision-making, is another area of research indescriptive theory (Bensahel 1979). This model focused on how the psychological stress of decisional conflict affects the decision making process. The proponents of this theory have suggested that there are coping patterns determined by expectation of risk and benefits associated with a decision and expectation of enough time to deliberate before a decision is made. Keinan proposed that psychological stress, in and of itself, affected the manner in which people reviewed their alternatives before making choices (Keinan 1987).

In summary, it is difficult to say which theory best suits local governments decision-making. Since decision making, in general and strategic decision making in particular, is often a complex process encompassing a variety of conditions, perhaps strategic decision making related to Local Governments is best served by a conglomeration of theoretical constructs.

4.6 The Need to Improve Strategic Decision Making

D. Jennings and S. Wattam argued that all organisations need to improve their decision-making. This need is more necessary in the case of strategic decision. They mention the following reasons for this need.

1- In general, organisations face a scarcity of resources and the need to make the most effective use of those that are available to them.

2- Increasingly, both private and public sector organisations face competition, either from the rising pace of competition or through government exposing more organisations and their decisions to market disciplines.

3- Issues such as consumer safety, pollution and employment practices, frequently raise public concern over the degree of social responsibility demonstrated by organisations in their decision-making. Both public and private sector organisations often find themselves open to examination by wider society, not only for the results of decisions they have made, but also for how those decisions were arrived at (Jennings and Wattam 1998).

4.7 Decision Support Systems

4.7.1 Definitions of DSS

It is important to examine the definitions of DSS in order to understand the characteristics and applications of DSS. A variety of DSS definitions exist and no one definition is universally accepted within a discipline. The following definitions are the most commonly found in the MIS and IS literature.

1- The early definition of DSS was formalised in the early 1970s. Scott Morton (1971) described the impact of a computer-based system on decision processes and effectiveness. Gorry and Scott Morton (1971) brought together much of the preceding work on computer-aided decision making in developing "A Framework for Management Information Systems." They referred to systems developed for traditional data handling tasks in the Management Information Systems (MIS) context as structured decision systems and systems intended to aid non-routine decision-making activities as DSS. Their framework represented the growing recognition that different types of organisational activities required different types of computer support. DSS were meant to be an adjunct to decision-makers, to extend their capabilities but not to replace their judgement (Gorry and Scott Morton 1971).

2- Keen and Scott Morton define DSS as " Decision Support Systems use suitable computer technology to support and improve the effectiveness of managerial decision-making in semi-structured tasks" (Keen and Scott Morton 1978).

3- Alter (1980) produced a broad functional interpretation of the DSS concept. To be included in his taxonomy, it was only necessary that a computer-based system:

(i) be specifically designed to aid the decision process,

(ii) support rather than automate decision making,

(iii) be quickly responsive to the changing needs of the decision-maker (Alter 1980).

4- Sprague and Carlson (1982 p.6) define DSS as: interactive computer-based systems that help decision-makers utilise data and models to solve unstructured problems. They add the following characteristics for the DSS:

(i) it tends to be aimed at the less well-structured, under-specified problems that upper-level managers typically face;

(ii) It attempts to combine the use of models or analytical techniques with traditional data access and retrieval functions;

(iii) It specifically focuses on features that make DSS easy to use by non-computer people in an interactive mode;

(v) It emphasises flexibility and adaptability to accommodate changes in the environment and decision-making approach of the user.

5- It was a very small step in processing from a functional system-oriented definition to a system-oriented definition involving the components that made the functionality possible. Representative of this type definition is one by Bonczek et al. (1980) which define DSS as computer-based system consisting of three interacting components:

(i) a language system- a mechanism to provide communication between the user and other components of the DSS,

(ii) a knowledge system- the repository of problem domain knowledge embodied in DSS, either as data or procedures,

(iii) a problem processing-the link between the other two components, containing one or of the general problem manipulatory capabilities required for decision-making.

1. King (1983) said that DSS has the following components:

(i) decision models,

(ii) interactive hardware and soft ware,

(iii) a database,

(v) a database management system,

(vi) graphical and other sophisticated displays,

(vii) a user-friendly modelling language.

More recent definitional statements on DSS have followed the earlier established formats. Examples of generalised functional definitions are:

7- A DSS is an interactive flexible and adaptable CBIS that utilises decision rules, models and models base coupled with a comprehensive data base and the decision maker's own insight, leading to specific, implementable decisions in solving problems that would not be amenable to management science optimisation models per se (Turban and Aronson 1998).

6- DSS is a computer-based system which has the objective of enhancing the overall effectiveness (e.g. by increasing reliability, accuracy and efficiency of obtaining relevant information) of decision makers, especially in their unstructured and semi-structured tasks (Jelassi, Williams et al. 1987).
7- DSS is an integrated set of computer tools that allows a decision maker to interact directly with computers to create information useful in making unanticipated semi-structured and unstructured decisions (Hicks 1993).
8- Decision Support Systems are used for less structured problems where the art of decision-making is blended with the science of decision-making (Kanter 1992).

Several themes emerged from these definitions. Decision support systems are basically information systems with an internal systems structure (the DSS) and an external system structure which include the people who use DSS, the functions of the DSS and the environment in which DSS used. Most definitions suggest that DSS is used by managers. Decision support systems are computerised tools used in making decisions. The purpose of DSS is to enhance the decision makers' ability to make decisions by providing structured information (Pinsonneault and Kraemer 1989). The ultimate decision to use DSS and / or to incorporate DSS derived information in the decision rests with the individual user (Tan and Sheps 1998). Finally, decision support systems are designed to support, not replace, people in the decision making process. DSS is not decision-making entity. If no human review of the system's recommendation occurs, it is not a DSS.

4.7.2 Types and Components of Decision Support Systems

Decision support systems differ in their scope, the decisions they support, the individuals who use them and the information and functions they provide. A variety of DSS exist. They range from a simple personal computer spreadsheet to a custom-written system of hundreds of users accessing a multi-gigabyte database running on mainframe computers costing tens of millions of dollars or pounds (Mallach 1994).

Alter (1980) divided decision support systems into a hierarchy of seven levels including: (1) Suggestion Systems, Optimisation Systems, (3) Representational Models, (4) Accounting Models Systems, (5) Analysis Information Systems, (6) Data analysis Systems and (7) File Drawer Systems. This hierarchy is based on the capabilities of DSS. Alter recognises that not all DSS can be categorised into one level and that there may be grey areas between adjacent levels (Alter 1980).

Sprague and Carlson's framework of DSS consists of three management subsystems: database management software (DBMS), Model Based Management Software (MBMS), and Dialogue Generation Management Software (DGMS). Also Bonczek et al. (1981) said that DSS structure could consist of a language subsystem, a problem process subsystem and a knowledge subsystem. Turban (Turban and Aronson 1998) said that a DSS is composed of the following components.

(1) Data management includes the database(s) which contains relevant data for the situation and is managed by software called a database management system (DBMS).
(2) Model Management is a software package that includes financial, statistical, management science or other quantitative models that provides the system's analytical capabilities, and an appropriate software management.
(3) Knowledge management subsystem is a subsystem through which the user can support any of other subsystems or act as an independent component. It provides intelligence to augment the decision maker's own.
(4) User interface subsystem where user communicates with and commands DSS through this subsystem.

Much DSS research has been conducted that could be classified as having dealt with one or more of these components.

A database is a repository of mainly numerical, fix length and transactional types, generated from the basic operations of the business and the external environment. Through DBMS and their query facilities, data can be retrieved, processed and reported to aid decision-making.

Models are quantitative and can be viewed as algorithms, procedures, subroutines, programs, and so on (Chang et al. 1992). The primary focus of both DBMS and MBMS is a transaction oriented operational system. Recent advances in management approaches, globalisation and changes in organisational structures impose particular requirements on DSS.

Researchers in the field of artificial intelligence have been trying to fill the gap by incorporating the qualitative dimension of decision making into DSS. So many DSS researchers started to think that DSS should act as a more knowledgeable or intelligent aid in the human decision-making process e.g., (Blanning 1987; Dalal and Yadav 1992). Therefore, a knowledge base has been proposed as an additional component of DSS.

A knowledge base (KB) consists of facts, concepts, theories, heuristics and other qualitative and symbolic knowledge organised and analysed to make them useful in problem solving. Through hand-crafted rules or other symbolic manipulations, the KB is able to support qualitative aspects of human decision making.

4.7.3 DSS for the Purpose of this Study

DSS is an interactive computer-based system which has the objective of enhancing the overall effectiveness of the decision-making process by using the analytical methods, models and knowledge to help decision-makers to define the problems or opportunities, problem solving and solution adoption through exploring, analysing and choosing between various decision alternatives, especially in their unstructured and semi-structured tasks.

4.8 Strategic Decision Making and DSS

Strategic decision-making is recognised as one of the most important parts of any organization. The availability of reliable information sources is a key component of strategic decision. Sources of information may be oral, written, or computer-based. The computer-based information sources remain the least studied in the context of strategic decision because strategic decision makers have tended to use other managers and their own intuition as their primary information sources (Jones and McLeod 1986). Because DSS allows fast information processing and analysis, the availability and use of DSS by strategic decision-makers may contribute in making effective strategic decisions by increasing the speed of identifying problems and opportunities, the extent of analysis in problems (opportunities) diagnosis, alternatives generation, alternatives evaluation choosing course of action and decision integration.

Moreover, the purpose of DSS is to facilitate the decision-making process phases. Regarding decision making as a flow of problem solving episodes, some of the researchers consider that the purpose of a DSS is to help problem-solving flows go more smoothly or rapidly (Holsapple 1995). However, Butters and Eom (1992), and Silver (1990) maintain that the integration of computing facilities with decision processes is not equally beneficial to all phases of the human decision making process (Silver 1990; Butters and Eom 1992). If DSS is linked to an external database, it can be relatively helpful in arriving at a thorough and accurate situational decision during the intelligence or formulation phase. However, DSS may be restricted to the scope of data gathered, as well as the execution of the decision making process. The use of DSS to support the intelligence phase of the decision-making may be limited if databases are not both external and internal in nature. During the design phase or conceptualisation and detailing phase, DSS may be vital to stimulate alternative decision scenarios by means of mathematical or statistical prediction techniques. DSS applications work best in the evaluation of alternatives (choice or evaluation phase) since this phase of decision-making is the most structured (Blios 1980). Because a substantial amount of human activities is needed to define the problem during the beginning (intelligence or formulation) phase of the strategic decision making process, many investigators believe the use of DSS would be premature at this time (Blios 1980; Silver 1990; Butters and Eom 1992). However, they support the use of DSS during the design phase to generate alternatives and stimulate decision outcomes based on mathematical modelling of the problem or the issue. Because DSS incorporates a large database, the decision-maker can access more information from the database than could possibly be stored in the human brain (Keen and Wagner 1979). The decision-maker can use this data to create representations of action situations that allow the user to project the likely outcome of a potential decision (Silver 1990). The capability of simulating the effects of a decision before the decision is actually made may be the greatest value of DSS (Mallach 1994). The final choice phase may be aided by DSS because the decision-maker can choose the most effective alternative.

Many factors influence strategic decision-making. A manager must use technology to understand and assess situations in a timely manner. The fact that DSS typically provides access to internal and external databases means that DSS users can view situations from environmental, as well as a corporate, perspective. Statistical analysis capabilities coupled with alternative presentation options allow users to perform what-if analysis and their results can be presented in a graphical or tabular format (Nord and Nord 1996).

The characteristics that should be exist in DSS to help managers cope with semi-structured or unstructured decisions as mention by Holsapple are as follows:

1- includes a body of knowledge that describes aspects of the decision maker's world, specifies how to accomplish various tasks, indicates what conclusions are valid in various circumstances, and so forth;
2- has an ability to acquire and manage descriptive knowledge (i.e., record keeping) and other kinds of knowledge as well (i.e., procedure keeping, rule keeping, etc.);
3- has ability to present knowledge on an ad hoc basis in various customized ways, as well as in standard reports;
4- has an ability to select any desired subset of stored knowledge for either presentation or deriving new knowledge in the course of problem recognition and/or problem solving;
5- can interact directly with a decision-maker or a participant in a decision maker, in such a way that this user has flexibility in the choice and sequencing of knowledge management activities (Holsapple 1995).

Realising that DSS benefits depends on the nature of the decision-maker and the decision situation, in general DSS can provide decision-makers with the following benefits.

1- In a most fundamental sense, DSS augments the decision-maker's own innate knowledge management abilities. It effectively extends the decision-makers' capacity for representing and processing knowledge in the course of making decisions.
2- By drawing on its knowledge store, DSS may be able to recognize problems that would have gone undiscovered by the decision-maker and communicate them to

the decision-maker. It may aid in the decomposition of a problem (e.g., the overall decision problem) into sub-problems.

3- A decision-maker can have DSS solve problems that the decision-maker alone would not even attempt or that would consume a great deal of decision-maker time due to the complexity and magnitude of the problem required.
4- Even for relatively simple problems encountered in decision-making, DSS may be able to reach solutions faster and/or more reliably than the decision maker due to the use of various problem solving techniques.
5- Even though DSS may be unable to solve a problem facing the decision-maker, it could be used to stimulate the decision-maker's thoughts about the problem. For instance, the decision-maker may use DSS in an exploratory way to browse selectively through stored data or to analyse selectively the implications of ideas related to the problem. The decision-maker can have DSS solve a similar problem to trigger insights about the problem actually being faced.
6- The very activity of constructing DSS may reveal new ways of thinking about the decision domain or even partially formalise various aspects of decision-making.
7- DSS may provide additional compelling evidence to justify a decision-maker's position, helping the decision-maker to secure agreement or co-operation of others. Similarly, DSS may be used by the decision-maker to check, or confirm, the results of having solved problems independent of DSS.
8- Due to the enhanced productivity DSS fosters within an organization, it may give the organization a competitive advantage over other organizations in the environment. Or, DSS may be necessary just to stay competitive with other organizations capabilities.

There are many improvements expected from DSS usage in making strategic decisions. These improvements have been claimed in the literature and summarised by Klein and Methlie (1995), as follows:

1- greater effectiveness of decision making (quality of a decision);
2- improved efficiency (reducing delay and cost for certain tasks) leading to a decision or the solution of a problem;
3- better communication among decision makers;

4- Improving the learning process of users (Klein and Methlie 1995).

The complex nature of the strategic decision-making process itself and the accompanying encumbrances that it brings to the DSS design and delivery situation, are specified by El Sherif and El Sawy (1988) as follows:

1- strategic decision making is a murky, ill-structured process that can be drawn out over weeks and months yet often requires very rapid response capabilities in crisis situations;
2- strategic decision-making is usually a group effort rather than an individual one, and it involves activities, such as co-operative ideation, co-operative problem solving, conflict resolution, negotiation, crisis management and consensus building (Gray 1988);
3- strategic decision making in turbulent and dynamic environments accompanied by a large environmental-scanning component which has its own information requirements for early warning about potential discontinuities, surprises, threats, and opportunities (El Sawy 1985);
4- a strategic decision involves multiple stakeholders with different implicit assumption that need to be surfaced and made explicit;
5- strategy formation in dynamic environments takes place in a somewhat less deliberate and a much more emergent fashion than conventional descriptions of strategic management suggest, bringing with it a large serendipitous discovery component whose support requirements are difficult to forecast (Mintzberg and Waters 1985);
6- since a large proportion of information needed for strategic decision-making comes from a virtually unlimited external environment, the key problem that the decision maker faces is information overload with multiple and conflicting interpretations rather than solely the absence of relevant information (Zmud 1986);
7- Much of the information that is used for strategic decisions is qualitative, verbal and poorly recorded;
8- Because the stakes in strategic decision-making are very high, there is much more situational vulnerability to both political manoeuvring and stressed emotional behaviour, which may call for additional considerations in DSS implementation.

Using DSS strategically in general and in making strategic decisions in particular, is important for the following reasons. First, the failure to use DSS strategically lost opportunities, duplicated efforts, incompatible systems and wasted resources. Second, the extent to which DSS meets the objectives from its adopting is determine by its use strategically. Third, senior managers can benefit from DSS that present relevant information and models to help them understand the threats, opportunities, internal capabilities and suitable strategies. The strategic use of DSS can also present the interdependencies among the many internal and external factors that require consideration during strategy development and implementation. Finally, the lack of using DSS strategically leaves organizations that spend a lot of investment in adopting it dissatisfied with, and reluctant to continue in, the process of developing DSS.

Summary

This chapter has sought to review the different dimensions of the main core of the thesis. So, this chapter examined the following topics: strategic decision making theory, characteristics of strategic decision problem, definitions of DSS, types and components of DSS, characteristics of DSS, and finally the relation between SDM and DSS. This is to gain understanding within paradigms of research into DSS usage within managerial (SDM) in general and in developing countries in particular.

Chapter 5 Research Methodology

5.1 Introduction

The production of knowledge depends very much on the techniques for collecting, analysing and interpreting data and on the way they are applied (Simon 1982). The same may be said of MIS. The academic study of MIS relies very much on the methods used to answer research questions and test research hypotheses, and on the careful application of these methods. Moreover, since most of the methods are borrowed from established disciplines, the issue of appropriate and skilful application becomes key.

A review of information systems research literature has been conducted to determine the most appropriate potential research strategy for the research objectives and propositions. Practices in information systems research have been subject to criticism by many researchers, including (Benbasat, Dexter et al. 1984; Straub 1989; Kraemer and Dutton 1991). The criticisms have consistently focused on lack of rigor, application of a limited range of methodologies and inappropriate application of methodologies. Subsequent reviews of published IS research by (Cheon, Grover et al. 1993; Grover, C. et al. 1993) have supported these judgements.

Due to these severe criticisms of past information systems research practices and also the broad based and multi-disciplinary nature of this research, it has been considered necessary to document clearly the current state of recommended practices in the various research strategies and to detail the logic for selecting an appropriate research methodology. Proposals have been made for improving research practices in order to support more 'scientific' work, even though researchers have been criticised for restricting their research to the use of a positivist methodology (Lee 1991; Orlikowski 1992).

The primacy of traditional empirical research in the field of information systems has often produced misleading or conflicting results (Attewell and Rule 1984; Orlikowski 1992). For example, Orlikowski and Baroudi examined 155 information systems research articles published from 1983 to 1988. They found that the majority of research had adopted a positivistic orientation, more suited to the natural sciences, which has limited the kinds of information systems phenomena studied and the way in which they were studied. They argued that this has implications for the development of theory in the field and for the practice of information systems implementation. For example the simplification and abstraction needed for good experimental design can remove enough features from the subject of study so that only obvious results are possible (Kaplan and Herbert 1988; Orlikowski and Baroudi 1991).

Many researchers have advocated that, in order to conduct meaningful research in the field of information systems, the researchers have to consider the purpose of research and the nature of the phenomena under investigation (Milton Jenkins 1984; Galliers and Land 1987). For example, Morgan and Smircich have observed that the appropriateness of a research approach "derives from the nature of the social phenomena to be explored" (Morgan and Smircich 1980). Various frameworks have been developed for assisting researchers to articulate their assumptions and beliefs underlying these considerations (Franz and Robey 1987; Markus and Robey 1988; Orlikowski 1992). These efforts are aimed at encouraging researchers to consider alternative philosophical bases leading to the adoption of approaches which are more subjective, less functional and less deterministic.

The overall scope of this chapter is to describe the research methodology which will be employed in the current study. To this end, section 3.1 and 3.2 will begin presenting brief sketches of the positivist and interpretative philosophies and their perspectives in shaping IS research. In section 3.3 the process of selecting the most appropriate strategy is discussed. Finally the strategy of this research and the reliability and validity of data collection methods will be discussed in detail.

5.2 The Positivist Philosophy and its Role in IS Research

According to the tenets of logical empiricism, scientific progress in any discipline begins with the untainted observation of reality. This is expected to provide the researcher with an image of the real world from which (s)he cognitively generates an a priori model of the process to be investigated. Hypotheses which are derived from the model are subjected to empirical tests and, if the data supports the hypotheses, then a confirmation of these instances is recorded. Thus, science progresses through the accumulation of multiple confirming instances obtained under a wide variety of circumstances and conditions (Anderson 1983).

The positivist philosophy suffers from several limitations, especially when applied to social sciences. First, this approach, based on the inductive statistical method, generalises a universal statement of truth from observations of a certain number of positive instances. The strict inductionist approach is often inappropriate because speculation and creation of a priori hypotheses are essential for a systematic procedure of theory building (Leong 1985). In addition to that, some researchers, (Meehl 1978) for example, argue that science does not, and can not, proceed by incremental gains achieved through statistical significance testing of hypotheses. Sociologists, too, have contributed to this debate, notably with (Glaser and Strauss 1967) influential argument for theory building through inductive qualitative research rather than through continual hypothesis testing. Second, the empiricist approach is based on the notion of pure observation which is impossible in research, especially in social sciences, since observations are always subject to measurement errors (Anderson 1983). In addition to that, the reliance on experimental control stems from the admirable goal of controlling experimenter bias by striving for objective measures of phenomena. Achieving this goal has been assumed to require the use of quantifiable data and statistical analysis (Downey and Ireland 1983; Kauber 1986) and also removing the effects of context in order to produce generalizable, reproducible results. Finally, this approach assumes that knowledge is derived from an objective interpretation of assumptions, without any of the subjective biases or a priori knowledge of the scientist coming into play.

However, because the study of social systems involves so many uncontrolled, and unidentified, variables, methods for studying closed systems do not apply as well in natural settings as in controlled ones (Cook 1979; Maxwell, Bashook et al. 1986).

A salutary aspect of the positivist approach to information systems is that it has led to a focus on the need for good tools and methods that could safeguard against the fallibility of the human mind. Substantial contributions to IS research have emerged due to the adoption of this model of science (Bharadwaj 1996). The dominance of the empirical approach to IS research has, however, led to criticism that IS research has frequently sacrificed relevance for rigour. Another danger of the empiricist approach, when applied to practical problems, is the narrowing of the problem scope to those aspects which are researchable by standard quantitative methods. The simplification and abstraction required for good experimental designs often removes interesting features from the subject of study (Bharadwaj 1996).

5.3 The Interpretative Philosophy and its Role in IS Research

The interpretative philosophy is based on the belief that science is subjective and therefore, allows alternative models of reality. It emphasises the creative aspects of science, and is, in many ways, the polar opposite of the positivist philosophy. The interpretive orientation conceives many possible realities, each of which is relative to a specific context or frame of reference. The social agreements about the meanings of the theories provide the necessary guarantee for the theories. The interpretive philosophy also shatters the myth of objectivity of science and asserts that all observations are influenced by a multitude of factors, including past experience and training.

The interpretive view is pertinent to IS research for several reasons. First, since the human element is inextricably linked with the technological aspect of IS research, it is only appropriate that the underlying philosophical perspective mirrors the links. Second, it effectively overcomes the problems associated with the pure empirical paradigm which views the construction of information systems as merely technical artefacts (Cooper 1988). Finally, this view has led to the development of several research programs in IS where behavioural research issues abound.

The interpretive perspective also advocates the use of multiple methodologies for conducting research. The methodological singularism of the empiricists has been criticised as a tendency to "force all problems into the models of one or two routine techniques, insufficient thought being given to the real objectives of the investigation or to the relevance of the assumptions implied by the imposed method" (Box 1967). In spite of the dramatic and salubrious shifts that the interpretive perspective brings to IS research, researchers have been cautioned against blindly adopting the principles of interpretive thought and methodological pluralism without a deeper examination of the limitations, assumptions and relevance of methodologies to their research.

Immersion in context is a hallmark of qualitative research methods and the interpretive perspective on the conduct of research. Interpretive researchers attempt to understand the way others construe, conceptualise and understand events, concepts and categories, in part because these are assumed to influence individual behaviour. The researchers examine the social reality and inter-subjective meanings held by subjects (Bredo and Feinberg 1982) by eliciting and observing what is significant and important to the subjects in situations where the behaviour occurs ordinarily. Consequently, qualitative methods are characterised by (1) the detailed observation of, and involvement of the researcher in, the natural setting in which the study occurs and (2) the attempt to avoid prior commitment to theoretical constructs or to hypotheses formulated before gathering any data (Yin 1984).

Qualitative strategies emphasise an interpretive approach that uses data to both pose and resolve research questions. Researchers develop categories and meanings from the data through an iterative process that starts by developing initial understanding of the perspectives of those being studied. That understanding is then tested and modified through cycles of additional data collection and analysis until coherent interpretation is reached (Bredo and Feinberg 1982). Thus, although qualitative methods provide less explanation of variance in statistical terms than quantitative methods, they can yield data from which process theories and richer explanations of how and why processes and outcomes occur can be developed (Markus and Robey 1988).

Because depending on a single approach can lead to biased results, most researchers in the field of IS tend to collect data depending on multiple methods (triangulation). This approach will be discussed in the next section.

5. 3 Triangulation

The positivist approach makes the claim that the methods used in natural science are the only true scientific ones, while the interpretive researchers make the counter claim that the study of people and their situation call for methods that are very different from those of natural science (Lee 1991). To solve this problem there has been an increasing tendency to adopt a multi-method research approach that attempts to combine the use of quantitative and qualitative research. Webb (1966) has suggested that social scientists are likely to exhibit greater confidence in findings which are derived from more than one method of enquiry; such an approach has been termed triangulation.

(Denzin 1978) identified four basic types of triangulation that can be utilised as a means to strengthen a research design. Firstly, there is data triangulation that involves the use of a variety of data sources; secondly, there is investigator triangulation where several researchers are used; thirdly, there is theory triangulation where multiple perspectives to interpret a single set of data are utilised. Finally, there is methodological triangulation which involves the use of multiple methods to investigate a field of inquiry; this type of triangulation will be adopted within this research. Denzin (1978) suggested that the logic of triangulation is based on the premise that:

> *"No single method ever adequately solves the problem of rival causal factors.... Because each method reveals different aspects of empirical reality, multiple methods of observations must be employed. This is termed triangulation"* (Denzin 1978).

Support for triangulation has mainly been concerned with the fact that there are disadvantages with qualitative and quantitative data and, hopefully, through a process of amalgamation, their relative strengths and weaknesses will be compensated for. Qualitative and quantitative methods need not be viewed as polar opposites (Van Maanen 1983). It is possible to integrate quantitative and qualitative methods (Maxwell, Bashook et al. 1986). Combining these methods introduces both testability and context into the research. Collecting different kinds of data by different methods from different sources provides a wider range of coverage that may result in a fuller picture of the unit under study than would have been achieved otherwise (Bonoma 1985). Moreover, using multiple methods increases the robustness of results because findings can be strengthened through triangulation, the cross-validation achieved when different kinds and sources of data converge and are found congruent (Yin 1984; Bonoma 1985; Benbasat, Goldstein et al. 1987), or when an explanation is developed to account for all the data when they diverge.

In fact, triangulated measurement tries to pinpoint the values of a phenomenon more accurately by sighting in on it from different methodological viewpoints. To be useful, a measuring instrument must both give consistent results and measure the phenomenon it purports to measure (Brewer and Hunter 1989).

Although not the dominant paradigm, qualitative methods and interpretive perspectives have been used in a variety of ways in information systems research (Kwon and Zmud 1987). Interpreting IT in terms of social action and meanings is becoming more popular as evidence grows that information systems development and use is a social, as well as a technical, process that includes problems related to social, organisational and conceptual aspects (Kwon and Zmud 1987; Lyytinen 1987). However, many information systems researchers who recognise the value of qualitative methods often portray these methods either as stand-alone or as a means of exploratory research preliminary to the "real" research of generating hypotheses to be tested using experimental or statistical techniques (Benbasat, Dexter et al. 1984). Even papers in which qualitative and quantitative methods are combined rarely report the study's methodological rationale or details (Benbasat, Goldstein et al. 1987). One result is the failure to discuss how qualitative methods can be combined productively with quantitative ones.b

Smithson (1994) observed that 'despite considerable concern over the methodological shortcomings of information systems research and the attraction of combining different approaches, the topic is relatively rarely discussed in the information systems literature. It would seem that researchers seldom combine approaches or, if they do, the implications are not highlighted in their reports'. Smithson suggests three possible reasons why this is the case: (1) doubts that exist over legitimacy or feasibility of combining positivist and interptetive approaches; (2) vulnerability stemming from the close correspondence between many researchers' value systems and their single methodology paradigm; (3) practical concerns over possible contradictory results from multiple methods.

(Attewell and Rule 1991) suggest that, 'conventional survey methods, such as mail questionnaires and telephone interviews, are inappropriate for many of the issues we need to address [in IS research], and that a multi-method approach is more effective'. (Bikson 1991) suggests that this view is desirable in most areas of social research; especially in a newly emerging sub-field such as the study of information systems in organisations. He points out that the information systems research he has been involved in, whether in cross-sectional or case study designs, has relied on a mix of information-gathering approaches including structured interviews, self-administered questionnaires, archival material and observation. Therefore, the researcher will depend, in his analysis and interpretation of the data, on the value of multiple operationalism in developing the research strategy about DSS usage in strategic decision making. The survey research data on the one hand, and the field interviews on the other hand, have constantly been alternative rather than competing sources of evidence and ideas.

5.4 Process of Selecting the most Appropriate Strategy

In this consideration of research into management support systems, (Benbasat and Dexter 1985) identifies three ways to select research strategies. The first approach is to assess the methodologies independently, that is, without reference to the research problem. In this approach, theoretical approach and interviews, for example, could be selected as being appropriate for hypothesis building, whereas field studies could be selected for testing models. Unfortunately, all research strategies have strengths and weaknesses. This approach does not permit the researcher to consider how trade-offs between strategies could be made to strengthen the research.

The second approach is to use a number of complementary research methodologies to overcome the limitations of any individual methodology. There is considerable merit in this approach, although it carries significant overheads. The third approach is to select the strategy according to the nature of the research problem. In this case the strengths and weaknesses of individual strategies can be carefully considered in order to strengthen the research.

Weick (1985) considers the question of selection of the most appropriate strategy with regard to research into the impact of technology and argues for a "broader approach" to research which would enable researchers to examine a subject more clearly. He found that researchers had a natural tendency to see what they expected, so insists that research strategies be selected which would enable the widest feasible collection of data. In a further paper on this topic, Benbasat and his colleagues (1987) suggest that the researcher selects a strategy as being most appropriate based on the goals of the researcher and the nature of the research topic.

Yin (1989) identifies five major research strategies and three conditions which can be used to determine the most appropriate research strategy for situation. The strategies are experiment, survey, archival analysis, history and case study. The conditions are:

- the type of research question asked,
- the extent of control over actual behavioural events exercised by the researcher,
- the degree of focus on current, as opposed to historical, events.

Table 5.1 Relevant situations for research strategies

Strategy	Form of research question	Requires control	Focus on current events
Experiment	how, why, who,	yes	yes
survey	what, where, how many, how much	no	yes
Archival analysis	who, what, where, how many, how much	no	yes/no
History	how, why	no	no
Case study	how, why	no	yes

Source: (Yin 1989)

Table 5.1 illustrates the relevant situations for each research strategy. Yin considers "what" questions to pertain to all five strategies when used in exploratory research. While Yin (1989) is of great assistance for case study researchers, his argument for the use of questions as a means of distinguishing between various strategies is not compelling. As *why* and *how* questions can be used for different strategies, there is insufficient distinction between the categories to be of assistance. Further, it is too easy for an inexperienced researcher to change the verb of the research to fit in with a previously selected strategy. Yin has taken the focus on research questions and the nature of research beyond the level of practical assistance and rigour.

Attewell and Rule (1991) support the use of a carefully chosen multiple method approach as being most effective. The range of strategies should be selected to meet the requirements of discovery and verification, and to facilitate analysis of the results. Their focus is to address the research problem (Attewell and Rule 1991).

An important issue which is not generally emphasised in the determination of an appropriate research strategy is the interests, experience and ability of the researcher. Researchers with a statistical orientation, not unreasonably, will be drawn more to quantitative research. Researchers lacking confidence in their ability to make interviews with managers would be prudent to avoid a research strategy which required qualitative research with managers. Consequently, researchers are well advised to select both research questions and designs which are consistent with their capabilities.

There is also an increasingly important approach which must be considered in determining the most appropriate research strategy, which is a strategy incorporating multiple methods (triangulation) of data collection. This strategy designed to meet the requirements of the research problem in a manner which will recognise and overcome the weaknesses of individual methods while utilising their strengths to enhance the research.

5.5 Research Strategy

Research into DSS and SDM, especially in developing countries, are problematic as there are limited precedents and difficulties arise in obtaining accurate details on the subject areas, number of organisations and units within these organisations being examined. Additional difficulties arise in applying research methodologies due to limited access to tools of research considered the norm in the western environments (e.g. listings of abstracts and cross-reference listings of publications); very limited prior research and an even more limited number of researchers which severely reduces models of research to be observed or avoided.

For these reasons, it was considered important for this research to document an attempt to apply the current state of mainstream IS research methodologies to research in developing countries. The key to selection of the most appropriate research strategy was determined as the research strategy which:

- incorporated multiple methods (triangulation) of data collection;

- had been carefully designed to meet the requirements of the research problem in a manner which would recognise and overcome the weakness of individual methods while utilising their strengths to enhance the research;
- was compatible with the research environment in developing countries, which is not familiar with experiments in the social sciences field;
- was compatible with the capabilities and experience of the researcher.

Following application of this process, the most appropriate strategy appears to be interview and survey. The laboratory experimentation strategy- as one of the dominant IS research methods- considered and set aside as the variables could not be isolated.

To conclude, the researcher will depend on multiple methods (triangulation) in data collection through survey and interview from the population because this is the best strategy to verify the different resources of data in both western and developing countries. Also, this is because of the need for rich qualitative information on the nature of the use of DSS in both these two cultures. Therefore, the following section will deal with the research strategy in detail.

5.5.1 Characteristics of Survey Research

The survey approach refers to a group of methods which emphasise quantitative analysis, where data for a large number of organisation is collected through methods such as mail questionnaires, telephone interviews, or published statistics, and this data is analysed using statistical techniques. However, often the survey approach provides only a snap-shot of the situation at a certain time, yielding little information on the underlying meaning of the data (Gable 1994).

Surveys conducted for research purposes have three distinct characteristics. First, the purpose of the survey is to produce quantitative descriptions of some aspects of the studied population. Survey analysis may be primarily concerned either with relationships between variables, or with projecting findings descriptively to a pre-defined population (Glock 1967). Survey research is a quantitative method, requiring standardised information from and /or about the subjects being studied.

Second, the main way of collecting information is by asking people structured and pre-defined questions. Their answers, which might refer to themselves or to some other unit of analysis, constitute the data to be analysed. Third, information is generally collected about a fraction of the study population- a sample- but it is collected in such a way as to be able to generalise the findings to the population (Pinsonneault and Kraemer 1993).

Survey research suffers from the potential for lack of insight into the causes of phenomena, bias by the researcher and/or respondents and uncertainty as to the degree to which the specific point of time is representative. Examples of IS survey research may be the determination of characteristics of users or the testing of organisations factors relating to the adoption of IT.

5.5.2 Semi-Structured Interviews

Despite the recent proliferation of techniques and the availability of more sophisticated methods for collecting information, the interview technique continues to be widely used, especially in business domains (Agarwal and Tanniru 1990). With respect to eliciting information from experts in particular, the interview method is by far the most prevalent (Brenner, Brown et al. 1985; Fletcher 1988; Welbank 1990). A major reason for the prevalence of this method is the typically high response rate attained (generally 60 to 75 percent), with even higher rates attainable through telephone interviews where the time for the interview and the estimated duration of the interview have been prearranged with the interviewee (Scheaffer, III et al. 1996). The major advantage of the interview technique is its ability to assist in issue clarification through repeated probing by the interviewer and the fact that it provides immediate feedback (Agarwal and Tanniru 1990).

Interviews fall along a continuum, anchored on one end by unstructured interviews and on the other by structured interviews. The unstructured interview is characterised by asking "rather general questions about the field, tolerating digressions, tape recording every thing and hoping to extract useful information from the transcript" (Welbank 1990). At the other end of the spectrum the structured interview is a "goal-oriented interview that promotes a systematic exchange of information by imposing an organization on the communication" (Agarwal and Tanniru 1990). The structured interview has many advantages over its unstructured counterpart including its ability to extract specific information that is easy to review, interpret and integrate, and the extent to which it forces the expert not diverge to from the goals of the interview session (McGraw and Harbison-Briggs 1989).

The semi-structured interview technique used for this research represents a blend of the two techniques at the ends of the spectrum. As such, it represents an attempt to use the strong points of both the structured and unstructured interviews to capture best the greatest amount of information from the experts in a reasonable amount of time. Using an interview guide served to maintain direction and focus for the interview yet allowed the interviewee or interviewer to digress when needed without impeding the flow of the interview.

The researcher conducted 5 formal interviews with the IT managers and strategy planning in the UK group and a number of informal interviews with the some expertise of IT in local authorities in the UK that the researcher met in the BIT conference. In Egypt the researcher conducted 12 interviews with head of cities and DSS department managers. The main purpose from these interviews was to validate the data collected through the survey.

5.6 Appropriate Application of Survey Research in MIS

Survey research involves examination of a phenomenon in a wide variety of natural settings. The researcher has very clearly defined independent and dependent variables and a specific model of the expected relationships which are tested against the observations of the phenomenon. Pinsonneault and Kraemer said that survey research is most appropriate when the central questions of interest about the phenomena are "what is happening?" and "how and why is it happening?" Survey research is especially well suited for answering questions about what, how much, and how many, and to great extent than is commonly understood, questions about how and why.

1. Control of independent and dependent variables is not possible or not desirable.
2. The phenomena of interest must be studied in their natural setting.
3. The phenomena of interest occur in current time or the recent past.

On the other hand, surveys are less appropriate than other methods, such as case studies and naturalistic observation, when detailed understanding of context and history of given computing phenomena is desired (Pinsonneault and Kraemer 1993).

So, to assist in achieving the objectives of the research a number of pertinent hypotheses or propositions were developed within the two research groups which are the UK and Egypt. The hypotheses or propositions thus developed can form the basis for further inquiry and assist in forming concepts and building grounded theory (Fielding and Fielding 1986). The testing of such hypotheses or propositions within Egypt and the UK will be done in the second stage of this study by using the survey research.

5.7 Sampling

The unit of analysis for this research is the chief executive officer or his/her delegate in the local governments in both the UK and Egypt. The sampling frame includes the Municipal Year book for 1999, the Directory of Local Government on the web by Tagish for the UK sample and the Directory of DSS Units in the local governments in Egypt issued by Information and Decision Support Centre (IDSC).

A package that was mailed to senior executive officers in both Egypt and the UK contained two items: a covering letter explaining the importance of the study and the questionnaire with a stamped return address on the back. The covering letter requested the respondent to return the completed questionnaire within two weeks. The respondents were assured of the confidentiality of their responses. Follow-up phone calls were made to the local authorities that had not responded two weeks after sending out the questionnaire.

A randomly selected list of 200 chief executive officers of the five different types of local authority: county councils, district councils, metropolitan districts, unitary authorities and London boroughs which make up the total number of councils in the United Kingdom which is 467. Seventy-nine usable responses were received (about 40 %) from the UK sample, but, if we take a way the 32 councils who refused to participate in the study for different reasons (16 don't use DSS at all, 3 don't use DSS in strategic decision making but use it in operational decisions and 13 councils use it but not willing to respond for limited staff resources) from the UK sample the response rate becomes 47 %.

Of the 309 questionnaires that were returned from the Egypt sample, 294 (about 73.5%) were valid, 12 were incomplete and 3 were returned by the post-office due to incorrect addresses. To ensure that the valid responses were representatives of the larger population, a non-response bias test was used to compare the early and late respondents. χ^2 tests show no significant difference between the two groups of respondents in either of the UK or Egypt sample at the 5% significance level, implying that a non-response bias is not a concern

5.8 Operationalisation of Constructs

The constructs composing the research model were operationalised using a combination of items extracted from previous relevant research and newly composed items.

5.8.1 System usage

It is now self-evident that computer technology is being increasingly utilised in the workplace. The extent to which decision makers use information systems or engage in other computer-related activities is most economically determined by asking them directly and this method is frequently used (Deane, Podd et al. 1998). Based on previous research which examines the usage of IT in the workplace which relied very heavily on defining usage based on self-reported estimates (Igbaria, Pavri et al. 1989; DeLone and McLean 1992; Birdi, Pennington et al. 1997) three dimensions of DSS usage were included in this study.

5.8.2 Actual usage of DSS

The actual usage dimension is widely used in MIS studies. For the purpose of this study, self reported percentage of use of DSS in SDM to the whole SD made during a period of time.

5.8.3 Frequency of use

This measure is suggested by many researchers for example (Raymond 1985; Sirnivasan 1985; DeLone 1988). Frequency of use was measured on a five-point scale ranging from "several times a month" to "once a year".

5.8.4 Level of use

This serves to measure proficiency of use of DSS. The respondents were asked to indicate their level of expertise of DSS usage in SDM on a five point scale ranging from “no use" to "extensive use". Many researchers used this measure, for example, (Maish 1979; Igbaria, Pavri et al. 1989). The ranges of use have been changed in this measure from days to months and from months to years because of the nature of SDM which is tend to be more sporadic.

5.8.5 Perceived Ease of Use (PEU) and Perceived Usefulness (PU)

This is the two constructs that originally proposed by Davis where he defined PU as the degree to which a person believes that using a particular system would enhance his or her job performance and PEU as the degree to which a person believes that using a particular system would be free of effort (Davis 1989). The validity of these two constructs (i.e., PEU and PU) in Davis's model was re-examined in a number of other studies. Adams et al., (Adams, Nelson et al. 1992) replicated Davis's study with a focus on evaluating the psychometric properties of the two scales, while they examined the relationship among ease of use, usefulness and system usage. The results showed that the reliability and validity of the two scales were very high. Another test of the reliability of PEU and PU scales by using two software packages showed that the instrument exhibited a high degree of test-re-test reliability (Hendrickson, Massey et al. 1993). As Davis (1989) pointed out, psychometricians emphasis that the validity of measurement scale is built from the outset. To ensure the content validity of the scales, the items selected must represent the concept about which generalisations are to be made (Bohmstedt 1970). Statements used in this research to operationalise PEU and PU were basically adapted from Davis's study (1989), with minor changes in wording and adding one item to PU, which is "lower cost" to fit the environment, specially developing countries, where cost is an important factor in using DSS.

5.8.6 Task characteristics

Several studies have attempted to develop conceptual models of the strategic decision-making process based on studies of multiple decision situations (Mintzberg, Raisinghani et al. 1976; Fahey 1981; Mazzolini 1981). They have broadly viewed the process in three steps of problem formulation and objective setting, identification and generation of alternative solutions, and the analysis and choice of a feasible alternative. These models appear to be variations or extensions of the intelligence-design-choice phases discussed by Simon (Simon 1965). Most strategic decisions are characterised by uncertainty and complexity (Kivijarvi and Zmud 1993). Complexity means existence of multiple and conflicting interpretations of the problem definition, which is particularly troublesome for the decision maker in using DSS. With highly complex decision situations, ...'the answers are obtained through subjective opinions rather than from objective data' (Daft and Lengel. 1986). Thus, characteristics of the task (i.e. strategic decision) in general are seen to be an important element likely to affect using DSS in making effective strategic decisions. To operationalize the concept of task characteristics the researcher combined both the complexity of the task as one of the most important characteristics of strategic decisions and the different stages of this process. The respondents were requested to indicate, on a five-point scale, their degree of agreement or disagreement with each item (5 being strongly agree and 1 strongly disagree). Although researchers expected that information technology would increase the amount of information available for strategic decision-making, the soft, personal information often used by management (Mintzberg 1975; El Sawy 1985) is not easily captured by a computer-based system (Karten 1987). To measure what the CEOs in local authorities think about the possibility of computerising SDM, the respondents were requested to indicate, on a five-point scale, their degree of agreement or disagreement with each item (5 being strongly agree and 1 strongly disagree) about the following two items "strategic decision process is too complex to be computerised" and "strategic decision making tasks are too person centred to be computerised".

5.8.7 Cultural characteristics

This construct investigates how the psychological context on both the individual and organisational level affects the perception and use of DSS in SDM. Hofstede's dimensions of cultures, power distance, individualism and uncertainty avoidance were adopted in general to measure this construct. Power Distance (PD) is the extent to which the less powerful members of organisations within a country expect and accept that power is distributed unequally. In large PD situations, superiors and subordinates consider themselves unequal; hierarchy is important. Centralisation and structure are important. Subordinates expect to be told, directed. In small power distance countries there is limited dependence of subordinates on their bosses. Malaysia, Guatemala, Panama, the Philippines and Mexico are, according to Hofstede's work, the strongest in PD, while the Scandinavian nations, New Zealand, Israel and Austria are the weakest. The Arab countries rank 7th while Great Britain ranks 43 of 53.

Individualism (IDV) pertains to societies in which the ties between individuals are loose; everyone is expected to look after himself or herself and his or her immediate family. Collectivism, as its opposite, pertains to societies in which people from birth onwards are integrated into strong, cohesive in groups which, throughout people's lifetime, continue to protect them in exchange for unquestioning loyalty. In high individualistic cultures, speaking one's mind is a virtue. The collectivist or low IDV culture, on the other hand, harmony is more important. High IDV nations include the USA, Australia, UK, Canada and Netherlands. The lowest IDV nations are the nations of the Pacific Rim and several central American countries. The Arab countries ranked 27th ,while Great Britain rank third.

Nation high in Masculinity (MAS) index attach the most importance to earnings, recognition for doing a job well, the opportunity for advancement, and challenge work A low MAS index reflects the importance of a good working relationship with the direct supervisor, co-operation with fellow employees, an acceptable family space, and employment security. High MAS countries include Japan, Austria, Venezuela and Italy. Low MAS nations are Denmark, Netherlands, Norway and Sweden. The Arab countries rank 23rd while Great Britain ranks 9th of 53.

Uncertainty Avoidance (UA) is defined as the extent to which the members of a culture feel threatened by uncertain or unknown situations. A need for predictability and a predisposition for written and unwritten rules express this dimension. UA leads to a reduction of ambiguity. According to Hofstede, the emotional need for rules in strong UA nations can result in a talent for precision and punctuality, especially where the PD is relatively small. Strategic planning demands a greater tolerance for ambiguity. Weak UA cultures are more likely to stimulate innovation and tolerate deviant ideas. Greece, Portugal, Guatemala, Uruguay and Belgium are the strongest in UA, while Hong

Kong, Sweden, Denmark, Jamaica and Singapore scored lowest. The Arab countries rank 27th while Great Britain ranks 47th of 53.

The researcher, as mentioned in the literature that the gap between DSS professionals and CEOs may play important role in DSS usage in SDM (Hatten and Hatten 1997), adds this to the chosen cultural dimensions of Hofestede. Although other dimensions may also be important, these were chosen as most obvious to the CEOs in both the two countries. The respondents were asked to indicate, on a five-point scale, their degree of agreement or disagreement with each item, 1 being "strongly disagree" and 5 being "strongly agree", on the effect of these items on DSS usage in SDM.

5.8.8 DSS characteristics

Previous studies have found that certain DSS characteristics seem to have an important influence on the effectiveness of the systems: user-friendliness; ease of use; size (cost) of DSS; range of alternatives; timeliness, accuracy and relevancy of output (Igbaria, Pavri et al. 1989; Udo and Davis 1992a; Udo and Davis. 1992b). Executives, access to computerised information systems arise as an issue in the strategic use of these systems (Hasan and Lampitsi 1995). Also, some researchers attempting to measure IS success proposed items related to DSS characteristics like system quality, information quality, information use and user satisfaction with the information (DeLone and McLean 1992; Li 1997). Based on the literature, the instrument asked the respondents to indicate their agreement or disagreement with 12 statements reflecting the different DSS characteristics that might affect DSS usage in SDM. The response options are anchored on a five-point Likert-type scale ranging from (1) strongly disagree to (5) strongly agree.

5.8.9 Environmental characteristics

The government plays a major role in local authorities in both developed and developing countries. It can play two roles, first as a regulator and second as investor (Blanning, Bui et al. 1997). The government policies could be extended to the development of human resources, which includes developing technical skills, as well as building a society that is computer literate which, in turn, will be reflected in creating favourable market conditions for using DSS strategically (Blanning, Bui et al. 1997). Also these two factors "favourable government policies" and "uncertainty in environment" were mentioned as key facilitators of the strategic use of IT (King and Teo. 1996). In addition to the previous items pressure from competition was mentioned in many studies as one of the factors for using IT strategically for example (Benjamin, Rockart et al. 1984; Johnston and Carrico 1988; Neo 1988). Based on previous literature, the instrument asked the respondents to indicate their agreement or disagreement with 4 statements reflecting the different environmental characteristics that might affect DSS usage in SDM. The response options are anchored on a five-point Likert-type scales ranging from (1) strongly disagree to (5) strongly agree.

5.8.10 Organisational characteristics

Many studies have investigated the influence of organisational attributes on the effectiveness of information systems in general (Cheney, Mann et al. 1986; Lind, Zmud et al. 1989) and DSS in particular (Sanders and Courtney 1985; Guimaraes, Igbaria et al. 1992). Based on previous literature, the instrument asked the respondents to indicate their agreement or disagreement with 7 statements reflecting the different organisational characteristics that might affect DSS usage in SDM. The response options are anchored on a five-point Likert-type scales ranging from (1) strongly disagree to (5) strongly agree.

5.8.11 Internal support characteristics

Internal support that the decision-makers get within the organisation either through training within the organisation or other sources of support, is critical, especially in developing countries where there is a lack of resources. As a result, some decision-makers rely on help from unspecialised persons (i.e. their colleagues), manuals, purchased books and help screens. Based on previous literature, the instrument asked the respondents to indicate their agreement or disagreement with 5 statements reflecting the different internal support characteristics that might affect DSS usage in SDM. The response options are anchored on a five-point Likert-type scales ranging from (1) strongly disagree to (5) strongly agree.

5.8.12 External support characteristics

Because of insufficient internal technical expertise, especially in developing countries, the availability and quality of external support could be considered an important determinant of DSS effectiveness in SDM. Recommendations from outside consultants were found to be an important variable in using IT strategically (Neo 1988). Also, the support that the decision-makers get from the government agencies is important and varies from one country to another. For example, some governments may wish to maintain tighter control over their information infrastructure, as is the case in most of developing countries, while others may prefer to take the market approach (Blanning, Bui et al. 1997). Also, good relationships with external vendors were one of the facilitators of success of end user computing (Shayo, Guthrie et al. 1999). Based on previous literature, the instrument asked the respondents to indicate their agreement or disagreement with 3 statements reflecting the different external support characteristics that might affect DSS usage in SDM. The response options are anchored on a five-point Likert-type scales ranging from (1) strongly disagree to (5) strongly agree.

5.8.13 Decision-maker characteristics

The importance of decision maker characteristics as determinants of information systems success has been emphasised by several authors (Sanders and Courtney 1985; Igbaria, Pavri et al. 1989; Guimaraes, Igbaria et al. 1992). Computer experience and user training have been found to have strong effects on microcomputer usage (Cheney, Mann et al. 1986). The importance of user training has long been proposed as a critical component of MIS success, in general, and for microcomputer usage in particular (Igbaria 1992). Also, cognitive style as one of decision maker characteristics, has probably received the most attention. Huber (1983) reviews these studies and concludes that cognitive style is not a sufficient basis for driving DSS design guidelines because cognitive style is only one of many individual differences (Huber and Robey 1983). Computer anxiety was found to have an effect on IS usage (Igbaria, Pavri et al. 1989). In addition to that, some studies regard motivation as the key to MIS success (DeSanctis 1982). Others find a positive relationship between user attitude and the successful use of information systems (Toubkin and Simis. 1980). Also, some Managers will have a more positive attitude towards change and a greater willingness to implement new ways of doing things. Innovative decision-makers are more eager to try new ideas, have more favourable attitudes toward change, are less dogmatic and are more able to cope with uncertainty and ambiguity (Brancheau and Wetherbe. 1990; Rogers 1995). Decision-makers characteristics were measured by asking mangers to indicate their agreement or disagreement with 12 statements reflecting the previously mentioned different dimensions of decision-makers characteristics in DSS usage in SDM. The response options are anchored on a five-point Likert-type scales ranging from (1) strongly disagree to (5) strongly agree.

5.8.14 Top management support characteristics

It is important that top management participation be active and not merely symbolic. Simply giving the go ahead for the DSS implementation in the organisation is not sufficient (Ang and Teo. 1997). Some of the ways that top management can demonstrate its support could be by providing the necessary resources, leadership by setting goals and polices for DSS and showing interest by participating in DSS design and development (King and Teo. 1996; Ang and Teo. 1997). Based on previous studies question using 6 statements on a five point scale format ranging from (1) strongly disagree to (5) strongly agree were used to determine top management support.

5.8.15 Problems related to DSS usage in SDM

Based on the problems that were mentioned in the literature the researcher built a frame for the potential problems that could affect using DSS in making strategic decisions. To operationalise the different kinds of problems the respondents were asked to rate the extent to which they encountered each problem on a five-point scale where 1 = not a problem and 5 = an extreme problem.

5.9 Reliability and Validity

Instrument validity and reliability tests have persisted in almost every study concerned with psychometric concepts (Davis, Bagozzi et al. 1989; Taylor and Todd 1995; Igbaria, Zinatelli et al. 1997; Agarwal and Prasad 1998a; Agarwal and Prasad 1998b). In the following section the different types of reliability and validity will be discussed.

5.9.1 Reliability

Reliability is a statistical measure of how reproducible the survey instrument's data are (Llitwin 1995). A test of reliability is designed to minimise errors and biases in a study. That is, a reliable measure will yield the same number in repeated applications to a phenomenon when that phenomenon has not changed. In other words, differences obtained by a reliable measure in repeated applications reflect actual change in the phenomenon under analysis rather than measurement error. Reliability is important because when a measure is unreliable, the researcher may not be assured that differences between observations are true differences. The instrument is a reliable measure if the values obtained by using the indicator are not affected by who is doing the measuring, by where the measuring is being done, or by any other factors other than variation in the concept being measured (Meier and Brudeny 1993).

5.9.2 Internal consistency

Internal consistency reliability is another commonly used psychometric measure in assessing survey instruments and scales. Internal consistency is an indicator of how well the different items measure the same issue. Internal consistency is measured by calculating a statistic known as Cronbach's coefficient alpha.

The reliability of an instrument is commonly estimated by correlating it with itself in one of three ways:

1- use the same instrument with the same people taking it on two different occasions with no intervening influences;

2- administer two equivalent forms of instrument to the same population;

3- compare a group's performance on one-half of the test with the other half (the "split-half" technique of correlating odd-numbered items with even-numbered items);

To determine the reliability for the purpose of this study, Cronbach's alpha was computed for each of the constructs and these values are given in table 5.2. Most of the reliability values are close to, or above, 0.70 which it is considered acceptable for this type of research.

Table 5.2 Cronbach's alpha for both research groups

Factors	Alpha for UK group	Alpha for Egypt group
DSS usage (3 items)	0.91	0.70
PEU (6 items)	0.81	0.69
PU (7 items)	0.82	0.72
Task characteristics (5items)	0.66	0.65
Cultural characteristics (4 items)	0.83	0.78

DSS characteristics (12 items)	0.74	0.68
Environmental characteristics (4)	0.79	0.71
Organisational characteristics (7)	0.83	0.78
Internal support characteristics (5)	0.80	0.74
External support characteristics(3)	0.89	0.81
Decision maker characteristics (12)	0.75	0.68
Top management support (6 items)	0.86	0.79

5.9.3 Validity

The second fundamental methodological notion at stake here is measurement validity. Measurement validity refers to the extent to which an indicator actually measures what it purports to measure. The objective of item creation is to ensure content validity. Content validity is the representativeness or sampling adequacy of the construct domain (Campbell 1977; Carmines and Zeller 1979). Given that the construct domain encompasses all DSS-related activities needed to perform SDM, items must be generated that are representative and inclusive of those activities.

To generate a representative sample of items and achieve content validity, the researcher employed a review of the literature and interviews with a variety of IT managers and decision-makers who used DSS in their work. The first process involved the examination of the DSS literature to ascertain different characteristics and activities of DSS noted by previous researchers. The second process consisted of interviews with IT managers and decision-makers in local authorities in both the UK and Egypt. Respondents were asked to comment on any aspect of DSS usage in decision-making in their jobs. The respondents remarked on the descriptions of DSS and the dimensions that should have been added, deleted, or modified. The item pool generated from the interviews was compared to the item pool generated from the literature. Redundant items were eliminated. The remaining items were then presented, as mentioned earlier, to the academics to perform the assessment of the instrument.

5.9.4 Types of validity

Several types of validity are typically measured when assessing the performance of a survey instrument.

5.9.5 Construct validity

This test seeks to avoid subjective judgements being used in the collection of data. Three tactics are suggested to increase construct validity: use of multiple sources of evidence; establishment of a chain of evidence which would enable an external observer to follow the derivation of any data or evidence from initial research questions to ultimate conclusions of the study and review of draft report by key respondents. Construct validity is established by showing that the measure is an appropriate operational definition of the construct it purports to measure. Factor analysis, reliability and known groups analysis are methods of construct validation (Kerlinger 1973).

5.9.6 Factor analysis

An exploratory principal factor analysis was performed on the data from 79 and 294 complete responses. The principal component factor solution with varimax rotation produced 21 factors that explained 77.49 percent of the systematic covariance among the different variables included in scale items in the UK group while produced 24 factors that explained 62.79 percent of the systematic covariance among the same items in the Egypt group. All derived factors had eigenvalues greater than one (Kim and Mueller 1978; Nunnally 1978). The details of this analysis will be discussed in the following section, especially each item's loading of each factor to explore the construct validity of each construct.

An exploratory factor analysis procedure was performed on each group of possible factor items for each group of the sample, the UK managers and Egypt managers. Since blindly accepting a factor solution based on a statistical package's output is unlikely to produce a solution that captures the desired level of parsimony, the researcher elected to employ a combination of alternatives recommended in the factor analysis literature to produce a parsimonious result. The following recommendations were posited in the literature as commonly accepted methods of achieving a satisfactory reduction in the number of factors (m) determined through factor analysis.

(1) Choose m such that the number of factors accounts for a predetermined percentage of the total variance (Green 1978; Rencher 1995; Hair, Anderson et al. 1998).

(2) Choose m equal to the number of factors with a minimum eigenvalue of 1.0 (Rummel 1970; Kaiser 1974; Green 1978; Kim and Mueller 1978; Hair, Anderson et al. 1998).

(3) Use some of a priori criterion: this approach is generally used if the analysis is testing a theory about the number of factors to be extracted or in instances where the analysis is attempting to replicate another research's work or model by extracting the same (m) previously found (Hair, Anderson et al. 1998).

(4) Use the scree test criterion: in this approach the analyst determines at what point the major slope from a relatively steep slope to one that is fairly flat, and chooses (m) to equal the point at which this change occurs (Hair, Anderson et al. 1998) (Horn 1965; Cattell 1966; Rummel 1970).

(5) Use of Cronbach's alpha as the selection criterion (Cronbach 1951; Cronbach, Rajaratnam et al. 1963). For exploratory factor analysis, factors with Cronbach's alpha values of less than 0.7 should be dropped (Hair, Anderson et al. 1998).

Since no statistically rigorous studies examine the factors affecting the usage of DSS in making strategic decision in the context of a developing country in comparison with a developed country, the third method was eliminated from consideration. Each of the remaining three methods was used to determine the initial number of factors to be remained, with the following results.

(1) Predetermined percentage method. Using a percentage of variance accounted for equal to 60 percent as recommended by (Hair, Anderson et al. 1998), the number of factors selected would be 10 from the UK group, 25 from the Egypt group.

(2) Number of eignvalues greater than one. The number of factors retained with this criterion would be 20 from the UK group and 28 from the Egypt group.

(3) Scree test criterion. Based on the scree plot for the factors on the UK group and the Egypt group, the number of factors retained would be 12, 29 in consequence.

Hair, et al caution that use of the number of eigenvalues greater than one criterion commonly produces an extraction of too many factors, particularly when the number of variables is greater than 50. This was clearly the case with this sample data set, so the decision was made to not consider the results using this particular criterion.

Based on the Hair, et al recommendation a combination, of the three remaining criteria was used in selecting the number of factors to be retained. Their three bases for using the combination of techniques is that, in an ideal situation, the three objective criteria would produce the same number of factors; however, in actual practice, they found that this is rarely the case. Since two of the three guidelines employed produced a recommendation to retain 10 factors from the UK and 25 from the Egypt group, while the other one recommended 20 from the UK group and 25 from the Egypt group, the analyst decided to retain the 20 and 25 factor solution as the initial solution to the question of how many factors should be retained. This initial selection, however, needed to be reconsidered after completing the next phase in the factor analysis process.

Because it is usually extremely difficult to determine whether the un-rotated factor structure will be meaningful or not, rotation of the factor structure is generally employed to achieve simpler and theoretically more meaningful factor solutions (Hair, Anderson et al. 1998). Once the rotation is completed the correlations between each variable and a factor (commonly referred to as factor loadings) are used as a means to interpret the role each variable plays in defining each factor. Researchers often employ a particular form of rotation simply because it happens to be the default selection for the particular statistical software package being used (Hair, Anderson et al. 1998).

Because oblique rotation method usage is not as widespread as orthogonal rotations, the analytical procedures for performing oblique rotations are not as well developed as those for orthogonal rotations and are still subject to much controversy (Hair, Anderson et al. 1998), and because Kaiser showed in his experiment (1974; 1970) that the varimax solution has two features that make it better choice: (1) it seems to give a clearer separation of the factors and (2) it tends to give a more invariant solution than quartimax when different subsets of variables are analysed (Kaiser 1974). Based on this evaluation, the varimax rotation the orthogonal varimax rotation was selected as a method for this study.

Elimination of items from the analysis

The next phase of the factor analysis procedure was making a decision on which items should be eliminated from the analysis. Hair, et al., (1998) recommended that the decision on which factor loadings are worth considering should be based on the concept of statistical power introduced by Cohen (1988). Cohen's work suggested that the analyst attempt to strike a balance between the alpha level for a test and the resulting power. The power of a statistical test is based on three considerations: (1) alpha value (probability of type 1 error), (2) effect size and (3) the size of the sample. Cohen further indicated that this balance was best achieved by designing studies to achieve alpha levels of at least.05 with power levels of 80%. Hair, et al. developed a table comparing sample size with minimum factor loadings that should be used for statistical significance. Based on this table, a minimum factor loading of .35 should be used for sample size from 250 up till 349, a minimum factor loading of .30 from 350 and a minimum factor loading of .60 if the sample size is 85 to achieve statistical significance.

So, items that did not load on a factor with a loading of at least 0.35 for Egypt sample and 0.60 for the UK group were eliminated. The factor analysis was re-specified with the non-loading items eliminated and then the results for each group were compared for interpretability.

Final Factor Results for Each Group

Twenty significant factors were identified using the exploratory analysis procedures conducted on the UK group. The criteria were used in determining those factors is the factor had to have at least two items constituting the factor and because of the sample size for this group is 79 so according to Hair, et al the factor loading value for each item should be at least .60 to be considered significant. The following discussion describes each factor, the latent construct name assigned to the factor, and why the researcher considers the factor to be important.

5.9.7 Factors relating to task characteristics

Factor 1 consists of three items related to the characteristics of strategic decision making. The first one is strategic decision making is too complex to be computerised; the second one is strategic decision making are too person centred to be computerised and, finally, the third one is the complexity of choice and implementation. The latent variable name assigned to factor 1 is computerisation of strategic decision-making.

Factor 2 consists of two items that are directly related to complexity of the task either these complexity related to the issue or the problem or analysis of the alternatives. So the latent variable name assigned to factor 1 is complexity of the task. The items loading significantly on this factor were not expected by the researcher because the IS literature contains numerous studies finding DSS to be used in routine tasks and operational decisions. The loading of the items in each factor is shown in table 6.1

Table 5.3 Rotated Component Matrix for the UK group

Items	Component	
	1	2
complexity of problem	3.014E-03	-.799
complexity of analysis	-6.311E-02	.591
complexity of choice and implementation	-.659	.121
SDM is too complex to be computerised	.684	-6.601E-02
SDM are too 'person centred to be computerised	.659	.465

For the same group of factors in the ***Egypt group***, factor 1 consists of two items both of them directly related to the complexity of the strategic decisions. Factor 2 consists of three items the first one is related to the complexity of problem or issue recognition, the second one related to the complexity of choice and implementation and the third one is related to the effectiveness of DSS usage in making SD. Factor 3 consists of one item which is "strategic decision making are too person centred to be computerised", so the researcher will not consider this item in the analysis, as recommended by (Churchill 1979) "latent variable should be measured by at least two indicators".

Table 5.4 Rotated Component Matrix for the Egypt group

Items	Component		
	1	2	3
complexity of problem	-.229	-.702	.163
complexity of analysis	-.199	.750	.164
complexity of choice and implementation	.885	-4.646E-02	-1.400E-02
SDM is too complex to be computerised	.882	6.920E-02	4.480E-02
SDM are too 'person centred to be computerised	3.843E-02	2.777E-03	.975

5.9.8 Factors relating to cultural characteristics

Factor 1 in the UK group is comprised of two items that are related to the cultural dimension from Hofsted. The first item loading significantly on this factor was masculinity (the extent to which assertive behaviour is desired over modest behaviour). The second item loading significantly on this factor was the culture gap between decision-makers and DSS staff. Factor 2 is comprised of two items, the first item that loaded significantly was individualism (the extent to which people act solely in their own interest or toward the goals of the group or organization of which they are part). The second item that loaded significantly in this factor was uncertainty avoidance (the extent to which people feel uncomfortable with uncertainty).

Table 5.5 Rotated Component Matrix for the UK group

Items	Component	
	1	2
individualism	.103	.791
masculinity	.874	.146
the cultural gap	.836	-.236
uncertainty avoidance	-.158	.691

For the same group of factors in the ***Egypt group*** factor 1 consists of three items, all of them directly related to cultural dimension of Hofsted. The first item loading significantly on this factor was individualism. The second item loading significantly on this factor was masculinity and the third item loading significantly on this factor was uncertainty avoidance (the extent to which people feel uncomfortable with uncertainty). Factor 2 is comprised of three items, the first one related to the effect of organisational culture on using DSS in making strategic decision and the second item loaded significantly on this factor were the culture gap between decision makers and DSS staff. The first item in this factor as negatively correlated to factor 1 which means there is a reverse relationship between using DSS in making strategic decision and the items of culture dimension for Hofstede in this group of sample. The third item loaded significantly on this factor was uncertainty avoidance, which also loaded in factor 1.

Table 5.6 Rotated Component Matrix for the Egypt group

Item	Component	
	1	2
individualism	.736	.189
masculinity	.165	-.712
the cultural gap	.181	.694
uncertainty avoidance	.744	-.170

5.9.9 Factors relating to DSS characteristics

Factor 1in the UK group consists of three items that directly related to the ease of use of DSS. The latent variable name assigned to this factor is ease of use of DSS. The first item loading significantly on this factor was DSS reliability. The second item loading significantly on this factor was ease of use built in help facility. The third item loading significantly on this factor was ease of use of DSS. Factor 2 in this group is comprised of two items. The first item loading significantly on this factor was whether the benefits from using DSS in making strategic decision is tangible or intangible. The second item loading significantly on this factor was adequacy of DSS processing capacity. Factor 3 in this group is comprised of two items the first item loading significantly on this factor was accessibility of DSS. The second item loading significantly on this factor was ease of finding the required data. Factor 4 in this group is comprised of three items. The first item loading significantly on this factor was whether using DSS is voluntary or compulsory but this item loaded negatively with this factor. The second and third items loaded significantly with the same score on this factor were DSS meets the requirements of decision-makers and adequacy of DSS data storage.

Table 5.7 Rotated Component Matrix for the UK group

Items	Component				
	1	2	3	4	5
cost effectiveness of DSS	7.636E-02	7.406E-02	1.967E-02	.117	-.852
ease of use of DSS	.782	9.854E-02	-7.593E-02	-3.145E-02	-.148
adequacy of DSS data storage	-.129	-.378	-.228	.561	7.412E-02
adequacy of DSS modelling capacity	-.153	.353	.549	-.177	.147

adequacy of DSS processing	2.970E-02	.730	-8.137E-03	-8.101E-02	4.682E-02
accessibility of DSS	.134	.158	-.751	5.864E-02	.196
ease of use built in help facility	.891	-8.311E-02	.143	6.941E-02	1.570E-02
usage of DSS is voluntary/compulsory	-.188	-.166	1.837E-02	-.792	.209
DSS meets the requirements of DM	-.241	4.111E-02	-1.931E-02	.561	.543
DSS reliability	.958	-5.597E-02	-2.621E-02	-3.361E-02	-8.803E-02
ease of finding the required data	.329	2.495E-02	.703	3.735E-03	7.373E-02
tangible/intangible benefits	-6.096E-02	.756	-4.458E-03	.135	-.127

For the same group of factors in the ***Egypt group*** factor 1 consists of four items that directly related to the adequacy of DSS except item 4, which is related to Accessibility of DSS. The first item loading significantly on this factor was adequacy of DSS modelling capacity. The second item loading significantly on this factor was Adequacy of DSS processing capacity. The third item loading significantly on this factor was Accessibility of DSS. The last item loading significantly on this factor as it mention previously was Adequacy of DSS data storing capacity. Factor 2 in this group is comprised of 4 items the first item loading significantly on this factor was ease of use built in help facility. The second item loading significantly on this factor was DSS meets the requirements of decision-makers. The third item loading significantly on this factor was ease of usage of DSS. The last item loading significantly on this factor was cost effectiveness of DSS. Factor 3 in this group is comprised of three items, the first item loading significantly on this factor was whither the benefits from using DSS is tangible or intangible. The second item loading significantly on this factor was accessibility of DSS. The third item loading significantly on this factor was cost effectiveness of DSS but it was negatively correlated with this factor. Factor 4 in this group is comprised of 3 items; the first item loading significantly on this factor was whither DSS usage is voluntary or compulsory. The second item loading significantly on this factor was adequacy of DSS data storage however this item also loaded significantly in factor 1 but the loading for this item was negative in this factor. The third item loading significantly on this factor was ease of use of DSS. This item also loaded in factor 2 positively and higher than it's loading in this factor. Factor 5 in this group is comprised of 2 items the first item loading significantly on this factor was ease of finding the required data. The second item loading significantly on this factor was DSS reliability.

Table 5.8 Rotated Component Matrix for the Egypt group

Item	Component				
	1	2	3	4	5
cost effectiveness of DSS	6.847E-02	.417	-.549	.247	-.114
ease of use of DSS	.270	.460	-.150	-.317	-5.107E-02
adequacy of DSS data storage	.373	-2.066E-02	-.219	-.447	-3.638E-02
adequacy of DSS modelling capacity	.690	.172	.139	7.299E-02	-7.457E-02
adequacy of DSS processing	.644	-.177	-.176	2.015E-02	7.168E-02
accessibility of DSS	.415	.115	.457	1.320E-02	3.940E-02
ease of use built in help facility	-.102	.623	-7.650E-02	-8.686E-02	.239
usage of DSS is voluntary/compulsory	.235	-.106	-8.182E-02	.799	-5.857E-03
DSS meets the requirements of DM	2.442E-02	.622	.260	5.794E-02	-.247
DSS reliability	.128	-.119	9.494E-02	-.159	.611
ease of finding the required data	-.139	.130	-5.531E-04	.223	.747
tangible/intangible benefits	-7.709E-02	4.413E-02	.665	.105	2.083E-02

5.9.10 Factors relating to environmental characteristics

Factor 1 in the UK group consists of three items. The first item loading significantly on this factor was favourable market conditions. The second item loading significantly on this factor was uncertainty in the environment. The third item loading significantly on this factor was competition among local governments. Factor two in this group is comprised of two items; the first item loading significantly on this factor was favourable government policies. The second item loading significantly on this factor was competition among local governments which loaded also in factor 1, but positively.

Table 5.9 Rotated Component Matrix for the UK group

Item	Component	
	1	2
competition among local governments	.873	-.158
favourable government policies	-.109	.898
uncertainty in the environment	.478	.672
favourable market conditions	.785	.314

For the same group of variables in the ***Egypt group***, factor 1 consists of two items that directly related to the environmental characteristics of DSS. The first item loading significantly on this factor was favourable government policies. The second item loading significantly on this factor was competition among local government but it loaded negatively on this factor. Factor 2 in this group is comprised of three items. The first item loading significantly on this factor was uncertainty in the environment but it loaded negatively on this factor. The second item loading significantly on this factor was competition among local government and it loaded also on factor 1. The third item loading significantly on this factor was favourable government policies. The last factor consists only of one item, so it will not be considered in the analysis.

Table 5.10 Rotated Component Matrix for the Egypt group

Item	Component		
	1	2	3
competition among local governments	-.692	.511	-.211
favourable government policies	.825	.322	-.115
uncertainty in the environment	-.110	-.880	-.105
favourable market conditions	-3.906E-03	6.689E-02	.977

5.9.11 <u>Factors Relating to Organisational Characteristics</u>

Factor 1in the UK group consists of three items. The first item loading significantly on this factor was degree of decentralisation and the second item was the position of DSS staff or department in the structure of the organization. The last item loading significantly on this factor was information intensity in the organization. The latent variable name assigned to this factor is structure of the organization. Factor 2 in this group is comprised of 2 items. The first item loading significantly on this factor was integration among departments. The second item loading significantly on this factor was size of the organisation which loaded negatively in this factor. Factor three in this group is comprised of 2 items. The first item loading significantly on this factor was computer facilities. The second item loading significantly on this factor was planning integration between using DSS and the overall planning process.

Table 5.11 Rotated Component Matrix for the UK group

Item	Component		
	1	2	3
size of the organization	-3.953E-02	-.561	4.375E-02
position of DSS staff/department	.744	-.136	3.229E-02
degree of decentralisation	.804	-.105	.106
information intensity	.617	.398	6.329E-02
integration among departments	-.137	.804	-2.842E-02
planning integration	.165	-.335	.705
computer facilities	1.636E-02	.150	.863

For the same group of variables in the ***Egypt group***, factor 1 consists of 4 items that, on initial review, appeared to be a conglomeration of items that were seemingly unrelated. Two items related to organisational structure and the other two items related to information intensity and computer facility. Further analysis revealed that the common thread existent across all these items is that they are all related by being items that provide the suitable internal environment to help using DSS which is the latent name assigned to this variable. The first item loading significantly on this variable was the degree of decentralisation, then the position of DSS staff / department in the information intensity in the organization and, finally, computer facilities which is negatively correlated to this factor. Factor 2 in this group contains four items two of them relating to planning integration and the other two relating to the size of the organization and information intensity. The first item loading significantly on this variable was planning integration, then the size of the organization, information intensity which is negatively correlated with this variable and the last item was the integration among departments. The latent name assigned to this variable is planning integration.

Table 5.12 Rotated Component Matrix for the Egypt group

Item	Component	
	1	2
size of the organization	.108	.615
position of DSS staff/department	.591	7.625E-02
degree of decentralisation	.668	4.736E-02
information intensity	.555	-.373
integration among departments	-1.877E-02	.347
planning integration	9.973E-02	.698
computer facilities	-.434	-.136

5.9.12 Factors Relating to Internal Support Characteristics

Factor 1in the UK group consists of two items that related by being items that provide help in usage DSS within the organisation which is the latent variable name assigned to this variable. The first item loading significantly on this factor was experience of DSS staff, then came training/consultation within the organization. Factor 2 in this group contains two items. The first item loading significantly on this factor was the availability of the library within the organization that have books and software manuals and then the advice provided by other colleagues loaded as the second item in this factor. Factor 3 in this group contains only one item loaded significantly on this factor which is related to access to help desk; as mentioned earlier in this chapter it should be excluded from the analysis.

Table 5.13 Rotated Component Matrix for the UK group

Item	Component		
	1	2	3
training / consultation within organization	.756	.141	.261

advice provided by other colleagues	.428	.618	-.370
providing library	-6.456E-02	.914	.138
access to help desk	5.141E-02	2.326E-02	.929
Experience of DSS staff	.828	-4.387E-02	-.156

For the same group of variables in the ***Egypt group***, factor 1 consists of 3 items. The first item loading significantly on this factor was advice provided by other colleagues providing library, then came advice provided by other colleagues and the last item related to providing library. Factor 2 in the same group consists of two items. The first item loading significantly on this factor was access to help desk and the second item was experience of DSS staff, which loaded in all three items. Factor 3 consists of 3 items. The first item loading significantly on this factor was training/consultation within organization and the other item was experience of DSS staff.

Table 5.14 Rotated Component Matrix for the Egypt group

Item	Component		
	1	2	3
training / consultation within organization	6.855E-02	-4.881E-02	.933
advice provided by other colleagues	-.728	5.606E-02	-.206
providing library	.637	.278	-7.352E-02
access to help desk	.118	.869	-7.811E-02
experience of DSS staff	.531	-.455	-.334

5.9.13 <u>Factors relating to external support characteristics</u>

All items of this construct loaded significantly in one factor in the UK group. The first item loading significantly on this factor was the recommendation from outside consultants and the second item was advice and support from the vendor and, finally, the support from government agencies.

Table 5.15 Component Matrix for the UK group

	Component

Item	Component
	1
recommendation from outside consultants	.880
advice and support from vendor	.878
support from government agencies	.537

For the same group of variables in the ***Egypt group***, factor 1 consists of 2 items. The first item loading significantly on this factor was recommendation from outside consultants and other item was support from government agencies. Factor 2 in the same group consists of 2 items. The first item loading significantly on this factor was advice and support from vendor and the other one was quality of external support.

Table 5.16 Component Matrix for the Egypt group

Item	Component
	1
recommendation from outside consultants	.655
advice and support from vendor	-.455
support from government agencies	.762

5.9.14 Factors relating to decision-makers characteristics

Factor 1in the UK group consists of six items, three of them is related to the anxiety that the decision-maker has from the DSS. The other three relating to the pre-experience that decision-makers got about DSS usage in making strategic decisions, whether this came from training, involvement in the development or the ability to use new method. The first item loading significantly on this factor was involvement of the development of DSS, fears from using DSS, familiarity with DSS usage, level of training, confidence in DSS usage and, finally, came the ability to use new methods. Factor 2 in the same group of variables contains 5 items, two of them loaded in factor 1, another two also relating to the cognitive style of the decision maker whether he is cognitive or analytical, and the last item relating to the innovativeness of the decision-maker. The first item loading significantly on this factor was cognitive style, the second was the innovativeness of decision makers, the third item was attitude toward

DSS, the fourth item was confidence in DSS usage which loaded significantly on both factor 1 and 4. The last item loaded in this factor was the ability to use new methods. Factor 3 in this group of variable includes 4 items, two of which pertain directly to the decision maker experience and self efficiency and the other two deal with attitudes towards using DSS and the ability to use new methods in consecutive. The last factor in this group of variables contains 4 items. The first item loading significantly on this factor was the ability to interpret the DSS output. The second item loading significantly on this factor was the innovativeness of the decision-maker, which loaded negatively on this factor, and positively in factor 2. The last two items loaded in this factor and in factor 1 within the same sequence, is familiarity with DSS usage and then confidence in DSS usage.

Table 5.17 Rotated Component Matrix for the UK group

Item	Component			
	1	2	3	4
years of experience	-1.663E-02	-5.246E-02	.823	.143
cognitive style	-.239	.772	9.928E-02	5.172E-02
self efficiency	.142	.286	.627	-.217
attitudes toward DSS	.197	.589	.392	.177
involvement in the development of DSS	.815	.191	-.203	-9.235E-02
level of training	.516	.150	.248	.196
innovativeness of decision maker	.299	.605	.143	-.423
fear from using DSS	.753	-.155	.129	1.899E-02
familiarity with DSS usage	.722	.178	5.557E-02	.393
ability to interpret DSS out put	.216	.146	3.561E-02	.843
ability to use new methods	.309	.571	-.375	.274
confidence in DSS usage	.483	.576	-5.843E-02	.304

For the same group of variables in the ***Egypt group***, factor 1 consists of 3 items. The first item loading significantly on this factor was innovativeness of the decision-maker. The second and third items loading significantly on this factor were self-efficiency and cognitive style respectively. Factor 2 in the same group contains 4 items, the first item loading significantly on this factor was attitudes toward DSS. The second and third items loading significantly on this factor were related to DSS anxiety, which were fears from using DSS and confidence in DSS usage in order and, finally, the fourth item was cognitive style. Factor 3 consists of 4 items. The first item loading significantly on this factor was ability to interpret DSS output and the second item was cognitive style, which loaded negatively on this factor and positively in both factors 1 and 2. The third and fourth items loading significantly on this factor were ability to use new methods which loaded also on factor 6 and involvement in the development of DSS which loaded also on both factors 4 and 5. Factor 4 in this group consists of 2 items, the first item loading significantly on this factor was level of training and the second was involvement in the development of DSS. Factor 5 in this group consists of 3 items, the first item loading significantly on this factor was familiarity with DSS usage and the second was involvement in the development of DSS. Finally, the last item loading significantly on this factor was innovativeness of the decision-maker, which loaded also on factor 1. Factor 5 in this group consists of 3 items. The first item loading significantly on this factor was years of experience. The second and third items were confidence in DSS usage which loaded also on factor 2 and ability to use new methods which loaded also on factor 3.

Table 5.18 Rotated Component Matrix for the Egypt group

Item	Component					
	1	2	3	4	5	6
years of experience	-.186	-.216	7.207E-02	.184	1.178E-02	.746
cognitive style	.442	.322	-.502	-2.092E-02	-.122	-8.150E-02
self efficiency	.684	-2.706E-02	.153	.271	-.201	-5.507E-02
attitudes toward DSS	-.180	.713	4.256E-02	.207	.188	-9.470E-02
involvement in the development of DSS	5.897E-02	.239	.358	.448	.483	-4.269E-02
level of training	6.519E-02	-1.889E-02	-.121	.849	-5.967E-02	7.184E-02
innovativeness	.719	-.151	6.160E-02	-.141	.319	8.139E-02

fear from using DSS	3.399E-02	.679	1.778E-02	-.100	-8.045E-02	8.833E-02
familiarity with DSS	1.640E-03	-4.043E-03	-.133	-7.466E-02	.832	1.062E-02
ability to interpret DSS out put	.146	6.613E-02	.803	-.144	-.105	-2.824E-02
ability to use new methods	.251	.120	.389	.196	-9.273E-02	.355
confidence in DSS usage	.193	.355	-8.191E-02	-.226	2.791E-02	.644

5.9.15 Factors relating to top management characteristics

Factor 1in the UK group consists of three items. The first item loading significantly on this factor was the involvement of top management in DSS design and development. The second and third items in consecutive were development a core of internal experts and setting polices and goals. Factor 2 in this group contains three items. The first item loading significantly on this factor was offering funds. The second item loading significantly on this factor was rewarding efforts for using DSS.

Table 5.19 Rotated Component Matrix for the UK group

Item	Component	
	1	2
top management understanding	.254	.559
rewarding efforts for using DSS	.153	.728
setting policies and goals	.598	.439
offering funds	1.214E-02	.784
DSS design and development	.919	2.612E-02
developing a core of internal experts	.808	.183

For the same group of variables in the ***Egypt group***, factor 1 consists of 2 items. The first item loading significantly on this factor was DSS design and development. The second item loading significantly on this factor was setting policies and goals. Factor 2 in this group contains two items. The first item loading significantly on this factor was developing a core of internal experts. The second item loading significantly on this factor was top management understanding. Factor 3 in this group contains two items. The first item loading significantly on this factor was offering funds and the second item was rewarding efforts for using DSS.

Table 5.20 Rotated Component Matrix for the Egypt group

Item	Component		
	1	2	3
top management understanding	-.661	2.357E-04	.100
rewarding efforts for using DSS	.394	.122	9.702E-02
setting policies and goals	-4.686E-02	-3.749E-02	.908
offering funds	.650	-.109	-9.060E-03
DSS design and development	.229	.661	.368
developing a core of internal experts	-.141	.789	-.254

5.9.16 Internal validity

Internal validity is appropriate for explanatory but not exploratory research, seeking to ensure that the research design allows for the responsibility of unexpected casual relationships emerging from the data collected. To address this issue, the researcher collected data from several local authorities in both the UK and Egypt in a pilot study to test the hypotheses.

5.9.17 Face validity

Face validity is based on a cursory review of items by untrained individuals to see whether they think the items look alright to them. To address this issue the researcher distributed the questionnaire to some of his colleagues and friends just to see what they think about the structure of the questionnaire and their understanding of the meaning.
Validation of instruments is a separate validity requirement. Straub (1989) contends that: "confirmatory empirical findings will be strengthened when instrument validation precedes both internal and statistical conclusion validity."
Straub argues for increased rigour in MIS research methodologies to enable increased confidence in the measurement of responses and the relationships drawn between

research findings. There are techniques which can be adopted in this research to achieve these ends include.

- Pre-test: in this phase the draft instrument goes through a qualitative testing of all validities. This phase, as Straub said, is designed to facilitate revision, leading to an instrument that could be formally validated. Because there is no formula by which content validity can be calculated, making it virtually impossible to be expressed quantitatively, content is determined by mere expert judgement. Usually, experts are asked to assess the content validity of the measurement instrument. The experts carefully review the instrument items as well as the process of development to make judgement concerning how well the test items represent the intended content area (Gay and P. Diehl 1992). The content of the questionnaire used in this study was an evaluation test by a number of academics who are interested in the area of DSS in number of universities in America, Australia, UK, Israel and Egypt. Consequently, the questionnaire was altered to accommodate the modifications required. The following pass at rectifying the questionnaire was conducted by the supervisors of this research. The comments and recommendations included modifications of content and wording of items. Theses recommendations were incorporated in the questionnaire to produce the final version of the questionnaire distributed to the subjects. The translation of the questionnaire to Arabic occurred after the pre-study test was concluded and the final questionnaire was composed. Two versions of the questionnaires were constructed. The questionnaire was developed in English, where the conceptual definitions, stated earlier, for DSS, SDM, and DSS usage, and the rest of the questionnaire constructs, dictated the item construction. Instrument compatibility was enhanced using the back translation technique suggested by Brislin (Brislin 1986). This technique entails the translation of the instrument back and forth from the original language to the target language by several bilinguals. The process of translation is repeated until both versions converge. This technique was carried out for the instrument used in this study with the aid of two professional native Arabic bilingual translators working in an academic institution. Then a pilot study was conducted on a number of senior executives and IT mangers in local government in the UK. Some alterations were made on the questionnaire according to the feedback returned from the academics and practitioners. Revised questionnaires were then sent out around mid January 2000 and data collection was completed within the following six months.

- Technical validation, the purpose of this phase is to validate construct validity and reliability. Tests of construct validity are generally, as Straub said, intended to determine if measures across subjects are similar across methods of measuring those variables.
- Pilot testing or pre-testing allows the researcher the time and opportunity to redesign problematic parts of the survey instruments before it is actually used. It also aiding in the prediction and resolution of scaling and administration problems as well as predicts difficulties that may arise during subsequent data collection that might otherwise have gone unnoticed (Llitwin 1995). Also, pre-setting can be used to qualitatively establish construct and content validity and the reliability of measures.

5.10 Threats to statistical conclusion validity

Statistical validity is an assessment of the relation between variables to provide an accurate picture of the true covariation (Cook and Campbell 1979). A large sample size was used in this study, especially in the Egypt group, to ensure the existence of reasonable statistical power. Moreover, the employment of SEM with latent variables (AMOS 4) to test the operational research model reduces the risk of statistical validity threats.

Summary

This presented an array of topics related to research methodology that was applied to this study. The topics included the different school of thoughts regarding research design, then the suitable research strategy was chosen which is multiple methods (triangulation) in data collection through survey and interview from the population because this was the best strategy to verify the different resources of data in both western and developing countries. Also, this is because of the need for rich qualitative information on the nature of the use of DSS in both these two cultures. In addition to that, the details of questionnaire development and testing of reliability and validity including factors analysis of each construct in both research group. Thorough coverage of these topics establishes a strong foundation for the dissertation and indicates the rigor used in producing the study results.

Chapter 6 Analysis of the Results

6.1 Introduction

After the questionnaires were returned and the data coded, the collected information was studied using a number of statistical analysis techniques. Initially, descriptive statistics, such as percentages and means, were used to consolidate and report the response rate information. Subsequently, SEM and CFA techniques were employed to determine if the modified TAM would fit the data in the context of DSS usage in local authorities and in which variables. Finally, individual t-tests were employed to determine if significant differences existed between the two research groups about the severity of the problems that decision-makers encounter when they use DSS in making their strategic decision.

6.2 Structural Equation Modelling Approach

Structural Equation Modelling (SEM) techniques are second-generation multivariate techniques and have gained increasing popularity in management sciences, notably marketing and organisational behaviour, in the last decade (Chau 1997). Bagozzi (1980) suggested that causal models developed following the structural equation modelling had number of advantages: (1) they make the assumptions, constructs and hypothesised relationships in a research theory explicit; (2) they add a degree of precision to a researcher's theory, since they require clear definitions of constructs, operationalisations and the functional relationships between constructs; (3) they permit a more complete representation of complex theories; (4) they provide a formal framework for constructing and testing both theories and measures. Furthermore, by demanding that the pattern of inter-variable relations be specified a priori, SEM lends itself well to the analysis of data for inferential purpose. By contrast, most other multivariate procedures are essentially descriptive by nature (e.g., exploratory factor analysis) so, that hypothesis testing is difficult, if not impossible (Byrne 2001). Finally, there are no more widely and easily applied alternative methods for modelling multivariate relations, or estimating point and /or interval indirect effects, than SEM (Byrne 2001).

In order to confirm the findings of the exploratory factor analysis and investigate the effect of each group of variables, PEU and PU on DSS usage the researcher fitted the structural model, depicted in Fig. (1), to the data. For this purpose, in the beginning the researcher used the items without any consideration for the exploratory factor analysis to see if there are any differences if the latent variables defined by the exploratory factor analysis were taken in consideration.

The researcher used AMOS 4.0 program to test the hypothesised linear effect of each group of variables on PEU, PU and DSS usage. There are a number of measures generated by AMOS to evaluate the goodness-of-fit of the model, like other commercial statistical software packages that adopt the structural equation modelling approach. The most popular index is, perhaps, the chi-square statistic. This statistic tests the proposed model against the general alternative in which all observed variables are correlated. It measures the distance (difference, discrepancy, deviance) between the sample covariance or correlation matrix and the fitted covariance or correlation matrix (Joreskog and Sorbom 1993). With this index, significant values indicate poor model fit while insignificant values indicate good fit. This is why it is also called a "badness-of-fit" measure. Hartwick and Barki (1994) pointed out a major shortcoming of this index. They noted that "in large samples, the chi-square statistic will almost be significant, since chi-square is a direct function of a sample size, in small samples, the statistic may not be chi-square distributed, leading to inaccurate probability values". In their study, Hartwick and Barki used four other measures of overall model goodness of fit: chi-square/degree of freedom, Non-Normed Fit Index (NNFI), Comparative Fit Index (CFI), and Average Absolute Standardised Residual (AASR). In another study Segars Grover (1993) included several other measures of model fit: Goodness of fit index (GFI), Adjusted Goodness-of-fit Index (AGFI), fit criterion, and Root Mean Square Residual. Table 6.2 lists the recommended values of various measures of model fit as suggested by these authors. Many researchers recommend that multiple fit criteria be use (Breckler 1990; Bollen and Long 1993; Tanaka 1993) in order to attenuate any measuring biases inherent in different measures.

Table 6.1 Recommended values of goodness-of-fit measures

Goodness-of-fit measure	Recommended value
Chi-square	$p \geq .05$
Chi-square/degree of freedom	≤ 3.0
Goodness-of-fit Index (GFI)	$\geq .90$
Adjusted Goodness-of-fit Index (AGFI)	$\geq .80$
Normed Fit Index (NFI)	$\geq .90$
Non-Normed Fit Index (NNFI)	$\geq .90$
Comparative Fit Index (CFI)	$\geq .90$
Root Mean Square Residual (RMSR)	$\leq .10$

Adapted with modification from: (Segars and Grover 1993; Hartwick and Barki 1994)

As noticed there are several measurements of model fit; these measurements and suggested threshold are described below.

6.2.1 Chi-Square/DF

This measure produces a chi-square statistic adjusted for degrees of freedom. It is recommended that, in order for a model to be considered a reasonable fit to the data, this number be less than 5 (Wheaton, Muthen et al. 1977).

6.2.2 Goodness-of-Fit Index (GFI) and Adjusted GFI (AGFI)

Developed by (Joreskog and Sorbom 1984) both of these measure the amount of variances and co-variances jointly attributed to the model. The values are generally between 0 and 1, where 1 indicates a perfect fit to the data. The AGFI takes adjusts for degrees of freedom. A GFI measure greater than .90 and AGFI measure greater than .80 are considered to be indicators of a good fitting model.

6.2.3 Non-Normed Fit Index (NNFI) and the Comparative Fit Index (CFI)

Developed by (Bentler and Bonnet 1980), these indices compare the proposed model to that of a fully saturated (perfect fitting model). Also with values ranging from 0 to 1, a measure indicating a good fit would be greater than .90 for both indices.

6.2.4 Root Mean Square Error of Approximation (RMS)

Developed by (Steiger and Lind 1980), this is another measure of fit using squared error terms and accounting for degrees of freedom. (Browne and Cudeck 1993) contend that an RMS of .80 or less would indicate a reasonable fit.

6.2.5 Parsimony Ratio PRATIO

This is the ratio of the degrees of freedom in the model to degrees of freedom in the independence (null) model. PRATIO is not a goodness of fit test itself, but is used in goodness of fit measures like PNFI and PCFI which reward parsimonious models (models with relatively few parameters to estimate in relation to the number of variables and relationship in the model). PNFI is the parsimony normed fit index, equal to the PRATIO times NFI. PCFI is the parsimony comparative fit index, equal to the PRATIO times CFI.

6.2.6 Relative Fit Index (RFI)

This index is not guaranteed to vary from 0 to 1. RFI close to 1 indicates a good fit.

6.2.7 Incremental Fit Index (IFI)

This index is not guaranteed to vary from 0 to 1. IFI close to 1 indicates a good fit and values above .90 an acceptable fit.

6.2.8 Tucker Lewis Coefficient (TLI).

This measure is also called the Bentler-Bonett Non-Normed Fit Index (NNFI). TLI is not guaranteed to vary from 0 to 1. TLI close to 1 indicates a good fit.

6.2.9 PCLOSE

This measure tests the null hypothesis that RMSEA is not greater than.05.

After discussing most of the related fit measures of SEM, the resèarcher will discuss the results related to the research hypotheses in both the research group in the following section.

6.3 The hypothesised model for the UK group regarding task characteristics

This factor produced an insignificant fit (χ^2 = 236.346, df = 164, p = .000). Analysis of modification index pointed to mis-specification and suggested adding a direct path from 9B (complexity of analysis and evaluation) to DSS usage, PEU to PU, 9E (SDM are too person centred to be computerised) to 8F (improve efficiency and effectiveness of decision making process) and from 8C (improving customer service) to Q3 (frequency of DSS usage) and allowing the indicated error in figure (1) to correlate. Therefore the model was modified accordingly and the results of the new model, shown in figure 1, was significantly better χ^2 = 167.334, df = 160, p = .330). This result indicated a good fit, as the probability level was well above the generally accepted critical value p = .05

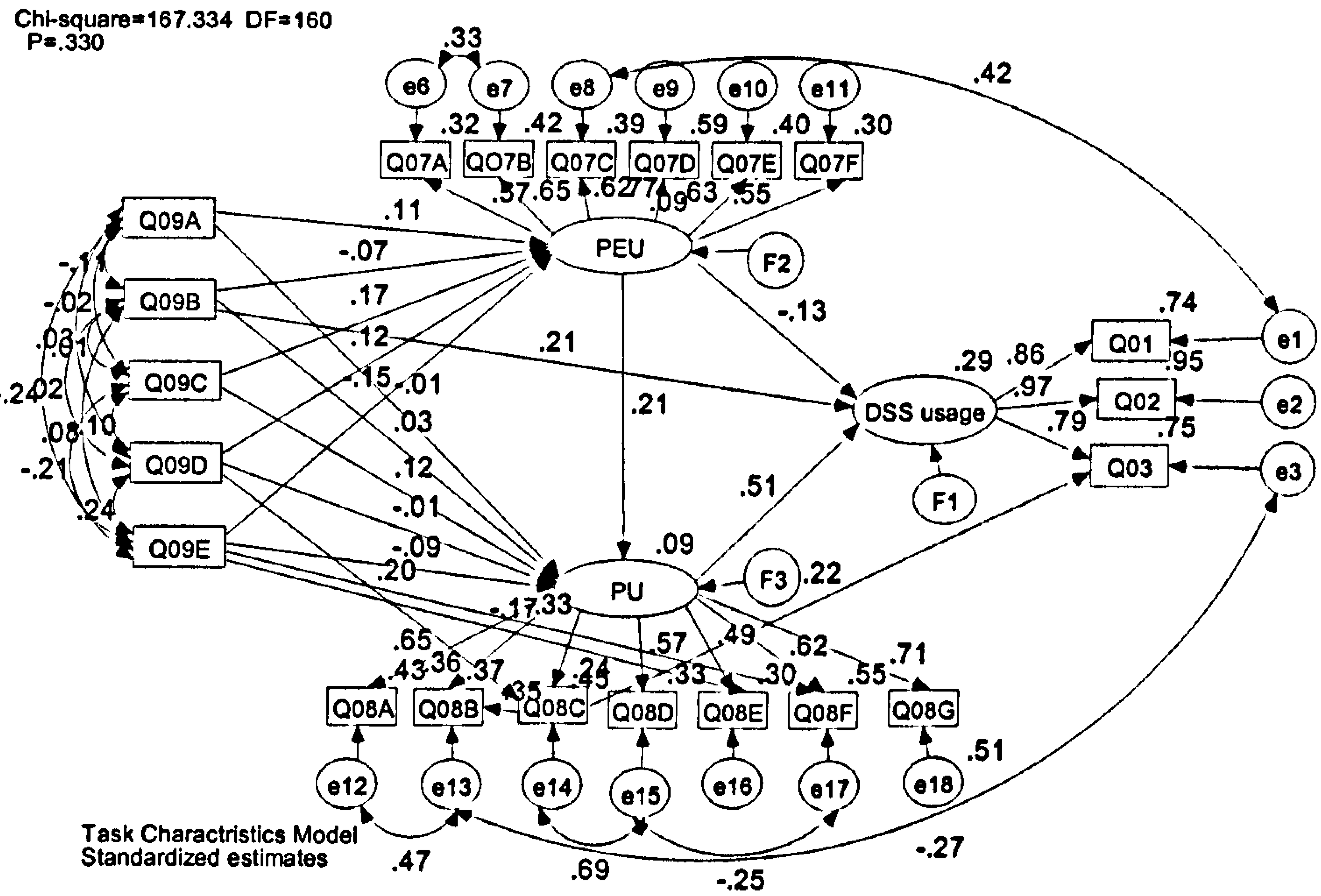

Figure 6.1 The effect of task characteristics, PEU and PU on DSS usage in the UK

The goodness-of-fit measures for this model are summarised in table (6.2).

Table 6.2 Fit measures for task characteristics model for the UK group

Fit measure	Task characteristics model for UK group
Discrepancy (CMIN)	167.334
Degrees of freedom	160
P	0.330
Number of parameters (NPAR)	71
Discrepancy / df (CMINDF)	1.046
RMR	0.074
GFI	0.849
Adjusted GFI	0.782
Parsimony-adjusted GFI	0.588
Normed fit index (NFI)	0.786

Relative fit index (RFI)	0.719
Incremental fit index (IFI)	0.988
Tucker-Lewis index (TLI)	0.983
Comparative fit index (CFI)	0.987
Parsimony ratio (PRATIO)	0.762
Parsimony-adjusted NFI (PNFI)	0.599
Parsimony-adjusted CFI (PCFI)	0.752
RMSEA (PCLOSE)	0.024
P for test of close fit	0.874

Although, according to factor analysis, all the items of task characteristics loaded significantly in two components, the model based on the exploratory factor analysis as shown in figure 2 will be less than if this two latent variables were not considered (χ^2 = 196.206, df = 177, p = .154), however, the model is still significant.

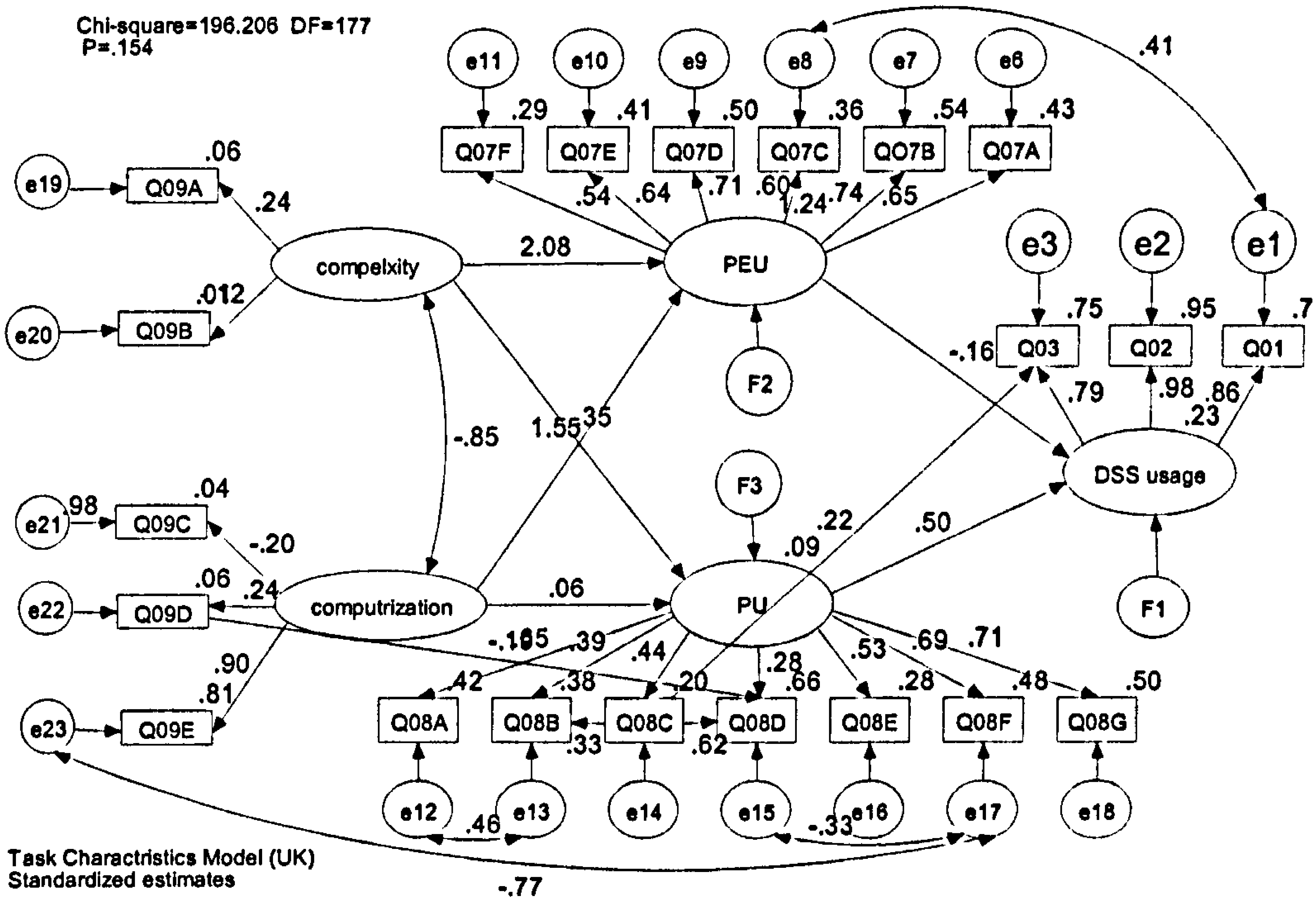

Figure 6.2 The effect of PEU, PU with latent variables on DSS usage in the UK group

The goodness-of-fit measures for this model are summarised in table 6.3.

Table 6.3: Fit Measures for task characteristics model for the UK group

Fit measure	Task characteristics model for UK group
Discrepancy (CMIN)	196.206
Degrees of freedom	177
P	0.154
Number of parameters (NPAR)	54
Discrepancy / df (CMINDF)	1.109
RMR	0.090
GFI	0.825
Adjusted GFI	0.772
Parsimony-adjusted GFI	0.632
Normed fit index (NFI)	0.749
Relative fit index (RFI)	0.702
Incremental fit index (IFI)	0.968
Tucker-Lewis index (TLI)	0.960
Comparative fit index (CFI)	0.966
Parsimony ratio (PRATIO)	0.843
Parsimony-adjusted NFI (PNFI)	0.631
Parsimony-adjusted CFI (PCFI)	0.814
RMSEA (PCLOSE)	0.037
P for test of close fit	0.749

The goodness-of-fit measures suggested that the modified model was better than the hypothesised model. All measures of the modified model surpassed the acceptable levels.

Structural equation modelling were used to test the first hypothesis related to:

H 1.1: PEU and PU of decision support systems fully mediate the influence of task characteristics variable on usage of DSS in SDM in both the UK and Egypt.

The results shown in table 6.3 provide a partial support for hypotheses 1.1 in relation to the UK group.

For the same group of variables in the ***Egypt group**, the hypothesised model* regarding task characteristics, produced a poor fit (χ^2 = 169.129, df = 166, p = .055). The modification index pointed to miss-specification and suggested a direct path from 9B to 8A, from 7 C to 8A, from 8C to 8B and from 7F to 8F. By allowing these items to relate the model produced a χ^2 = 77.604, df = 169, p = .310. This result indicated a good fit, as the probability level was well above the generally accepted critical value p = .05, as indicated in figure 3.

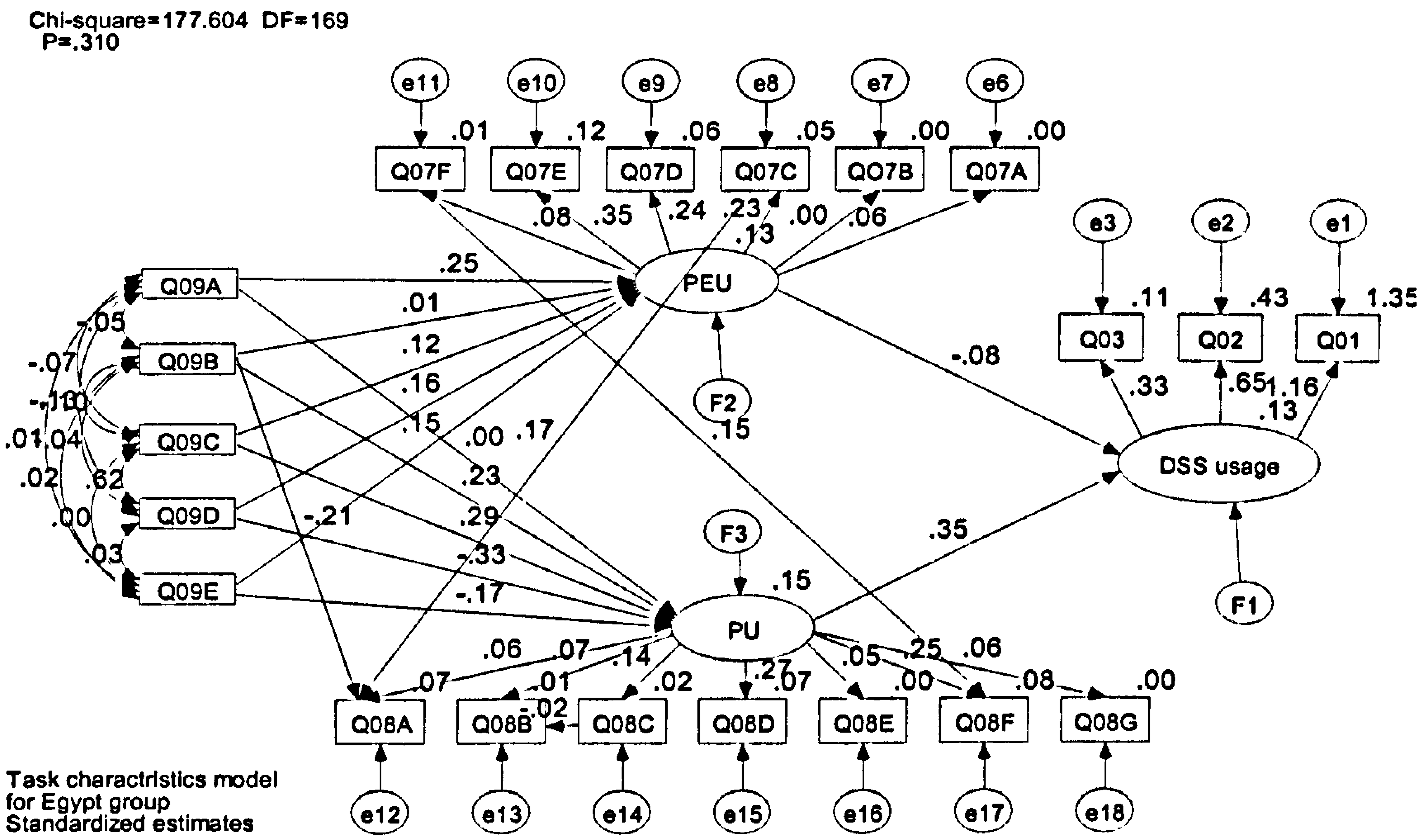

Figure 6.3 The effect of task characteristics, PEU and PU on DSS usage in Egypt group

The goodness of fit measures for this model are summarised in table 6.4.

Table 6.4 Fit Measures for task characteristics model for the Egypt group

Fit measure	Task characteristics model for Egypt group
Discrepancy (CMIN)	177.604
Degrees of freedom	169
P	0.310
Number of parameters (NPAR)	62
Discrepancy / df (CMINDF)	1.051
RMR	0.070
GFI	0.947

Adjusted GFI	0.927
Parsimony-adjusted GFI	0.692
Normed fit index (NFI)	0.745
Relative fit index (RFI)	0.683
Incremental fit index (IFI)	0.984
Tucker-Lewis index (TLI)	0.978
Comparative fit index (CFI)	0.982
Parsimony ratio (PRATIO)	0.805
Parsimony-adjusted NFI (PNFI)	0.599
Parsimony-adjusted CFI (PCFI)	0.791
RMSEA (PCLOSE)	0.013
P for test of close fit	1.000

The goodness-of-fit measures suggested that the modified model was better than the hypothesised model. All measures of the modified model surpassed the acceptable levels.

Although one of the items of task characteristics which is the "SDM is too 'person centred' to be computerised" loaded insignificantly in factor 3 according to sample size in the UK, the exploratory factor analysis suggested this item to be deleted because it's the only item loaded in this factor. If this done the fit measures for the resulted model as shown in figure 2 will be less than if this item included in the analysis (χ^2 = 183.504, df = 165, p = .154) however the model is still significant.

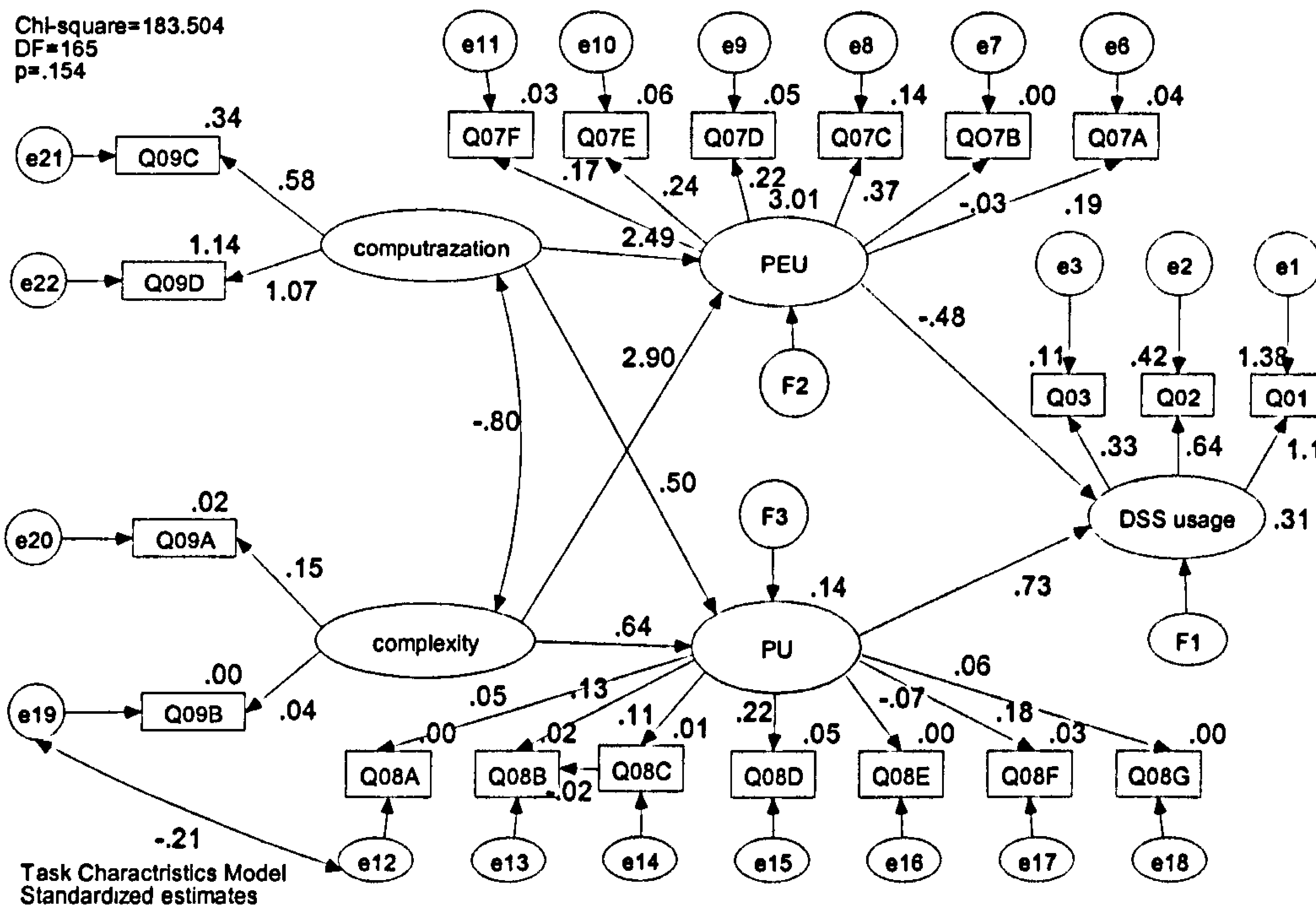

Figure 6.4 Task characteristics with latent variables in the Egypt group

The results shown in table 6.5 provide a partial support for hypothesis 1.1 in relation to the Egypt group.

6.4 The hypothesised model for the UK group regarding cultural characteristics

This factor produced insignificant fit (χ^2 = 274.260, df = 160, p = .000). Analysis of modification index pointed to mis-specification and suggested adding a direct path from PEU to PU, and because there were large correlated error between items 10 and 17, 6 and 7, 1 and 8, 3 and 14, 17 and 14, 15 and 14, 11D and F1 and finally 13 and 14, they were subsequently specified as free parameters in the model. There for the model was modified accordingly and the results of the new model, shown in figure 5, was significantly better (χ^2 = 159.859, df = 148, p = .237). This result indicated a good fit, as the probability level was well above the generally accepted critical value p = .05

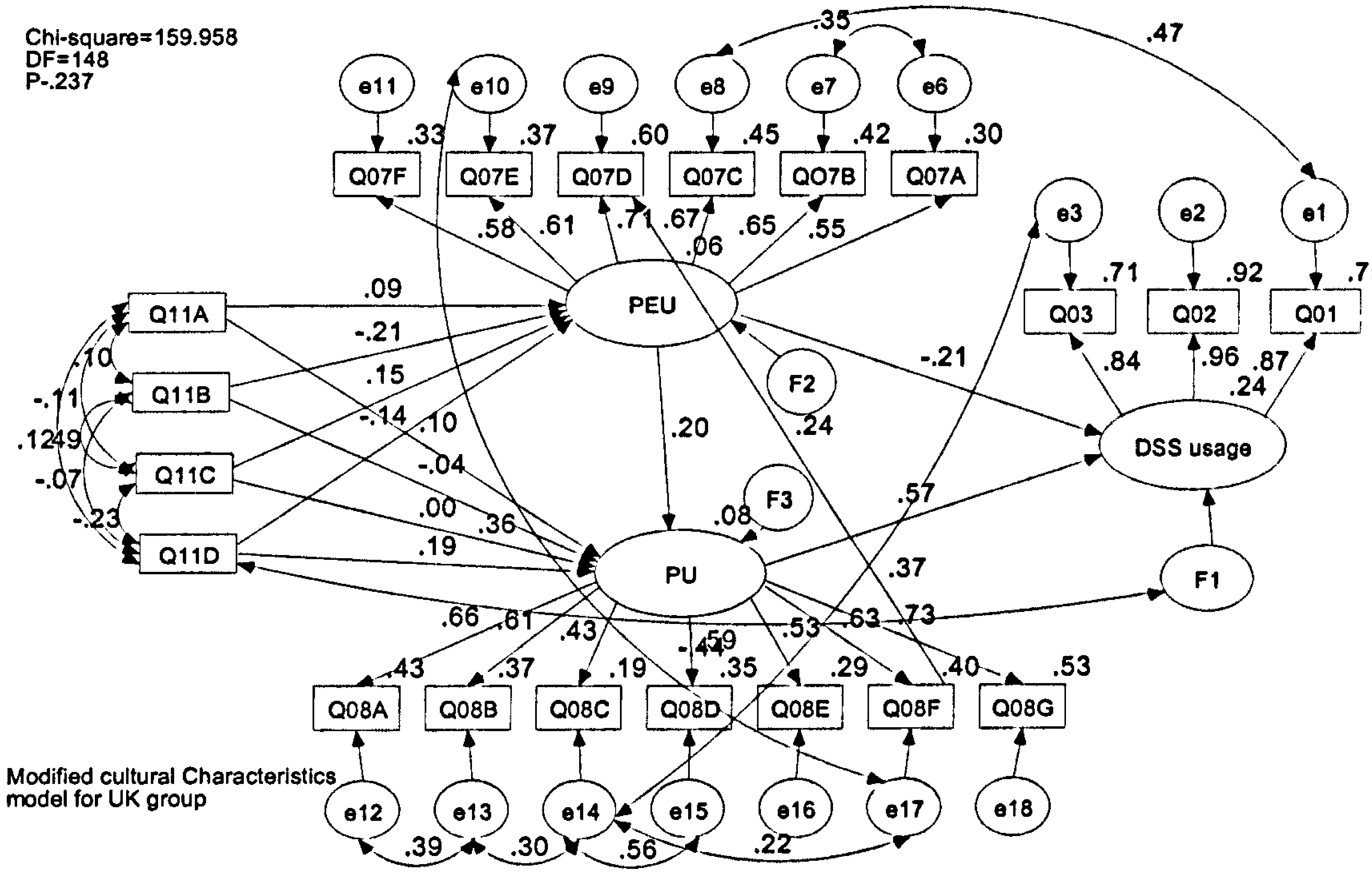

Figure 6.5 The effect of cultural characteristics, PEU and PU on DSS usage in the UK group

The goodness of fit measures for this model are summarised in table 6.5.

Table 6.5 Fit measures for task characteristics model for the UK group

Fit measure	Cultural characteristics model for UK group
Discrepancy (CMIN)	159.958
Degrees of freedom	148
P	0.237
Number of parameters (NPAR)	62
Discrepancy / df (CMINDF)	1.081
RMR	0.073
GFI	0.850
Adjusted GFI	0.787
Parsimony-adjusted GFI	0.599
Normed fit index (NFI)	0.793
Relative fit index (RFI)	0.734
Incremental fit index (IFI)	0.981

Tucker-Lewis index (TLI)	0.974
Comparative fit index (CFI)	0.979
Parsimony ratio (PRATIO)	0.779
Parsimony-adjusted NFI (PNFI)	0.618
Parsimony-adjusted CFI (PCFI)	0.763
RMSEA (PCLOSE)	0.795
P for test of close fit	0.795

The goodness-of-fit measures suggested that the hypothesised model and the modified model were insignificant. All measures of the modified model fall below the acceptable levels.

The results shown in table 6.7 provide support for the hypothesis 2.1 in relation to the UK group.

H 2.1: PEU and PU of decision support systems fully mediate the influence of cultural characteristics variable on usage of DSS in SDM in both the UK and Egypt.

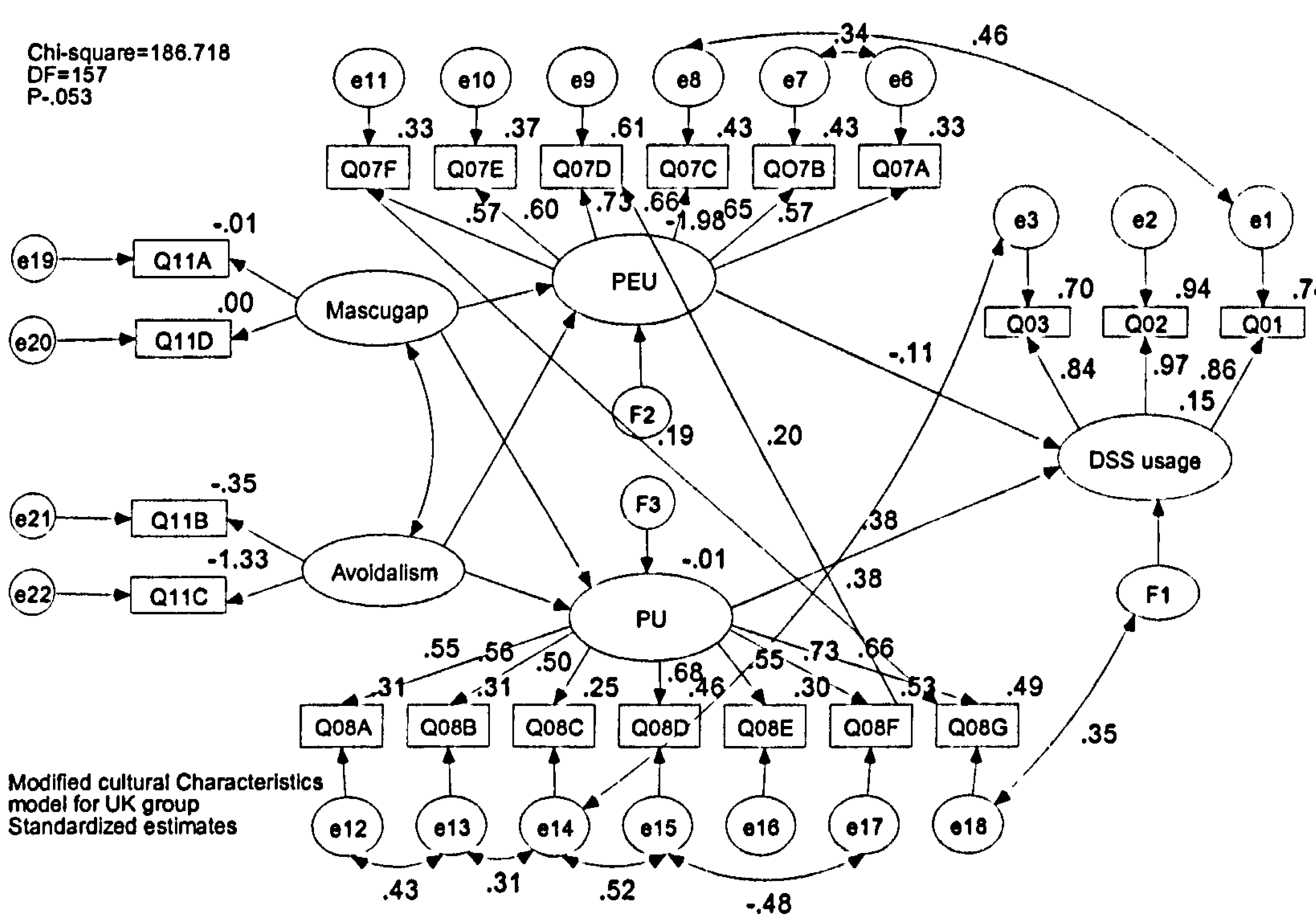

Figure 6.6 The effect of cultural characteristics, PEU and PU on DSS usage in the UK group

Although, according to factor analysis, all the items of cultural characteristics loaded significantly in two components, the model based on the exploratory factor analysis as shown in figure 6, will be less than if these two latent variables were not considered (χ^2 = 186.718, df = 157, p = .053) however the model is still significant.

For the same group of variables in the ***Egypt group****, the hypothesised model regarding cultural characteristics,* produced insignificant fit (χ^2 = 201.236, df = 159, p = .013). Analysis of modification index pointed to mis-specification and suggested adding a direct path from PEU to PU, from 11D to 8G and from 11C to 8F and by allowing the indicated error in figure 7 to correlate, the results of the new mode were significantly better (χ^2 = 159.859, df = 148, p = .237). This result indicated a good fit, as the probability level was well above the generally accepted critical value p = .05

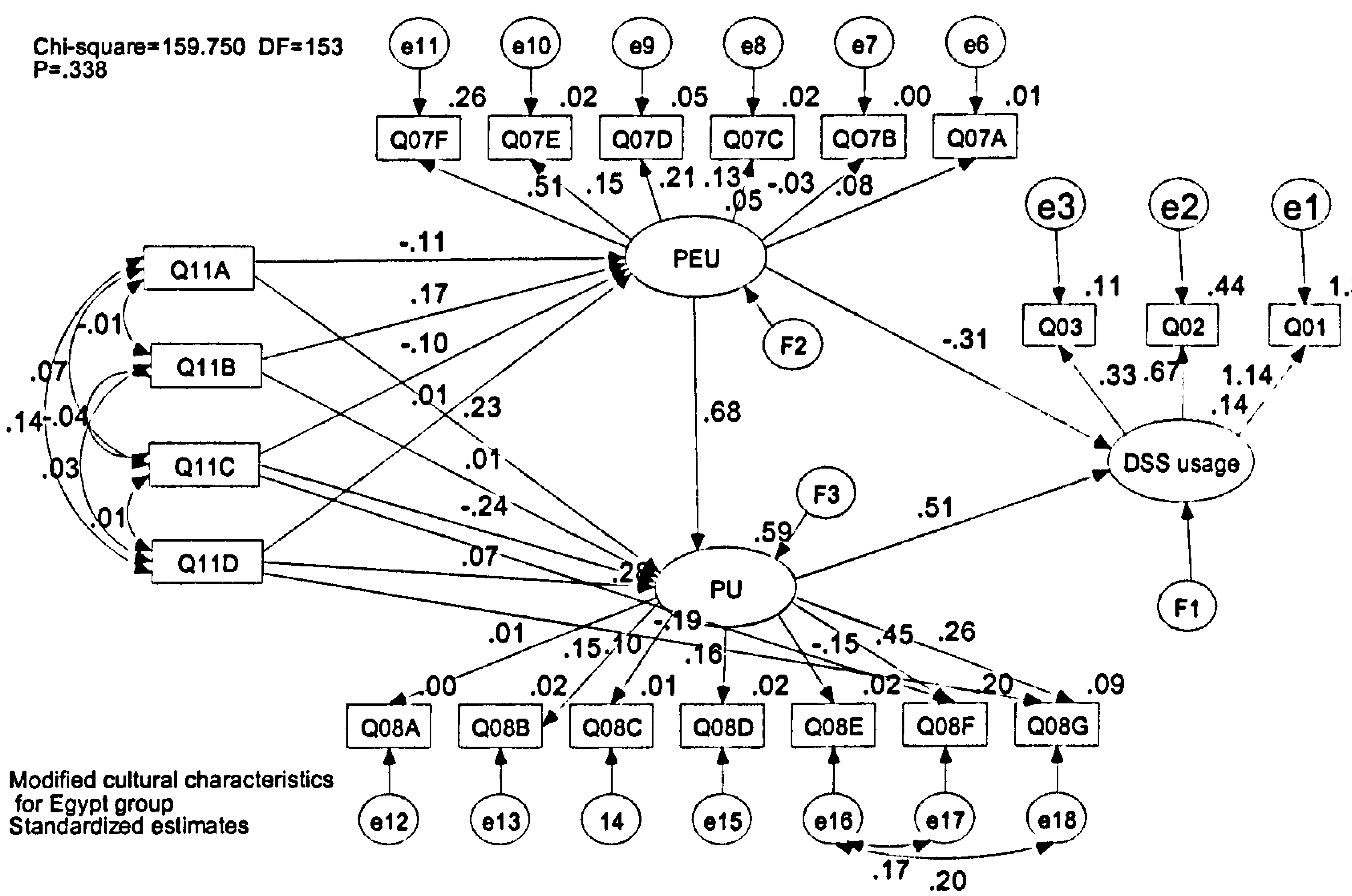

Figure 6.7 The effect of cultural characteristics, PEU and PU on DSS usage in Egypt group

The goodness-of-fit measures for this model are summarised in table 6.6.

Table 6.6 Fit measures for task characteristics model for the Egypt group

Fit measure	Cultural characteristics model for Egypt
Discrepancy (CMIN)	159.750
Degrees of freedom	153
P	0.338
Number of parameters (NPAR)	57
Discrepancy / df (CMINDF)	1.044
RMR	0.072
GFI	0.950
Adjusted GFI	0.932
Parsimony-adjusted GFI	0.692
Normed fit index (NFI)	0.710
Relative fit index (RFI)	0.640
Incremental fit index (IFI)	0.983
Tucker-Lewis index (TLI)	0.977
Comparative fit index (CFI)	0.981
Parsimony ratio (PRATIO)	0.805
Parsimony-adjusted NFI (PNFI)	0.572
Parsimony-adjusted CFI (PCFI)	0.790
RMSEA (PCLOSE)	0.012
P for test of close fit	1.000

The goodness-of-fit measures suggested that the modified model was better than the hypothesised model. All measures of the modified model surpassed the acceptable levels.

Although, according to the factor analysis, all the items of task characteristics loaded significantly in two components, the model based on the exploratory factor analysis, as shown in figure 7, will be less than if these two latent variables were not considered (χ^2 = 182.967, df = 160, p = .103), however, the model is still significant.

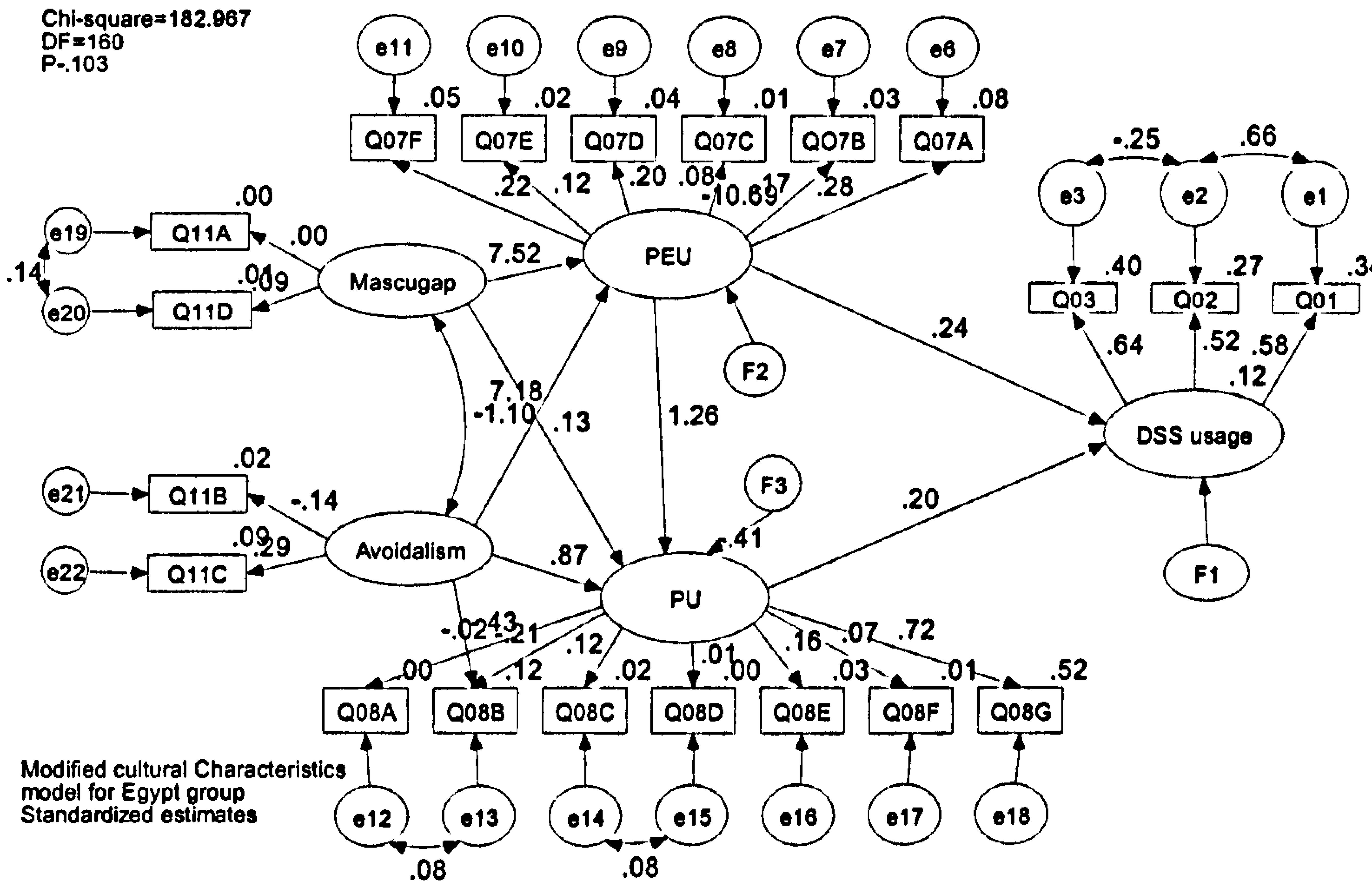

Figure 6.8 The effect of cultural characteristics, PEU and PU on DSS usage in Egypt group

The results shown in table 6.9 provide a partial support for hypothesis 2.1 in relation to the Egypt group.

Because this was the case in most of the other constructs, it will be redundant to repeat the analysis for factor analysis with latent variables and with the observed variables in all the rest of the variables, so the researcher will focus on the model with observed variable as it gives a better fit in all the constructs.

6.5 The hypothesised model for the UK group regarding DSS characteristics

After making a direct paths from PEU to PU, from 13C to Q2, from 13 I to 8B and DSS usage, from 13 K to DSS usage, from 8 C to Q3 and Q2 and, finally, from PU to 8C, 8B and 8A. Also, by allowing the indicated error in figure 9 to correlate, this produced a significant fit (χ^2 = 287.543, df = 256, p = .058).

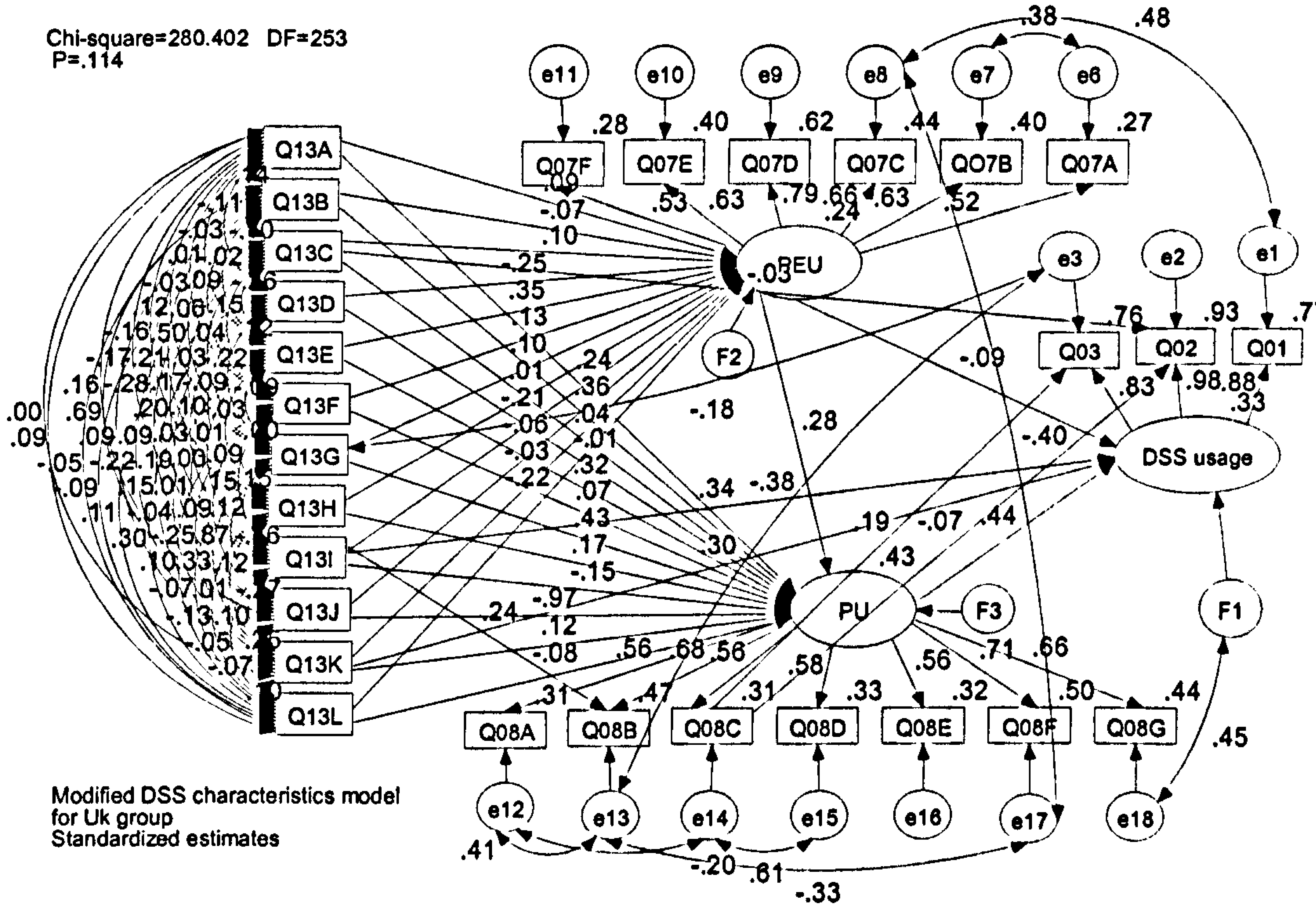

Figure 6.9 The effect of DSS characteristics, PEU and PU on DSS usage for the UK group

The goodness-of-fit measures for this model are summarised in table 6.7.

Table 6.7 Fit measures for task characteristics model for the UK group

Fit measure	DSS characteristics model for UK group
Discrepancy (CMIN)	280.402
Degrees of freedom	253
P	0.114
Number of parameters (NPAR)	153
Discrepancy / df (CMINDF)	1.108
RMR	0.063
GFI	0.822
Adjusted GFI	0.714
Parsimony-adjusted GFI	0.512
Normed fit index (NFI)	0.768
Relative fit index (RFI)	0.653

Incremental fit index (IFI)	0.971
Tucker-Lewis index (TLI)	0.951
Comparative fit index (CFI)	0.967
Parsimony ratio (PRATIO)	0.669
Parsimony-adjusted NFI (PNFI)	0.514
Parsimony-adjusted CFI (PCFI)	0.647
RMSEA (PCLOSE)	0.037
P for test of close fit	0.793

The goodness-of-fit measures suggested that the modified model was better than the hypothesised model. Most of the measures of the modified model surpassed the acceptable levels.

The results shown in table 6.11 provide partial support for hypothesis 3.1 in relation to the UK group.

H 3.1: PEU and PU of decision support systems fully mediate the influence of DSS characteristics variables on usage of DSS in SDM in both the UK and Egypt.

For the same group of variables in the ***Egypt group****, the hypothesised model regarding DSS characteristics*, after making a direct paths from 13C to 2, and also by allowing the indicated error 14 and 15 errors 18 and 16 in figure 8 to correlate, which means dropping the constraint that the correlation of these two terms be zero; this produced a significant fit (χ^2 = 283.041, df = 267, p = .239).

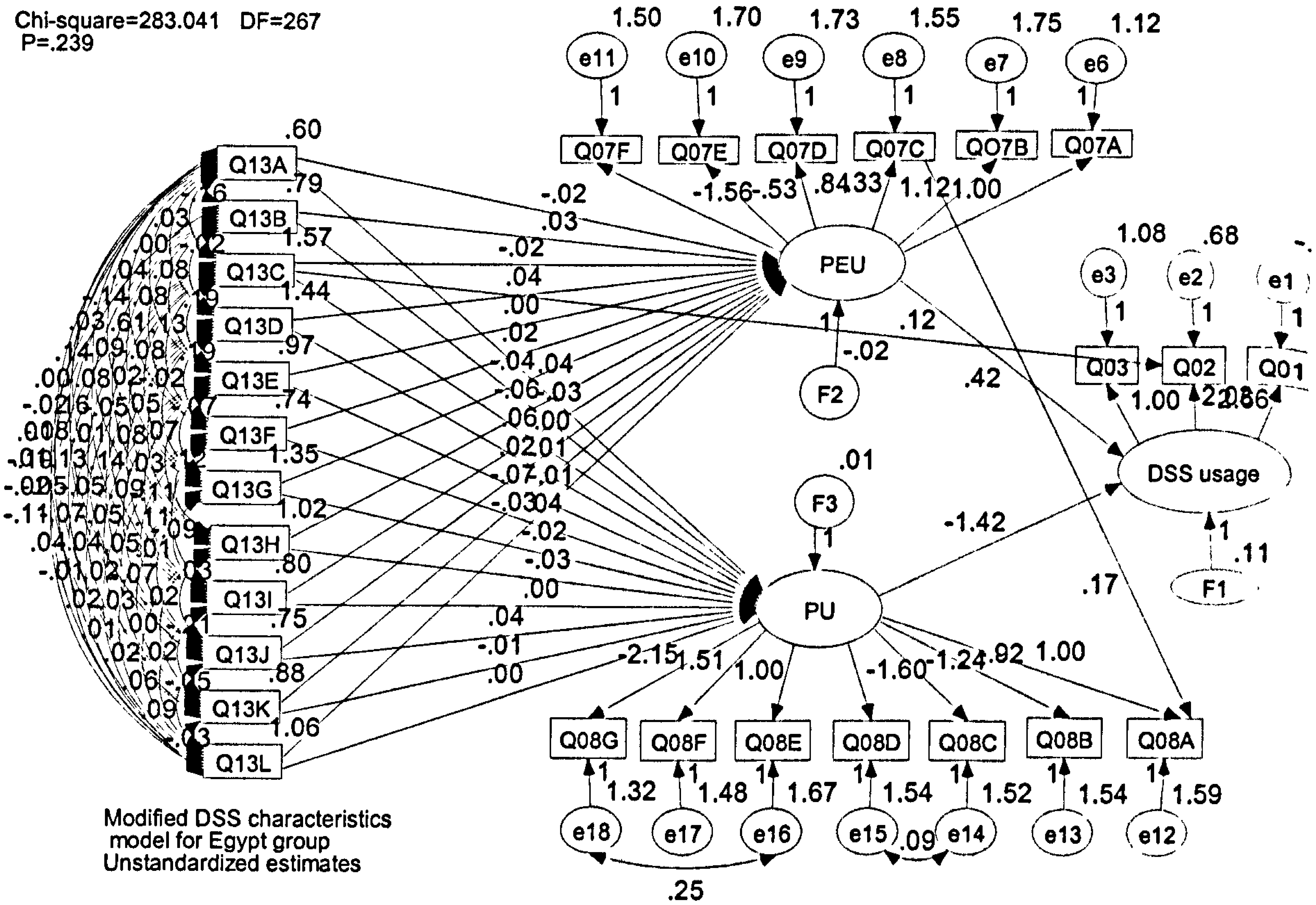

Figure 6.10 The effect of DSS characteristics, PEU and PU on DSS usage in Egypt group

The goodness of fit measures for this model are summarised in table 6.8.

Table 6.8 Fit Measures for DSS characteristics model for the Egypt group

Fit measure	DSS characteristics model for Egypt group
Discrepancy (CMIN)	283.041
Degrees of freedom	267
P	0.239
Number of parameters (NPAR)	139
Discrepancy / df (CMINDF)	1.060
RMR	0.065
GFI	0.937
Adjusted GFI	0.904
Parsimony-adjusted GFI	0.616

Normed fit index (NFI)	0.744
Relative fit index (RFI)	0.637
Incremental fit index (IFI)	0.981
Tucker-Lewis index (TLI)	0.969
Comparative fit index (CFI)	0.978
Parsimony ratio (PRATIO)	0.706
Parsimony-adjusted NFI (PNFI)	0.525
Parsimony-adjusted CFI (PCFI)	0.691
RMSEA (PCLOSE)	0.014
P for test of close fit	1.000

The goodness-of-fit measures suggested that the modified model was better than the hypothesised model. All measures of the modified model surpassed the acceptable levels.

The results shown in table 6.13 provide a partial support for hypothesis 2.1 in relation to the Egypt group.

6.6 The hypothesised model for the UK group regarding environmental characteristics

After making a direct paths from PEU to PU, from 14B to DSS usage, from 14D to Q1 & Q2, from 8C to Q3 and also by allowing the indicated errors in Fig 9 to correlate, which means dropping the constraints that the correlation of these errors terms be zero; this produced a significant fit (χ^2 = 153.503, df = 142, p = .241).

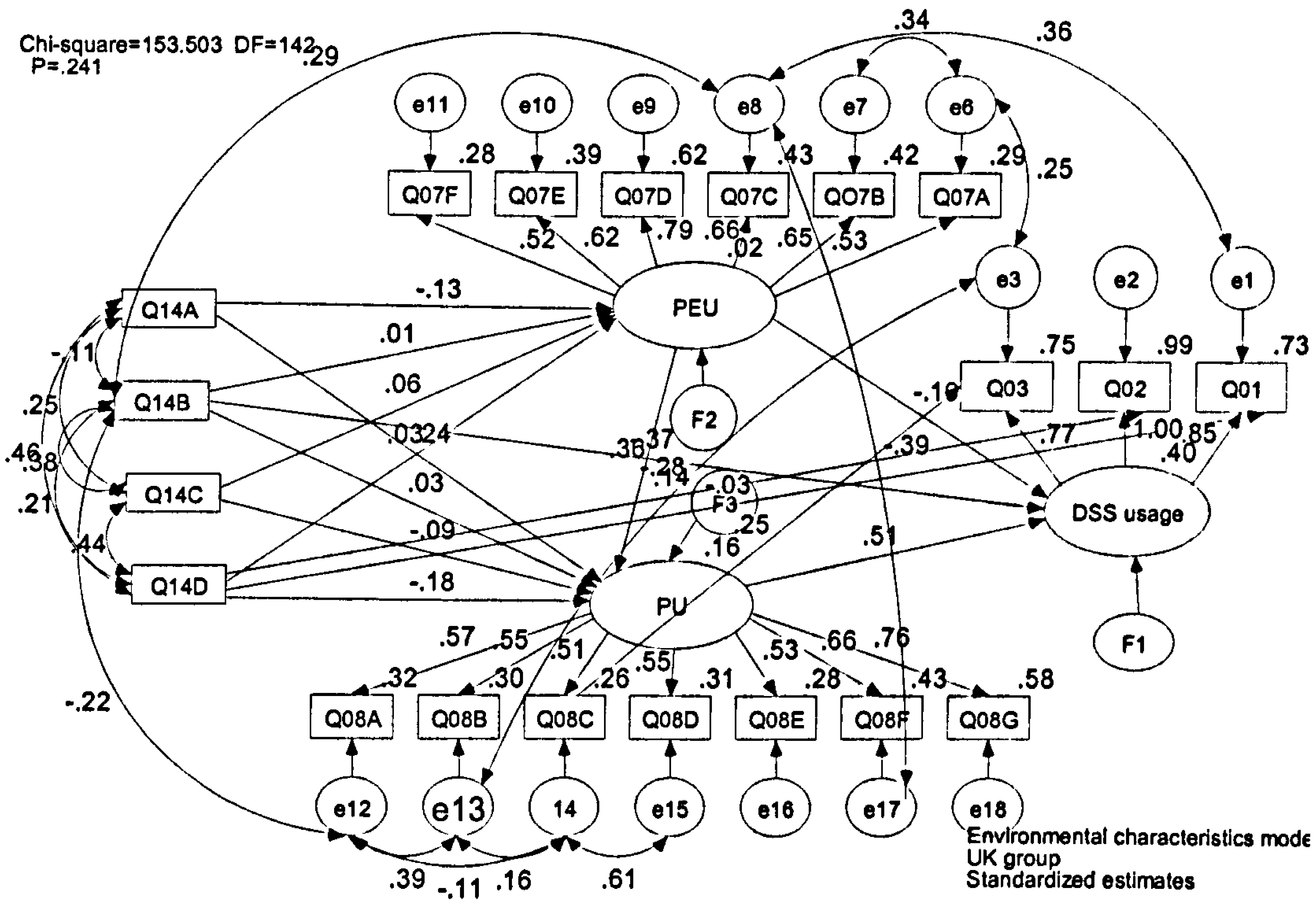

Figure 6.11 The effect of environmental characteristics, PEU and PU on DSS usage for the UK group

The goodness-of-fit measures for this model are summarised in table 6.9.

Table 6.9 Fit measures for environmental characteristics model for the UK group

Fit measure	Environmental characteristics for the UK
Discrepancy (CMIN)	153.503
Degrees of freedom	142
P	0.241
Number of parameters (NPAR)	68
Discrepancy / df (CMINDF)	1.081
RMR	0.077
GFI	0.851
Adjusted GFI	0.779
Parsimony-adjusted GFI	0.575
Normed fit index (NFI)	0.812
Relative fit index (RFI)	0.748

Incremental fit index (IFI)	0.983
Tucker-Lewis index (TLI)	0.975
Comparative fit index (CFI)	0.982
Parsimony ratio (PRATIO)	0.747
Parsimony-adjusted NFI (PNFI)	0.607
Parsimony-adjusted CFI (PCFI)	0.734
RMSEA (PCLOSE)	0.032
P for test of close fit	0.789

The goodness-of-fit measures suggested that the modified model was better than the hypothesised model. Most of the measures of the modified model surpassed the acceptable levels.

The results shown in table 6.9 provide partial support for hypothesis 4.1 in relation to the UK group.

H 4.1: perceived ease of use and perceived usefulness of decision support systems fully mediate the influence of environmental characteristics variables on usage of DSS in making strategic decisions in both the UK and Egypt.

For the same group of variables in the ***Egypt group***, *the hypothesised model regarding environmental characteristics*, produced a significant fit (χ^2 = 166.829, df = 158, p = .300).

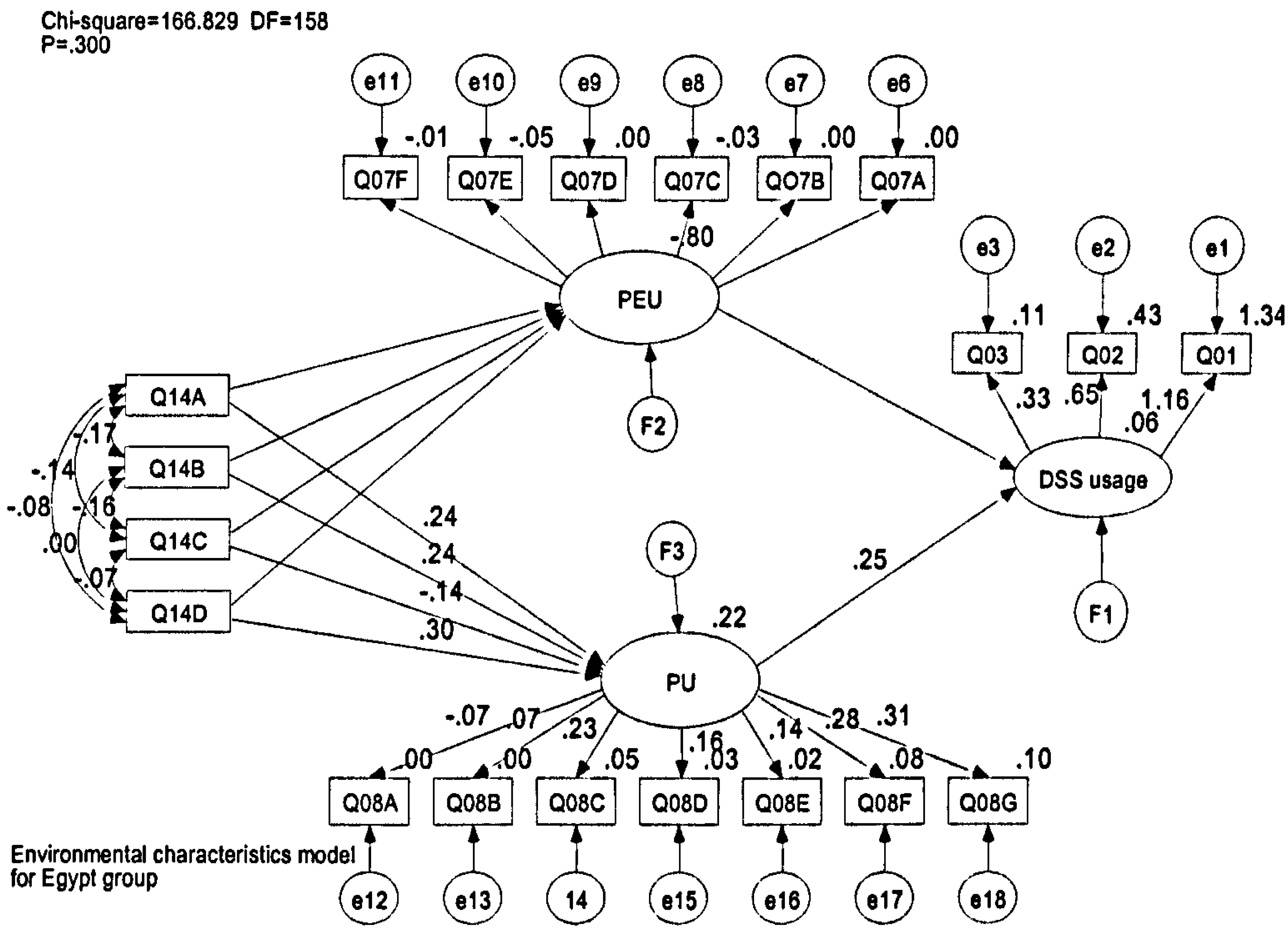

Figure 6.12 The effect of environmental characteristics, PEU and PU on DSS usage for the Egypt group

The goodness-of-fit measures for this model are summarised in table 6.10.

Table 6.10 Fit Measures for environmental characteristics model for the Egypt group

Fit measure	Environmental characteristics for Egypt
Discrepancy (CMIN)	166.829
Degrees of freedom	158
P	0.300
Number of parameters (NPAR)	52
Discrepancy / df (CMINDF)	1.056
RMR	0.073
GFI	0.947
Adjusted GFI	0.929
Parsimony-adjusted GFI	0.712
Normed fit index (NFI)	0.701

Relative fit index (RFI)	0.640
Incremental fit index (IFI)	0.978
Tucker-Lewis index (TLI)	0.971
Comparative fit index (CFI)	0.976
Parsimony ratio (PRATIO)	0.832
Parsimony-adjusted NFI (PNFI)	0.583
Parsimony-adjusted CFI (PCFI)	0.812
RMSEA (PCLOSE)	0.014
P for test of close fit	1.000

The goodness-of-fit measures suggested that the modified model was better than the hypothesised model. All measures of the modified model surpassed the acceptable levels.

The results shown in table 6.10 provide a partial support for hypothesis 2.1 in relation to the Egypt group.

6.7 The hypothesised model for the UK group regarding organisational characteristics

After making a direct paths from PEU to PU, from 15F to 7A, from 15D to 8D, from 15G to Q2 and also by allowing the indicated errors in Fig 13 to correlate, which means dropping the constraints that the correlation of these errors terms be zero; this produced a significant fit (χ^2 = 197.324, df = 186, p = .271).

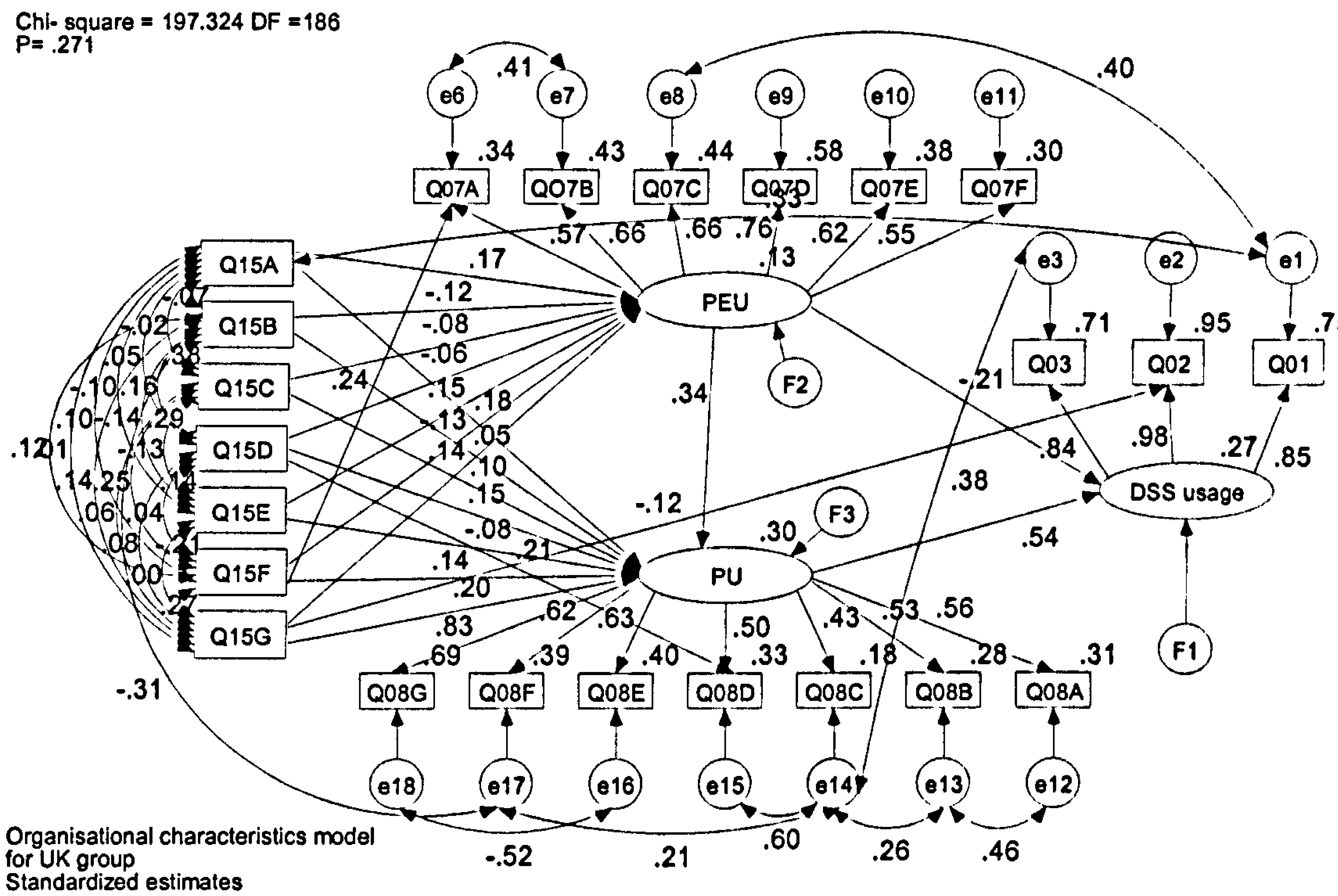

Figure 6.13 The effect of organisational characteristics, PEU and PU on DSS usage for the UK group

The goodness-of-fit measures for this model are summarised in table 6.11.

Table 6.11 Fit Measures for organisational characteristics model for the UK group

Fit measure	Organisational characteristics for the UK
Discrepancy (CMIN)	197.324
Degrees of freedom	186
P	0.271
Number of parameters (NPAR)	90
Discrepancy / df (CMINDF)	1.061
RMR	0.074
GFI	0.835
Adjusted GFI	0.755
Parsimony-adjusted GFI	0.563
Normed fit index (NFI)	0.772
Relative fit index (RFI)	0.690

Incremental fit index (IFI)	0.983
Tucker-Lewis index (TLI)	0.975
Comparative fit index (CFI)	0.982
Parsimony ratio (PRATIO)	0.735
Parsimony-adjusted NFI (PNFI)	0.568
Parsimony-adjusted CFI (PCFI)	0.722
RMSEA (PCLOSE)	0.028
P for test of close fit	0.866

The goodness-of-fit measures suggested that the modified model was better than the hypothesised model. All measures of the modified model surpassed the acceptable levels.

The results shown in table 6.10 provide partial support for hypothesis 4.1 in relation to the UK group.

H 5.1: PEU and PU of decision support systems fully mediate the influence of organisational characteristics variables on usage of DSS in SDM in both the UK and Egypt.

The hypothesised model for the Egypt group regarding organisational characteristics, after making a direct paths from PEU to PU, from 15C to Q3 and by allowing the indicated errors in Fig 14 to correlate, which means dropping the constraints that the correlation of these errors terms be zero; this produced a significant fit (χ^2 = 201, df = 197, p = .402).

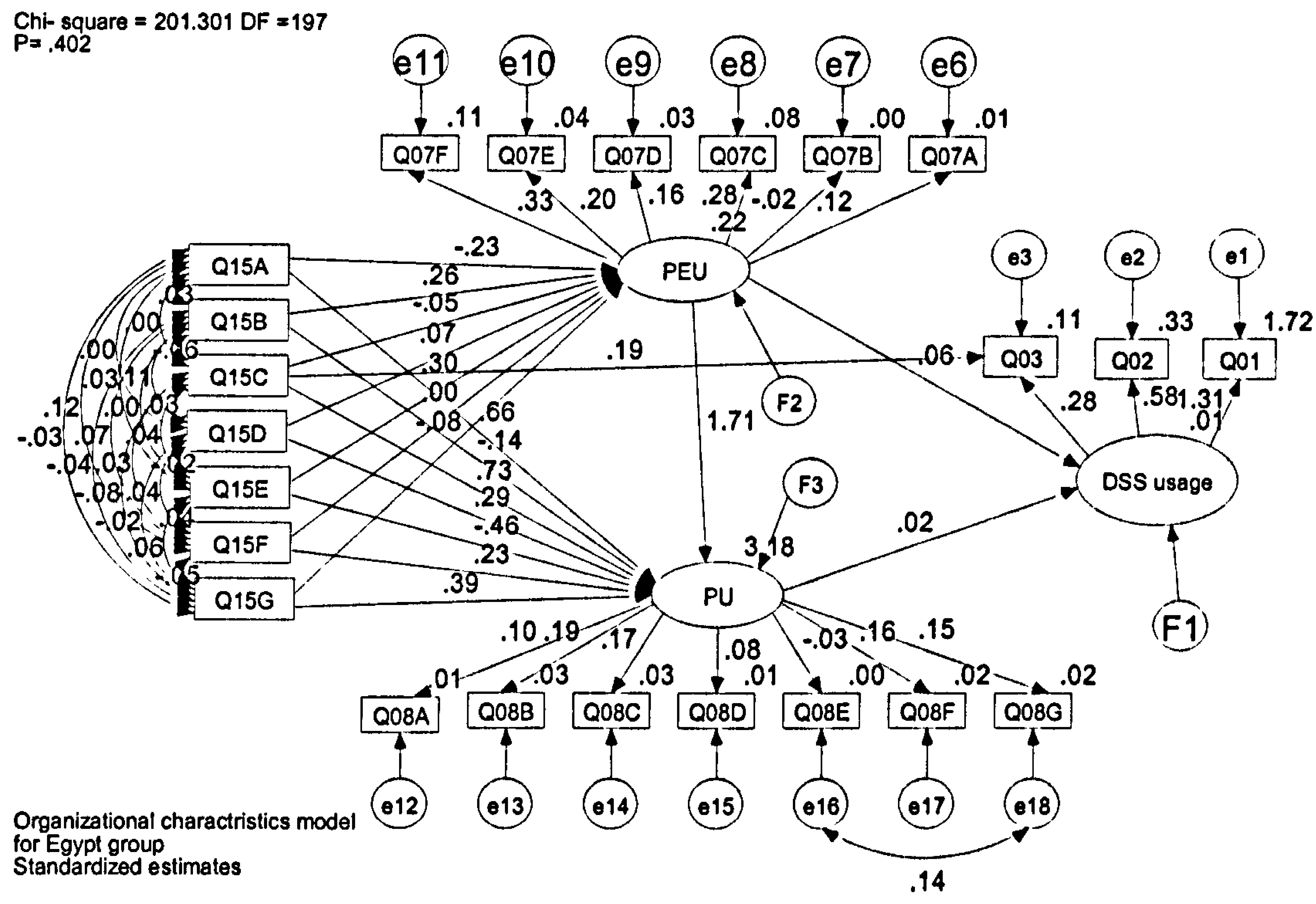

Figure 6.14 The effect of organisational characteristics, PEU and PU on DSS usage for the Egypt group

The goodness-of-fit measures for this model are summarised in table 6.12

Table 6.12 Fit measures for organisational characteristics model for the Egypt group

Fit measure	Organisational characteristics model
Discrepancy (CMIN)	201.301
Degrees of freedom	197
P	0.402
Number of parameters (NPAR)	79
Discrepancy / df (CMINDF)	1.022
RMR	0.071
GFI	0.945
Adjusted GFI	0.924
Parsimony-adjusted GFI	0.675

Normed fit index (NFI)	0.672
Relative fit index (RFI)	0.578
Incremental fit index (IFI)	0.990
Tucker-Lewis index (TLI)	0.985
Comparative fit index (CFI)	0.988
Parsimony ratio (PRATIO)	0.779
Parsimony-adjusted NFI (PNFI)	0.523
Parsimony-adjusted CFI (PCFI)	0.769
RMSEA (PCLOSE)	0.009
P for test of close fit	1.000

The goodness-of-fit measures suggested that the modified model was better than the hypothesised model. All measures of the modified model surpassed the acceptable levels.

The results shown in table 6.12 provide partial support for hypothesis 5.1 in relation to Egypt group

6.8 The hypothesised model for the UK group regarding internal support characteristics

After deleting access to help desk or hotline from the analysis and making a direct path from PEU to PU, this produced, as indicated in figure15, a significant model (χ^2 = 178.917, df = 167, p = .250). But, if all the items of the construct are taken on consideration, the resulted model produced less significant fit model than if this item is deleted (χ^2 = 178.597, df = 153, p = .077), however, the model still significant.

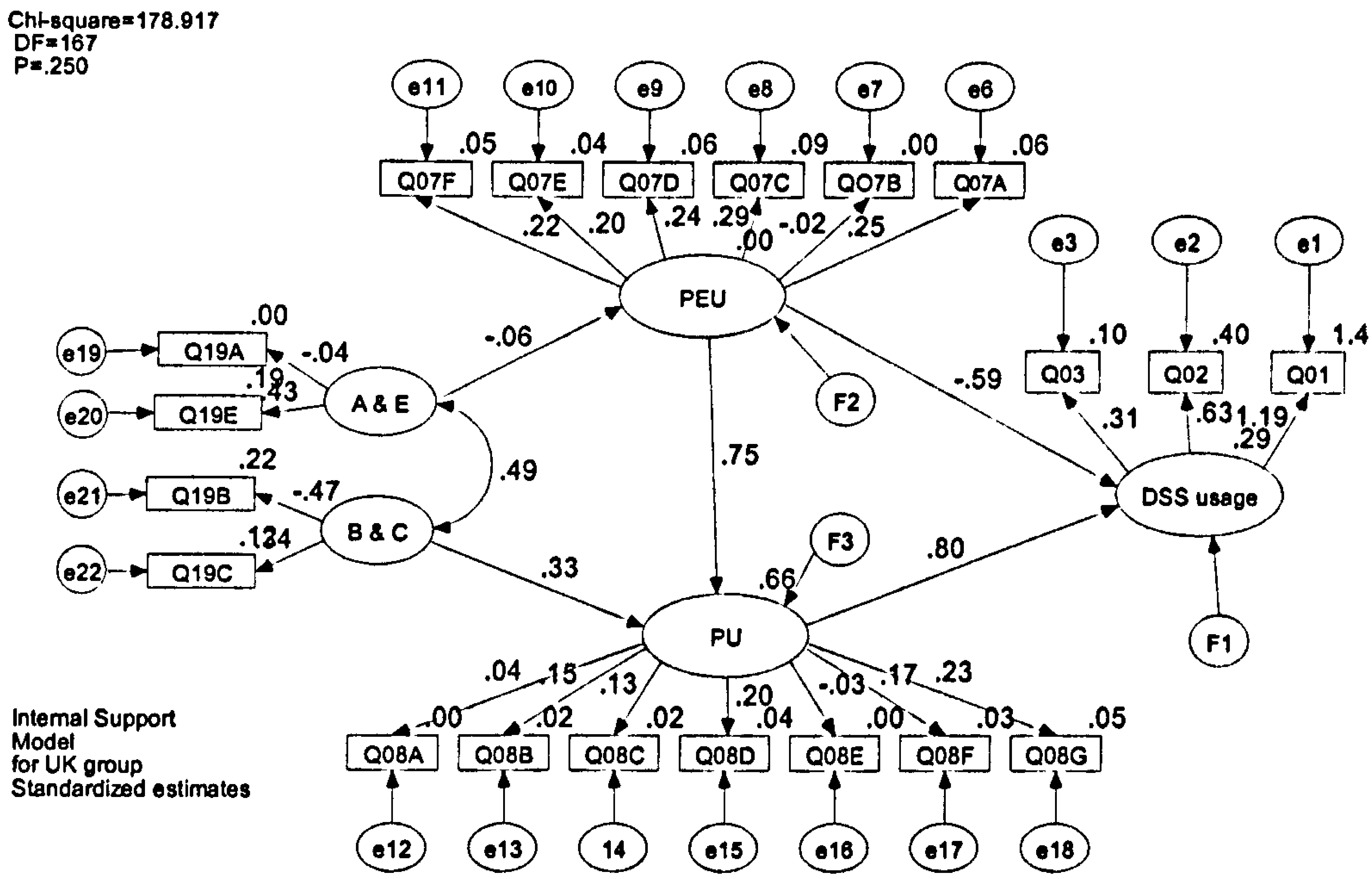

Figure 6.15 The effect of internal support characteristics, PEU and PU on DSS usage for the UK group

The goodness-of-fit measures for this model are summarised in table 6.13 as follows:

Table 6.13 Fit measures for organisational characteristics model for the UK group

Fit measure	Internal support characteristics for the UK
Discrepancy (CMIN)	178.917
Degrees of freedom	167
P	0.250
Number of parameters (NPAR)	43
Discrepancy / df (CMINDF)	1.071
RMR	0.072
GFI	0.944
Adjusted GFI	0.929
Parsimony-adjusted GFI	0.750
Normed fit index (NFI)	0.662
Relative fit index (RFI)	0.615
Incremental fit index (IFI)	0.967

Tucker-Lewis index (TLI)	0.960
Comparative fit index (CFI)	0.965
Parsimony ratio (PRATIO)	0.879
Parsimony-adjusted NFI (PNFI)	0.582
Parsimony-adjusted CFI (PCFI)	0.848
RMSEA (PCLOSE)	0.016
P for test of close fit	1.000

The results shown in table 6.13 provide support for rejecting hypothesis 6.1 in relation to the UK group.

H 6.1: PEU and PU of decision support systems fully mediate the influence of internal support characteristics variables on usage of DSS in SDM in both the UK and Egypt.

*The hypothesised model for the **Egypt** group regarding internal support characteristics*, after making a direct paths from PEU to PU, as indicated in figure 16; this produced a significant fit (χ^2 = 173.021, df= 171, p = .442).

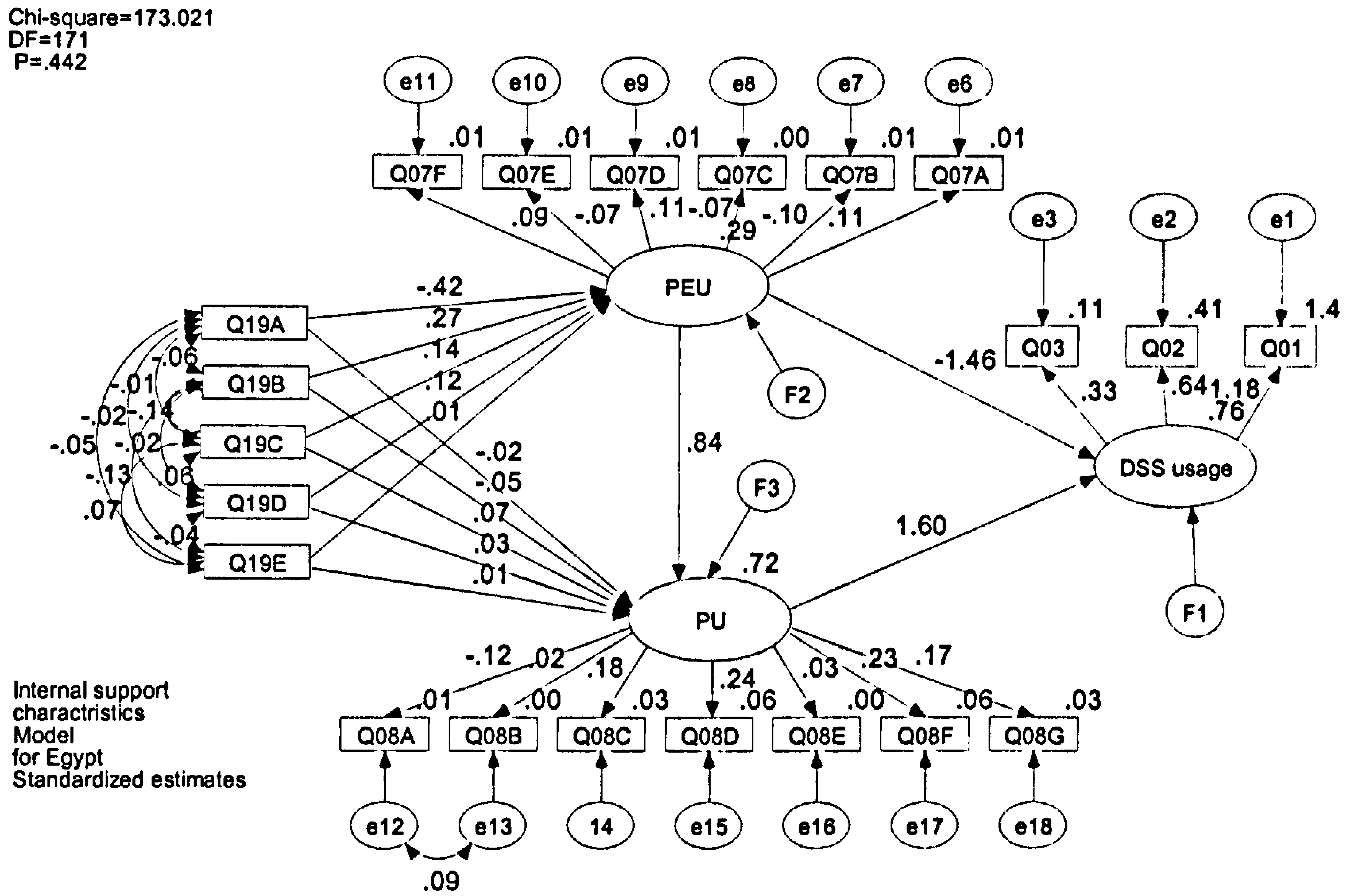

Figure 6.16 The effect of internal support characteristics, PEU and PU on DSS usage for Egypt group

The goodness of fit measures for this model are summarised in table 6.13 as follows:

Table 6.14 Fit measures for organisational characteristics model for the Egypt group

Fit Measure	Internal support characteristics model for Egypt group
Discrepancy (CMIN)	173.021
Degrees of freedom	171
P	0.442
Number of parameters (NPAR)	60
Discrepancy / df (CMINDF)	1.012
RMR	0.071
GFI	0.948
Adjusted GFI	0.929
Parsimony-adjusted GFI	0.702

Normed fit index (NFI)	0.679
Relative fit index (RFI)	0.606
Incremental fit index (IFI)	0.995
Tucker-Lewis index (TLI)	0.992
Comparative fit index (CFI)	0.994
Parsimony ratio (PRATIO)	0.814
Parsimony-adjusted NFI (PNFI)	0.553
Parsimony-adjusted CFI (PCFI)	0.809
RMSEA (PCLOSE)	0.006
P for test of close fit	1.000

The goodness-of-fit measures suggested that the modified model was better than the hypothesised model. All measures of the modified model surpassed the acceptable levels

The results shown in table 6.14 provide partial support for hypothesis 6.1 in relation to Egypt group

6.9 The hypothesised model for the UK group regarding external support characteristics

Although the researcher did the modification by making a direct paths from PEU to PU, from 8C to Q03, from 7E to 8D and also by allowing the indicated errors to correlate, which means dropping the constraints that the correlation of these errors terms be zero as indicated in figure 14, this produced an insignificant fit (χ^2 = 184.819, df = 136, p = .003). In this case, the model is rejected as not being a good fit with the data.

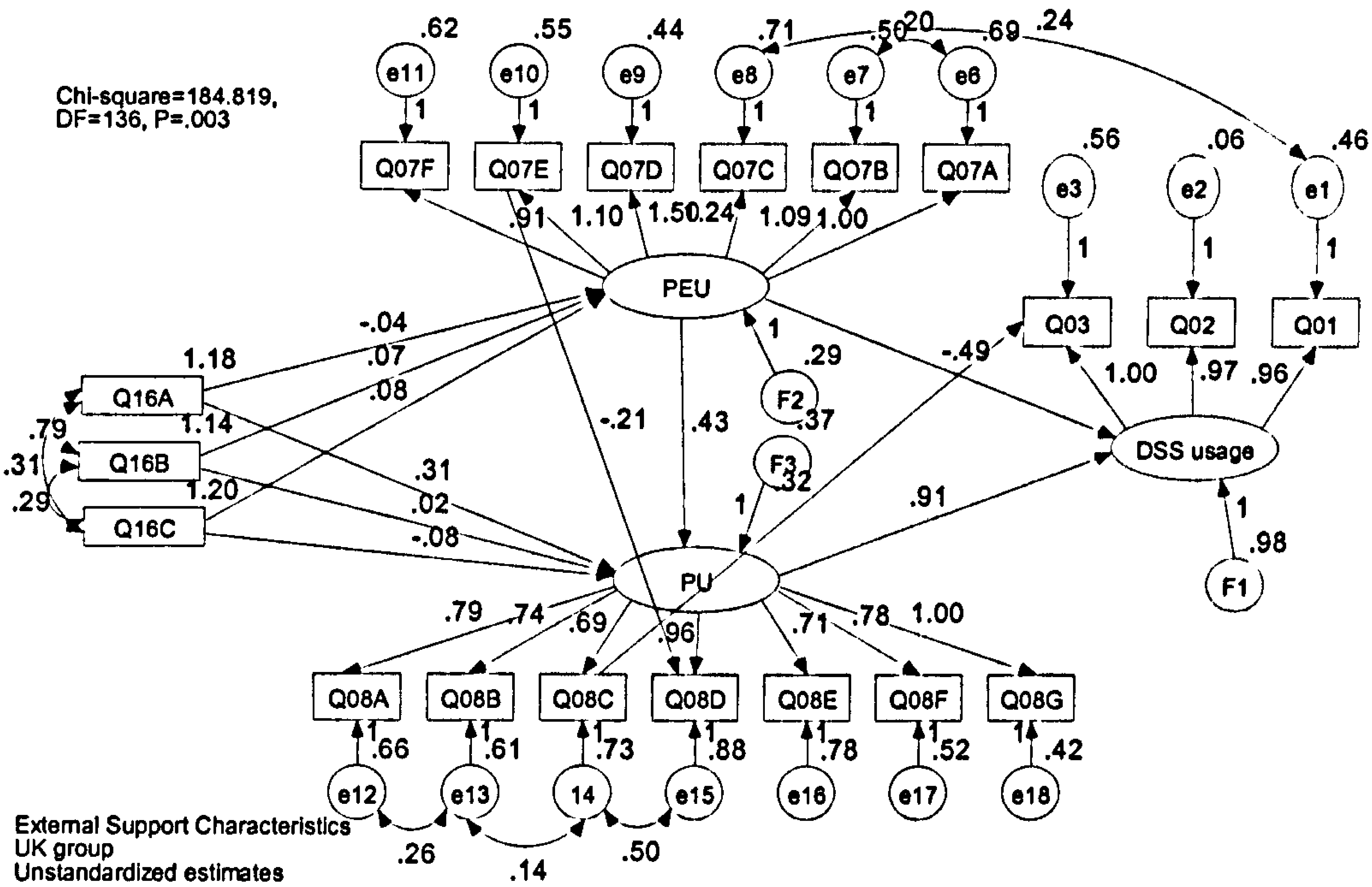

Figure 6.17 The effect of external support characteristics, PEU and PU on DSS usage for the UK group

The goodness-of-fit measures for this model are summarised in table 6.15.

Table 6.15 Fit Measures for external support characteristics model for the UK group

Fit measure	External support characteristics for the UK group
Discrepancy (CMIN)	184.819
Degrees of freedom	136
P	0.003
Number of parameters (NPAR)	54
Discrepancy / df (CMINDF)	1.359
RMR	0.084
GFI	0.824
Adjusted GFI	0.754
Parsimony-adjusted GFI	0.590
Normed fit index (NFI)	0.771

Relative fit index (RFI)	0.712
Incremental fit index (IFI)	0.927
Tucker-Lewis index (TLI)	0.904
Comparative fit index (CFI)	0.923
Parsimony ratio (PRATIO)	0.795
Parsimony-adjusted NFI (PNFI)	0.613
Parsimony-adjusted CFI (PCFI)	0.734
RMSEA (PCLOSE)	0.068
P for test of close fit	0.128

The goodness-of-fit measures suggested that the modified model was not better than the hypothesised model. Most of the measures of the modified model were below the acceptable levels except the RMSEA and CMINDF.

The results shown in table 6.15 provide an evidence for rejecting hypothesis 7.1 in relation to the UK group.

H 7.1: PEU and PU of decision support systems fully mediate the influence of external support characteristics variables on usage of DSS in SDM in both the UK and Egypt.

The hypothesised model for the Egypt group regarding external support characteristics, produced a significant fit (χ^2 = 168.819, df = 144, p = .077).

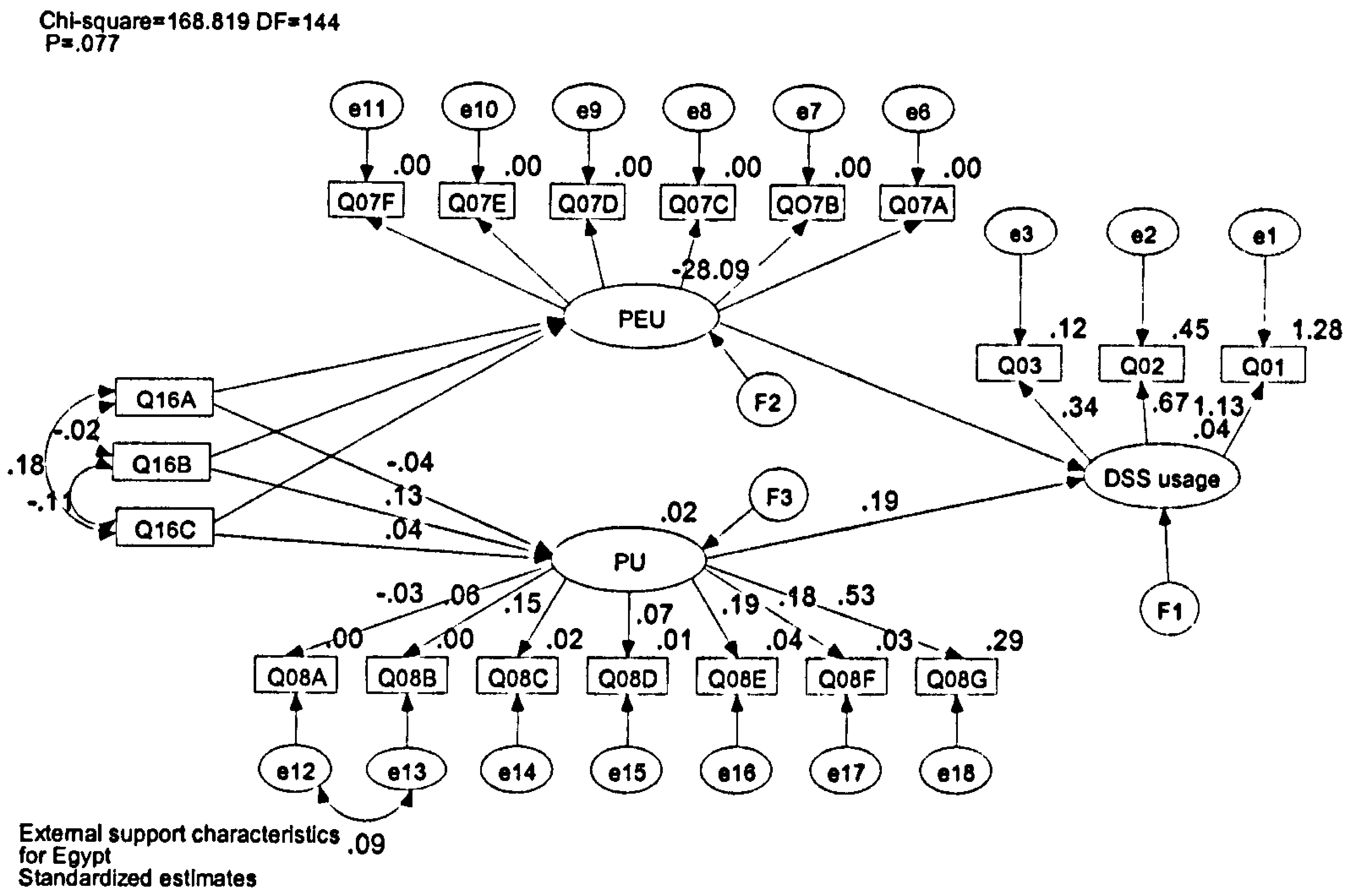

Figure 6.18 The effect of external support characteristics, PEU and PU on DSS usage for the Egypt group

The goodness-of-fit measures for this model are summarised in table 6.16.

Table 6.16 Fit measures for external support characteristics model for the Egypt group

Fit measure	External support characteristics for Egypt group
Discrepancy (CMIN)	168.819
Degrees of freedom	144
P	0.077
Number of parameters (NPAR)	46
Discrepancy / df (CMINDF)	1.172
RMR	0.079
GFI	0.944
Adjusted GFI	0.926
Parsimony-adjusted GFI	0.716
Normed fit index (NFI)	0.675
Relative fit index (RFI)	0.614
Incremental fit index (IFI)	0.934

Tucker-Lewis index (TLI)	0.915
Comparative fit index (CFI)	0.929
Parsimony ratio (PRATIO)	0.842
Parsimony-adjusted NFI (PNFI)	0.568
Parsimony-adjusted CFI (PCFI)	0.782
RMSEA (PCLOSE)	0.024
P for test of close fit	1.000

The goodness-of-fit measures suggested that the modified model was better than the hypothesised model. All measures of the modified model surpassed the acceptable levels.

The results shown in table 6.16 provide a partial support for hypothesis 7.1 in relation to the Egypt group.

6.10 The hypothesised model for the UK group regarding decision-maker characteristics

Although the researcher did the modification by making a direct paths from PEU to PU, from 18K to 8A, from 18C to Q3 and also by allowing the indicated errors to correlate, which means dropping the constraints that the correlation of these errors terms be zero as indicated in figure 17, this produced an insignificant fit (χ^2 = 409.432, df = 265, p = .000). In this case, the model is rejected as not being a good fit with the data.

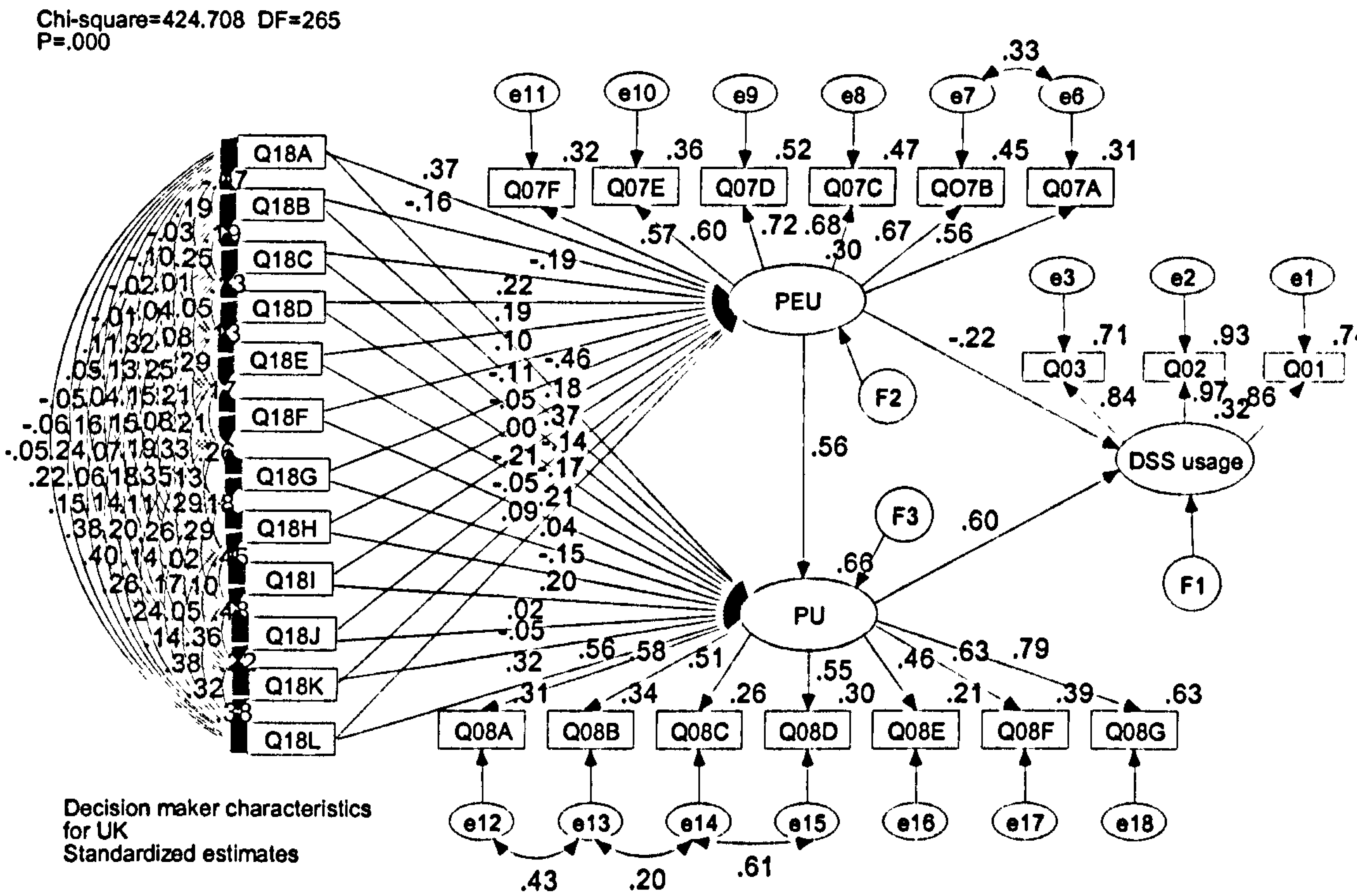

Figure 6.19 The effect of decision-maker characteristics, PEU and PU on DSS usage for the UK group

The goodness-of-fit measures for this model are summarised in table 6.17 as follows:

Table 6.17 Fit measures for decision maker characteristics model for the UK group

Fit measure	Decision maker characteristics model for the UK group
Discrepancy (CMIN)	424.708
Degrees of freedom	265
P	0.000
Number of parameters (NPAR)	141
Discrepancy / df (CMINDF)	1.603
RMR	0.087
GFI	0.760
Adjusted GFI	0.632
Parsimony-adjusted GFI	0.496

Normed fit index (NFI)	0.645
Relative fit index (RFI)	0.493
Incremental fit index (IFI)	0.828
Tucker-Lewis index (TLI)	0.721
Comparative fit index (CFI)	0.805
Parsimony ratio (PRATIO)	0.701
Parsimony-adjusted NFI (PNFI)	0.452
Parsimony-adjusted CFI (PCFI)	0.564
RMSEA (PCLOSE)	0.088
P for test of close fit	0.000

The goodness-of-fit measures suggested that the modified model was better than the hypothesised model. All measures of the modified model were below the acceptable levels.

The results shown in table 6.17 provide an evidence for rejecting hypothesis 8.1 in relation to the UK group.

H 8.1 PEU and PU of decision support systems fully mediate the influence of decision-maker characteristics variables on usage of DSS in SDM in both the UK and Egypt.

The hypothesised model for the Egypt group regarding decision-maker characteristics, after the researcher did the modification by making a direct paths from PEU to PU, from 18F to DSS usage, from18D to 8B, from 8F to 7F, from Q2 to Q 1 and also by allowing the indicated errors to correlate, which means dropping the constraints that the correlation of these errors terms be zero as indicated in figure 18; this produced significant fit (χ^2 = 292.842, df = 266, p = .124).

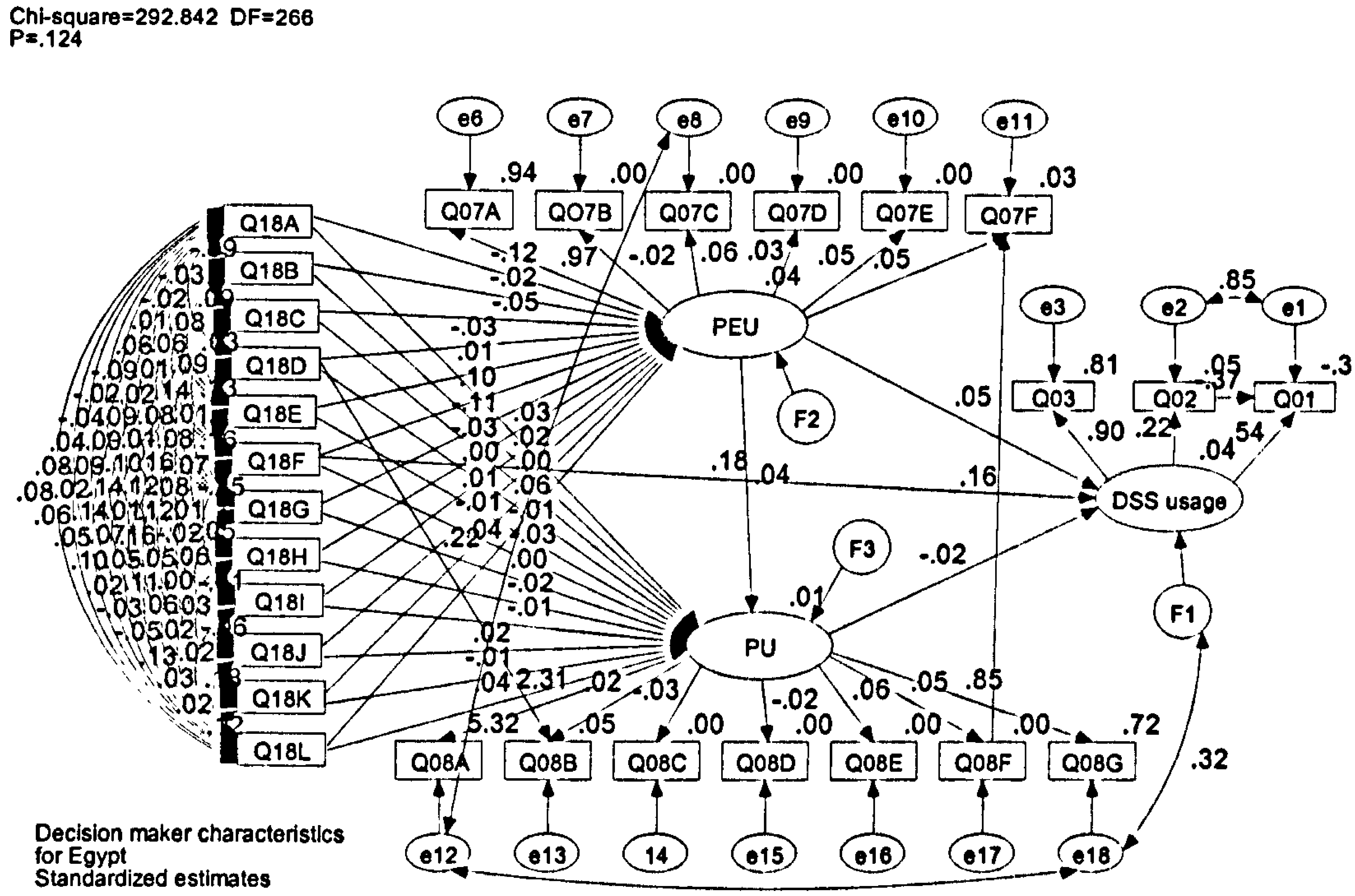

Figure 6.20 The effect of decision maker characteristics, PEU and PU on DSS usage for the Egypt group

The goodness of fit measures for this model are summarised in table 6.18.

Table 6.18 Fit Measures for decision maker characteristics model for the Egypt group

Fit measure	Decision-maker characteristics model for Egypt
Discrepancy (CMIN)	292.842
Degrees of freedom	266
P	0.124
Number of parameters (NPAR)	140
Discrepancy / df (CMINDF)	1.101
RMR	0.068
GFI	0.934
Adjusted GFI	0.900
Parsimony-adjusted GFI	0.612

Normed fit index (NFI)	0.642
Relative fit index (RFI)	0.492
Incremental fit index (IFI)	0.951
Tucker-Lewis index (TLI)	0.913
Comparative fit index (CFI)	0.939
Parsimony ratio (PRATIO)	0.704
Parsimony-adjusted NFI (PNFI)	0.452
Parsimony-adjusted CFI (PCFI)	0.661
RMSEA (PCLOSE)	0.019
P for test of close fit	1.000

The goodness-of-fit measures suggested that the modified model was better than the hypothesised model. All measures of the modified model surpassed the acceptable levels.

The results shown in table 6.18 provide a partial support for hypothesis 8.1 in relation to the Egypt group

6.11 The Hypothesised Model for the UK Group Regarding Top Management Characteristics

After making a direct paths from PEU to PU, from 21A to Q3, from 21C to Q2 and 8E, from 21B to Q8E, from 21D to 7B, from 21 F to 8 G and also by allowing the indicated errors in Fig 19 to correlate, which means dropping the constraints that the correlation of these errors terms be zero; this produced a significant fit (χ^2 = 190.847, df= 170, p = .131).

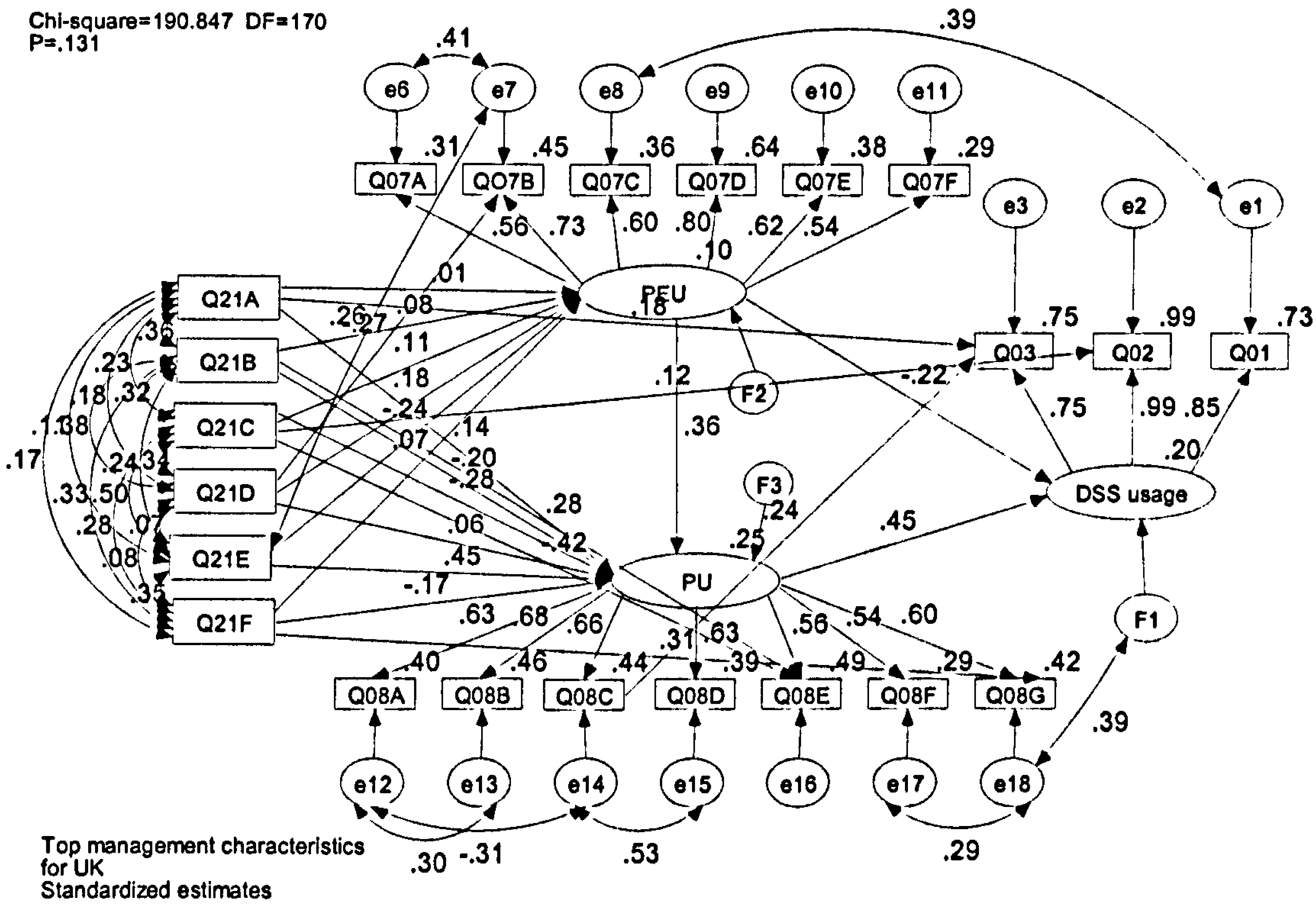

Figure 6.21 The effect of top management characteristics, PEU and PU on DSS usage for the UK group

The goodness-of-fit measures for this model are summarised in table 6.19.

Table 6.19 Fit measures for top management characteristics model for the UK group

Fit measure	Top management characteristics model for UK group
Discrepancy (CMIN)	190.847
Degrees of freedom	170
P	0.131
Number of parameters (NPAR)	83
Discrepancy / df (CMINDF)	1.123
RMR	0.081
GFI	0.830
Adjusted GFI	0.747
Parsimony-adjusted GFI	0.558
Normed fit index (NFI)	0.789
Relative fit index (RFI)	0.713

Incremental fit index (IFI)	0.972
Tucker-Lewis index (TLI)	0.958
Comparative fit index (CFI)	0.969
Parsimony ratio (PRATIO)	0.736
Parsimony-adjusted NFI (PNFI)	0.581
Parsimony-adjusted CFI (PCFI)	0.713
RMSEA (PCLOSE)	0.040
P for test of close fit	0.706

The goodness-of-fit measures suggested that the modified model was better than the hypothesised model. Most of the measures of the modified model surpassed the acceptable levels

The results shown in table 6.19 provide partial support for hypotheses 9.1 in relation to the UK group.

H 9.1: PEU and PU of decision support systems fully mediate the influence of top management characteristics variables on usage of DSS in SDM in both the UK and Egypt.

The hypothesised model for the Egypt group regarding top management characteristics, after making a direct paths from PEU to PU, as indicated in figure 20 and from 21B to Q3; this produced a significant fit (χ^2 = 199.883, df= 186, p = .231).

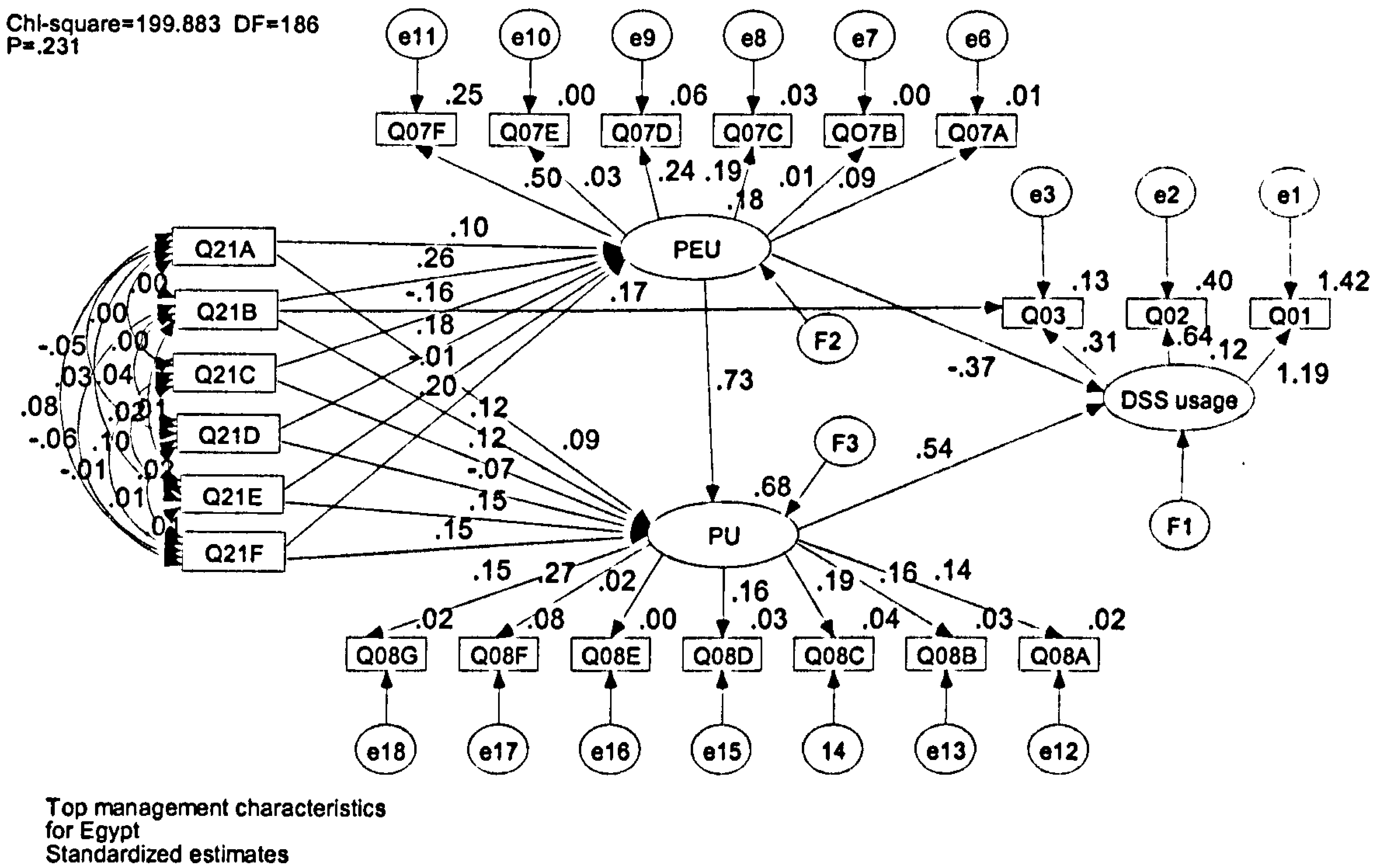

Figure 6.22 The effect of top management characteristics, PEU and PU on DSS usage for Egypt group

The goodness-of-fit measures for this model are summarised in table 6.20.

Table 6.20 Fit measures for top management characteristics model for the Egypt group

Fit measure	Top management characteristics model for Egypt
Discrepancy (CMIN)	199.883
Degrees of freedom	186
P	0.231
Number of parameters (NPAR)	67
Discrepancy / df (CMINDF)	1.075
RMR	0.072
GFI	0.942
Adjusted GFI	0.921
Parsimony-adjusted GFI	0.693

Normed fit index (NFI)	0.657
Relative fit index (RFI)	0.573
Incremental fit index (IFI)	0.965
Tucker-Lewis index (TLI)	0.951
Comparative fit index (CFI)	0.960
Parsimony ratio (PRATIO)	0.805
Parsimony-adjusted NFI (PNFI)	0.529
Parsimony-adjusted CFI (PCFI)	0.773
RMSEA (PCLOSE)	0.016
P for test of close fit	1.000

The goodness-of-fit measures suggested that the modified model was better than the hypothesised model. All measures of the modified model surpassed the acceptable levels.

The results shown in table 6.20 provide partial support for hypothesis 9.1 in relation to the Egypt group.

After analysing each construct as an individual model, and to understand the whole picture of the constructs, the researcher gathered all the constructs in one model for the two groups. Because of sample size limitations, multi-item constructs for the external variables were measured using a summated scale derived as the average value of all items pertaining to these constructs (Taylor and Todd 1995).

The hypothesised research model for the UK is shown in figure 23. The goodness-of-fit measures for this model are summarised in table 6.20 indicated a significant χ^2 = 231.641, df = 206, p = .106. This result indicated a good fit to some extent, as the probability level was above the generally accepted critical value p = .05. which supported the research hypotheses.

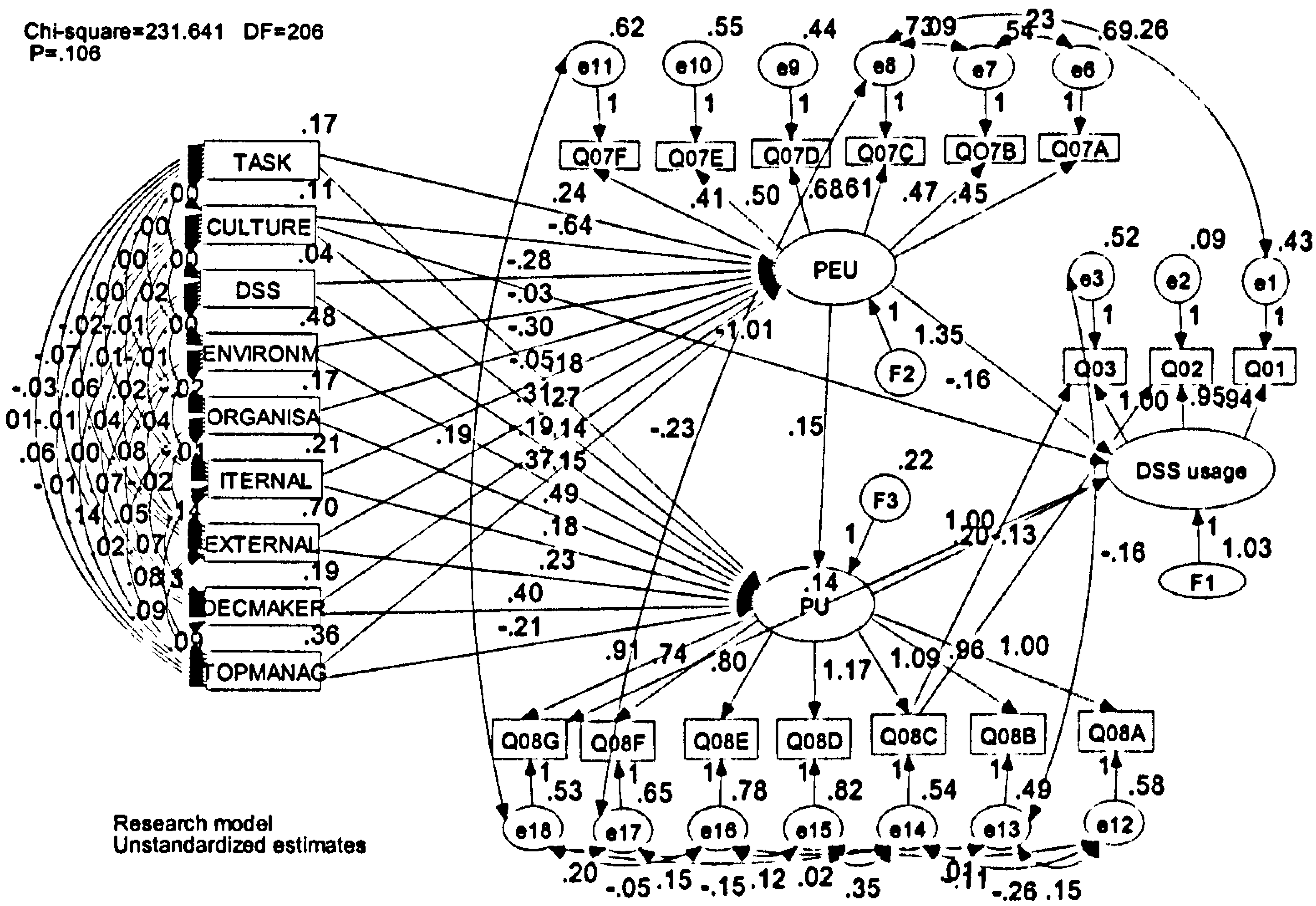

Figure 6.23 The effect of the all constructs on DSS usage in making SDM in the UK group

Table 6.21 Fit measures for the whole research model

Fit measure	Task characteristics model
Discrepancy (CMIN)	231.64
Degrees of freedom	206
P	0.11
Number of parameters (NPAR)	120
Discrepancy / df (CMINDF)	1.12
RMR	0.06
GFI	0.83
Adjusted GFI	0.73
Parsimony-adjusted GFI	0.52
Normed fit index (NFI)	0.76
Relative fit index (RFI)	0.65
Incremental fit index (IFI)	0.97
Tucker-Lewis index (TLI)	0.94

Comparative fit index (CFI)	0.96
Parsimony ratio (PRATIO)	0.69
Parsimony-adjusted NFI (PNFI)	0.52
Parsimony-adjusted CFI (PCFI)	0.66
RMSEA (PCLOSE)	0.04
P for test of close fit	0.72

The parameter estimates and their t-values are shown in table 6.22

Table 6.22 Regression weights for the UK group

Parameters		Estimate	SE	p
PEU	← External support	0.31		
PEU	← Internal support	-0.05		
PEU	← Top management	0.37		
PEU	← Decision maker	-0.19		
PEU	← Culture	-0.64		
PEU	← DSS	-0.28		
PEU	← Environmental	-0.03		
PEU	← Organisational	-0.30		
PEU	← Task	0.24		
PU	← Decision maker	0.40	0.19	0.03**
PU	← Top management	-0.21	1.32	0.12
PU	← Internal support	0.18	0.16	0.26
PU	← External support	0.23	0.10	0.02**
PU	← Organisational	0.49	.18	0.006**
PU	← Environmental	0.15	0.10	0.13
PU	← DSS	-0.14	0.32	0.66
PU	← Culture	0.27	0.22	0.22
PU	← Task	0.18	0.16	0.24
PU	← PEU	0.151		
DSS usage	← PU	0.90233		
DSS usage	← PEU	-0.14295		
DSS usage	←Culture	-0.92		
Q07D	← PEU	0.96		
Q07C	← PEU	0.61		
Q07B	← PEU	0.47		

Q02	←DSS Usage	1.05		
Q07E	← PEU	0.501		
Q03	←DSS Usage	1.103		
Q01	←DSS Usage	1.104	10.63	0.00***
Q08E	← PU	0.80	0.23	0.00***
Q08D	← PU	1.17	0.29	0.00***
Q08C	← PU	0.29	3.81	0.00***
Q08G	← PU	0.91	0.24	0.00***
Q08F	← PU	0.74	0.20	0.00***
Q08A	← PU	1.00		
Q08B	← PU	0.96	0.18	0.00***
Q07A	← PEU	0.46		
Q07F	← PEU	0.41		
Q03	← Q08C	0.199	0.11	0.06*
Q02	← Q08C	-0.127	0.075	0.09*
Q08G	←DSS Usage	0.16		

Note: Data are maximum likelihood estimates. Estimates without a P value are fixed parameters. P values significant at 0.10 are followed by *, at level 0,05 followed by ** at level 0.001 followed by ***.

The hypothesised research model for the ***Egypt group*** is shown in figure 24. The goodness-of-fit measures for this model are summarised in table 6.22 and indicated a significant χ^2 = 246.58, df = 225, p = .154. This result indicated a good fit as the probability level was above the generally accepted critical value p = .05. which supported the research hypotheses.

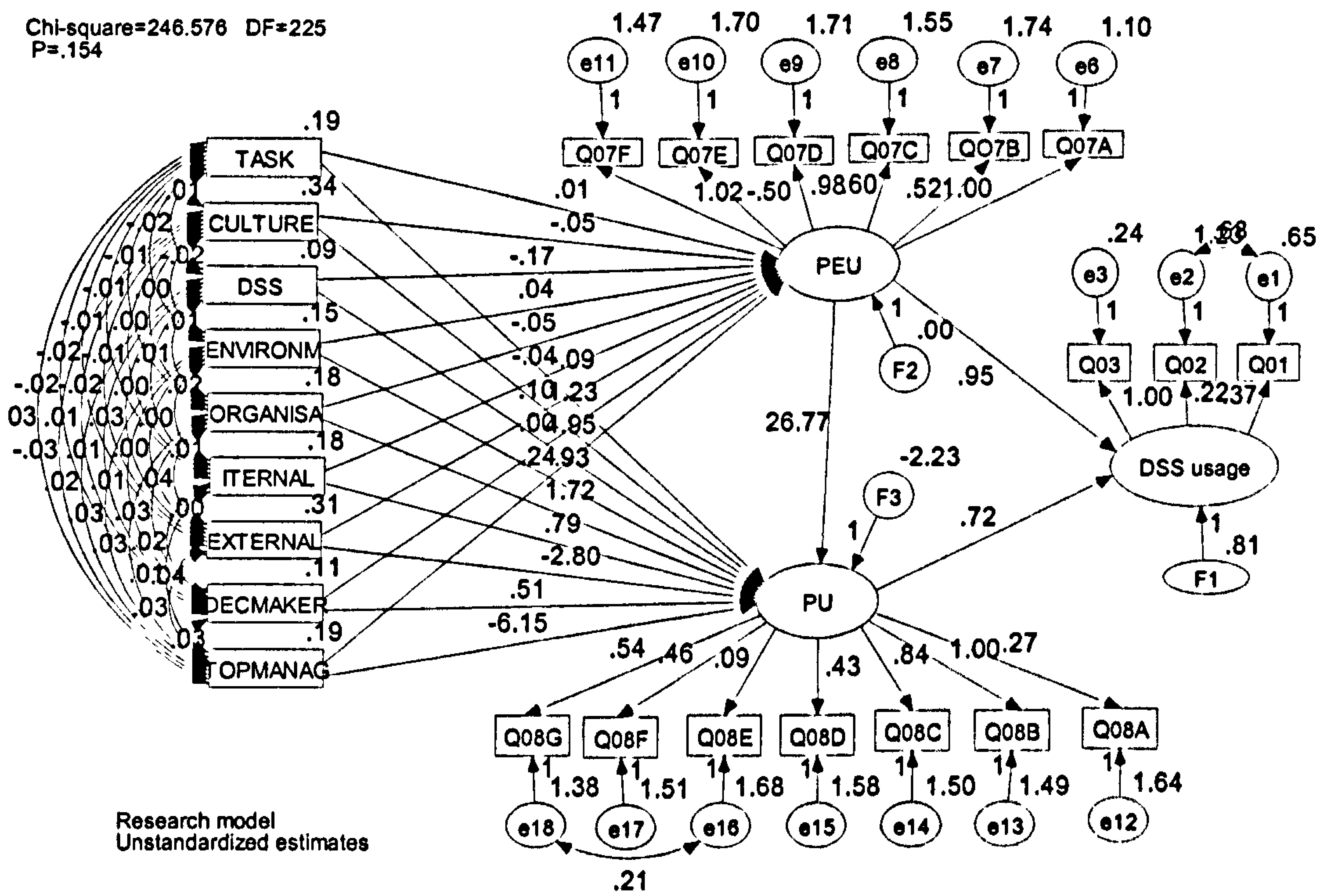

Figure 6.24 The effect of the all constructs on DSS usage in making SDM in Egypt group

Table 6.23 Fit measures for the whole research model

Fit measure	Task characteristics model
Discrepancy (CMIN)	246.58
Degrees of freedom	225
P	0.15
Number of parameters (NPAR)	100
Discrepancy / df (CMINDF)	1.10
RMR	0.06
GFI	0.94
Adjusted GFI	0.91
Parsimony-adjusted GFI	0.65
Normed fit index (NFI)	0.68
Relative fit index (RFI)	0.57
Incremental fit index (IFI)	0.96

Tucker-Lewis index (TLI)	0.94
Comparative fit index (CFI)	0.95
Parsimony ratio (PRATIO)	0.75
Parsimony-adjusted NFI (PNFI)	0.51
Parsimony-adjusted CFI (PCFI)	0.72
RMSEA (PCLOSE)	0.02
P for test of close fit	1.00

The parameter estimates and their t-values are shown in table 6.24

Table 6.24 Regression Weights for Egypt group

		Estimate	SE	P
PEU	← External support	0.10	0.07	0.14
PEU	← Internal support	-0.04	0.08	0.62
PEU	← Top management	0.24	0.10	0.02**
PEU	← Decision maker	0.00	0.11	0.98
PEU	← Culture	-0.05	0.06	0.43
PEU	← DSS	-0.17	0.12	0.17
PEU	← Environmental	0.04	0.09	0.64
PEU	← Organisational	-0.05	0.08	0.56
PEU	← Task	0.01	0.07	0.92
PU	← Decision maker	0.51	2.89	0.86
PU	← Top management	-6.15	59.56	0.92
PU	← Internal support	0.79	9.70	0.93
PU	← External support	-2.80	25.16	0.91
PU	← Organisational	1.72	12.26	0.89
PU	← Environmental	-0.93	10.24	0.93
PU	← DSS	4.95	42.34	0.91
PU	← Culture	1.23	11.41	0.91
PU	← Task	-0.09	2.70	0.97
PU	← PEU	26.77	250.75	0.91
DSS usage	← PU	0.72	0.21	0.00***
DSS usage	← PEU	0.95	0.54	0.08*
Q07D	← PEU	0.98	0.54	0.07*

Q07C	← PEU	0.60	0.45	0.19
Q07B	← PEU	0.52	0.47	0.26
Q02	←DSS Usage	0.22	0.10	0.03**
Q07E	← PEU	-0.50	0.46	0.27
Q03	←DSS Usage	1.00		
Q01	←DSS Usage	0.37	0.14	0.01**
Q08E	← PU	0.09	0.19	0.62
Q08D	← PU	0.43	0.20	0.03**
Q08C	← PU	0.84	0.24	0.00***
Q08G	← PU	0.54	0.20	0.01**
Q08F	← PU	0.46	0.20	0.02**
Q08A	← PU	0.27	0.19	0.16
Q08B	← PU	1.00		
Q07A	← PEU	1.00		
Q07F	← PEU	1.02	0.53	0.05**

Note: Data are maximum likelihood estimates. Estimates without a P value are fixed parameters. P values significant at 0.10 are followed by *, at level 0.05 followed by ** at level 0.001 followed by ***.

6.12 Difference in perceptions about the effect of task characteristics between the two groups

The objective in each hypothesis is to compare the similarities and differences between the UK and Egypt about the variables that affect DSS usage in making strategic decisions. T-tests are the most appropriate for such analysis. They provide a method for comparing between two independent groups. The following table headed "independent samples test" provides the inferential statistics. This table provides information for two different t-tests: one where the variances of the population are assumed to be equal and one where the population variances are not assumed to be equal. Fortunately, there is a test that can be performed to see whether the variances are different enough to cause concern. Levene's test (as it is known) is similar to a t-test in that it tests the hypothesis that the variances in the two groups are equal. Therefore, if Levene's test is significant at $p \leq 0.05$ then we can conclude that the null hypothesis is incorrect and that the variances are significantly different, therefore, the assumption of homogeneity of variances has been violated. If, however, Levene's test is non-significant, then we must accept the null hypothesis that the difference between the variances is zero; the variances are roughly equal and the assumption is tenable. In short, the following rule is applied:

- read across the first row labelled equal variances assumed, and
- If you find that the value under Sig. Is $\leq$ 0.05 continue along that line to assess whether the means are significantly different; or
- if you find that the value under Sig. Is $\succ$ 0.05 refer to the t-test in the next row labelled Equal variances not assumed.

Usually the two estimates will agree with each other in terms of whether to reject or not reject the null but, in strict terms, the relevant estimate should be used, either that for equal or unequal variances.

Applying this rule to the following data, significant differences between the two groups were found in this group of variables. There is a significant difference between the UK group and the Egypt group in relation to the whole variables of this group where $P < 0.05$ in all variables.

Table 6.25 Difference between the two groups about the effect of task characteristics

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
complexity of problem	Equal variances assumed	4.854	.028	-4.644	370	.000	-.68	.15	-.96	-.39
	Equal variances not assumed			-5.141	143.845	.000	-.68	.13	-.94	-.42
complexity of analysis	Equal variances assumed	10.653	.001	6.221	370	.000	.73	.12	.50	.96
	Equal variances not assumed			6.849	142.549	.000	.73	.11	.52	.94
complexity of choice and implementation	Equal variances assumed	.457	.500	4.222	370	.000	.47	.11	.25	.69
	Equal variances not assumed			4.227	123.541	.000	.47	.11	.25	.69
SDM is too cmplex to be comuterises	Equal variances assumed	.789	.375	-3.948	370	.000	-.47	.12	-.71	-.24
	Equal variances not assumed			-3.551	108.737	.001	-.47	.13	-.74	-.21
SDM are too 'person centred to be computerised	Equal variances assumed	18.451	.000	-10.099	370	.000	-1.13	.11	-1.35	-.91
	Equal variances not assumed			-8.235	99.177	.000	-1.13	.14	-1.40	-.85
the effective of DSS usage in complex task	Equal variances assumed	.892	.346	-3.919	370	.000	-.48	.12	-.72	-.24
	Equal variances not assumed			-4.257	139.442	.000	-.48	.11	-.70	-.26

The results shown in table 6.25 provide evidence to reject the null hypotheses 1.2 in relation to there being no difference between the UK group and Egypt group.

> H 1.2: There is no significant difference between the UK group and the Egypt group about the effect of task characteristics on DSS usage in making strategic decisions.

6.13 Difference in perceptions about the effect of cultural characteristics between the two groups

There is a significant difference between the UK group and the Egypt group in relation to the effect of all variables of this group on using DSS in making strategic decisions. The results shown in table 6.26 provide evidence to reject the null hypothesis 2.2 in relation to there being no difference between the UK group and the Egypt group.

> H 2.2: There is no significant difference between the UK group and the Egypt group about the effect of cultural characteristics on DSS usage in making strategic decisions.

Table 6.26 Difference between the two groups about the effect of cultural characteristics

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
individualism	Equal variances assumed	19.070	.000	10.332	370	.000	1.08	.10	.87	1.29
	Equal variances not assumed			13.377	197.728	.000	1.08	8.07E-02	.92	1.24
masculinity	Equal variances assumed	20.211	.000	8.479	370	.000	1.15	.14	.88	1.41
	Equal variances not assumed			11.466	220.146	.000	1.15	1.00E-01	.95	1.34
the cultural gap	Equal variances assumed	47.807	.000	-8.739	370	.000	-1.16	.13	-1.42	-.90
	Equal variances not assumed			-12.881	276.740	.000	-1.16	9.01E-02	-1.34	-.98
uncertainty avoidance	Equal variances assumed	51.284	.000	-13.202	370	.000	-1.92	.15	-2.21	-1.64
	Equal variances not assumed			-18 869	254.688	.000	-1.92	.10	-2.12	-1.72
the effect of organizational cultural	Equal variances assumed	.625	.430	-5.314	370	.000	-.54	.10	-.74	-.34
	Equal variances not assumed			-5.968	147.466	.000	-.54	9.01E-02	-.72	-.36

6.14 Difference in perceptions about the effect of DSS characteristics between the two groups

There were significant differences between the UK group and the Egypt group in relation to the effect of adequacy of DSS storage, adequacy of DSS modelling capacity, accessibility of DSS, ease of use DSS, DSS meets the requirements of decision-makers, ease of finding the required data, whether using DSS is voluntary or compulsory, DSS reliability and, finally, whither the benefits from using DSS in making strategic decisions were tangible or intangible. From the other side, there were no significance differences found between the two groups about the effect of the overall cost effectiveness of DSS, adequacy of DSS processing and ease of use built-in help facility for assistance, on using DSS for making strategic decisions. The results shown in table 6.27 provide partial support for hypothesis 3.2.

H 3.2: there is no significant difference between the UK group and the Egypt group about the effect of DSS characteristics on DSS usage in making strategic decisions.

Table 6.27 Difference between the two groups about the effect of DSS characteristics

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
cost effectiveness of DSS	Equal variances assumed	.353	.553	.144	370	.886	1.38E-02	9.61E-02	-.18	.20
	Equal variances not assumed			.154	135.461	.878	1.38E-02	9.00E-02	-.16	.19
ease of use of DSS	Equal variances assumed	19.339	.000	-8.238	370	.000	-.87	.11	-1.08	-.66
	Equal variances not assumed			-10.486	189.998	.000	-.87	8.30E-02	-1.03	-.71
adequacy of DSS's data storage	Equal variances assumed	47.696	.000	8.990	370	.000	1.32	.15	1.03	1.61
	Equal variances not assumed			12.611	242.300	.000	1.32	.10	1.11	1.52
Adequacy of DSS's modeling capacity	Equal variances assumed	36.473	.000	8.705	370	.000	1.23	.14	.95	1.50
	Equal variances not assumed			11.833	223.098	.000	1.23	.10	1.02	1.43
Adequacy of DSS's processing	Equal variances assumed	12.957	.000	1.272	370	.204	.15	.12	-8 26E-02	.39
	Equal variances not assumed			1.502	161.845	.135	.15	.10	-4.76E-02	.35
Accessibility of DSS	Equal variances assumed	6.850	.009	-3.628	370	.000	-.38	.11	-.59	-.17
	Equal variances not assumed			-4.111	149.831	.000	-.38	9.29E-02	-.57	-.20
eaese of use built in help facility	Equal variances assumed	42.028	.000	1.210	370	.227	.17	.14	-.10	.43
	Equal variances not assumed			1.648	224.257	.101	.17	.10	-3.23E-02	.36
usage of DSS is voluntary/compulsory	Equal variances assumed	3.944	.048	16.795	370	.000	2.04	.12	1.80	2.28
	Equal variances not assumed			20.464	172.573	.000	2.04	9.96E-02	1.84	2.23
DSS meets the requirments of DM	Equal variances assumed	.270	.603	-4.016	370	.000	-.45	.11	-.67	-.23
	Equal variances not assumed			-4.304	136.416	.000	-.45	.10	-.65	-.24
DSS reliability	Equal variances assumed	14.671	.000	-4 848	370	.000	-.50	.10	-.71	-.30
	Equal variances not assumed			-5.973	176 648	.000	-.50	8.42E-02	-.67	-.34
Ease of finding the required data	Equal variances assumed	.093	.761	-5.750	370	.000	-.68	.12	-.92	-.45
	Equal variances not assumed			-5.835	125.841	.000	-.68	.12	-.91	-.45
Tangible/intangible benefits	Equal variances assumed	32.241	.000	13.257	370	.000	1.62	.12	1.38	1 86
	Equal variances not assumed			16.725	186.169	.000	1.62	9.71E-02	1.43	1.82

6.15 Difference in perceptions about the effect of environmental characteristics between the two groups

There were significant differences between the UK group and the Egypt group in relation to the whole variable of this group of variables where P was less than 0.05 in all these items, which means that there were significant differences between the means of these two samples which provide evidence to reject the null hypothesis 4.2.

H 4.2: There is no significant difference between the UK group and the Egypt group about the effect of environmental characteristics on DSS usage in making strategic decisions.

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Table 6.28 Difference between the two groups about the effect of environmental characteristics

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Competition among local governments	Equal variances assumed	25.937	.000	-11.432	370	.000	-1.35	.12	-1.58	-1.11
	Equal variances not assumed			-9.451	100.354	.000	-1.35	.14	-1.63	-1 06
favourable government policies	Equal variances assumed	.575	.449	-9.611	370	.000	-1.06	.11	-1.28	-.85
	Equal variances not assumed			-8.932	112.685	.000	-1.06	.12	-1.30	-.83
uncertainty in the environment	Equal variances assumed	3.749	.054	-9.174	370	.000	-.99	.11	-1.20	-.78
	Equal variances not assumed			-9.705	133.672	.000	-.99	.10	-1.19	-.79
Favourable market conditions	Equal variances assumed	.439	.508	2.893	370	.004	.41	.14	.13	.69
	Equal variances not assumed			2.764	116.384	.007	.41	.15	.12	.71

6.16 Difference in perceptions about the effect of organisational characteristics between the two groups

There were significant differences between the UK group and the Egypt group in relation to the effect of size of the organization, information intensity, and integration among department in relation to data /information exchange and sharing experience. Also, no significance difference was found between the two groups about the effect of position of DSS staff/department in the organisational structure, planning integration between using DSS and overall planning process, degree of decentralisation and the availability of computer facilities in the organization.

The results shown in table 6.29 provide partial support for hypothesis 5.2.

H 5.2: There is no significant difference between the UK group and the Egypt group about the effect of organisational characteristics on DSS usage in making strategic

Table 6.29 Difference between the two groups about the effect of organisational characteristics

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Size of the organization	Equal variances assumed	1.234	.267	3.690	370	.000	.50	.14	.23	.76
	Equal variances not assumed			3.795	128.228	.000	.50	.13	.24	.76
position of DSS staff/department	Equal variances assumed	1.943	.164	.192	370	.848	2.80E-02	.15	-.26	.31
	Equal variances not assumed			.200	130.070	.842	2.80E-02	.14	-.25	.31
degree of decentralization	Equal variances assumed	12.482	.000	-.034	370	.973	-4.93E-03	.15	-.29	.28
	Equal variances not assumed			-.038	149.223	.970	-4.93E-03	.13	-.26	.25
information intensity	Equal variances assumed	17.441	.000	7.038	370	.000	.95	.14	.69	1.22
	Equal variances not assumed			8.717	178.757	.000	.95	.11	.74	1.17
integration among departments	Equal variances assumed	41.571	.000	6.439	370	.000	.90	.14	.62	1.17
	Equal variances not assumed			8.511	207.888	.000	.90	.11	.69	1.10
planning integration	Equal variances assumed	1.362	.244	.222	370	.825	2.76E-02	.12	-.22	.27
	Equal variances not assumed			.235	134.211	.814	2.76E-02	.12	-.20	.26
computer facilities	Equal variances assumed	5.742	.017	-1.778	370	.076	-.19	.11	-.40	1.99E-02
	Equal variances not assumed			-1.779	123.460	.078	-.19	.11	-.40	2.11E-02

6.17 Difference in perceptions about the effect of internal support characteristics between the two groups

There were significant differences between the UK group and the Egypt group in relation to all variables of this group where P was less than 0.05 except for the variables where there were no significant differences found which are: training consultation within the organisation and providing library (where p= 0.288 and p= 0.999 in order).

The results shown in table 6.30 provide evidence to partially reject the null hypothesis 6.2.

H 6.2: There is no significant difference between the UK group and the Egypt group about the effect of internal support characteristics on DSS usage in making SD.

Table 6.30 Difference between the two groups about the effect of internal support

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
training / consultation within organization	Equal variances assumed	4.200	.041	-1.064	370	.288	-.12	.11	-.33	9.89E-02
	Equal variances not assumed			-1.101	129.430	.273	-.12	.11	-.33	9.28E-02
advice provided by other colleagues	Equal variances assumed	1.522	.218	-7.545	370	.000	-.71	9.43E-02	-.90	-.53
	Equal variances not assumed			-6.962	111.783	.000	-.71	.10	-.91	-.51
providing library	Equal variances assumed	5.830	.016	-.001	370	.999	-1.30E-04	.14	-.27	.27
	Equal variances not assumed			-.001	135.960	.999	-1.30E-04	.13	-.25	.25
access to help desk	Equal variances assumed	26.801	.000	6.400	370	.000	.90	.14	.62	1.18
	Equal variances not assumed			8.068	185.874	.000	.90	.11	.68	1.12
Experience of DSS staff	Equal variances assumed	32.155	.000	2.551	370	.011	.34	.13	7.73E-02	.60
	Equal variances not assumed			3.192	182.804	.002	.34	.11	.13	.55

6.18 Difference in perceptions about the quality of internal support between the two groups

There was a significant difference between the UK group and Egypt group about the quality of internal supports that the decision-makers get from the organization.

The results shown in table 6.31 provide evidence to reject this part of hypothesis 6.2 related to the quality of internal support:

> H 6.2: There is no significant difference between the UK group and the Egypt group about the effect of internal support characteristics on DSS usage in making strategic decisions.

Table 6.31 Difference between the two groups about quality of internal support

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
quality of internal support	Equal variances assumed	11.711	.001	6.712	368	.000	.87	.13	.62	1.13
	Equal variances not assumed			7.571	149.183	.000	.87	.12	.65	1.10

6.19 Difference in perceptions about the effect of external support characteristics between the two groups

There were significant differences between the UK group and the Egypt group in relation to the whole variable of this group of variables where P was less than 0.05 in all these items, which means that there were significant differences between the means of these two samples.

The results shown in table 6.32 provide evidence to partially reject the null hypothesis 7.2.

H 6.2: There is no significant difference between the UK group and the Egypt group about the effect of external support characteristics on DSS usage on making strategic decisions.

Table 6.32 Difference between the two groups about the effect of external support

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
recommendation from outside consultants	Equal variances assumed	.994	.319	-4.122	370	.000	-.58	.14	-.85	-.30
	Equal variances not assumed			-4.161	124.902	.000	-.58	.14	-.85	-.30
advice and support from vendor	Equal variances assumed	.388	.534	-3.439	370	.001	-.44	.13	-.69	-.19
	Equal variances not assumed			-3.262	115.411	.001	-.44	.13	-.70	-.17
Support from government agencies	Equal variances assumed	25.580	.000	-9.691	370	.000	-1.01	.10	-1.22	-.81
	Equal variances not assumed			-7.723	97.344	.000	-1.01	.13	-1.28	-.75

6.20 Difference in perceptions of the quality of external support between the two groups

There was a significant difference between the UK group and the Egypt group about the quality of internal support that the decision-makers got from the organization (where p= .006).

The results shown in table 6.33 provide evidence to reject this part of hypothesis 7.2 related to the quality of internal support.

H 7.2: There is no significant difference between the UK group and the Egypt group about the effect of external support characteristics in DSS usage on making strategic decisions.

Table 6.33 Difference between the two groups about the quality of external support

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Quality of external supp	Equal variances assumed	.001	.979	2.810	370	.005	.29	.10	8.77E-02	.50
	Equal variances not assumed			2.778	121.505	.006	.29	.11	8.40E-02	.50

6.21 Difference in perceptions about the effect of decision-makers characteristics between the two groups

There were significant differences between the UK group and the Egypt group in relation to the effect of the following variables on using DSS to make strategic decisions: years of experience the decision-makers had, self efficiency of the decision makers, attitudes toward DSS, level of training and education, innovativeness of decision-maker, familiarity with DSS usage, ability to change and use new methods to make strategic decisions and confidence in DSS usage. Also, no significance difference was found between the two groups about the effect of cognitive style (analytical or heuristic), fear from using DSS in making strategic decisions, involvement in the development of DSS and the ability to interpret DSS output on using DSS on making strategic decisions (Where p= 0.79, p= .721, p= .0294 and p= 0.542 in order).

The results shown in table 6.34 provide evidence to reject partially hypothesis 8.2.

H 8.2: There is no significant difference between the UK group and the Egypt group about the effect of decision maker characteristics on DSS usage in making strategic decisions.

Table 6.34 Difference between the two groups about the effect of DM characteristics

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
years of experience	Equal variances assumed	2.402	.122	-5.338	370	.000	-.49	9.14E-02	-.67	-.31
	Equal variances not assumed			-5.200	119.197	.000	-.49	9.38E-02	-.67	-.30
cognitive style	Equal variances assumed	6.072	.014	1.763	370	.079	.23	.13	-2.71E-02	.50
	Equal variances not assumed			1.856	132.795	.066	.23	.13	-1.54E-02	.48
self efficiency	Equal variances assumed	7.244	.007	-3.564	368	.000	-.44	.12	-.68	-.20
	Equal variances not assumed			-4.106	151.615	.000	-.44	.11	-.65	-.23
attitudes toward DSS	Equal variances assumed	4.936	.027	3.370	370	.001	.39	.12	.16	.62
	Equal variances not assumed			3.776	146.881	.000	.39	.10	.19	.60
involvement in the development of DSS	Equal variances assumed	1.962	.162	1.142	370	.254	.15	.14	-.11	.42
	Equal variances not assumed			1.054	111.866	.294	.15	.15	-.14	.44
level of training	Equal variances assumed	1.028	.311	-3.081	370	.002	-.36	.12	-.59	-.13
	Equal variances not assumed			-3.070	122.737	.003	-.36	.12	-.59	-.13
innovativeness of decision maker	Equal variances assumed	.068	.794	-2.037	370	.042	-.25	.12	-.49	-8.71E-03
	Equal variances not assumed			-2.148	132.976	.034	-.25	.12	-.48	-1.98E-02
Fear from using DSS	Equal variances assumed	1.587	.209	.354	370	.724	4.44E-02	.13	-.20	.29
	Equal variances not assumed			.358	125.301	.721	4.44E-02	.12	-.20	.29
Familiarity with DSS usage	Equal variances assumed	2.011	.157	3.117	370	.002	.38	.12	.14	.62
	Equal variances not assumed			2.988	116.849	.003	.38	.13	.13	.64
Ability to interpret DSS ou put	Equal variances assumed	2.371	.124	.587	369	.558	7.04E-02	.12	-.17	.31
	Equal variances not assumed			.612	131.021	.542	7.04E-02	.12	-.16	.30
Ability to use new methods	Equal variances assumed	11.503	.001	5.506	370	.000	.69	.13	.45	.94
	Equal variances not assumed			6.227	149.285	.000	.69	.11	.47	.91
confidence in DSS usage	Equal variances assumed	13.203	.000	2.293	370	.022	.30	.13	4.21E-02	.55
	Equal variances not assumed			2.544	144.409	.012	.30	.12	6.59E-02	.53

6.22 Difference in perceptions about the effect of top management characteristics between the two groups

There were significant differences between the UK group and the Egypt group in relation to the effect of the rewarding efforts for using DSS and offering funds. Also there is no significance difference found between the two groups about the effect of top management understanding, setting policies and goals, developing a core of internal experts on using DSS in making strategic decisions and DSS design and development on using DSS in making strategic decisions.

The results shown in table 6.35 provide partially support for hypothesis 9.2.

H 9.2: There is no significant difference between the UK group and the Egypt group about the effect of top management characteristics on DSS usage in making strategic

Table 6.35 Difference between the two groups about the effect of top management

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
top management understanding	Equal variances assumed	.463	.496	-.118	370	.906	-1.25E-02	.11	-.22	.20
	Equal variances not assumed			-.119	125.257	.905	-1.25E-02	.10	-.22	.19
rewarding efforts for using DSS	Equal variances assumed	.107	.744	-2.764	370	.006	-.35	.13	-.60	-.10
	Equal variances not assumed			-2.898	131.909	.004	-.35	.12	-.59	-.11
setting policies and goals	Equal variances assumed	2.621	.106	-.674	370	.501	-9.47E-02	.14	-.37	.18
	Equal variances not assumed			-.729	138.455	.467	-9.47E-02	.13	-.35	.16
offering funds	Equal variances assumed	5.861	.016	-4.271	370	.000	-.50	.12	-.73	-.27
	Equal variances not assumed			-3.970	112.722	.000	-.50	.13	-.75	-.25
DSS design and development	Equal variances assumed	3.209	.074	1.541	370	.124	.24	.16	-6.74E-02	.56
	Equal variances not assumed			1.575	127.131	.118	.24	.16	-6.26E-02	.55
developing a core of internal experts	Equal variances assumed	3.535	.061	-1.678	370	.094	-.20	.12	-.43	3.39E-02
	Equal variances not assumed			-1.869	145.273	.064	-.20	.11	-.41	1.14E-02

6.23 Regression Analysis

Multiple regression assumes that the model is:

$Yi = \beta 0 + \beta 1X1i + \beta 2X1I + \ldots\ldots + \beta kXki + \epsilon i$ (with the usual notation that the xi values denote the independent variables and the Yi value denotes the dependent variable). Further, the error term values (ϵi) are independent and identically distributed with the normal distribution with a mean of zero and a common standard deviation (σ_ϵ) (i.e., $\epsilon_i \sim N(0, \sigma_\epsilon)$) (Neter and Wasserman 1990; Mendenhall and Sincich 1995). It is also assumed that the independent variables must be quantitative or categorical and the outcome variable (dependent) must be quantitative, continuous and unbounded (Field 2000).

6.23.1 Variables relating to task characteristics

In the UK group, two variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was complexity of analysis and evaluation of alternatives in strategic decisions. The other variable which has significant effect was the effectiveness of DSS usage in making strategic decisions. The complexity of analysis and evaluation of alternatives accounts for 9.2 % of the variation in DSS usage in making strategic decisions according to R^2 value. However, when the other variable is included the value of R^2 increases to 14.1% of the variance in DSS usage. The adjusted R^2 gives some idea of how well we can generalise and, ideally, the closer this value is to R^2 the better. In this data the difference between the values is 0.141 - 0.118 = 0.023 (about 0.2%). This shrinkage means that if the model were derived from the population rather than a sample, it would account for approximately 2% less variance in the outcome. The Durbin-Watson test statistic, which tests whether the assumption of independent errors is tenable. As a rule of thumb values less than 1 or greater than 3 should be definitely raise alarm bells. The closer to 2 the value is, the better and, for these data, the value is 1.618, which is close to 2, that assumption has almost certainly been met.

The data indicated in table 6.36 and table 6.37 provide partial support to hypothesis 1.3.

H 1.3: There is no direct relation between DSS usage and task characteristics variables in both the UK group and the Egypt group.

Table 6.36 The regression model for task characteristics and Durbin-Watson test

Model Summary [c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.303[a]	.092	.080	.2817	
2	375[b]	.141	.118	.2758	1 618

a. Predictors: (Constant), complexity of analysis

b. Predictors: (Constant), complexity of analysis, the effective of DSS usage in complex task

c. Dependent Variable: percentage of use

Assessing the assumption of no multicollinearity

Multicollinearity exists when there is a strong correlation between two or more predictors in a regression model. Luckily, SPSS produces various colinearity diagnostics, one of which is the variance inflation factor (VIF). VIF indicates whether a predictor has a strong linear relationship with the other predictor(s). Although there are no hard and fast rules about what value of VIF should cause concern, Myers (1990) suggests that a value of 10 is a good one at which to worry. What's more, Bowerman and O'Connell (1990) suggest that if the average VIF is greater than 1, then multicollinearity may be biasing the regression model. Related to VIF is *tolerance* statistic, which is reciprocal (1/VIF) as such a value below 0.1 indicates serious problems, although Menard (1995) suggests that values below 0.2 are worthy of concern. For the current model the VIF values are all well below 10 and the tolerance statistics are all well above 0.2; therefore, the researcher can safely conclude that there is no collinearity within the data for this group of variable.

Table 6.37 Assessing the assumption of multicollinearity

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-6.15E-02	.165		-.374	.709		
	complexity of analysis	.110	.039	.303	2.788	.007	1.000	1.000
2	(Constant)	-.271	.190		-1.427	.158		
	complexity of analysis	9.899E-02	.039	.273	2.545	.013	.982	1.018
	the effective of DSS usage in complex task	7.607E-02	.037	.223	2.077	.041	.982	1.018

a. Dependent Variable: percentage of use

Also, the variance proportions for each of the two variables, complexity of analysis and the effectiveness of DSS usage in complex task, are distributed across different dimensions (or eigenvalues). For this group of variables the complexity of analysis has most of its variance (73 %) loading onto dimension 3, while the effectiveness of DSS usage in complex task has most of its variance (84 %) loading onto dimension 2, which means that there is no multicollinearity between the independent variables.

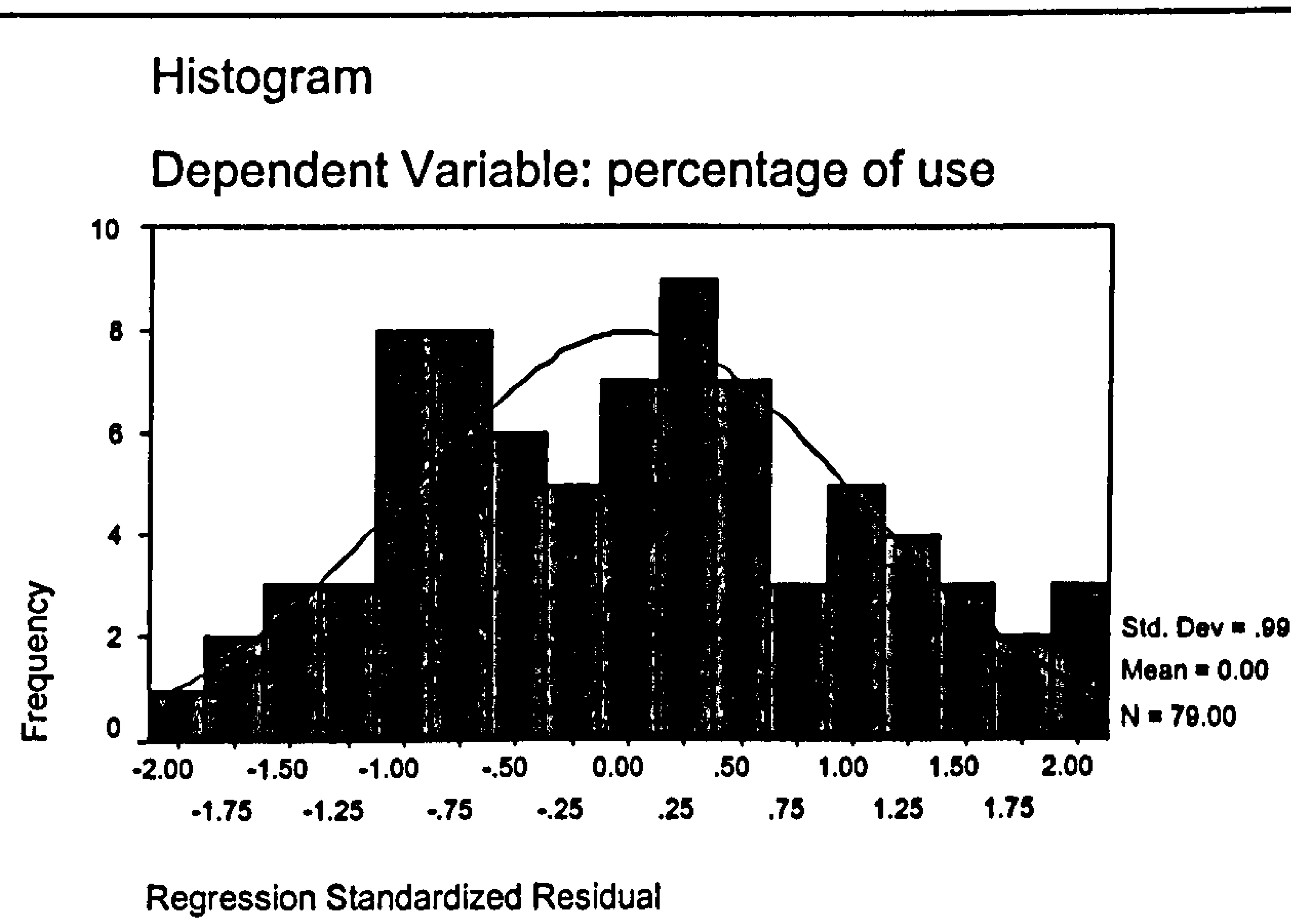
Table 6.38 Collinearity diagnostics

Collinearity Diagnostics [a]

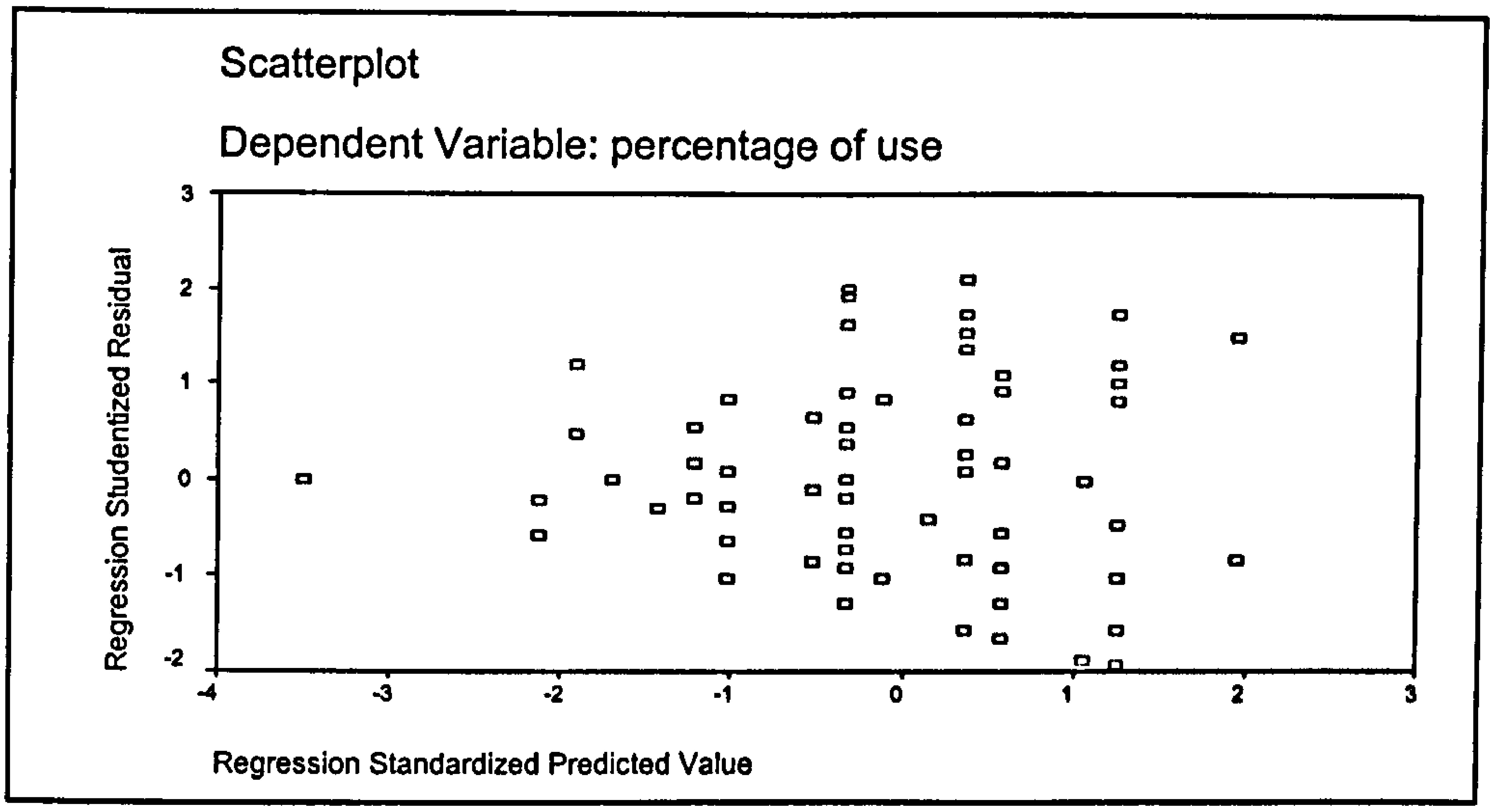
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	complexity of analysis	the effective of DSS usage in complex task
1	1	1.981	1.000	.01	.01	
	2	1.872E-02	10.287	.99	.99	
2	1	2.938	1.000	.00	.00	.01
	2	4.496E-02	8.084	.03	.26	.84
	3	1.695E-02	13 165	.97	.73	15

a. Dependent Variable: percentage of use

To test the ***normality of residual***, the observed frequencies (indicated by the bars) with normal distribution superimposed indicates normality of the shape of the curve which is a sign for the normality of the residuals.



In relation to the assumption of ***linearity***, minor problems appear to exist but violation of linearity does not exist due to most of the residuals being randomly dispersed in a band cluster around the horizontal line through 0.



For the same group of variables in the ***Egypt group***, three variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was that strategic decisions-making are too person centred to be computerised and then came in the second order complexity of analysis and evaluation of alternatives which came first in the UK group. The final variable in this group which has significant effect was strategic decisions are too complex to be computerised. These three variables all together account for 4.9 % of the variation in DSS usage in making strategic decisions according to R^2 value. The difference between R^2 and adjusted R^2 is .049 - .039 = .010 (1%), which means that if the model were derived from the population rather than a sample, it would account for approximately 1% less variance in the outcome. The value of the Durbin-Watson test for these data was 1.4 which is acceptable to meet the assumption of independent errors.

Data indicated in tables 6.39 and 6.40 provide a partial support to hypothesis 1.3 in relation to the Egypt group.

Table 6.39 The regression model for task characteristics and Durbin-Watson test

Model Summary [d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.144[a]	.021	.017	.1893	
2	.189[b]	.036	.029	.1882	
3	.221[c]	.049	039	.1872	1 400

a. Predictors: (Constant), SDM are too 'person centred to be computerised

b. Predictors: (Constant), SDM are too 'person centred to be computerised, complexity of analysis

c. Predictors: (Constant), SDM are too 'person centred to be computerised, complexity of analysis, SDM Is too cmplex to be comuterises

d. Dependent Variable: percentage of use

To test the assumption of ***multicollinearity*** for the current data sample, the VIF values are all well below 10 and the tolerance is well above 0.2; therefore the researcher can safely conclude that there is no collinearity within the data for this sample.

Table 6.40 Assessing the assumption of multicollinearity

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.452	.059		7.719	.000		
	SDM are too 'person centred to be computerised	-3.47E-02	.014	-.144	-2.492	.013	1.000	1.000
2	(Constant)	.372	.069		5.384	.000		
	SDM are too 'person centred to be computerised	-3.54E-02	.014	-.147	-2.557	.011	.999	1.001
	complexity of analysis	2 450E-02	.011	.123	2.133	.034	.999	1 001
3	(Constant)	.454	.080		5.666	.000		
	SDM are too 'person centred to be computerised	-3.45E-02	.014	-.143	-2.501	.013	.998	1.002
	complexity of analysis	2.364E-02	.011	.118	2.067	.040	.998	1.002
	SDM Is too cmplex to be comuterises	-2.41E-02	.012	-.114	-1.990	.048	.997	1.003

a. Dependent Variable: percentage of use

Also, the variance proportions for the three variables are distributed across different dimensions (or eigenvalues). The first variable which was strategic decisions-making, are too person centred to be computerised and has most of its variance (59%) loading onto dimension 4, while the other two variables in order loading onto dimension 2 and 3 in consequence.

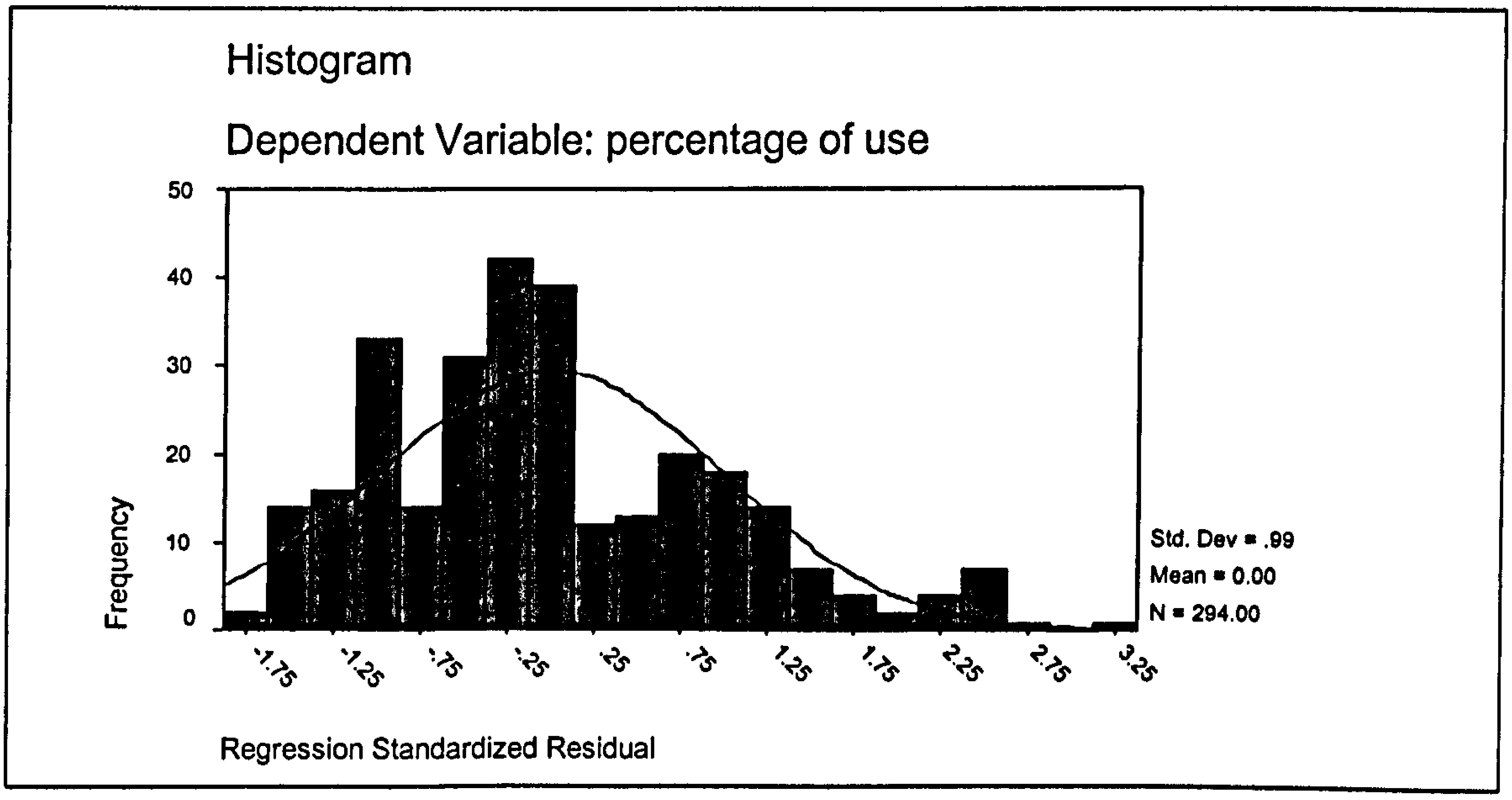
Table 6.41 Collinearity diagnostics

Collinearity Diagnostics [a]

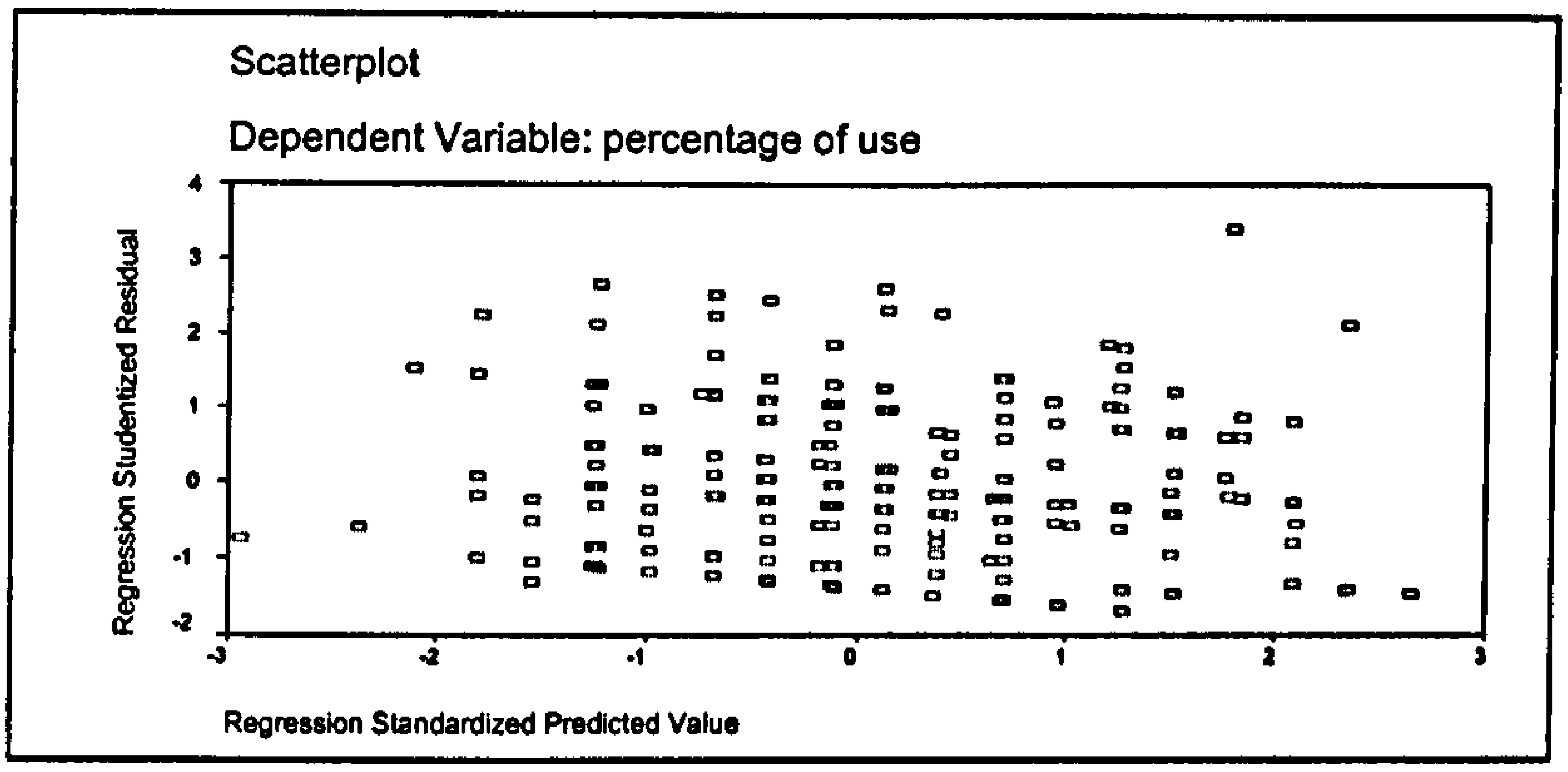
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	SDM are too 'person centred to be computerised	complexity of analysis	SDM is too cmplex to be comuterises
1	1	1.982	1.000	.01	.01		
	2	1.792E-02	10 516	.99	.99		
2	1	2.927	1.000	.00	.00	.01	
	2	5.740E-02	7.141	.02	.19	.82	
	3	1.573E-02	13.642	.97	.80	.17	
3	1	3.868	1.000	.00	.00	.00	.00
	2	7.264E-02	7.297	.00	.00	.60	.36
	3	4.561E-02	9.209	.01	.40	.23	.43
	4	1 332E-02	17.044	98	.59	.17	20

a. Dependent Variable: percentage of use

To test the ***normality of residual***, the observed frequencies (indicated by the bars) with normal distribution superimposed indicates normality of the shape of the curve, although there is a slight skew towards the left, which is a sign of the normality of the residuals.



In relation to the assumption of ***linearity***, minor problems appear to exist but violation of linearity does not exist due to most of the residuals being randomly dispersed in a band cluster around the horizontal line through 0.



6.23.2 <u>Variables relating to cultural characteristics</u>

In the UK group two variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was the cultural gap between decision-makers on one side and DSS staff on the other side. The second variable that has significant effect was uncertainty avoidance (extent to which people feel uncomfortable with uncertainty). The cultural gap accounts for 6.1 % of the variation in DSS usage in making strategic decisions according to R^2value. However, when the other variable included the value of R^2 increased to 10.8% of the variance in DSS usage. The difference between R^2 and the adjusted R^2 for this data is 0.061 - 0.049 = .0012 (about 1.2 %). This shrinkage means that, if the model were derived from the population rather than a sample, it would account for approximately 1.2 % less variance in the outcome. The Durbin-Watson test for this sample was 1.7, which is close to 2, which means that the assumption of independent errors has almost certainly been met.

The data indicated in table 6.58 and table 6.59 provide partial support to hypothesis 2.3.

H 2.3: There is no direct relationship between DSS usage and cultural characteristics variables in both the UK and Egypt.

Table 6.42 The regression model for cultural characteristics and Durbin-Watson test

Model Summary [c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.247[a]	.061	.049	.2865	
2	.329[b]	.108	085	2809	1 669

a. Predictors: (Constant), the cultural gap

b. Predictors: (Constant), the cultural gap, uncertainty avoidance

c. Dependent Variable: percentage of use

Assessing the assumption of no multicollinearity

For the current group of variables the VIF values are all well below 10 and the tolerance statistics are all well above 0.2; therefore, the researcher can safely conclude that there is no collinearity within the data for this group of variable.

Table 6.43 Assessing the assumption of multicollinearity

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.647	.120		5.389	.000		
	the cultural gap	-.135	.061	-.247	-2.235	.028	1.000	1 000
2	(Constant)	.857	.157		5.448	.000		
	the cultural gap	-.155	.060	-.282	-2.571	.012	.974	1.026
	uncertainty avoidance	-.103	051	-.221	-2 013	.048	.974	1 026

a. Dependent Variable: percentage of use

Also the variance proportions for each of the two variables, the cultural gap and uncertainty avoidance are distributed across different dimensions (or eigenvalues). For this group of variables the cultural gap has most of its variance (75 %) loading onto dimension 3, while uncertainty avoidance has most of its variance (61 %) loading onto dimension 2, which means that there is no multicollinearity between the independent variables.

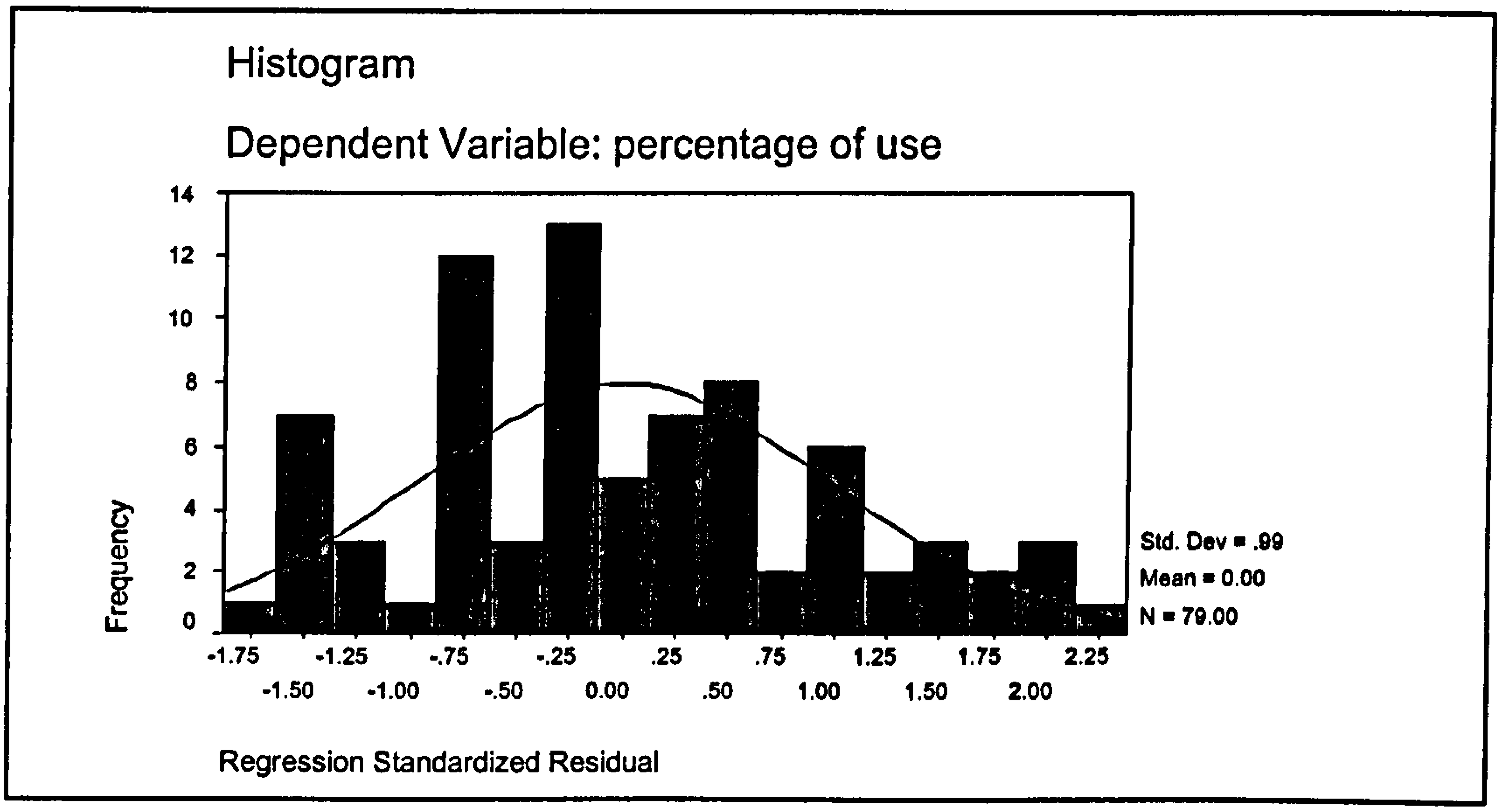
Table 6.44 Collinearity diagnostics

Collinearity Diagnostics [a]

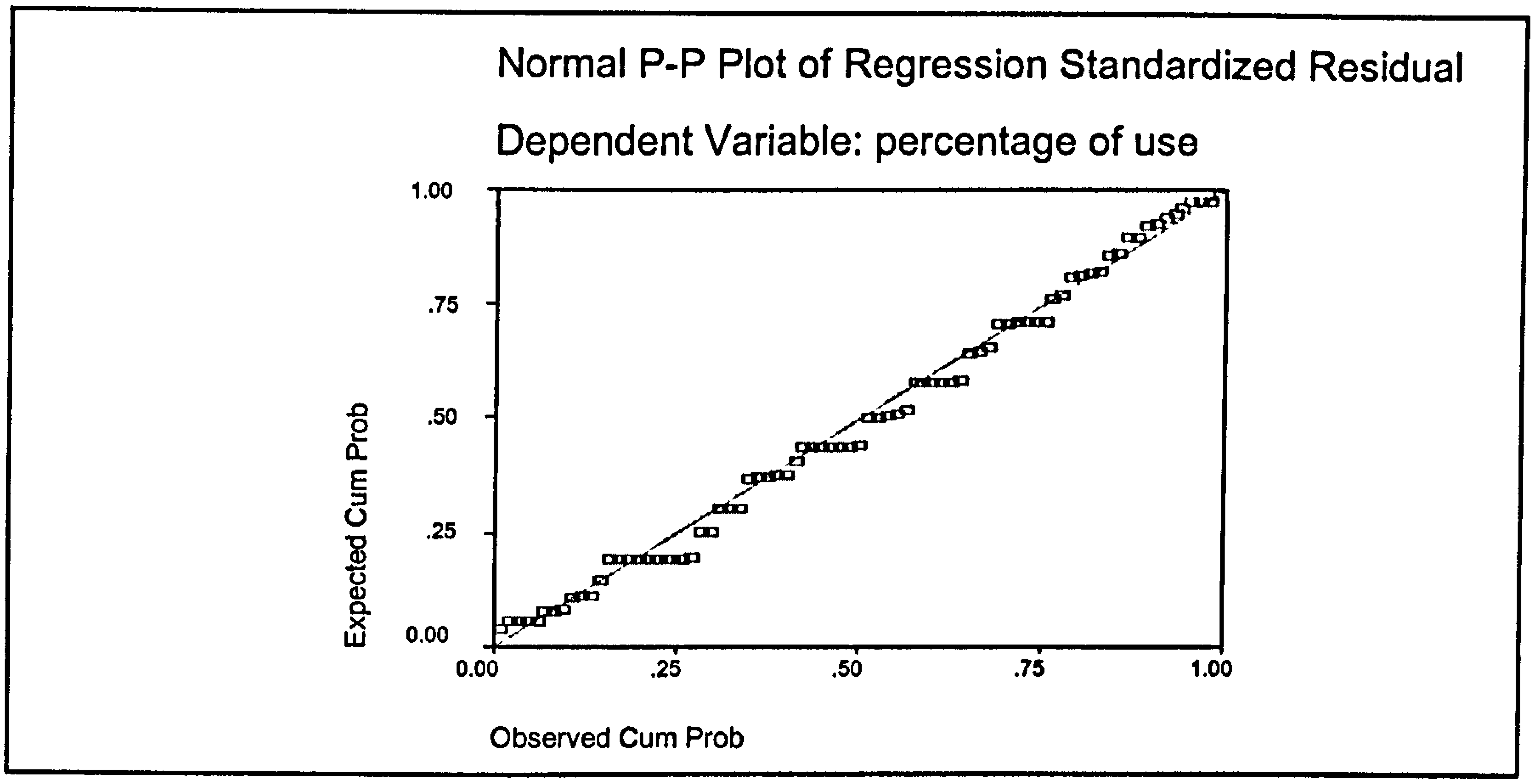
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Variance Proportions the cultural gap	Variance Proportions uncertainty avoidance
1	1	1.963	1.000	.02	.02	
	2	3.665E-02	7.319	.98	.98	
2	1	2.859	1.000	.00	.01	.01
	2	.115	4.990	.01	.24	.61
	3	2.604E-02	10.479	.99	.75	.37

a. Dependent Variable: percentage of use

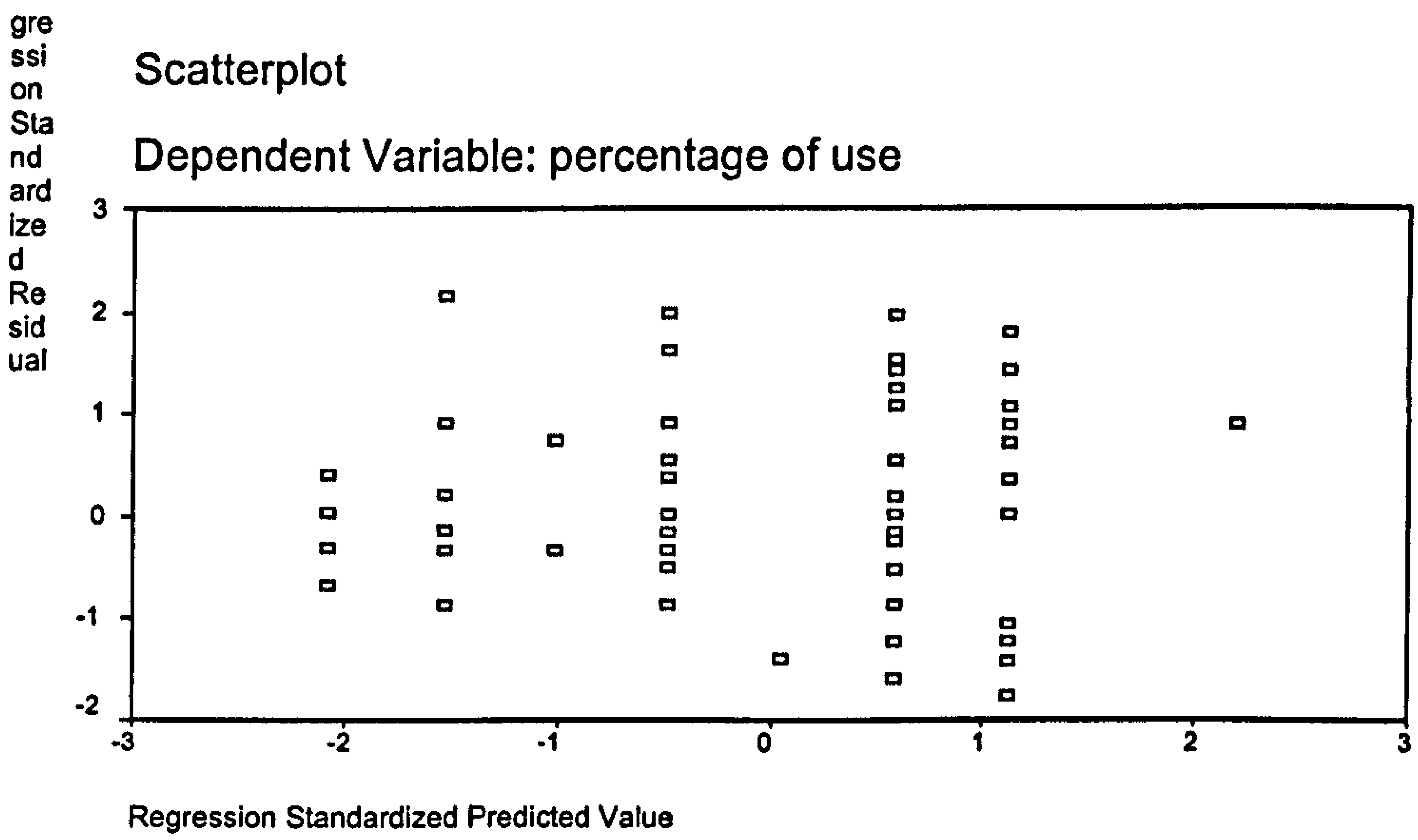
To test the ***normality of residual***, the observed frequencies (indicated by the bars) with normal distribution superimposed indicates normality of the shape of the curve although there is a slight skew towards the left, which is a sign of the normality of the residuals.



Also, the vast proportions of residuals appear to be on the line or marginally a little below it, indicating that the observed residuals cumulative proportions are normally distributed.



In relation to the assumption of ***linearity***, minor problems appear to exist but violation of linearity does not exist due to most of the residuals being randomly dispersed in a band cluster around the horizontal line through 0.



For the same group of variables in the ***Egypt group***, two variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was the cultural gap and then individualism came second in order. These two variables together account for 3.4 % of the variation in DSS usage in making strategic decisions according to R^2 value. The difference between R^2 and adjusted R^2 is 0.034 - .019 = .015 (1.5 %), which means that, if the model were derived from the population rather than a sample it would account for approximately 1.5 % less variance in the outcome. The value of Durbin-Watson test for these data was 1.41 which is acceptable to meet the assumption of independent errors.

Data indicated in tables 6.45 and 6.46 provide partial support for the hypothesis 2.3 related to the Egypt group.

Table 6.45 The regression model for cultural characteristics and Durbin-Watson test

Model Summary [c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.138[a]	.019	.016	.1895	
2	.185[b]	034	.028	.1883	1 411

a. Predictors: (Constant), the cultural gap

b. Predictors: (Constant), the cultural gap, Individualism

c. Dependent Variable: percentage of use

To test the assumption of no ***multicollinearity*** for the current data sample, the VIF values are all well below 10 and the tolerance are well above 0.2; therefore the researcher can safely conclude that there is no collinearity within the data for this sample.

Table 6.46 Test the assumption of multicollinearity

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig	Collinearity Statistics	
		B	Std Error	Beta			Tolerance	VIF
1	(Constant)	.379	.032		11.986	.000		
	the cultural gap	-2 29E-02	.010	-.138	-2 375	.018	1 000	1 000
2	(Constant)	.291	.052		5 646	.000		
	the cultural gap	-2 43E-02	.010	-.146	-2 525	.012	.996	1 004
	Individualism	2 683E-02	.012	.124	2 146	033	996	1 004

a. Dependent Variable. percentage of use

Also the variance proportions for the three variables are distributed across different dimensions (or eigenvalues). The first variable which was the cultural gap has most of its variance (84%) loading onto dimension 2 while the other variable which is individualism loading onto dimension 3 (79 %).

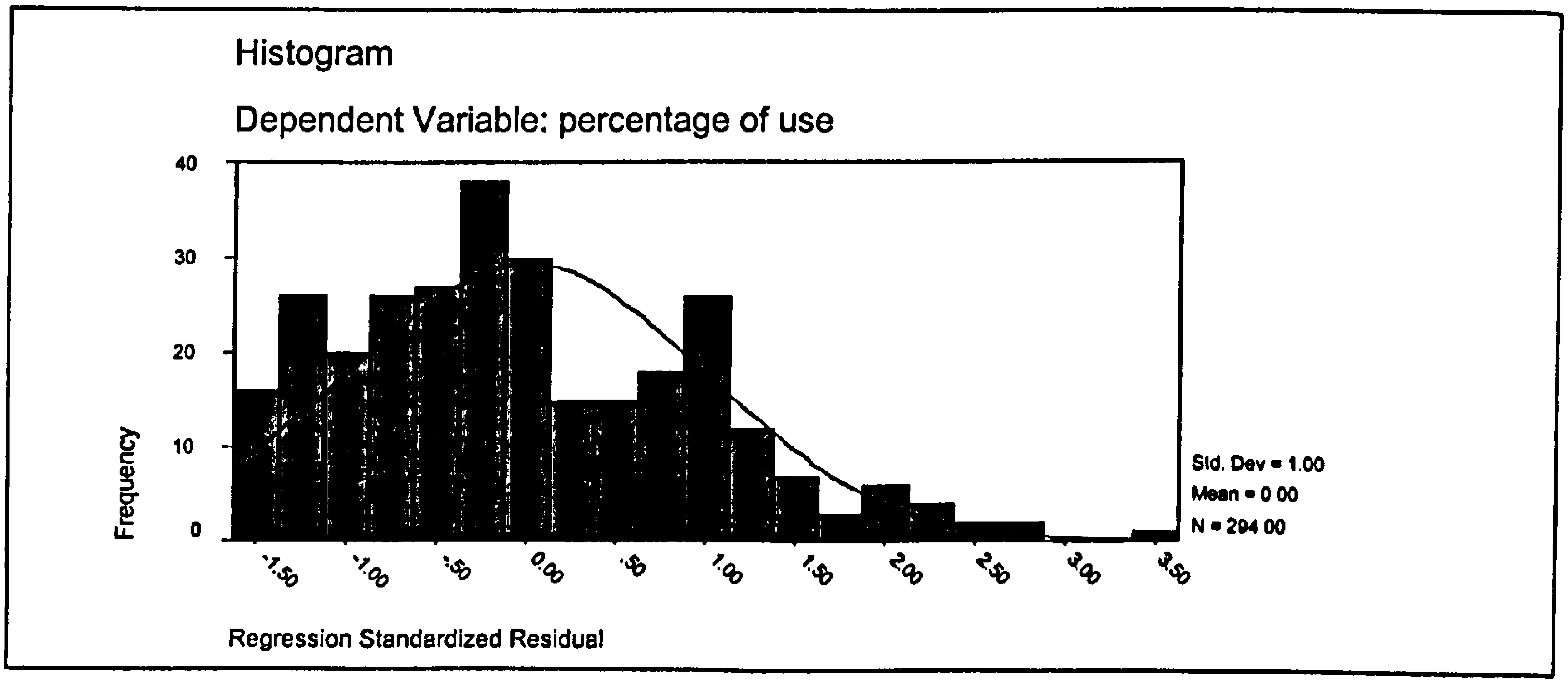
Table 6.47 Collinearity diagnostics

Collinearity Diagnostics [a]

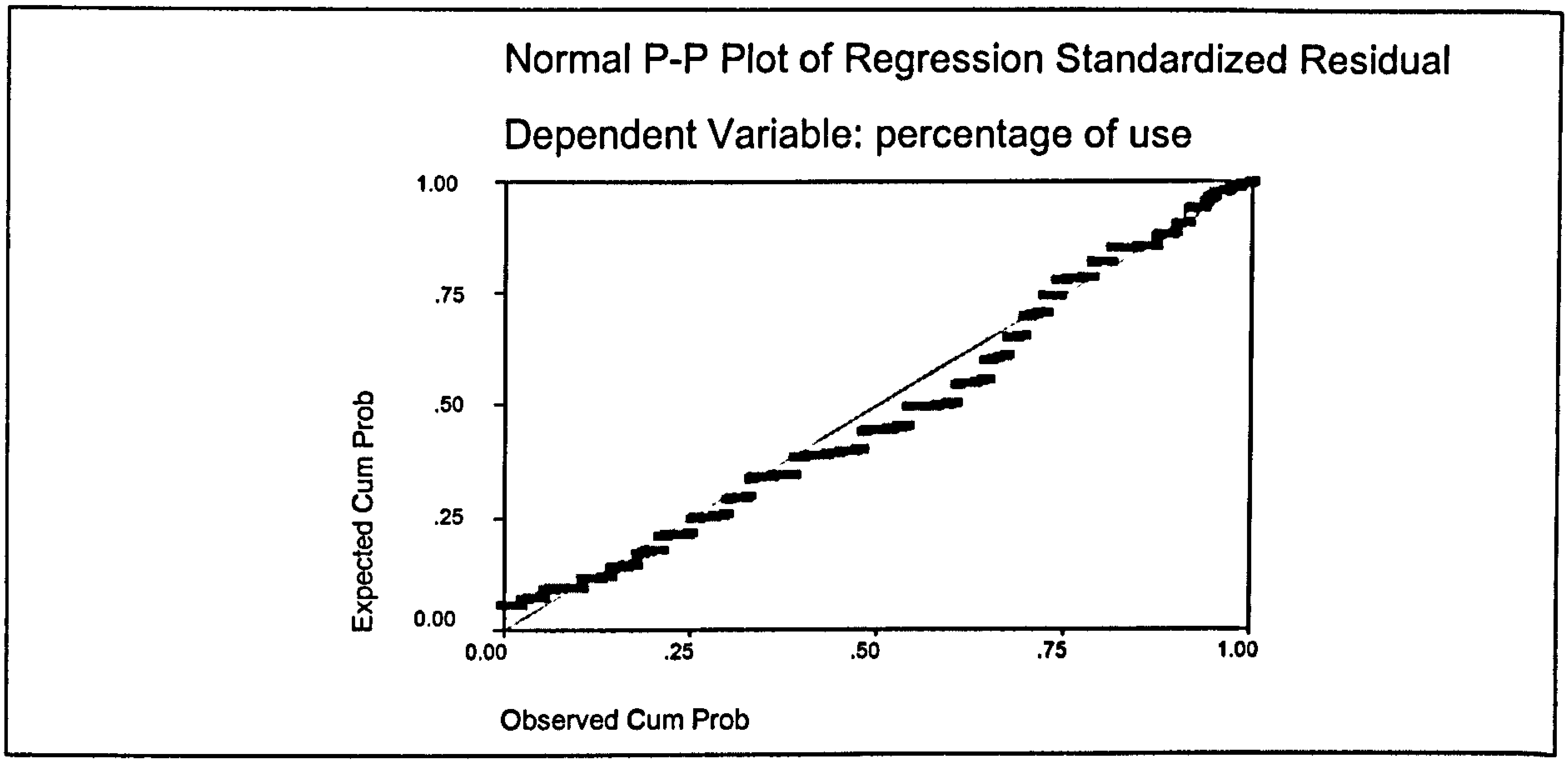
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	the cultural gap	individualism
1	1	1.937	1.000	.03	.03	
	2	6.300E-02	5.545	.97	.97	
2	1	2.879	1.000	.01	.01	.01
	2	9.233E-02	5.585	.03	.84	.20
	3	2 829E-02	10.089	97	.14	79

a. Dependent Variable: percentage of use

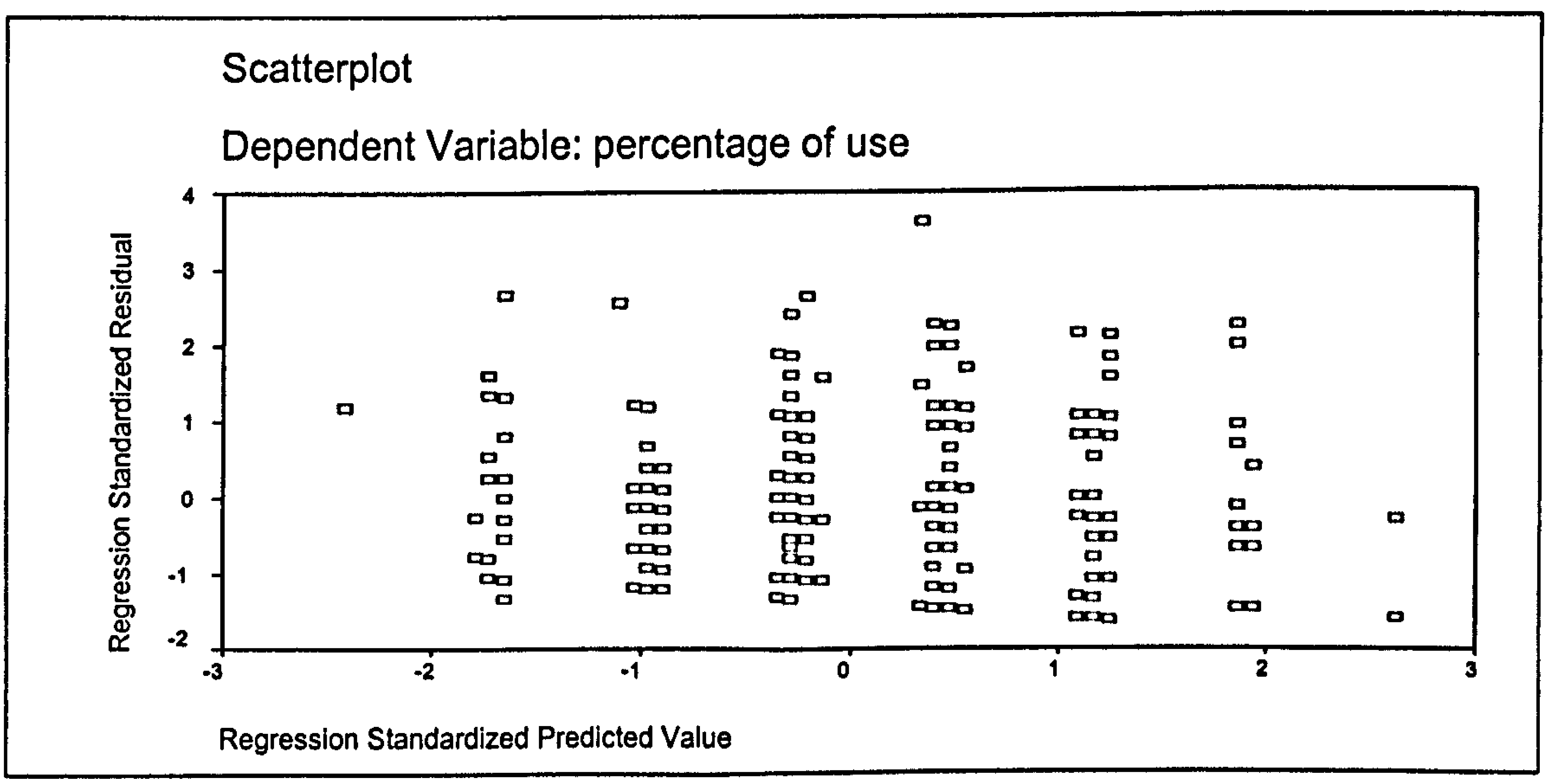
To test the ***normality of residual***, the observed frequencies (indicated by the bars) with normal distribution superimposed indicates normality of the shape of the curve although there is a slight skew towards the left, which is a sign of the normality of the residuals.



Also, the vast proportion of residuals appears to be on the line or marginally little below it, indicating that the observed residuals cumulative proportion are normally distributed.



In relation to the assumption of ***linearity***, minor problems appear to exist but violation of linearity does not exist due to most of the residuals being randomly dispersed in a band cluster around the horizontal line through 0.



6.23.3 Variables relating to DSS characteristics

In the UK group three variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was ease of DSS usage in making strategic decisions. The second variable that has significant effect was ease of finding the required data. The third variable in this group that has significant effect was adequacy of DSS's modelling capacity. Ease of DSS usage in making strategic decisions accounts for 7 % of the variation in DSS usage in making strategic decisions according to R^2 value. However, when the second and third variables included the value of R^2 increased to 14.3 % and 19.1 % of the variance in DSS usage in consequence, the difference between R^2 and the adjusted R^2 for this data is 0.191 - 0.159 = .0032 (about 3.2 %). This shrinkage means that, if the model were derived from the population rather than a sample, it would account for approximately 3.2 % less variance in the outcome. The Durbin-Watson test for this sample was 2.021, which is around 2 so that assumption has almost certainly been met. The data indicated in table 6.48 and table 6.49 provide partial support to hypothesis 3.3.

H 3.3: There is no direct relationship between DSS usage and DSS characteristics variables in both the UK group and the Egypt group.

Table 6.48 The regression model for DSS characteristics and Durbin-Watson test

Model Summary [d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.265[a]	.070	.058	.2850	
2	.378[b]	.143	.120	.2755	
3	437[c]	.191	.159	.2694	2 021

a. Predictors: (Constant), ease of use of DSS

b. Predictors: (Constant), ease of use of DSS, Ease of finding the required data

c. Predictors: (Constant), ease of use of DSS, Ease of finding the required data, Adequacy of DSS's modeling capacity

d. Dependent Variable: percentage of use

To test the assumption of ***multicollinearity*** for the current data sample, the VIF values are all well below 10 and the tolerance is well above 0.2; therefore the researcher can safely conclude that there is no collinearity within the data for this sample.

Also, the variance proportions for each of the three variables, the ease of use and ease of finding the required data and adequacy of DSS's modelling capacity are distributed across different dimensions (or eigenvalues). For this group of variables the ease of use has most of its variance (53 %) loading onto dimension 4, while ease of finding the required data and adequacy of DSS's modelling capacity have most of their variances (98 %) and (55 %) loading onto dimension 2 and 3 respectively, which means that there is no multicollinearity between the independent variables.

Table 6.49 Test the assumption of multicollinearity

Collinearity Diagnostics [a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	ease of use of DSS	Ease of finding the required data	Adequacy of DSS's modeling capacity
1	1	1.986	1.000	.01	.01		
	2	1.429E-02	11.786	.99	.99		
2	1	2.928	1.000	.00	.00	.01	
	2	5.806E-02	7.102	.04	.12	.93	
	3	1.361E-02	14.671	.96	.88	.06	
3	1	3.898	1.000	.00	.00	.01	.00
	2	6.146E-02	7.964	.01	.05	.98	.04
	3	3.054E-02	11.297	.00	.42	.00	.55
	4	9.813E-03	19.932	.98	.53	.02	.41

a. Dependent Variable: percentage of use

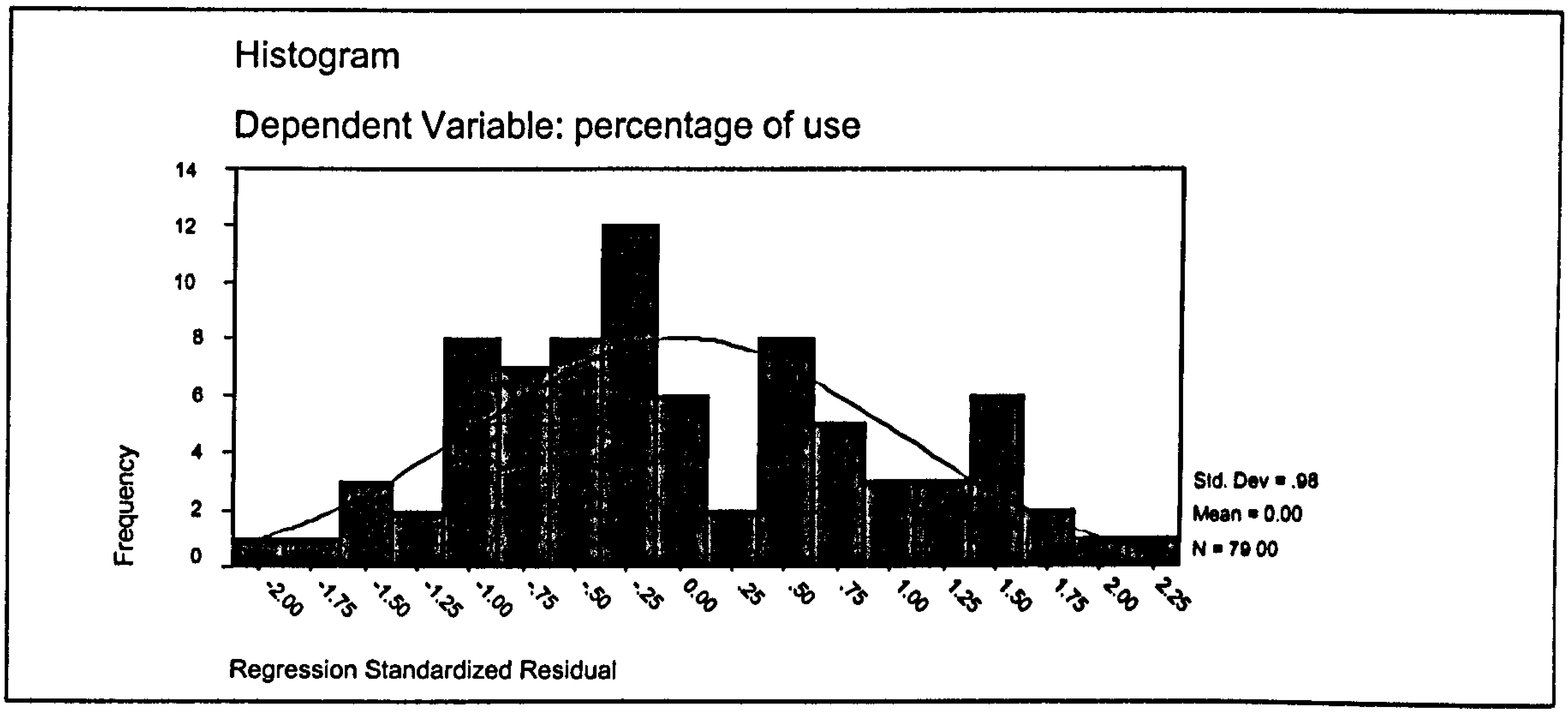
To test the ***normality of residual***, the observed frequencies (indicated by the bars) with normal distribution superimposed indicate normality of the shape of the curve, which is a sign of the normality of the residuals.

Table 6.50 Collinearity statisitics

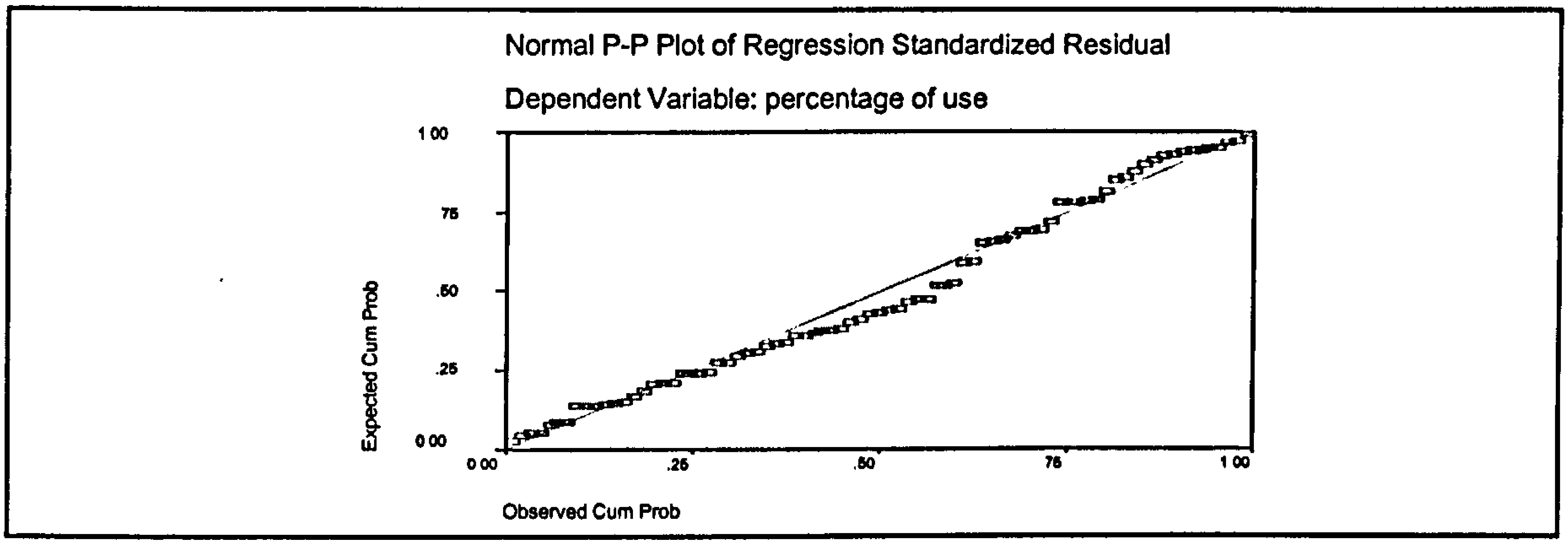
Coefficients a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.842	.190		4.424	.000		
	ease of use of DSS	-.136	.056	-.265	-2.416	.018	1.000	1.000
2	(Constant)	.619	.204		3.037	.003		
	ease of use of DSS	-.148	.054	-.289	-2.713	.008	.992	1.008
	Ease of finding the required data	8.636E-02	.034	.270	2.533	.013	.992	1.008
3	(Constant)	.283	.255		1.110	.271		
	ease of use of DSS	-.145	.053	-.283	-2.712	.008	.991	1.009
	Ease of finding the required data	7.580E-02	.034	.237	2.248	.028	.970	1.031
	Adequacy of DSS's modeling capacity	9.599E-02	.045	.222	2.110	.038	.976	1.023

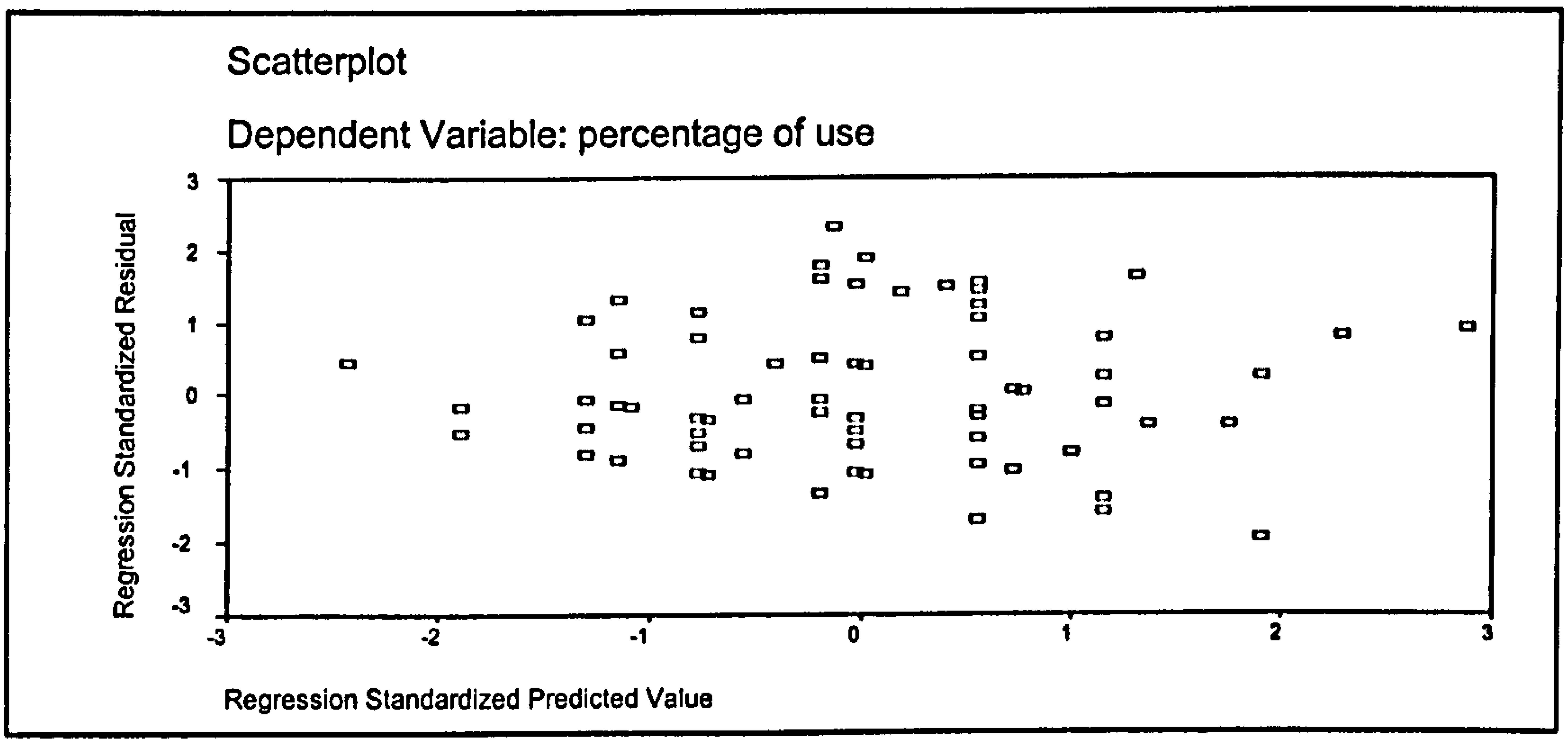
a. Dependent Variable: percentage of use



Also, the vast proportion of residuals appears to be on the line or marginally little below it, indicating that the observed residuals cumulative proportions are normally distributed.



In relation to the assumption of ***linearity,*** minor problems appear to exist but violation of linearity does not exist due to most of the residuals being randomly dispersed in a band cluster around the horizontal line through 0.



For the same group of variables in the ***Egypt group,*** four variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was DSS reliability and then came second in order whether the usage of DSS is voluntary or compulsory. These two variables together account for 5.2 % of the variation in DSS usage in making strategic decisions according to R^2 value. The third and fourth variables according to Beta value were DSS meets the requirements of decision-maker and cost effectiveness respectively.

These two variables together account for 2.6 % of the variation in DSS usage in making strategic decisions according to R^2 value. All together these four variables account for 7.8 % of the variation in DSS usage in making strategic decisions. The difference between R^2 and adjusted R^2 is 0.078 - .068 = .010 (1.00 %), which means that if the model were derived from the population rather than a sample, it would account for approximately 1.00 % less variance in the outcome. The value of the Durbin-Watson test for these data was 1.566, which is so close to 2, which means that the assumption of independent errors has certainly been met.

Data indicated in table 6.51 and 6.52 provide partial support for hypothesis 3.3 related to the Egypt group.

Table 6.51 The regression model for DSS characteristics and the Durbin-Watson test

Model Summary [e]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.188[a]	.035	.033	.2152	
2	.227[b]	.052	.046	.2137	
3	.257[c]	.066	.058	.2124	
4	.280[d]	078	068	2112	1 566

a. Predictors: (Constant), DSS reliability

b. Predictors: (Constant), DSS reliability, usage of DSS is voluntary/compulsory

c. Predictors: (Constant), DSS reliability, usage of DSS is voluntary/compulsory, DSS meets the requirments of DM

d. Predictors: (Constant), DSS reliability, usage of DSS is voluntary/compulsory, DSS meets the requirments of DM, cost effectiveness of DSS

e. Dependent Variable: percentage of use

To test the assumption of no ***multicollinearity*** for the current data sample, the VIF values are all well below 10 and the tolerance are well above 0.2; therefore the researcher can safely conclude that there is no collinearity within the data for this sample.

Table 6.52 Test the assumption of multicollinearity

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	.173	.053		3.288	.001		
	DSS meets the requirments of DM	3.243E-02	.012	.152	2.635	.009	1.000	1.000
2	(Constant)	.299	.079		3.772	.000		
	DSS meets the requirments of DM	3.258E-02	.012	.153	2.663	.008	1.000	1.000
	cost effectiveness of DSS	-3.00E-02	.014	-.121	-2.113	.035	1.000	1.000
3	(Constant)	.428	.102		4.190	.000		
	DSS meets the requirments of DM	2.568E-02	.013	.121	2.029	.043	.925	1.081
	cost effectiveness of DSS	-3.07E-02	.014	-.124	-2.169	.031	.999	1.001
	DSS reliability	-2.59E-02	.013	-.118	-1.990	.048	.924	1.082

a. Dependent Variable: percentage of use

Also, the variance proportions for each of the three variables, DSS meets the requirements of decision-makers, cost effectiveness and DSS reliability, are distributed across different dimensions (or eigenvalues). For this group of variables DSS meets the requirements of decision-maker have most of its variance (43 %) loading onto dimension 4. While cost effectiveness and DSS reliability have most of their variances (63 %) and (44 %) loading onto dimension 3 and 2 respectively, which means that there is no multicollinearity between the independent variables.

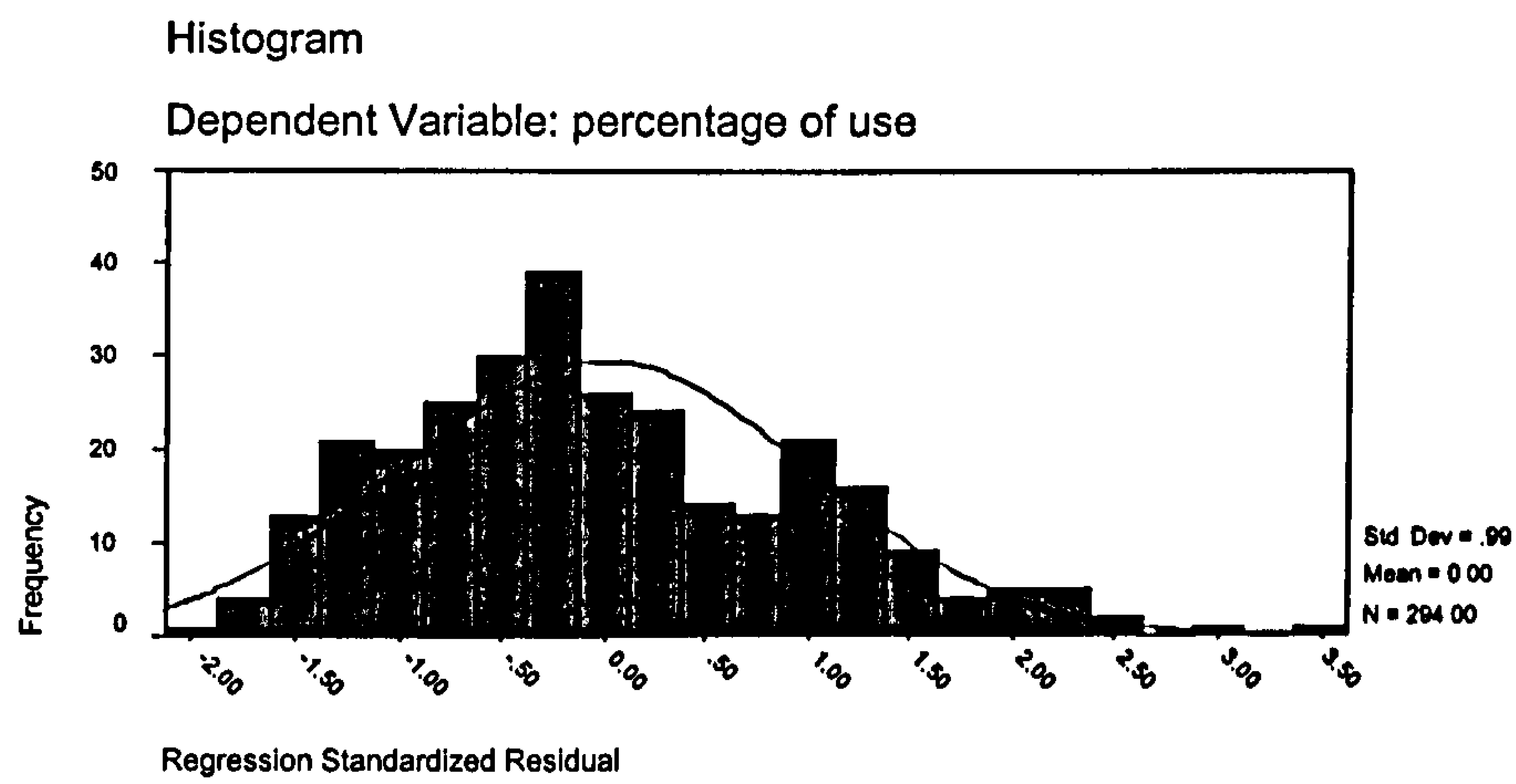
Table 6.53 Collinearity diagnostics

Collinearity Diagnostics[a]

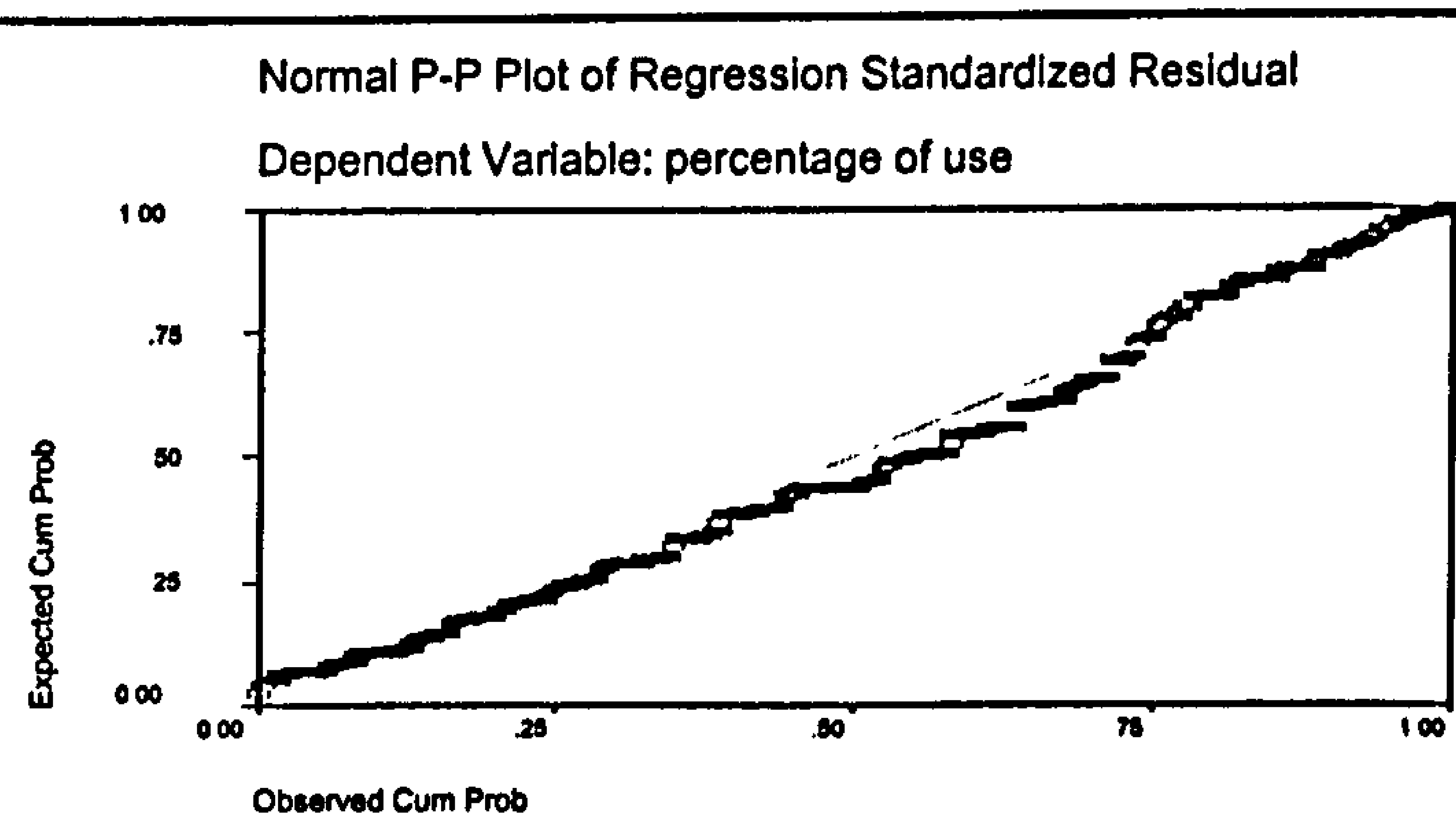
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Variance Proportions DSS meets the requirments of DM	Variance Proportions cost effectiveness of DSS	Variance Proportions DSS reliability
1	1	1.978	1.000	.01	.01		
	2	2.218E-02	9.443	.99	.99		
2	1	2.949	1.000	.00	.00	.00	
	2	3.849E-02	8.753	.01	.65	.36	
	3	1.262E-02	15.284	.99	.35	.64	
3	1	3.898	1.000	.00	.00	.00	.00
	2	6.041E-02	8.033	.00	.29	.00	.44
	3	3.347E-02	10.791	.00	.28	.63	.13
	4	8.498E-03	21.416	1.00	.43	.36	.40

a. Dependent Variable: percentage of use

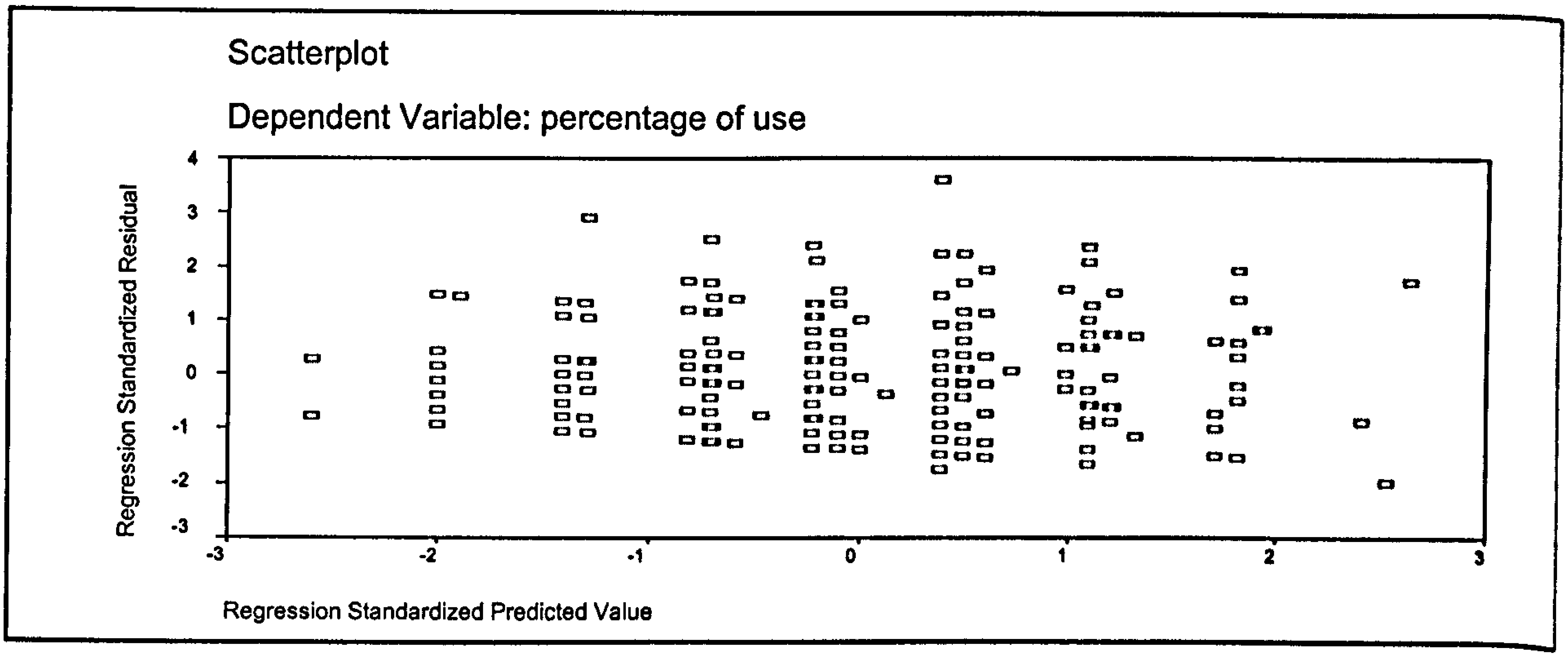
To test the ***normality of residual***, the observed frequencies (indicated by the bars) with normal distribution superimposed indicate little abnormality with the clustering towards the left of the histogram. Minor deviation is to be expected, therefore, it can be assumed that the distribution overall is adequate in reflecting normality.



Also, the vast proportion of residuals appears to be on the line or marginally little below it, indicating that the observed residuals cumulative proportions are normally distributed.



In relation to the assumption of ***linearity***, minor problems appear to exist but violation of linearity does not exist due to most of the residuals being randomly dispersed in a band cluster around the horizontal line through 0.



6.23.4 Variables relating to environmental characteristics

In the UK group two variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was uncertainty in the environment. The second variable that has significant effect according to beta value was favourable government polices. Uncertainty in the environment accounts for 10 % of the variation in DSS usage in making strategic decisions according to R^2 value. However, when the second variable included the value of R^2 increased to 14.6 % of the variance in DSS usage respectively. The difference between R^2 and the adjusted R^2 for this data is 0.146 - 0.124 = .022 (about 2.2 %). This shrinkage means that, if the model were derived from the population rather than a sample, it would account for approximately 2.2 % less variance in the outcome. The Durbin-Watson test for this sample was 1.409, which is close to 2 which mean that the assumption of independent errors has almost certainly been met.

The data indicated in table 6.54 and table 6.55 provide partial support to hypothesis 4.3:

H 4.3: There is no direct relationship between DSS usage and environmental characteristics variables in both the UK group and Egypt group.

Table 6.54 The regression model for environmental characteristics and the Durbin-Watson test

Model Summary [c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.316[a]	.100	.088	.2805	
2	.382[b]	.146	.124	.2749	1.409

a. Predictors: (Constant), uncertainty in the environment

b. Predictors: (Constant), uncertainty in the environment, favourable government policies

c. Dependent Variable: percentage of use

To test the assumption of ***multicollinearity*** for the current data sample, the VIF values are all well below 10 and the tolerance is well above 0.2; therefore, the researcher can safely conclude that there is no collinearity within the data for this sample.

Table 6.55 Test the assumption of multicollinearity

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.720	.118		6.108	.000		
	uncertainty in the environment	-.118	.040	-.316	-2.918	.005	1.000	1.000
2	(Constant)	.859	.134		6.402	.000		
	uncertainty in the environment	-8.74E-02	.042	-.234	-2.063	.042	.875	1.143
	favourable government policies	-7.05E-02	.035	-.231	-2.038	.045	.875	1.143

a. Dependent Variable: percentage of use

Also, the variance proportions for each of the two variables, uncertainty in the environment and favourable government polices, are distributed across different dimensions (or eigenvalues). For this group of variables, uncertainty in the environment has most of its variance (54 %) loading onto dimension 3, while favourable government polices has most of their variances (86 %) loading onto dimension 2, which means that there is no multicollinearity between the independent variables.

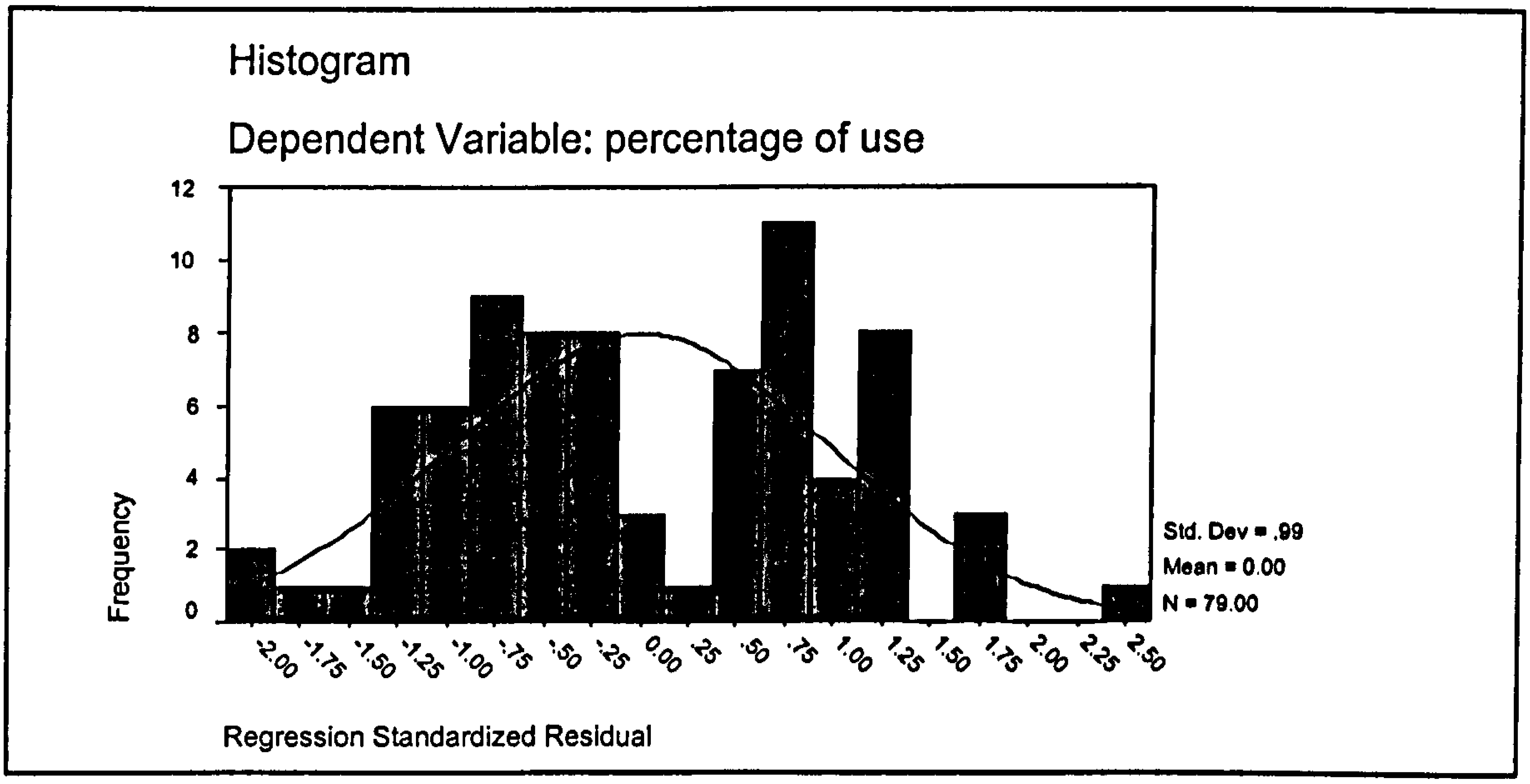
Table 6.56 Collinearity diagnostics

Collinearity Diagnostics [a]

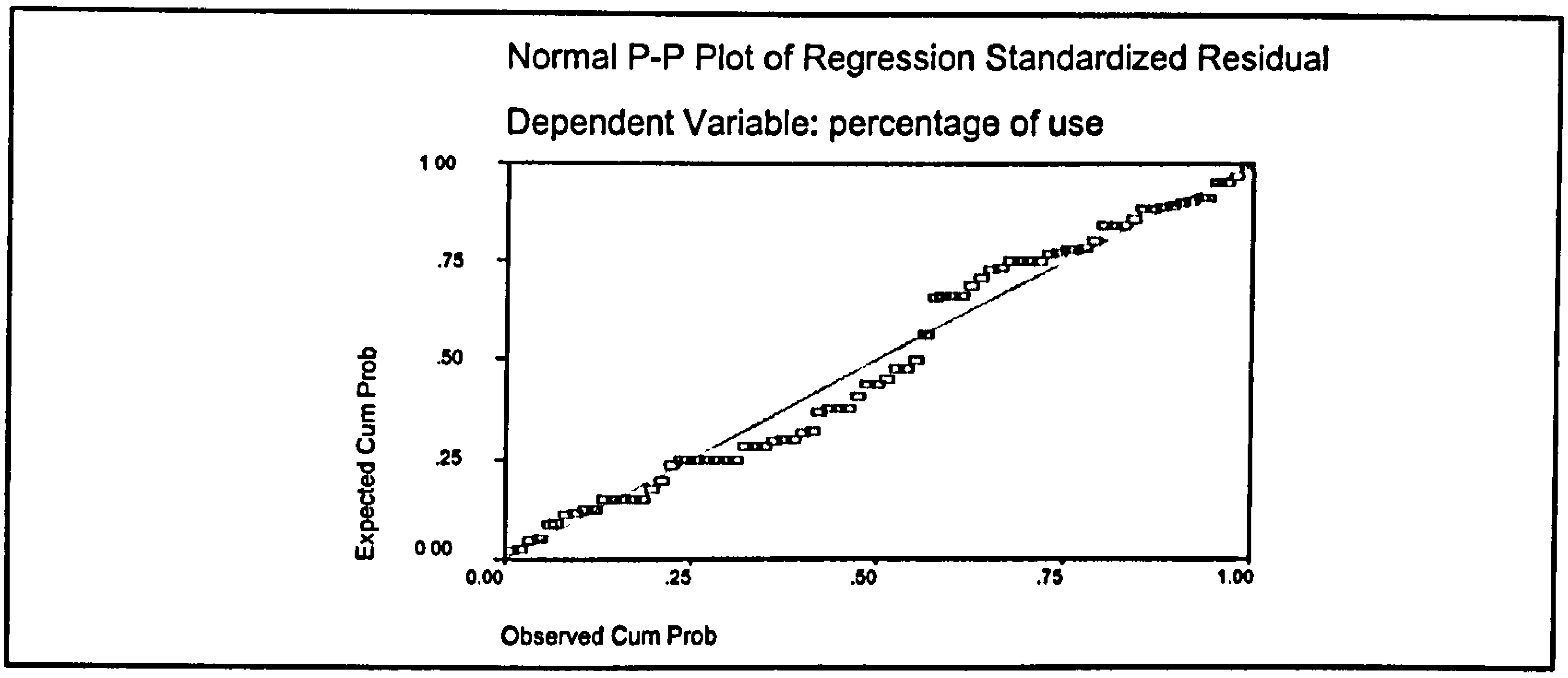
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	uncertainty in the environment	favourable government policies
1	1	1.964	1.000	.02	.02	
	2	3 649E-02	7.335	.98	.98	
2	1	2.914	1.000	.01	.01	.01
	2	5.055E-02	7.593	.03	.45	.86
	3	3 505E-02	9 119	96	54	13

a. Dependent Variable: percentage of use

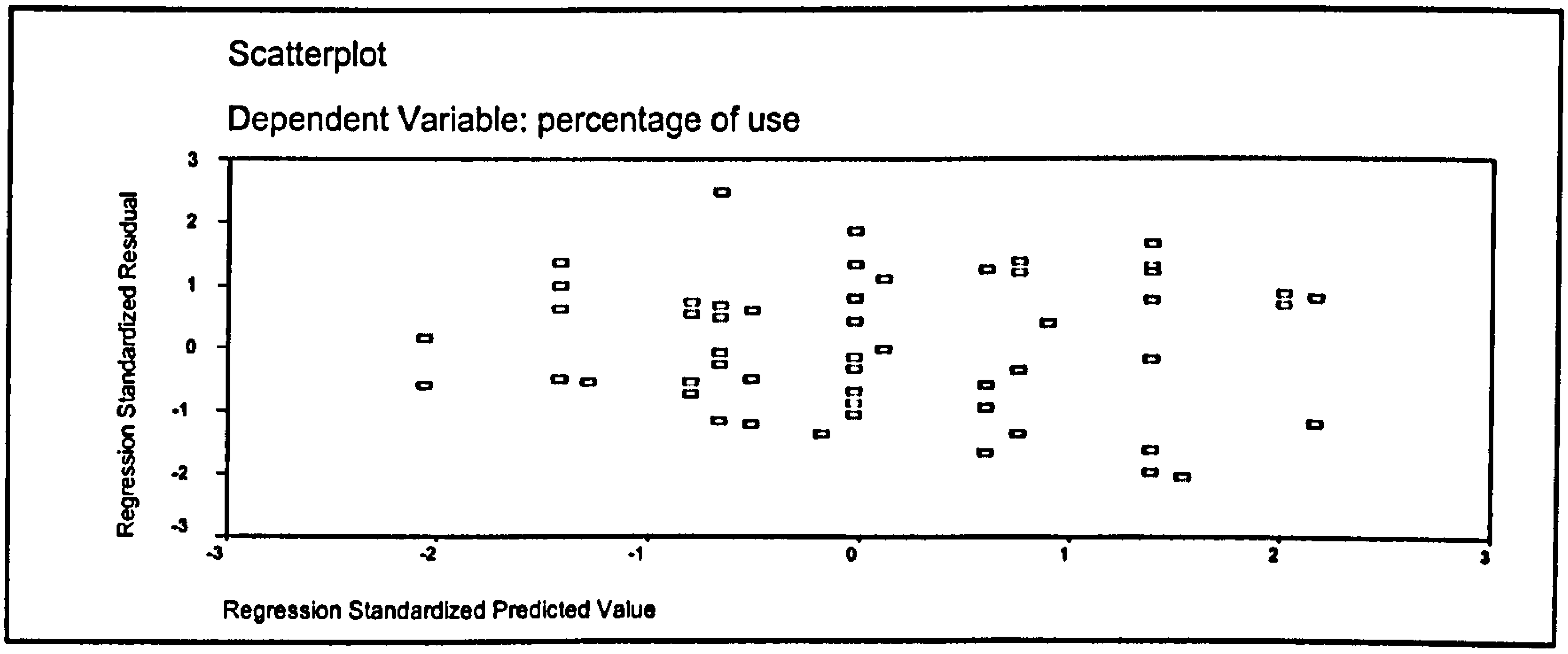
To test the ***normality of residual***, the observed frequencies (indicated by the bars) with normal distribution superimposed indicates normality of the shape of the curve. Minor deviation is to be expected, therefore, it can be assumed the distribution overall is adequate in reflecting normality.



There is some deviation observed for the environmental characteristics, indicating minor problems with overall normality, but still acceptable to meet the assumption of normality. Initially, the observed residuals are seen to be on the "normal" line, then the observed residuals went marginally below it, which means that the observed cumulative proportion exceeds the expected. Toward the middle of the "normal" line, the observed residuals are seen to be above the line, since there are a smaller number of negative residuals than expected. Towards the end of the "normal" line, the observed residuals are seen to be back on the line again, indicating that the observed residuals cumulative proportions are normally distributed.



In relation to the assumption of ***linearity***, minor problems appear to exist but violation of linearity does not exist due to most of the residuals being randomly dispersed in a band cluster around the horizontal line through 0.



For the same group of variables in the ***Egypt sample***, two variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was competition within local government. The second variable that has significant effect according to beta value was favourable government polices. Competition within local government accounts for 1.4 % of the variation in DSS usage in making strategic decisions according to R^2 value. However, when the second variable included the value of R^2 increased to 3.00 % of the variance in DSS usage in consequence. The difference between R^2 and the adjusted R^2 for this data is 0.030 - 0.024 = .006 (about 0.6 %). This shrinkage means that if the model were derived from the population rather than a sample, it would account for approximately .6 % less variance in the outcome. The Durbin-Watson test for this sample was 1.338, which is close to 2, which means that the assumption of independent errors has almost certainly been met.

Data indicated in tables 6.57 and 6.58 provide partial support for hypothesis 4.3 related to the Egypt group.

Table 6.57 The regression model for environmental characteristics and the Durbin-Watson test

Model Summary [c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.119[a]	.014	.011	.1699	
2	.174[b]	.030	.024	.1887	1 338

a. Predictors: (Constant), Competition among local governments

b. Predictors: (Constant), Competition among local governments, favourable government policies

c. Dependent Variable: percentage of use

To test the assumption of ***multicollinearity*** for the current data sample, the VIF values are all well below 10 and the tolerance is well above 0.2; therefore, the researcher can safely conclude that there is no collinearity within the data for this sample.

Table 6.58 Test the assumption of multicollinearity

Coefficients ª

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	.201	.054		3.741	.000		
	Competition among local governments	2.690E-02	.013	.119	2.047	.042	1.000	1.000
2	(Constant)	5.678E-02	.085		.672	.502		
	Competition among local governments	3.196E-02	.013	.141	2.411	.017	.970	1.031
	favourable government policies	2.918E-02	.013	.129	2.203	.028	.970	1.031

a. Dependent Variable: percentage of use

Also, the variance proportions for each of the two variables, competition among local government and favourable government policies, are distributed across different dimensions (or eigenvalues). For this group of variables competition among local government has most of its variance (54 %) loading onto dimension 3, while favourable government policies has most of their variances (62 %) loading onto dimension 3, which means that there is no multicollinearity between the independent variables.

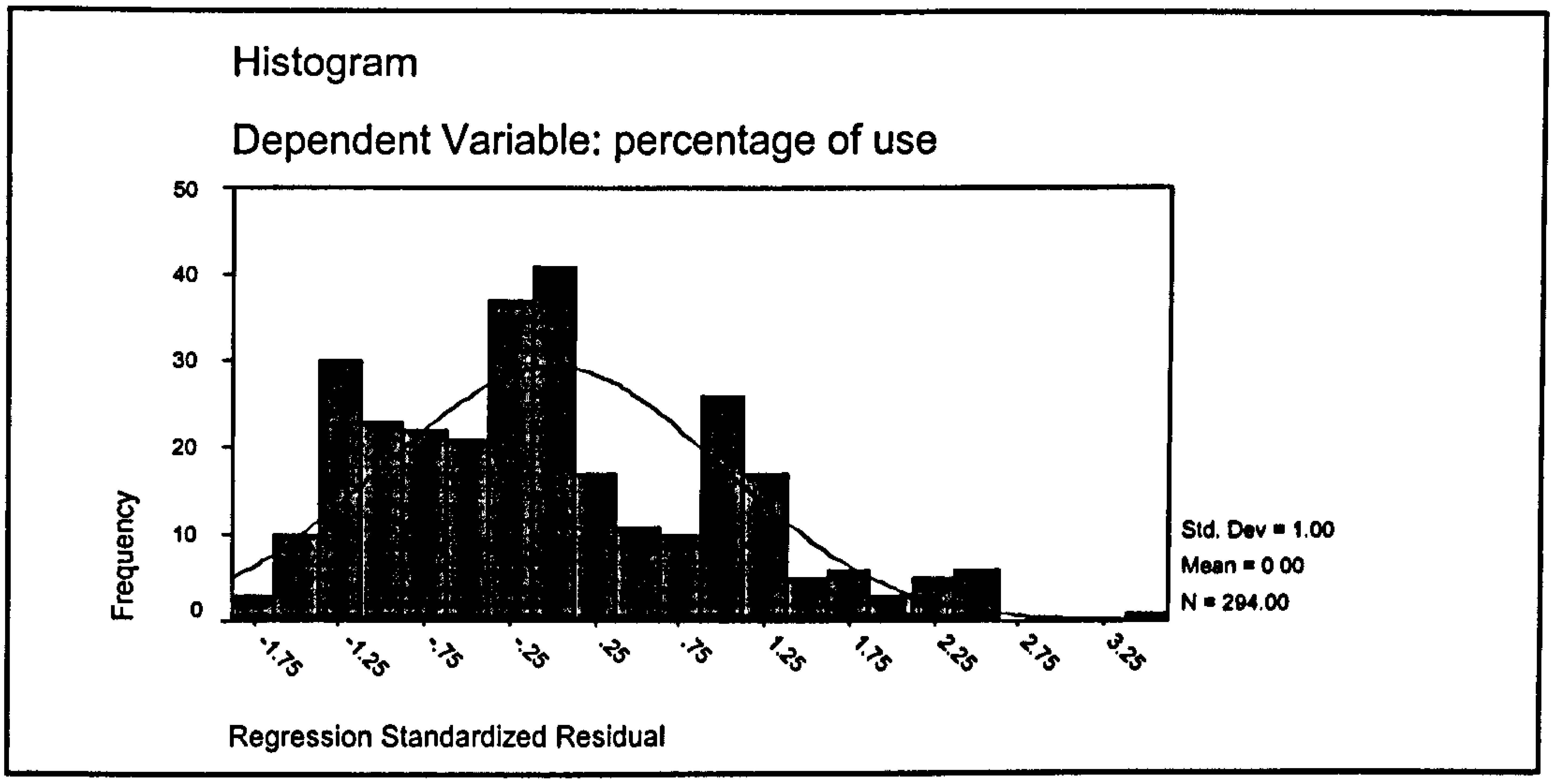
Table 6.59 Collinearity diagnostics

Collinearity Diagnostics ª

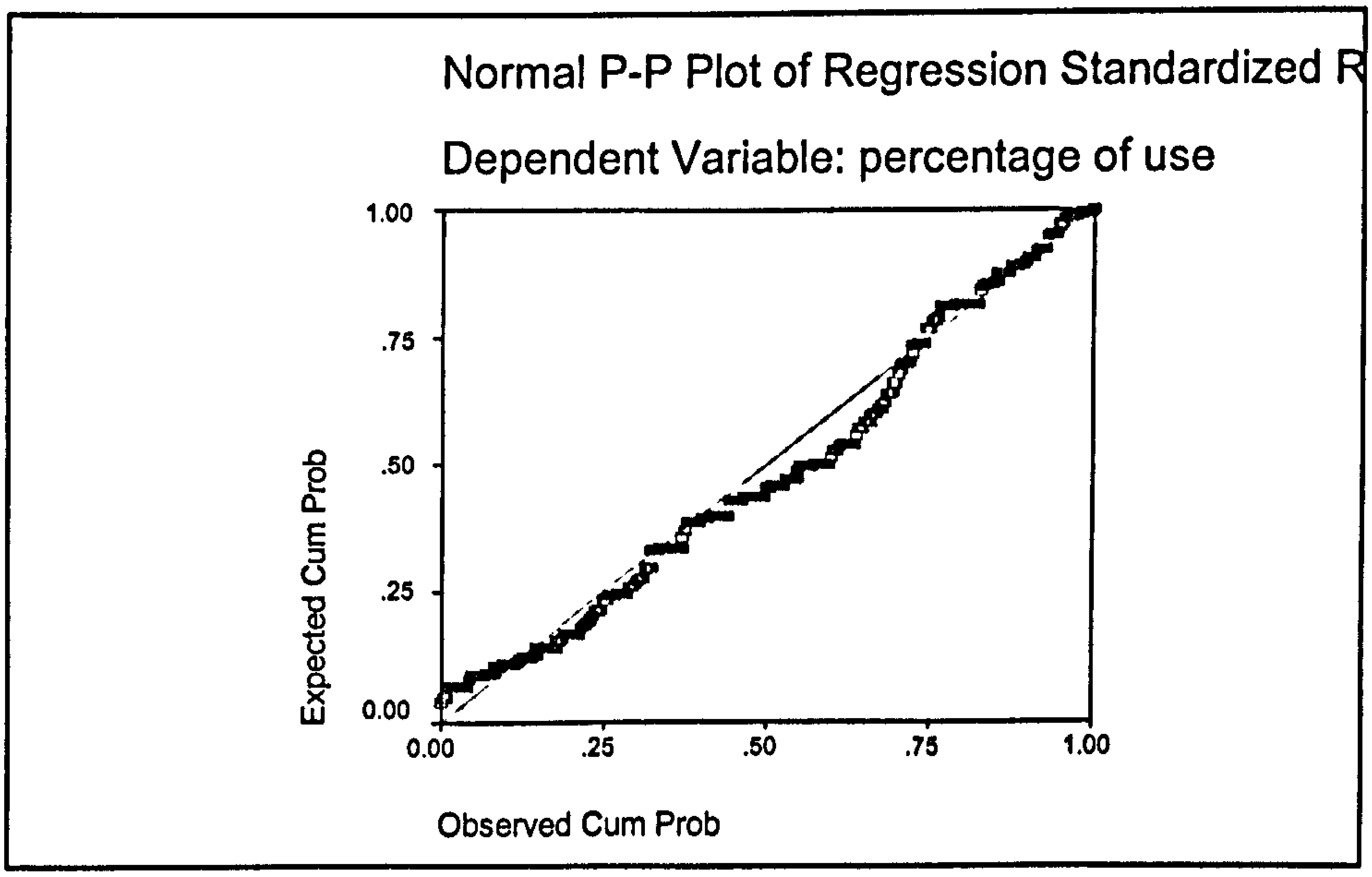
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Variance Proportions Competition among local governments	Variance Proportions favourable government policies
1	1	1.979	1.000	.01	.01	
	2	2.147E-02	9.601	.99	.99	
2	1	2.942	1.000	.00	.00	.00
	2	4.719E-02	7.895	.00	.46	.37
	3	1.125E-02	16.172	1.00	.54	.62

a. Dependent Variable: percentage of use

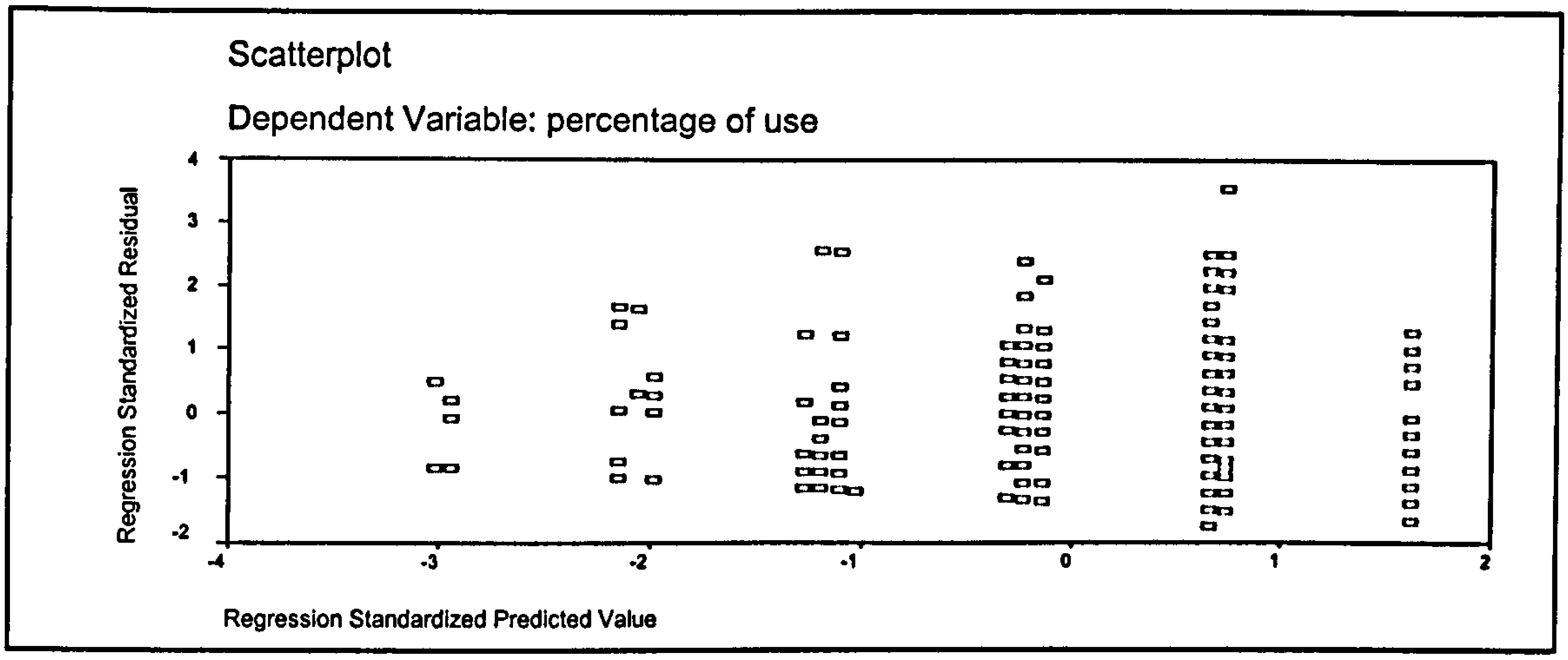
To test the ***normality of residual,*** the observed frequencies (indicated by the bars) with normal distribution superimposed indicates normality of the shape of the curve. Although there is slight skew towards the left, the distribution overall is adequate in reflecting normality.



There is some deviation observed for the environmental characteristics in this sample, indicating minor problems with overall normality but still acceptable to meet the assumption of normality. Initially, the observed residuals are seen to be around the "normal" line, then the observed residuals went marginally below it which means that the observed cumulative proportion exceeded the expected. Towards the end of the "normal" line, the observed residuals are seen to be back on line again, indicating that the observed residuals cumulative proportion is normally distributed.



Linearity and equality of variance does clearly exist due to most of the residuals being randomly distributed in a band cluster around the horizontal line through 0.



6.23.5 <u>Variables relating to organisational characteristics</u>

In the UK group, three variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was planning integration between using DSS and over all planning process. The second variable that has significant effect according to beta value was size of the organization. The last variable in this group that has significant effect according to beta value was degree of decentralisation. Planning integration accounts for 7.9 % of the variation in DSS usage in making strategic decisions according to R^2value. However, when the second and third variables included the value of R^2 increased to 12.9 % and 17.9 % respectively of the variance in DSS usage increased respectively. The difference between R^2 and the adjusted R^2 for this data is 0.179 - 0.146 = .033 (about 3.3 %). This shrinkage means that if the model were derived from the population rather than a sample, it would account for approximately 3.3 % less variance in the outcome. The Durbin-Watson test for this sample was 1.72, which is so close to 2, which means that the assumption of independent errors has almost certainly been met.

The data indicated in table 6.60 and table 6.61 provide partial support to hypothesis 5.3.

H 5.3: There is no direct relationship between DSS usage and organisational characteristics variables in both the UK group and Egypt group.

Table 6.60 The regression model for organisational characteristics and the Durbin-Watson test

Model Summary [d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.281[a]	.079	.067	.2837	
2	.359[b]	.129	.106	.2777	
3	423[c]	.179	.146	.2714	1 720

a. Predictors: (Constant), planning integration

b. Predictors: (Constant), planning integration, Size of the organization

c. Predictors: (Constant), planning integration, Size of the organization, degree of decentralization

d. Dependent Variable: percentage of use

To test the assumption of ***multicollinearity*** for the current data sample, the VIF values are all well below 10 and the tolerance is well above 0.2; therefore, the researcher can safely conclude that there is no collinearity within the data for this sample.

Table 6.61 Test the assumption of multicollinearity

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.893E-02	.140		.279	.781		
	planning integration	9.150E-02	.036	.281	2.571	.012	1.000	1.000
2	(Constant)	-.164	.168		-.975	.333		
	planning integration	8.339E-02	.035	.256	2.378	.020	.988	1.013
	Size of the organization	6.414E-02	.031	.224	2.079	.041	.988	1.013
3	(Constant)	-.337	.183		-1.844	.069		
	planning integration	6.394E-02	.035	.196	1.804	.075	.923	1.083
	Size of the organization	6.667E-02	.030	.233	2.210	.030	.986	1.014
	degree of decentralization	7.089E-02	.033	.232	2.148	.035	.935	1.070

a. Dependent Variable: percentage of use

Also, the variance proportions for each of the three variables, planning integration, size of the organization and degree of decentralisation, are distributed across different dimensions (or eigenvalues). For this group of variables the planning integration has most of its variance (65 %) loading onto dimension 3, while size of the organization and degree of decentralisation have most of their variances (53 %) and (46 %) loading onto dimension 2 and 3, respectively, which means that there is minor deviation for this assumption because the degree of decentralisation loaded onto dimension 2 and 3, but still a considerable score of planning integration loaded onto dimension 4 (34 %). The group of variable (organisational characteristics) reflects minor deviation but still it can be assumed that no multicollinearity exists between the independent variables.

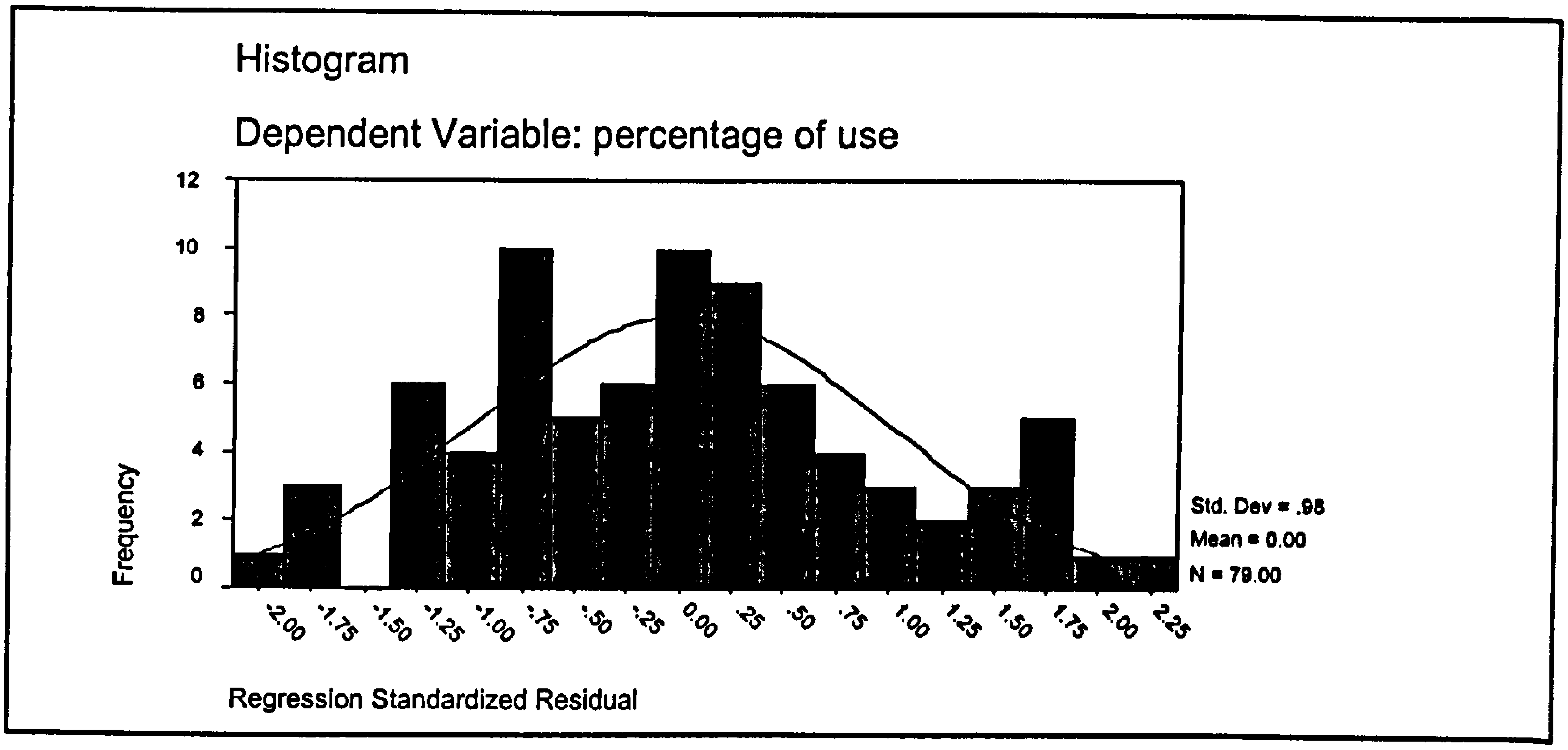
Table 6.62 Collinearity diagnostics

Collinearity Diagnostics [a]

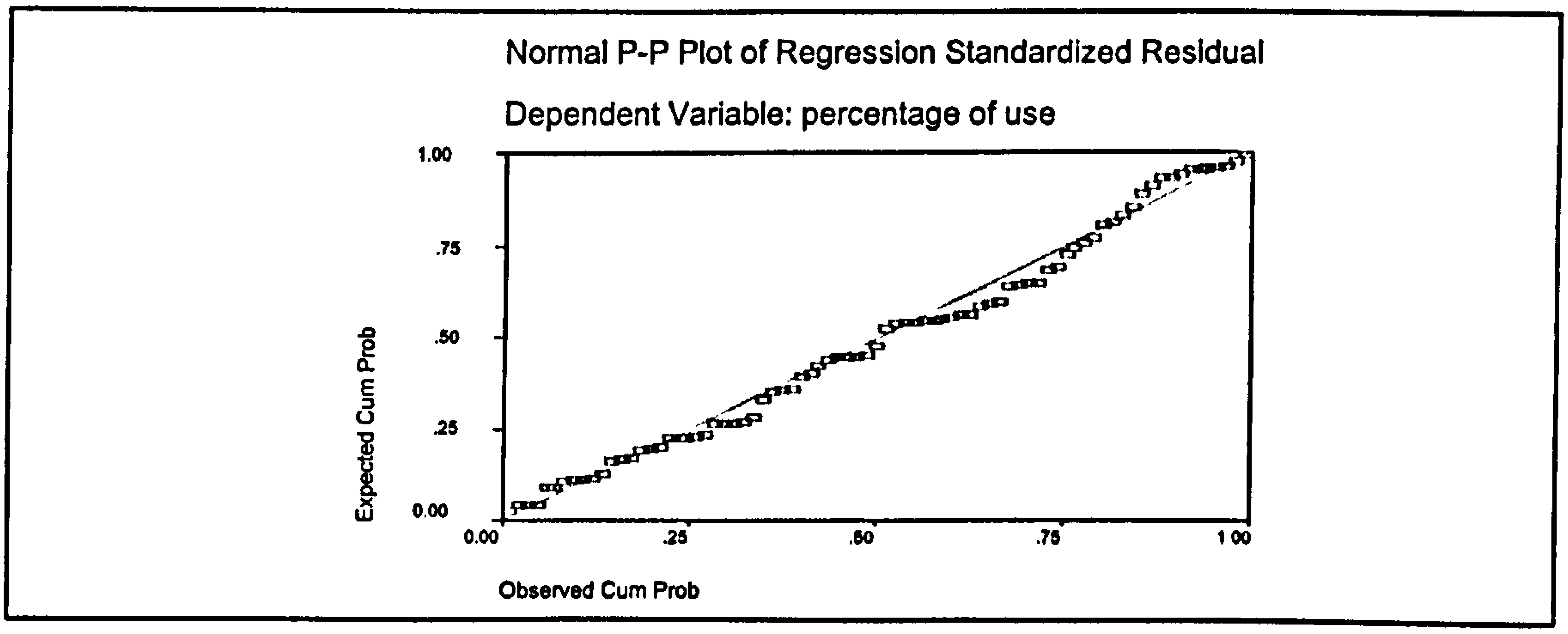
				Variance Proportions			
Model	Dimension	Eigenvalue	Condition Index	(Constant)	planning integration	Size of the organization	degree of decentralization
1	1	1.974	1.000	.01	.01		
	2	2.642E-02	8.642	.99	.99		
2	1	2.921	1.000	.00	.01	.01	
	2	5.664E-02	7.181	.01	.35	.75	
	3	2.257E-02	11.375	.98	.64	.24	
3	1	3.861	1.000	.00	.00	.00	.03
	2	7.504E-02	7.173	.00	.01	.53	.43
	3	4.370E-02	9.400	.01	.65	.19	.43
	4	2.061E-02	13.687	.99	.34	.27	.11

a. Dependent Variable: percentage of use

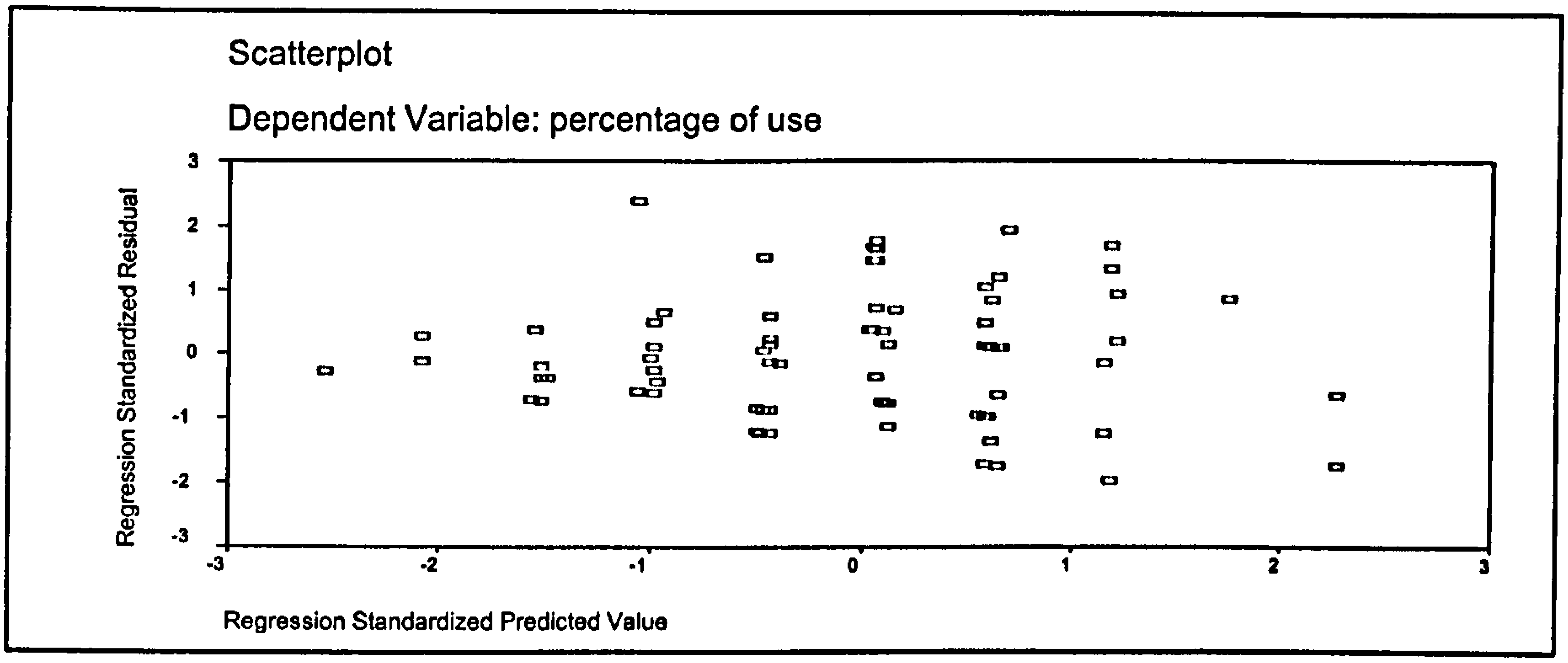
To test the ***normality of residual***, the observed frequencies (indicated by the bars) with normal distribution superimposed indicates normality of the shape of the curve, although there is slight skew towards the left, which is a sign of the normality of the residuals.



Also, the vast proportions of residuals appear to be on the line or marginally little below it, indicating that the observed residuals cumulative proportions are normally distributed.



Linearity and equality of variance does clearly exist due to most of the residuals being randomly distributed in a band cluster around the horizontal line through 0.



For the same group of variables in the ***Egypt group***, three variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was availability of computer facilities. The second variable that has significant effect according to beta value was information intensity. The last variable in this group that has significant effect according to beta value was degree of decentralisation. Computer facilities account for 2.2 % of the variation in DSS usage in making strategic decisions according to R^2 value. However, when the second and third variables included the value of R^2 increased to 4.1 % and 5.3 %, respectively of the variance in DSS usage. The difference between R^2 and the adjusted R^2 for this data is 0.053 - 0.043 = .010 (about 1.00 %). This shrinkage means that, if the model were derived from the population rather than a sample it would account for approximately 1.00 % less variance in the outcome. The Durbin-Watson test for this sample was 1.438, which is close to 2, which means that the assumption of independent errors has almost certainly been met.

Data indicated in tables 6.63 and 6.64 provide a partial support for hypothesis 4.3 related to the Egypt group.

Table 6.63 The regression model for organisational characteristics and the Durbin-Watson test

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.147[a]	.022	.018	.1892	
2	.201[b]	.041	.034	.1877	
3	.231[c]	.053	.043	.1868	1.438

a. Predictors: (Constant), computer facilities

b. Predictors: (Constant), computer facilities, information intensity

c. Predictors: (Constant), computer facilities, information intensity, degree of decentralization

d. Dependent Variable: percentage of use

To test the assumption of ***multicollinearity*** for the current data sample, the VIF values are all well below 10 and the tolerance is well above 0.2; therefore, the researcher can safely conclude that there is no collinearity within the data for this sample.

Table 6.64 Test the assumption of multicollinearity

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.168	.057		2.970	.003		
	computer facilities	3.369E-02	.013	.147	2.544	.011	1.000	1.000
2	(Constant)	.110	.061		1.797	.073		
	computer facilities	3.414E-02	.013	.149	2.598	.010	1.000	1.000
	information intensity	2.317E-02	.010	.137	2.393	.017	1.000	1.000
3	(Constant)	4.060E-02	.070		.579	.563		
	computer facilities	3.637E-02	.013	.159	2.771	.006	.992	1.008
	information intensity	2.265E-02	.010	.134	2.350	.019	.999	1.001
	degree of decentralization	1.810E-02	.009	.113	1.971	.050	.992	1.008

a. Dependent Variable: percentage of use

Also, the variance proportions for each of the three variables, computer facilities, information intensity and degree of decentralisation, are distributed across different dimensions (or eigenvalues). For this group of variables the computer facilities has most of its variance (82 %) loading onto dimension 4, while information intensity and degree of decentralisation have most of their variances (85 %) and (67 %) loading onto dimension 2 and 3, respectively, which means that there is no multicollinearity between the independent variables.

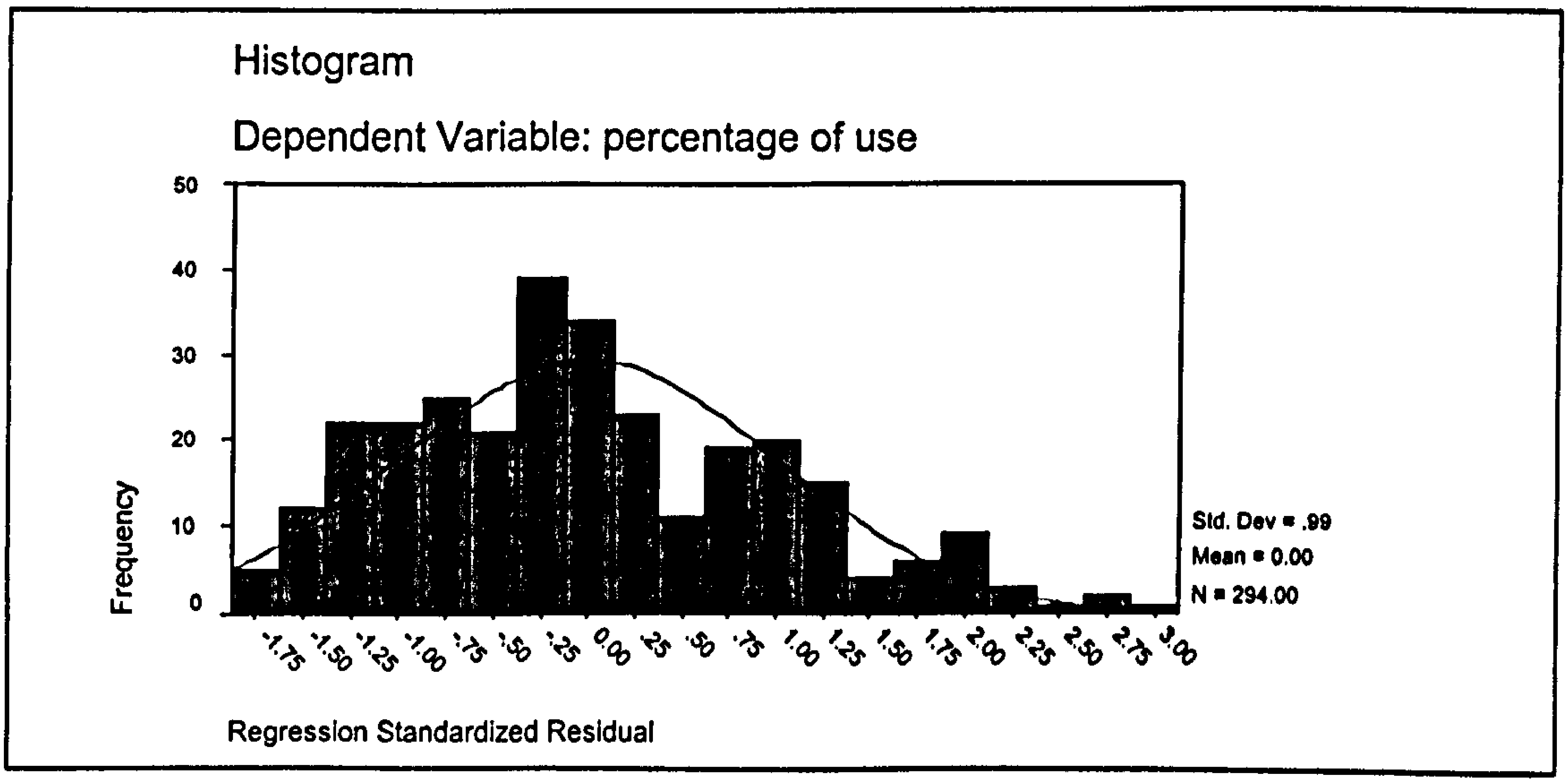
Table 6.65 Collinearity diagnostics

Collinearity Diagnostics ª

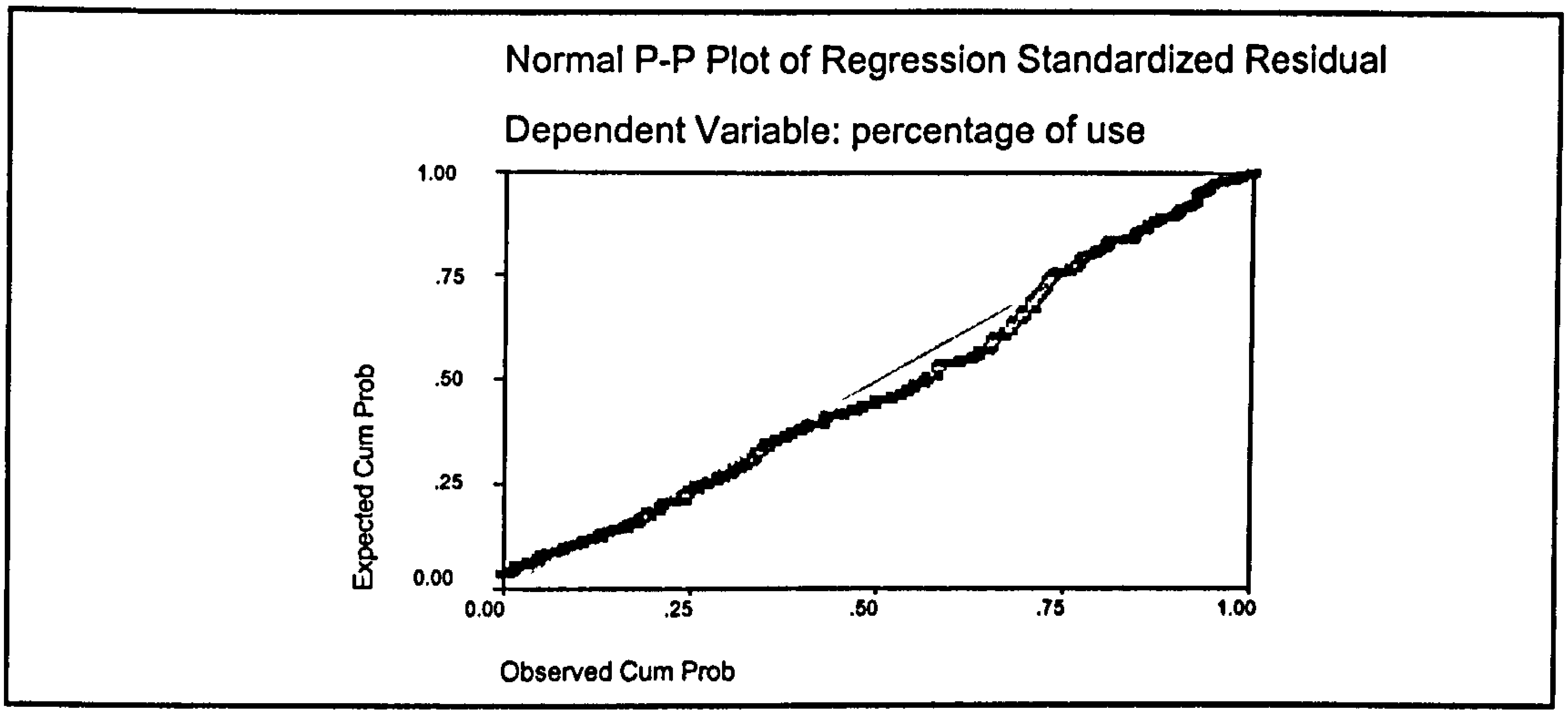
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	computer facilities	Information intensity	degree of decentralization
1	1	1.981	1.000	.01	.01		
	2	1.926E-02	10.142	.99	.99		
2	1	2.850	1.000	.00	.00	.02	
	2	.131	4.658	.03	.06	.92	
	3	1.819E-02	12.520	.97	.93	.06	
3	1	3.749	1.000	.00	.00	.01	.01
	2	.151	4.989	.00	.01	.85	.13
	3	8.465E-02	6.655	.02	.16	.08	.67
	4	1.565E-02	15.479	.97	.82	.06	.17

a. Dependent Variable: percentage of use

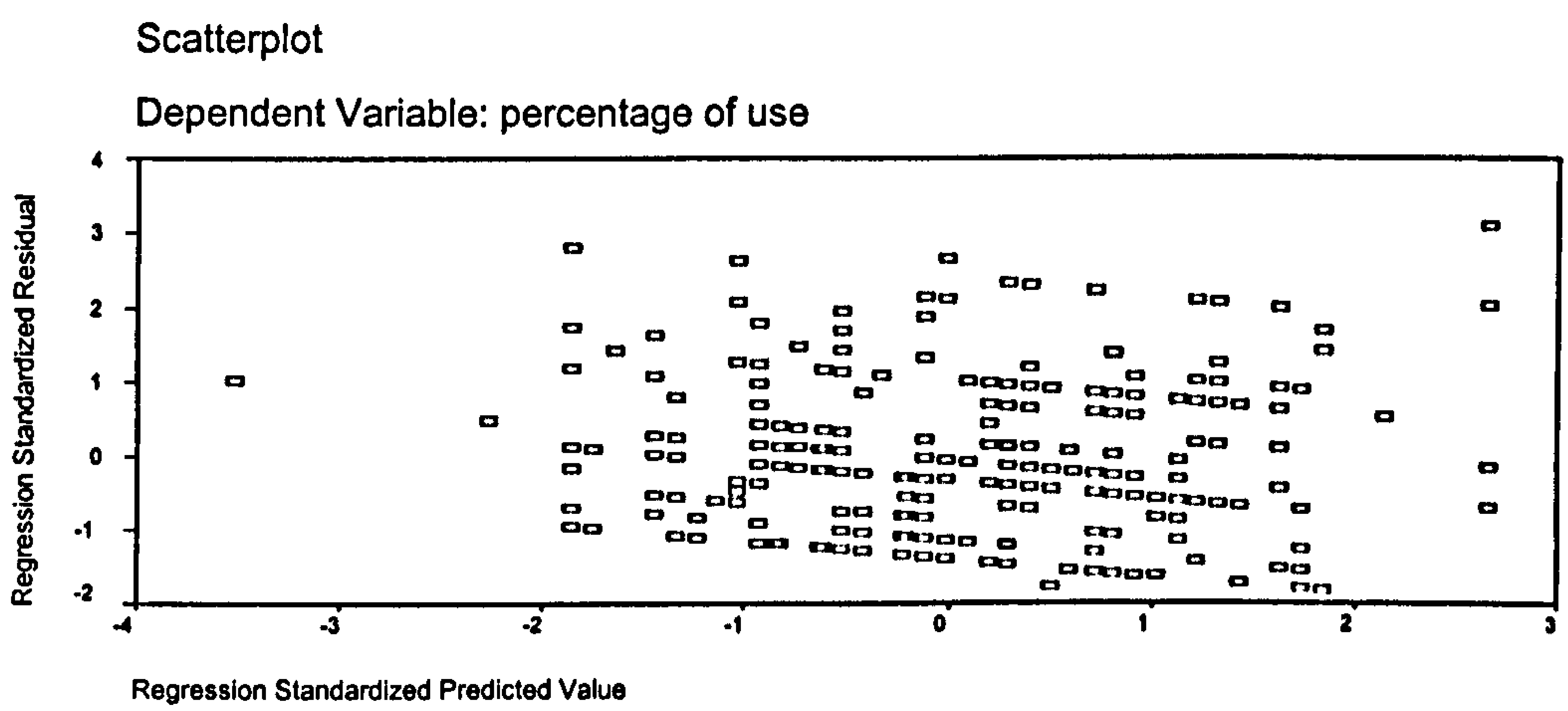
To test the ***normality of residual***, the observed frequencies (indicated by the bars) with normal distribution superimposed indicates normality of the shape of the curve although there is a slight skew towards the left, but the curve is still a sign for the normality of the residuals.



Also, the vast proportions of residuals appear to be on the line or marginally below it, indicating that the observed residuals cumulative proportions are normally distributed.



Linearity and equality of variance does clearly exist due to most of the residuals being randomly distributed in a band cluster around the horizontal line through 0.



6.23.6 Variables relating to internal support characteristics

In the UK group, four variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was experience of DSS staff. The second variable that has significant effect according to beta value was access to help desk. The third variable that has significant effect according to beta value was providing library (books and software manuals). The fourth and last variable was quality of internal support, which reflect the general effect of all kinds of internal support that might have an effect on using DSS in making strategic decisions. Experience of DSS staff accounts for 6.1 % of the variation in DSS usage in making strategic decisions according to R^2 value, however, when the second and the third variables included the value of R^2 increased to 12.2 % and of the variance in DSS usage respectively. The quality of internal support itself accounts for 5.1 of the variation in DSS usage in making strategic decisions. The difference between R^2 and the adjusted R^2 for this data is 0.236 - 0.195 = .041 (about 4.1 %). This shrinkage means that if the model were derived from the population rather than a sample, it would account for approximately 4.1 % less variance in the outcome. The Durbin-Watson test for this sample was 1.648, which is close to 2, which means that the assumption of independent errors has almost certainly been met.

The data indicated in table 6.65 and table 6.66 provide partial support for hypothesis 6.3.

H 6.3: There is no direct relationship between DSS usage and internal support characteristics variables in both the UK group and Egypt group.

Table 6.66 The regression model for internal support characteristics and the Durbin-Watson test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.247[a]	.061	.049	.2864	
2	.349[b]	.122	.098	.2789	
3	.430[c]	.185	.152	.2705	
4	.486[d]	.236	.195	.2635	1.648

a. Predictors: (Constant), Experience of DSS staff

b. Predictors: (Constant), Experience of DSS staff, access to help desk

c. Predictors: (Constant), Experience of DSS staff, access to help desk, providing library

d. Predictors: (Constant), Experience of DSS staff, access to help desk, providing library, quality of internal support

e. Dependent Variable: percentage of use

To test the assumption of *multicollinearity* for the current data sample, the VIF values are all well below 10 and the tolerance is well above 0.2; therefore, the researcher can safely conclude that there is no collinearity within the data for this sample.

Table 6.67 test the assumption of multicollinearity

Coefficients ª

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig	Collinearity Statistics	
		B	Std Error	Beta			Tolerance	VIF
1	(Constant)	.764	.171		4.473	.000		
	Experience of DSS staff	-9.79E-02	.044	-.247	-2 238	.028	1.000	1 000
2	(Constant)	1.137	.233		4.882	.000		
	Experience of DSS staff	-.102	.043	-.257	-2.388	.019	.998	1.002
	access to help desk	-9 27E-02	.041	-.246	-2.287	.025	.998	1.002
3	(Constant)	.930	.242		3.847	.000		
	Experience of DSS staff	-.102	.041	-.258	-2.476	.016	.998	1 002
	access to help desk	-9.90E-02	.039	-.263	-2.514	.014	.994	1.006
	providing library	7.567E-02	.031	.252	2.407	.019	.995	1 005
4	(Constant)	.610	.275		2.215	.030		
	Experience of DSS staff	-9.03E-02	.041	-.228	-2.222	.029	.981	1.019
	access to help desk	-9.62E-02	.038	-.255	-2.505	.014	.993	1.007
	providing library	8.160E-02	.031	.271	2.655	.010	.988	1.012
	quality of internal support	7 844E-02	.035	230	2 237	.028	974	1 027

a. Dependent Variable: percentage of use

Also, the variance proportions for each of the four variables, experience of DSS staff, providing library, access to help disk and quality of internal support, are distributed across different dimensions (or eigenvalues). For this group of variables the experience of DSS staff has most of its variance (47 %) loading onto dimension 5. While access to help disk and providing library have most of their variances (59 %) and (60 %) loading onto dimension 4 and 2 respectively. Finally, quality of internal support has most of its variances (44 %) loading onto dimension 3, which means that there is no multicollinearity between the independent variables.

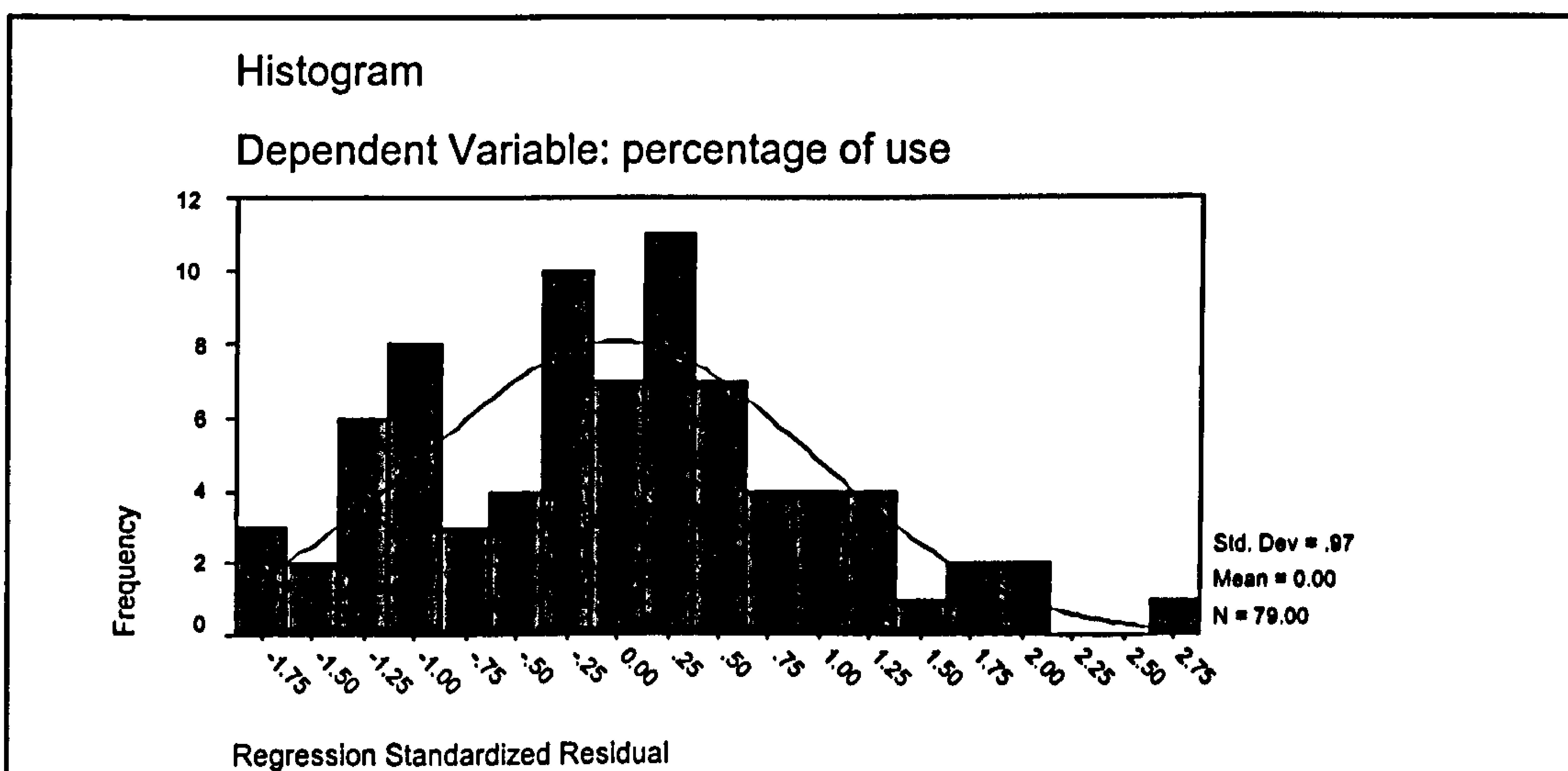
Table 6.68 Collinearity diagnostics

Collinearity Diagnostics [a]

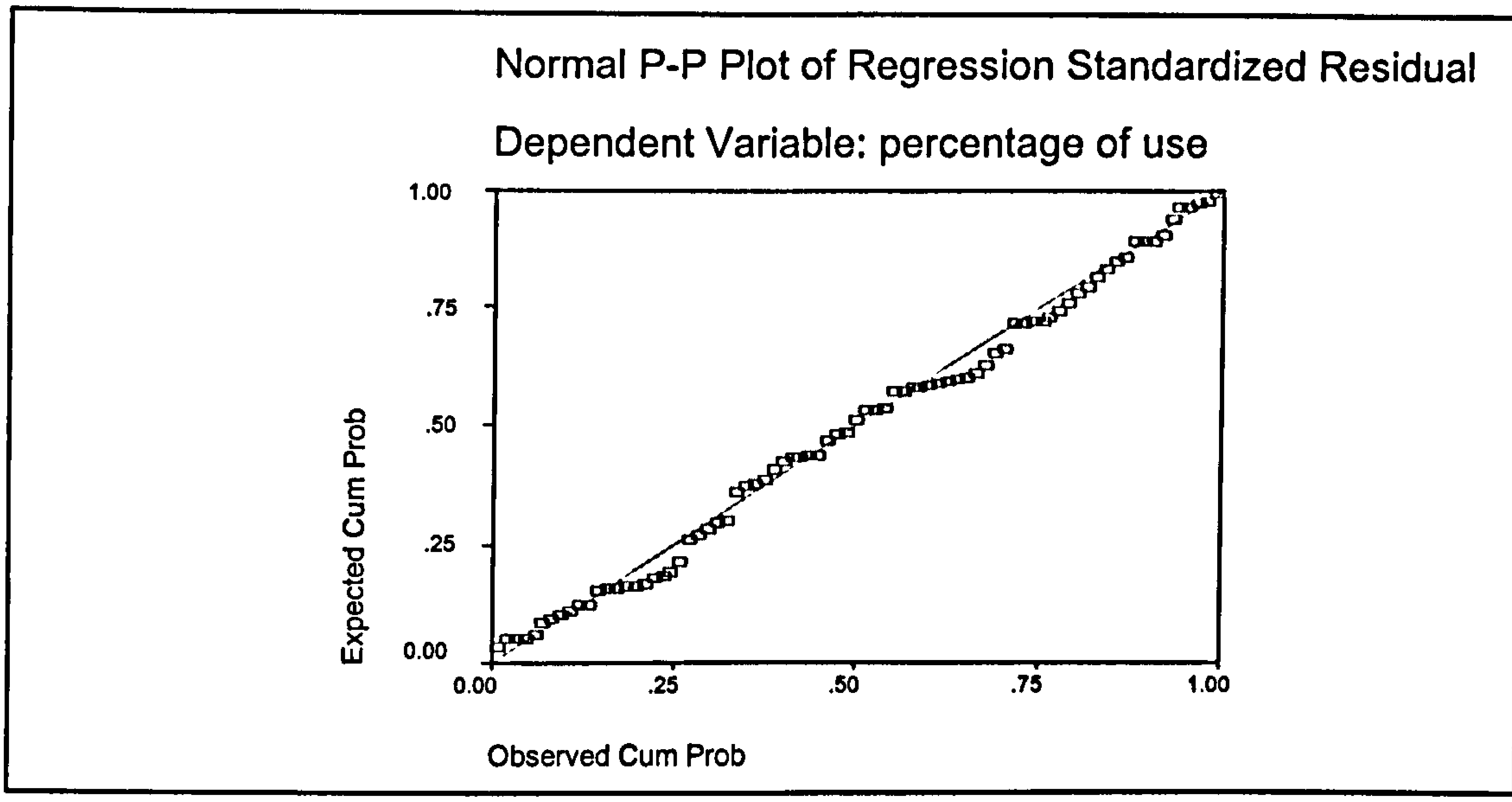
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Experience of DSS staff	access to help desk	providing library	quality of internal support
1	1	1.982	1.000	.01	.01			
	2	1.795E-02	10.509	.99	.99			
2	1	2.949	1.000	.00	.00	.00		
	2	3.868E-02	8.732	.00	.44	.52		
	3	1.206E-02	15.637	1.00	.56	.48		
3	1	3 877	1.000	.00	.00	.00	.01	
	2	7.272E-02	7.302	.01	.06	.05	.92	
	3	3.862E-02	10.020	.00	.42	.54	.00	
	4	1.130E-02	18.523	.99	.52	.41	.07	
4	1	4.807	1.000	.00	.00	.00	.00	.00
	2	8.785E-02	7.397	.00	.00	.00	.60	.31
	3	5.819E-02	9.088	.00	.17	.09	.30	.44
	4	3.846E-02	11.179	.00	.36	.59	.00	.01
	5	8 923E-03	23 209	.99	.47	.32	.09	.24

a. Dependent Variable: percentage of use

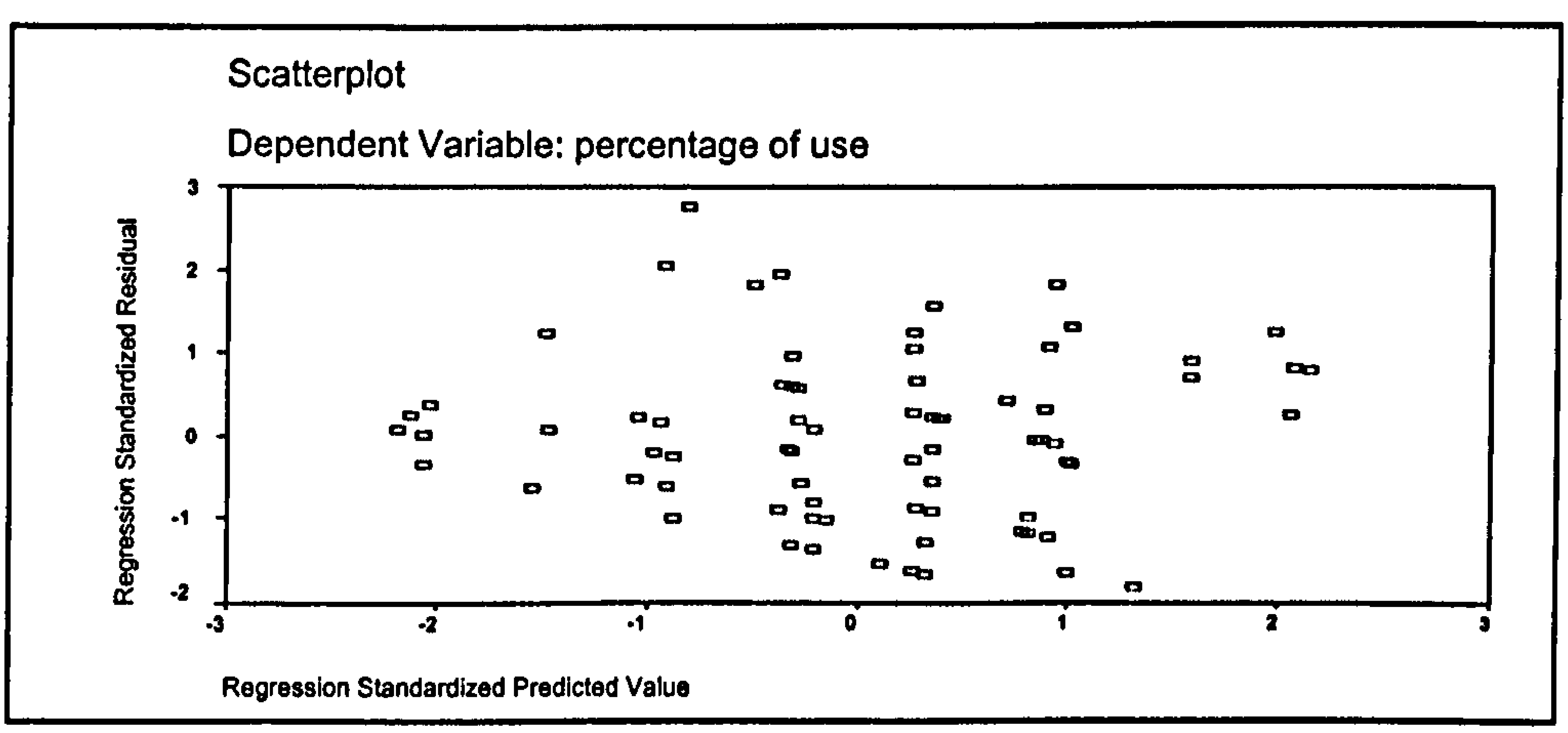
To test the ***normality of residual***, the observed frequencies (indicated by the bars) with normal distribution superimposed indicates normality of the shape of the curve although there is a slight skew towards the left, but the curve is still a sign of the normality of the residuals.



Also, the vast proportions of residuals appear to be on the line or marginally little below it, indicating that the observed residuals cumulative proportions are normally distributed.



Linearity and equality of variance does clearly exist due to most of the residuals being randomly distributed in a band cluster around the horizontal line through 0.



For the same group of variables in ***Egypt group*** variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was advice provided by other colleagues. The second variable that has significant effect according to beta value was providing library. The two variables together account for 4.1 % of the variation in DSS usage in making strategic decisions according to R^2 value. The difference between R^2 and adjusted R^2 is 0.041 - .035 = .006 (0.6 %), which means if the model were derived from the population rather than a sample it would account for approximately 0.6 % less variance in the outcome. The value of Durbin-Watson test for these data was 1.334, which is close to 2, which means that assumption of independent errors has certainly been met.

Data indicated in tables 6.69 and 6.70 provide partial support for hypothesis 6.3 in relation to the Egypt group.

Table 6.69 The regression model for internal support characteristics and the Durbin-Watson test

Model Summary [c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.164[a]	.027	.024	.1888	
2	.203[b]	.041	.035	.1878	1 334

a. Predictors: (Constant), advice provided by other colleagues

b. Predictors: (Constant), advice provided by other colleagues, providing library

c. Dependent Variable: percentage of use

To test the assumption of ***multicollinearity*** for the current data sample, the VIF values are all well below 10 and the tolerance are well above 0.2; therefore the researcher can safely conclude that there is no collinearity within the data for this sample.

Table 6.70 Test the assumption of multicollinearity

Coefficients [a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std Error	Standardized Coefficients Beta	t	Sig	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	.500	.069		7.279	.000		
	advice provided by other colleagues	-4.40E-02	.016	-.164	-2.834	.005	1.000	1.000
2	(Constant)	.401	.083		4.808	.000		
	advice provided by other colleagues	-3.93E-02	.016	-.147	-2.522	.012	.979	1.021
	providing library	2.187E-02	.010	.121	2.085	.038	.979	1.021

a. Dependent Variable: percentage of use

Alsom, the variance proportions for each of the two variables, advice provided by other colleagues and providing library are distributed across different dimensions (or eigenvalues). For this group of variables the, advice provided by other colleagues has most of its variance (88 %) loading onto dimension 3, while access to help desk and providing library have most of their variances (77 %) loading onto dimension 2, which means that there is no multicollinearity between the independent variables.

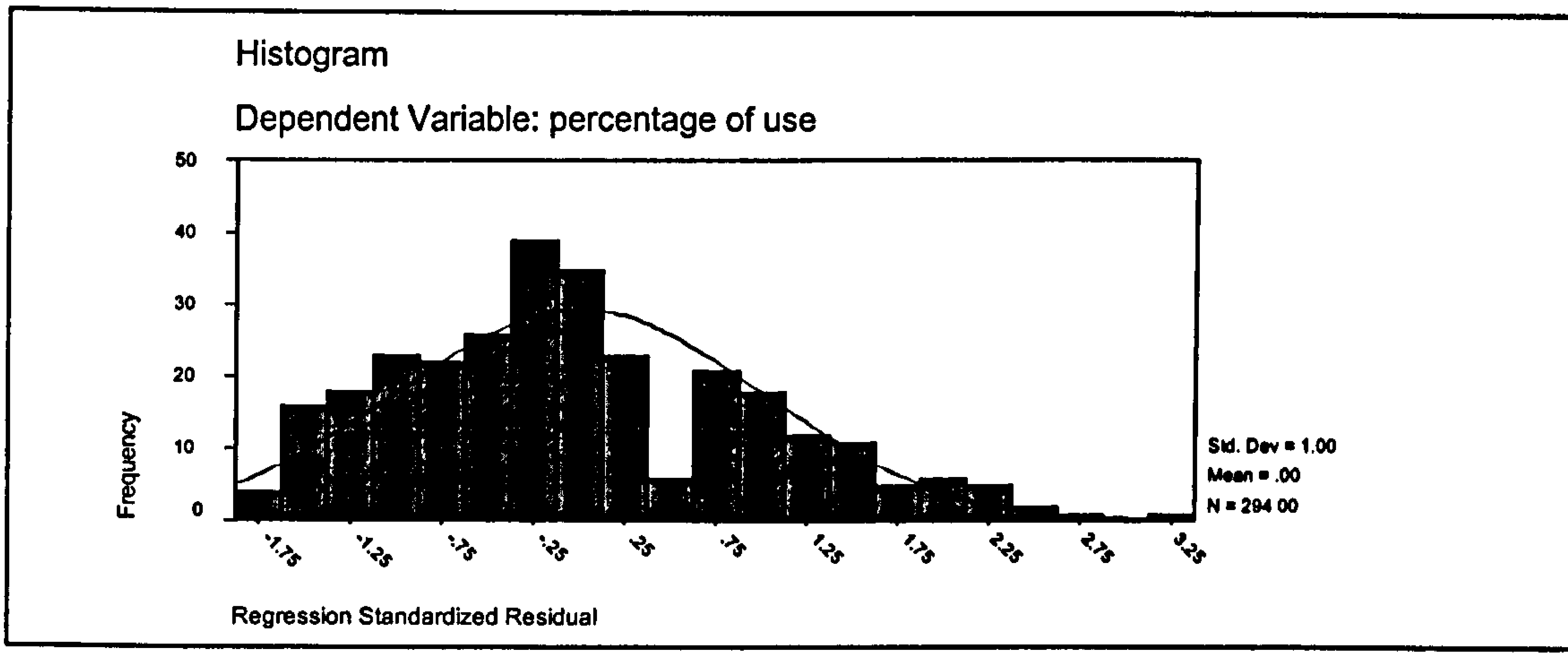
Table 6.71 Collinearity diagnostics

Collinearity Diagnostics [a]

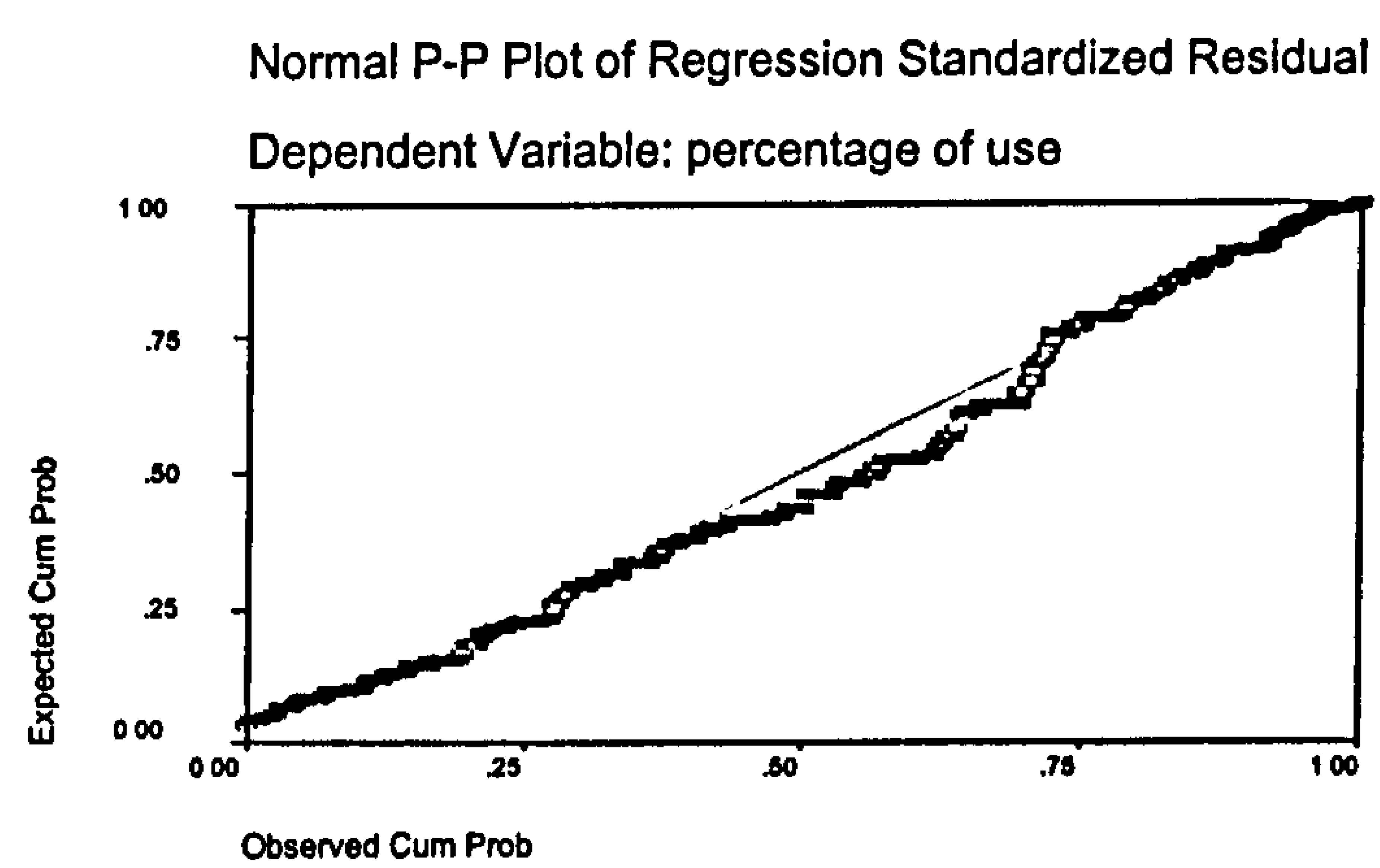
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Variance Proportions advice provided by other colleagues	Variance Proportions providing library
1	1	1.987	1.000	.01	.01	
	2	1.302E-02	12.355	.99	.99	
2	1	2.925	1.000	.00	.00	.01
	2	6.424E-02	6.748	.02	.12	.77
	3	1.063E-02	16.585	.98	.88	.22

a. Dependent Variable: percentage of use

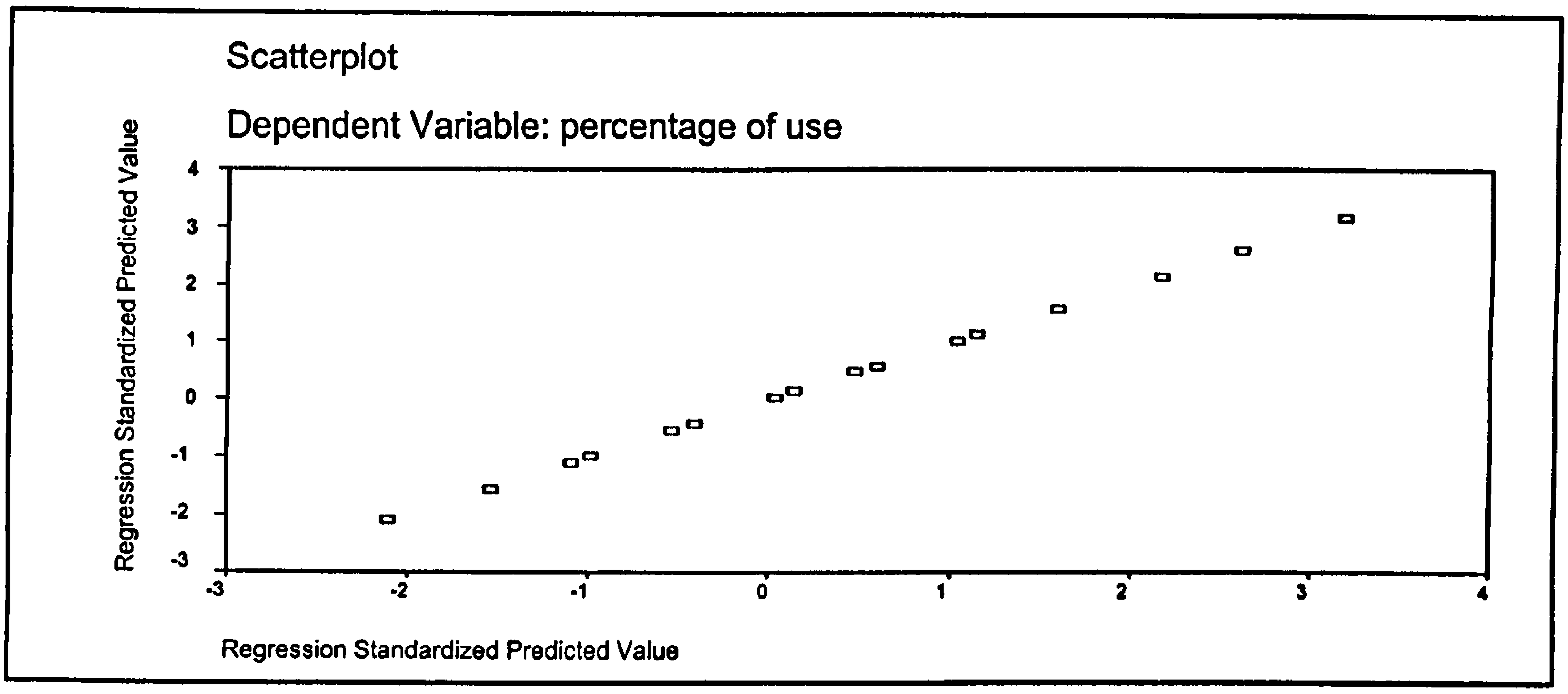
To test the ***normality of residual***, the observed frequencies (indicated by the bars) with normal distribution superimposed indicates normality of the shape of the curve, although there is a slight skew towards the left, but the curve is still a sign of the normality of the residuals.



Also, the vast proportion of residuals appears to be on the line or marginally below it, indicating that the observed residuals cumulative proportion is normally distributed.



In relation to the assumption of ***linearity***, minor problems appear to exist but violation of linearity does not exist due to most of the residuals being randomly dispersed in a band cluster around the horizontal line through 0.



6.23.7 <u>Variables relating to external support characteristics</u>

In the UK group, two variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was recommendation from outside consultants. The second variable that has significant effect was support from government agencies. The recommendation from outside consultants accounts for 6 % of the variation in DSS usage in making strategic decisions according to R^2value. However, when the second variable included the value of R^2 increased to 10.7 % of the variance in DSS usage respectively. The difference between R^2 and the adjusted R^2 for this data is 0.107 - 0.048 = .0023 (about 2.3 %). This shrinkage means that if the model were derived from the population rather than a sample it would account for approximately 2.3 % less variance in the outcome. The Durbin-Watson test for this sample was 1.701, which is so close to 2, that means that the assumption of independent errors has certainly been met.

The data indicated in table 6.72 and table 6.73 provide partial support to hypothesis 7.3.

H 7.3: There is no direct relationship between DSS usage and external support characteristics variables in both the UK group and Egypt group.

Table 6.72 The regression model for external support characteristics and the Durbin-Watson test

Model Summary [c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.245[a]	.060	.048	.2866	
2	.327[b]	.107	.084	.2811	1.701

a. Predictors: (Constant), recommendation from outside consultants

b. Predictors: (Constant), recommendation from outside consultants, Support from government agencies

c. Dependent Variable: percentage of use

To test the assumption of ***multicollinearity*** for the current data sample, the VIF values are all well below 10 and the tolerance is well above 0.2; therefore, the researcher can safely conclude that there is no collinearity within the data for this sample.

Table 6.73 Test the assumption of multicollinearity

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.201	.090		2.232	.029		
	recommendation from outside consultants	6.605E-02	.030	.245	2.221	.029	1.000	1.000
2	(Constant)	.360	.119		3.028	.003		
	recommendation from outside consultants	8.164E-02	.030	.303	2.703	.008	.933	1.071
	Support from government agencies	-5.97E-02	.030	-.224	-1.999	.049	.933	1.071

a. Dependent Variable: percentage of use

Also, the variance proportions for each of the two variables, recommendation from outside consultants and support from government agencies, are distributed across different dimensions (or eigenvalues). For this group of variables the, recommendation from outside consultants has most of its variance (87%) loading onto dimension 2. While support from government agencies has most of their variances (66 %) loading onto dimension 3, which means that there is no multicollinearity between the independent variables.

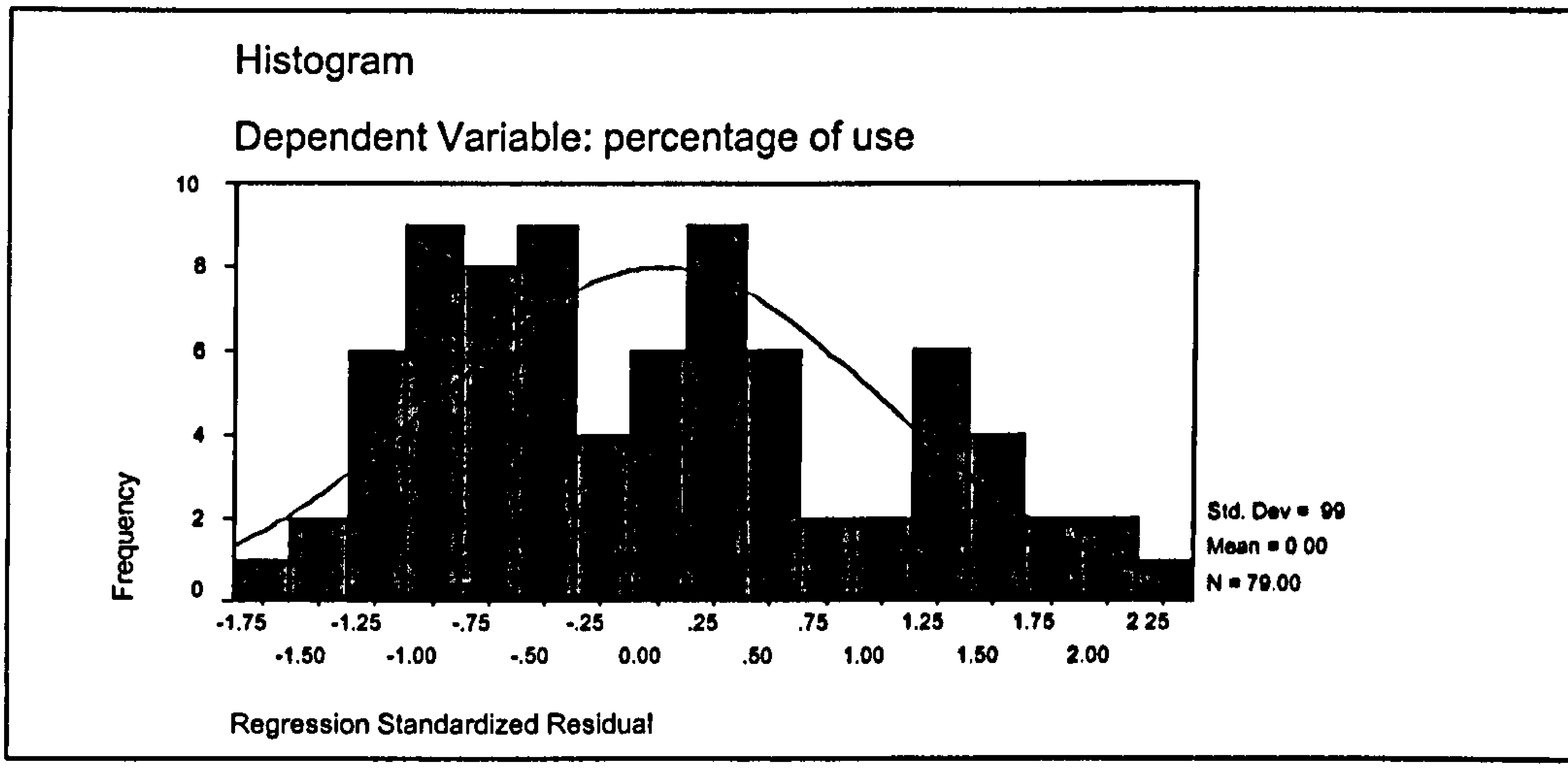
Table 6.74 Collinearity Diagnostics

Collinearity Diagnostics [a]

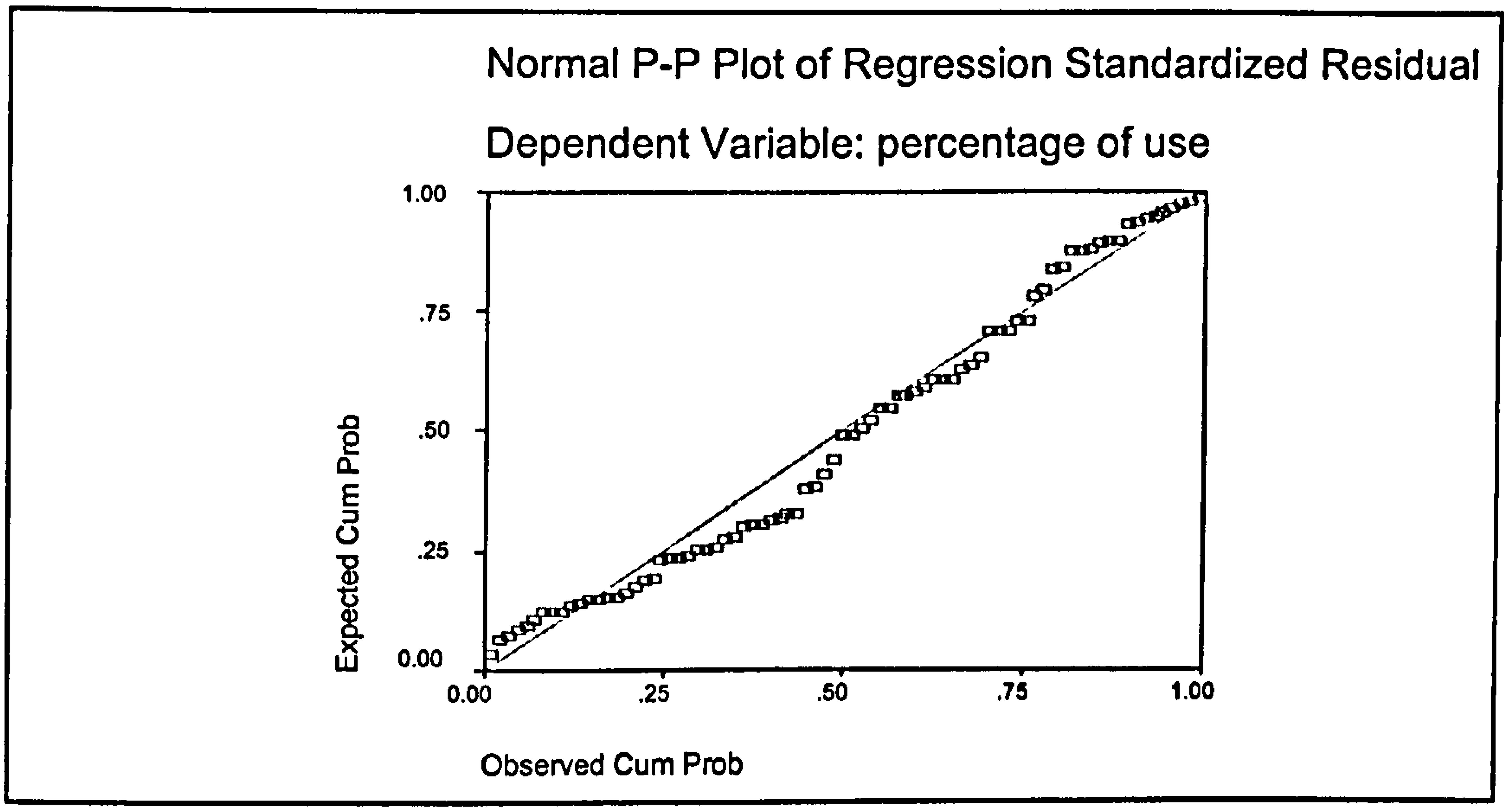
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	recommendation from outside consultants	Support from government agencies
1	1	1.934	1.000	.03	.03	
	2	6.595E-02	5.415	.97	.97	
2	1	2.869	1.000	.01	.01	.01
	2	8.547E-02	5.794	.04	.87	.33
	3	4 564E-02	7 928	.95	.11	66

a. Dependent Variable: percentage of use

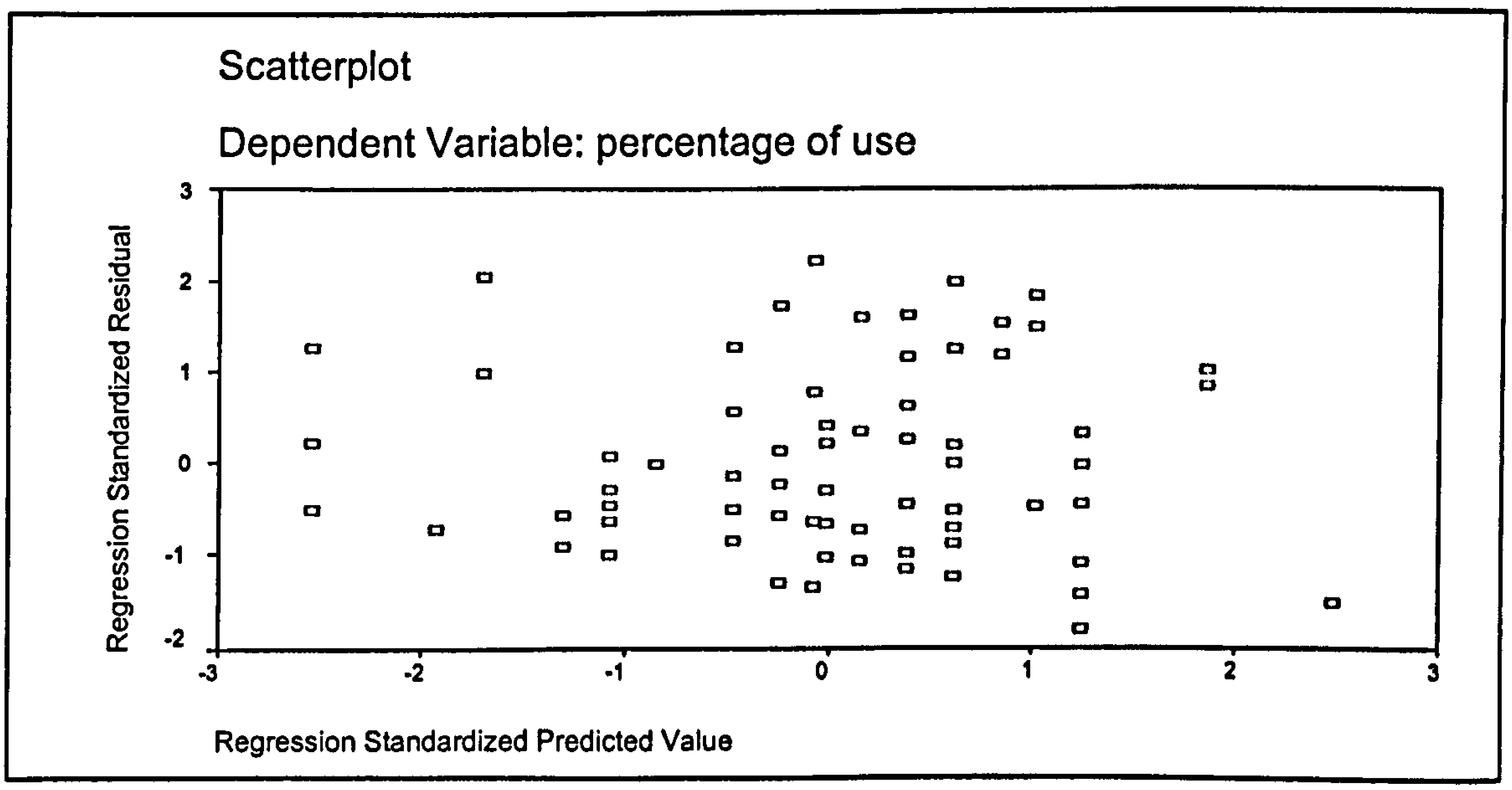
To test the ***normality of residual,*** the observed frequencies (indicated by the bars) with normal distribution superimposed indicates normality of the shape of the curve although there is a slight skew towards the left, but the curve is still a sign for the normality of the residuals.



There is some deviation observed for the environmental characteristics in this sample, indicating a minor problem with overall normality but is still acceptable to meet the assumption of normality. Initially, the observed residuals are seen to be around the "normal" line, then the observed residuals went marginally below it which means that the observed cumulative proportion exceeding the expected. Towards the end of the "normal" line, the observed residuals are seen to be above the normal line, since there are a smaller number of large negative residuals than expected. Once again, the observed residuals are seen to be back on line again, indicating that the observed residuals cumulative proportion is normally distributed.



Linearity and equality of variance does clearly exist due to most of the residuals being randomly distributed in a band cluster around the horizontal line through 0.



For the same group of variables in the ***Egypt group***, two variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was advice and support from vendor. The second variable that has significant effect according to beta value was support from government agencies. The two variables together account for 3.6 % of the variation in DSS usage in making strategic decisions according to R^2 value. The difference between R^2 and adjusted R^2 is 0.036 - .029 = .007 (0.7 %), which means if the model were derived from the population rather than a sample it would account for approximately 0.7 % less variance in the outcome. The value of the Durbin-Watson test for these data was 1.383, which is close to 2, which means that assumption of independent errors certainly has been met.

Data indicated in table 6.75 and 6.76 provide a partial support for hypothesis 7.3 in relation to the Egypt group.

Table 6.75 The regression model for external support characteristics and the Durbin-Watson test

Model Summary [c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.142[a]	.020	.017	.1894	
2	.190[b]	.036	029	.1881	1 383

a. Predictors: (Constant), advice and support from vendor

b. Predictors: (Constant), advice and support from vendor, Support from government agencies

c. Dependent Variable: percentage of use

To test the assumption of ***multicollinearity*** for the current data sample, the VIF values are all well below 10 and the tolerance is well above 0.2; therefore, the researcher can safely conclude that there is no collinearity within the data for this sample.

Table 6.76 Test the assumption of multicollinearity

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.220	.038		5.800	.000		
	advice and support from vendor	2.770E-02	.011	.142	2.449	.015	1.000	1.000
2	(Constant)	.375	.080		4.681	.000		
	advice and support from vendor	2.492E-02	.011	.128	2.204	.028	.987	1.013
	Support from government agencies	-3.31E-02	.015	-.127	-2.194	.029	.987	1.013

a. Dependent Variable: percentage of use

Also, the variance proportions for each of the two variables, recommendation from outside consultants and support from government agencies are distributed across different dimensions (or eigenvalues). For this group of variables, the recommendation from outside consultants has most of its variance (87%) loading onto dimension 2, while support from government agencies has most of their variances (66 %) loading onto dimension 3, which means that there is no multicollinearity between the independent variables.

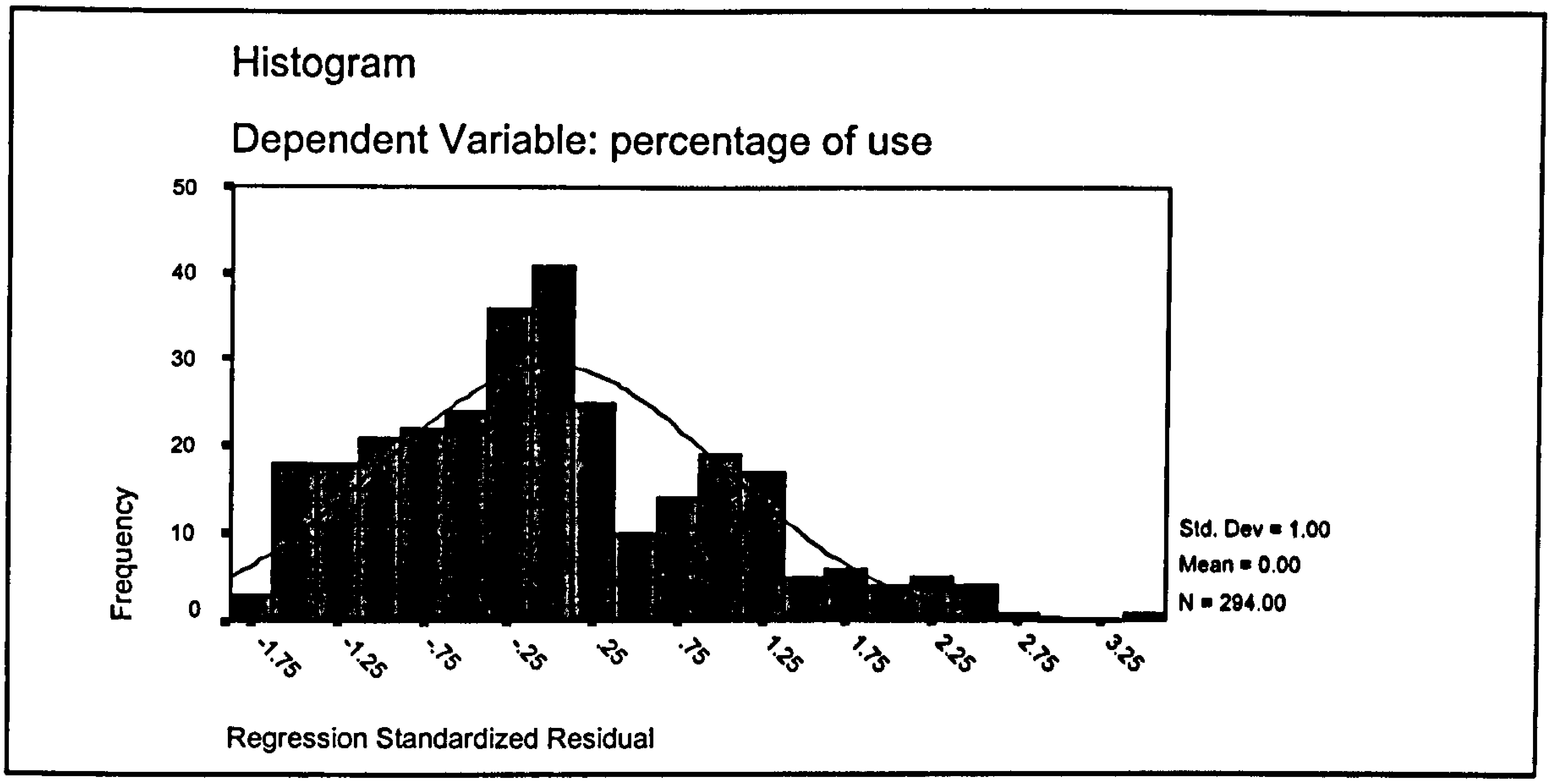
Table 6.77 Collinearity diagnostics

Collinearity Diagnostics[a]

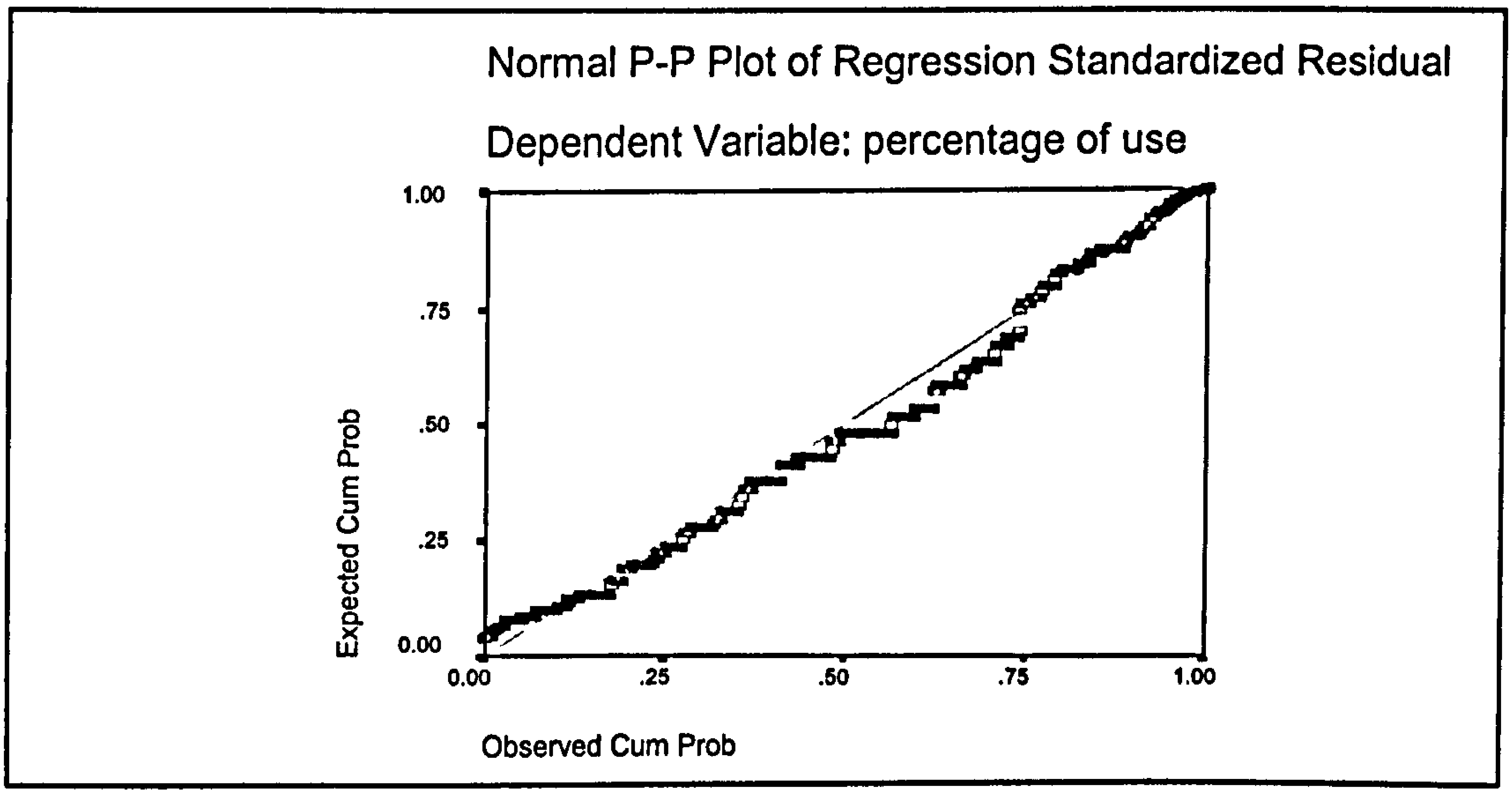
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	advice and support from vendor	Support from government agencies
1	1	1.957	1.000	.02	.02	
	2	4.335E-02	6.718	.98	.98	
2	1	2.921	1.000	.00	.01	.00
	2	6.739E-02	6.584	.02	.80	.11
	3	1.137E-02	16.031	.98	.19	.89

a. Dependent Variable: percentage of use

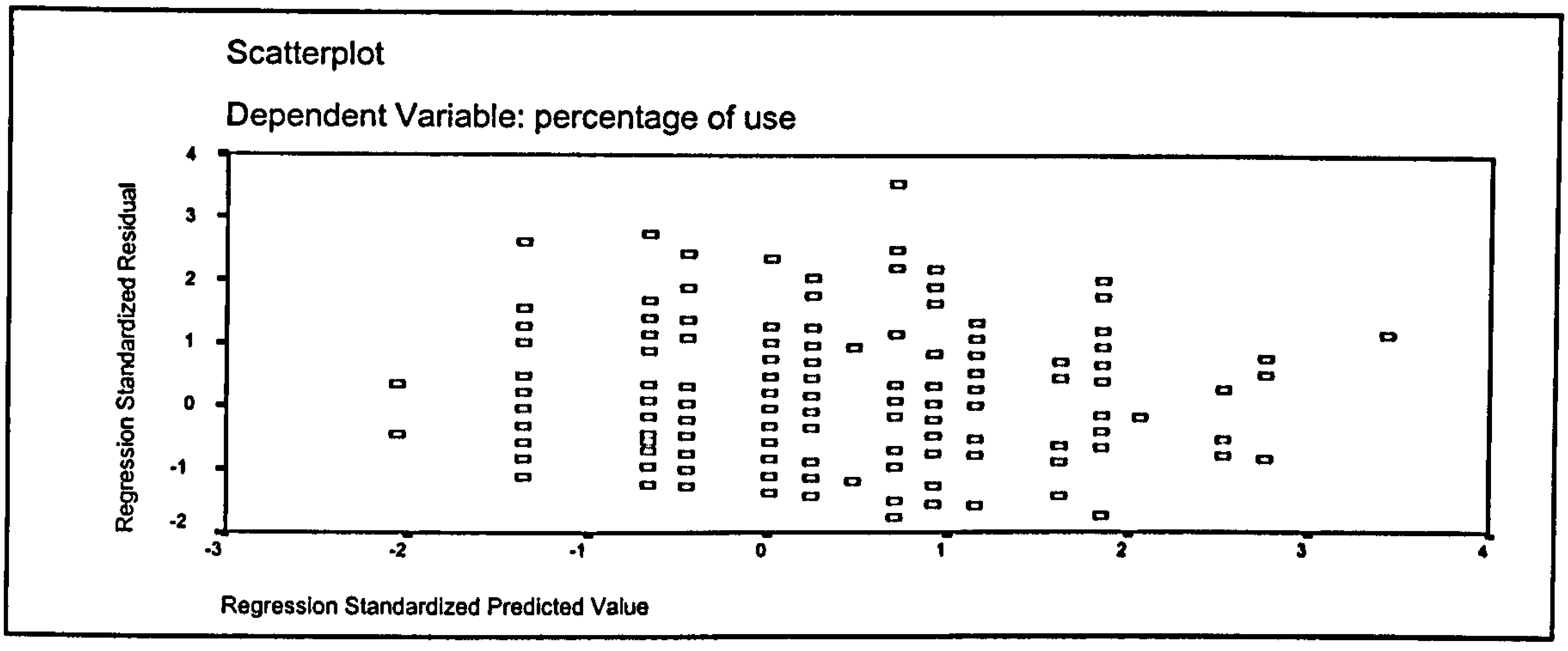
To test the ***normality of residual***, the observed frequencies (indicated by the bars) with normal distribution superimposed indicates normality of the shape of the curve, although there is a slight skew towards the left, but the curve is still a sign for the normality of the residuals.



Also, the vast proportion of residuals appears to be on the line or marginally below it, indicating that the observed residuals cumulative proportion is normally distributed.



Linearity and equality of variance does clearly exist due to most of the residuals being randomly distributed in a band cluster around the horizontal line through 0.



6.23.8 Variables relating to decision-makers characteristics

In the UK group, four variables were found significant using the stepwise regression. The first variable that has the most significant effect according to the beta value was ability to interpret DSS output. The second variable that has significant effect according to beta value was involvement in the DSS development. The third variable that has significant effect according to beta value was years of experience of the decision makers. The fourth and last variable was attitudes toward DSS. Ability to interpret DSS output accounts for 8.4 % of the variation in DSS usage in making strategic decisions according to R^2 value. However, when the second and the third variables included the value of R^2 increased to 26.3 % and of the variance in DSS usage respectively. The attitudes toward DSS account for 5.4 % of the variation in DSS usage in making strategic decisions. The difference between R^2 and the adjusted R^2 for this data is 0.317 - 0.279 = .036 (about 3.6 %). This shrinkage means that, if the model were derived from the population rather than a sample, it would account for approximately 3.6 % less variance in the outcome. The Durbin-Watson test for this sample was 1.662, which is close to 2, which means that the assumption of independent errors has almost certainly been met.

The data indicated in table 6.78 and table 6.79 provide partial support for hypothesis 8.3.

H 8.3: There is no direct relationship between DSS usage and decision maker characteristics variables in both the UK group and Egypt group.

Table 6.78 The regression model for decision-makers characteristics and the Durbin-Watson test

Model Summary [e]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.290[a]	.084	.072	.2766	
2	.418[b]	.174	.152	.2644	
3	.513[c]	.263	.233	.2515	
4	.563[d]	.317	.279	.2438	1.662

a. Predictors: (Constant), Ability to interpret DSS out put

b. Predictors: (Constant), Ability to interpret DSS out put, involvement in the development of DSS

c. Predictors: (Constant), Ability to interpret DSS out put, involvement in the development of DSS, years of experience

d. Predictors: (Constant), Ability to interpret DSS out put, involvement in the development of DSS, years of experience, attitudes toward DSS

e. Dependent Variable: percentage of use

To test the assumption of ***multicollinearity*** for the current data sample, the VIF values are all well below 10 and the tolerance is well above 0.2; therefore the researcher can safely conclude that there is no collinearity within the data for this sample.

Table 6.79 Test the assumption of multicollinearity

Coefficients [a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std Error	Standardized Coefficients Beta	t	Sig	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	2.760E-02	.137		.201	.841		
	Ability to interpret DSS out put	9.279E-02	.035	.290	2.644	.010	1.000	1.000
2	(Constant)	.245	.152		1.617	.110		
	Ability to interpret DSS out put	.104	.034	.325	3.077	.003	.987	1.013
	Involvement in the development of DSS	-7.29E-02	.025	-.302	-2.863	.005	.987	1.013
3	(Constant)	.722	.215		3.349	.001		
	Ability to interpret DSS out put	.100	.032	.313	3.111	.003	.985	1.015
	Involvement in the development of DSS	-8.00E-02	.024	-.332	-3.286	.002	.977	1.023
	years of experience	-.114	.038	-.299	-2.976	.004	.988	1 012
4	(Constant)	.419	.244		1.717	.090		
	Ability to interpret DSS out put	8.690E-02	.032	.272	2.747	.008	.956	1.046
	Involvement in the development of DSS	-8.62E-02	.024	-.357	-3.630	.001	.966	1.035
	years of experience	-.114	.037	-.297	-3.053	.003	.988	1.012
	attitudes toward DSS	8 718E-02	.036	.238	2 404	.019	.954	1 048

a. Dependent Variable: percentage of use

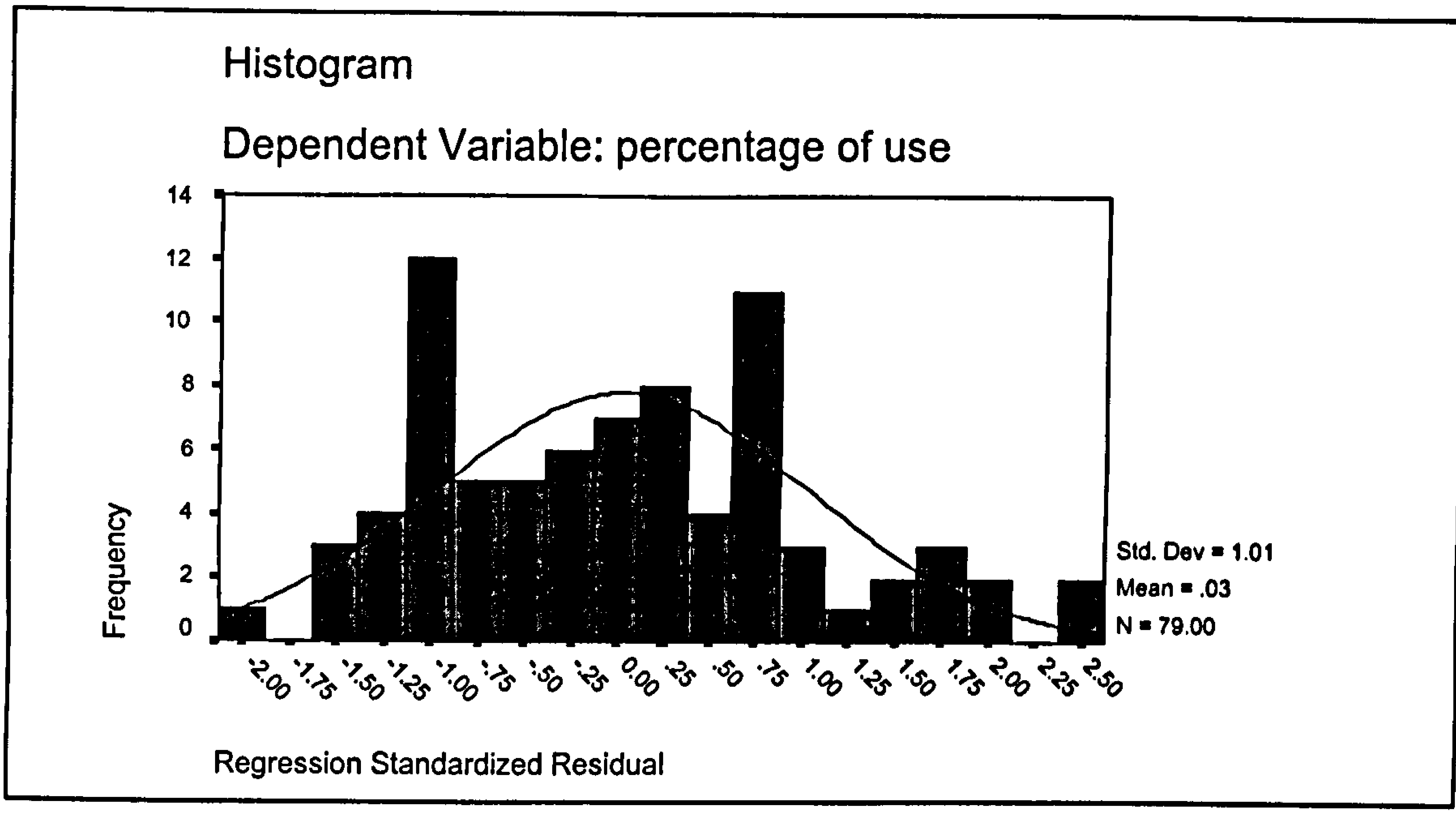
Also, the variance proportions for each of the four variables, ability to interpret DSS output, involvement in the DSS development, years of experience and attitudes toward DSS, are distributed across different dimensions (or eigenvalues). For this group of variables the ability to interpret DSS output has most of its variance (64 %) loading onto dimension 3. While involvement in the DSS development and years of experience have most of their variances (88 %) and (45 %) loading onto dimension 2 and 5, respectively. Finally, attitudes toward DSS have most of its variances (68 %) loading onto dimension 4, which means that there is no multicollinearity between the independent variables.

Table 6.80 Collinearity diagnositcs

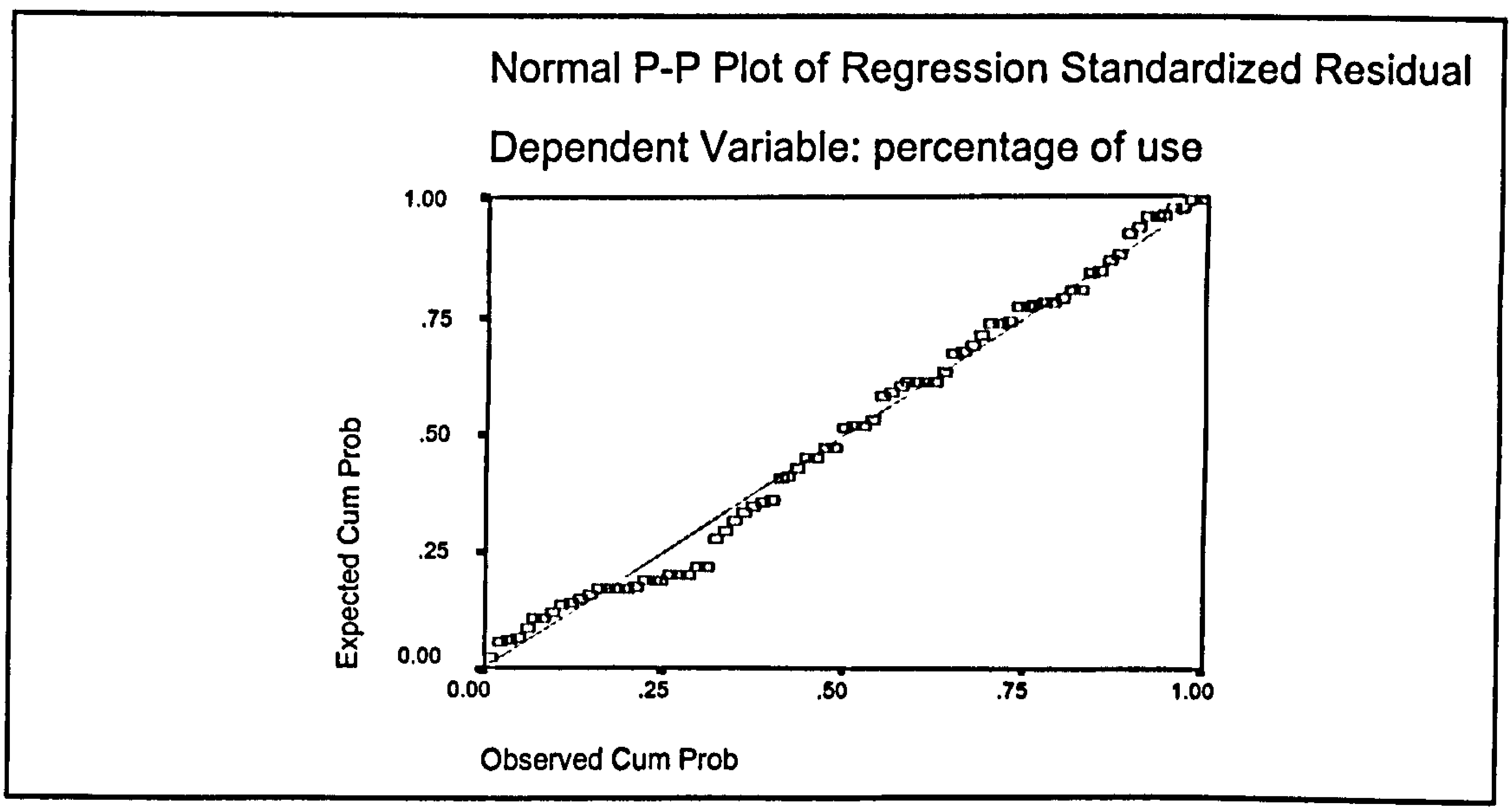
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Ability to interpret DSS output	Involvement in the development of DSS	years of experience	attitudes toward DSS
1	1							
	2	2.638E-02	8.649	.99	.99			
2	1	2.903	1.000	.00	.01	.01		
	2	7.227E-02	6.339	.03	.21	.87		
	3	2.430E-02	10.930	.96	.78	.12		
3	1	3.868	1.000	.00	.00	.01	.00	
	2	8.311E-02	6.813	.01	.03	.85	.08	
	3	4.675E-02	9.084	.00	.70	.02	.27	
	4	1.236E-02	17.664	.99	.27	.12	.65	
4	1	4.828	1.000	.00	.00	.00	.00	.00
	2	8.466E-02	7.552	.00	.02	.88	.06	.01
	3	4.681E-02	10.157	.00	.64	.02	.29	.00
	4	3.054E-02	12.574	.00	.23	.03	.20	.68
	5	9.755E-03	22.246	.99	.10	.06	.45	.31

a

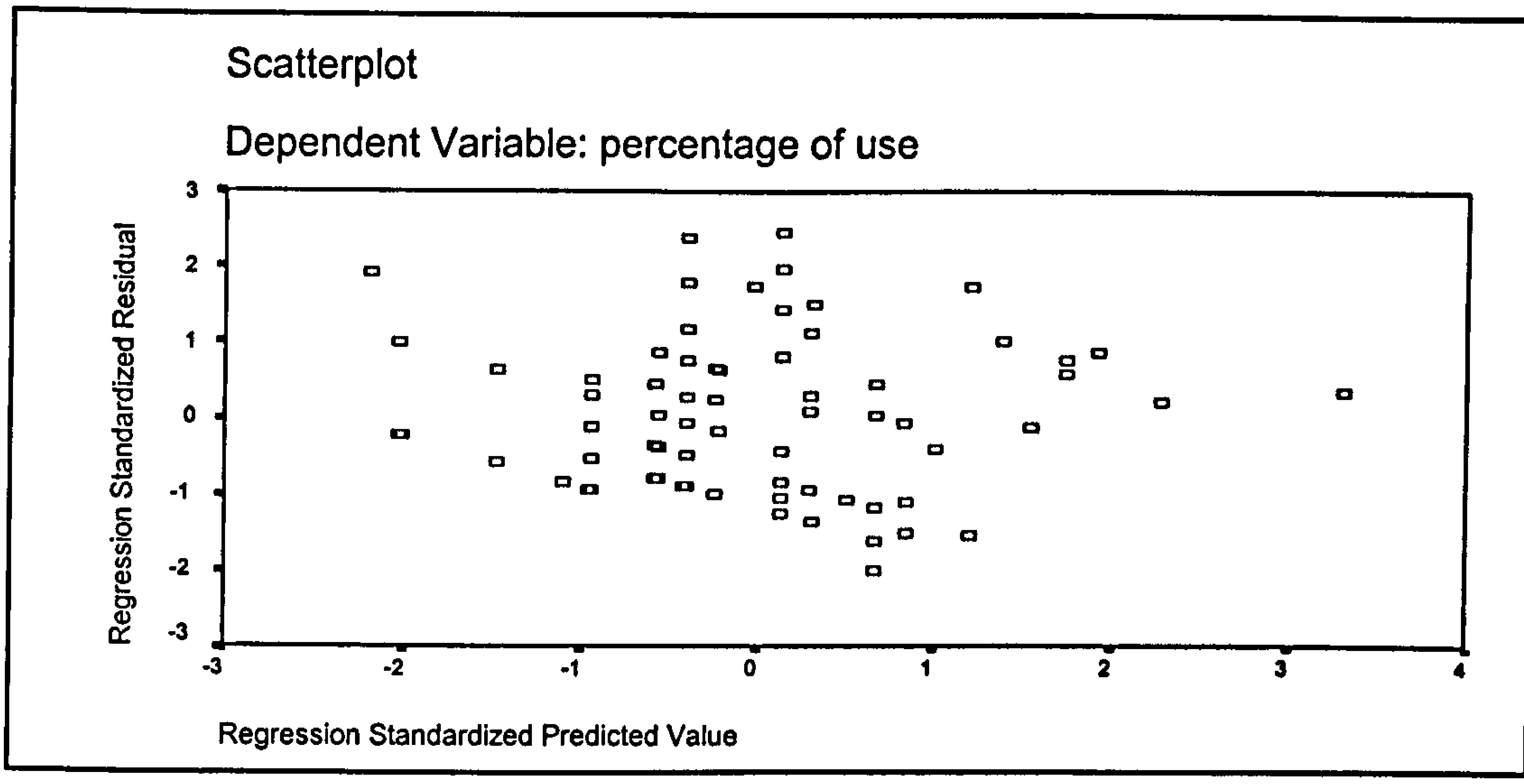
To test the ***normality of residual***, the observed frequencies (indicated by the bars) with normal distribution superimposed indicates normality of the shape of the curve, although there is a slight skew towards the left, but the curve is still a sign for the normality of the residuals.



Also, the vast proportion of residuals appears to be on the line or marginally below it, indicating that the observed residuals cumulative proportion is normally distributed.



Linearity and equality of variance does clearly exist due to most of the residuals being randomly distributed in a band cluster around the horizontal line through 0.



For the same group of variables in the ***Egypt group***, five variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was level of training, which accounts for 2.7 % of the variation in DSS usage in making strategic decisions according to R^2value. The second variable that has significant effect according to beta value was confidence in DSS usage, which accounts for 2.2 % of the variation in DSS usage in making strategic decisions according to R^2value. The third variable that has the most significant effect according to beta value was involvement in the development of DSS, which accounts for 1.5 % of the variation in DSS usage in making strategic decisions according to R^2value. The fourth variable in this group was innovativeness of decision-makers, which accounts for 1.5 % of the variation in DSS usage in making strategic decisions according to R^2value. The last variable in this group was attitudes toward DSS, which accounts for 1.3 % of the variation in DSS usage in making strategic decisions according to R^2value. The difference between R^2 and adjusted $R^2$is 0.088 - .072 = .006 (1.6 %), which means if the model were derived from the population rather than a sample, it would account for approximately 1.6 % less variance in the outcome. The value of Durbin-Watson test for these data was 1.436, which is close to 2, which means that the assumption of independent errors has certainly been met. Data indicated in table 6.81 and 6.82 provide partial support for hypothesis 8.3 in relation to Egypt group.

Table 6.81 The regression model for DM characteristics and the Durbin-Watson test

Model Summary f

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.165[a]	.027	.024	.1876	
2	.213[b]	.045	.039	.1862	
3	.246[c]	.060	.051	.1850	
4	.274[d]	.075	.062	.1839	
5	.296[e]	.088	.072	.1830	1 436

a. Predictors: (Constant), level of training

b. Predictors: (Constant), level of training, confidence in DSS usage

c. Predictors: (Constant), level of training, confidence in DSS usage, involvement in the development of DSS

d. Predictors: (Constant), level of training, confidence in DSS usage, involvement in the development of DSS, innovativeness of decision maker

e. Predictors: (Constant), level of training, confidence in DSS usage, involvement in the development of DSS, innovativeness of decision maker, attitudes toward DSS

f. Dependent Variable: percentage of use

To test the assumption of ***multicollinearity*** for the current data sample, the VIF values are all well below 10 and the tolerance is well above 0.2; therefore, it can be safely concluded that there is no collinearity within the data for this sample.

Table 6.82 Test the assumption of multicollinearity

Coefficients [a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	2.760E-02	.137		.201	.841		
	Ability to interpret DSS out put	9.279E-02	.035	.290	2.644	.010	1.000	1.000
2	(Constant)	.245	.152		1.617	.110		
	Ability to interpret DSS out put	.104	.034	.325	3.077	.003	.987	1.013
	involvement in the development of DSS	-7.29E-02	.025	-.302	-2.863	.005	.987	1.013
3	(Constant)	.722	.215		3.349	.001		
	Ability to interpret DSS out put	.100	.032	.313	3.111	.003	.985	1.015
	involvement in the development of DSS	-8.00E-02	.024	-.332	-3.286	.002	.977	1.023
	years of experience	-.114	.038	-.299	-2.976	.004	.988	1.012
4	(Constant)	.419	.244		1.717	.090		
	Ability to interpret DSS out put	8.690E-02	.032	.272	2.747	.008	.956	1.046
	involvement in the development of DSS	-8.62E-02	.024	-.357	-3.630	.001	.966	1.035
	years of experience	-.114	.037	-.297	-3.053	.003	.988	1.012
	attitudes toward DSS	8.718E-02	.036	.238	2.404	.019	.954	1.048

a. Dependent Variable: percentage of use

Also, the variance proportions for each of the five variables, level of training, confidence in DSS usage, involvement in the development of DSS, innovativeness of decision-makers and attitudes toward DSS are distributed across different dimensions (or eigenvalues). For this group of variables the level of training has most of its variance (41 %) loading onto dimension 5, while the second and third variables have most of their variances (41 %) and (48 %) loading onto dimension 3 and 2 respectively. Finally, the fourth and fifth variables have most of its variances (44 %) and (54 %) loading onto dimension 5 and 6, respectively, which means that there is no multicollinearity between the independent variables.

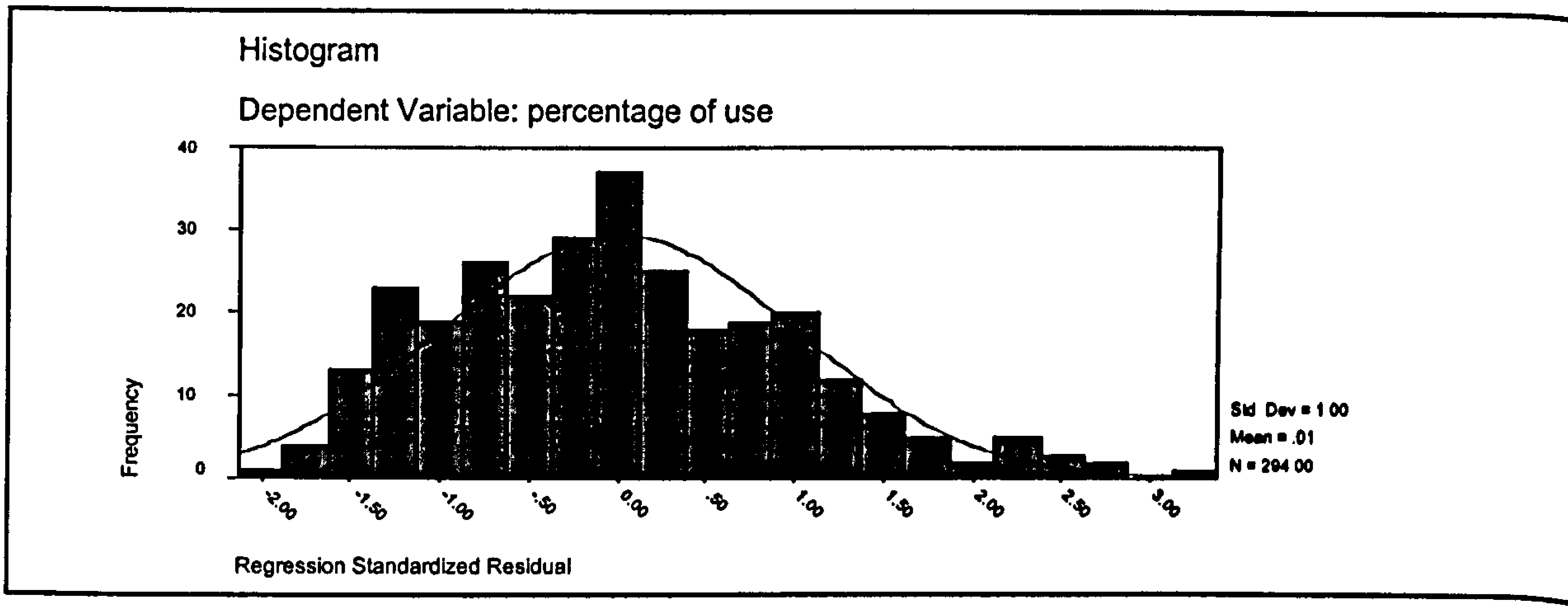
Table 6.83 Collinearity diagnostics

Collinearity Diagnostics[a]

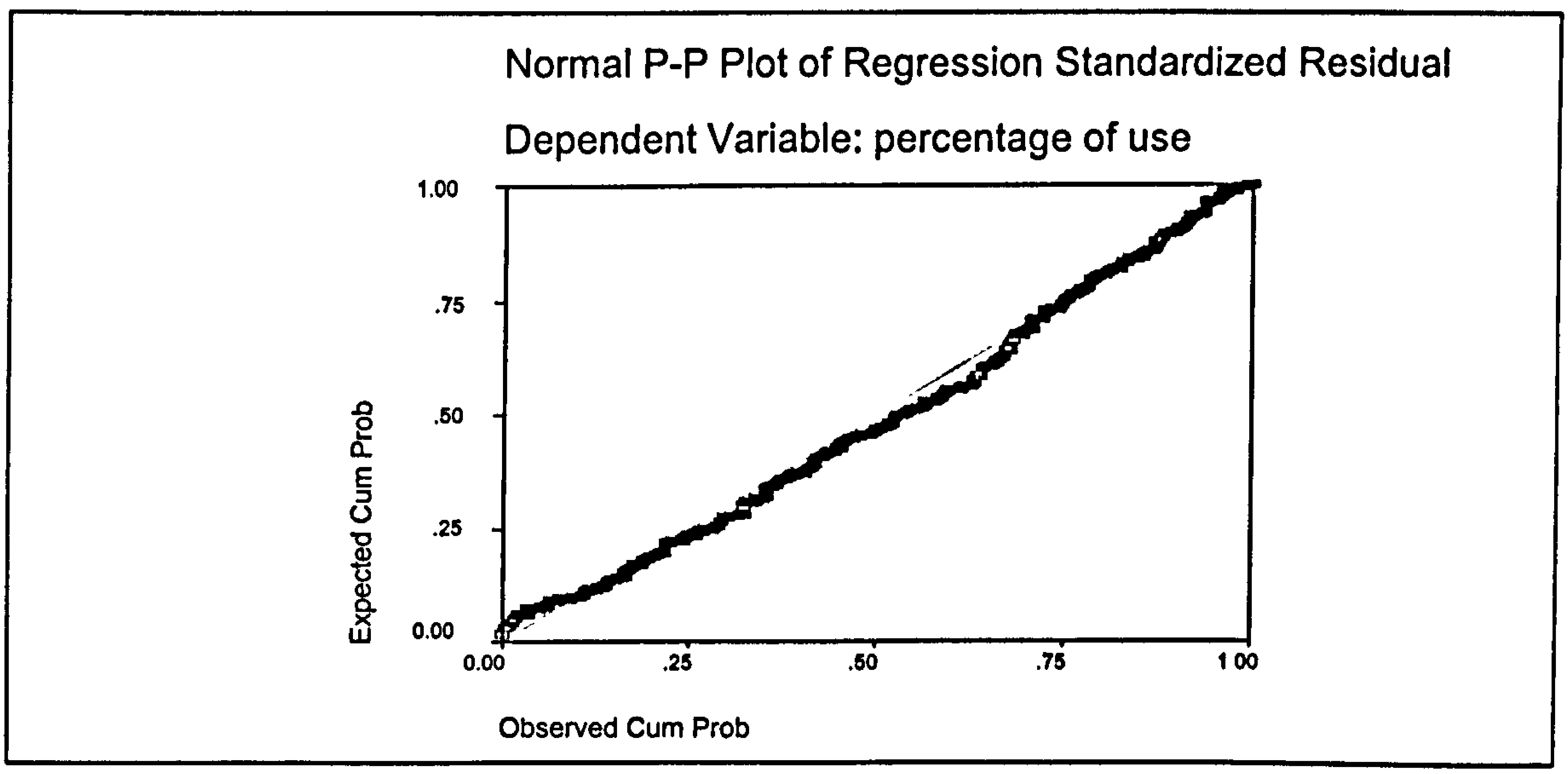
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	level of training	confidence in DSS usage	involvement in the development of DSS	innovativeness of decision maker	attitudes toward DSS
1	1	1.976	1.000	.01	.01				
	2	2.356E-02	9.160	.99	.99				
2	1	2.914	1.000	.00	.01	.01			
	2	6.698E-02	6.596	.01	.26	.71			
	3	1.876E-02	12.465	.99	.74	.28			
3	1	3.847	1.000	.00	.00	.01	.01		
	2	8.077E-02	6.901	.00	.01	.56	.40		
	3	5.480E-02	8.379	.02	.42	.16	.51		
	4	1.760E-02	14.786	.98	.57	.27	.09		
4	1	4.781	1.000	.00	.00	.00	.00	.00	
	2	8.244E-02	7.615	.00	.03	.30	.50	.08	
	3	7.269E-02	8.109	.00	.01	.44	.01	.41	
	4	5.393E-02	9.415	.01	.47	.08	.43	.03	
	5	1.044E-02	21.403	.99	.48	.18	.06	.48	
5	1	5.729	1.000	.00	.00	.00	.00	.00	.00
	2	8.246E-02	8.336	.00	.03	.30	.48	.08	.00
	3	7.282E-02	8.870	.00	.01	.41	.00	.43	.00
	4	5.650E-02	10.070	.00	.15	.16	.44	.05	.30
	5	4.983E-02	10.723	.00	.40	.00	.04	.00	.54
	6	9.069E-03	25.134	.99	.41	.12	.03	.44	.16

a. Dependent Variable: percentage of use

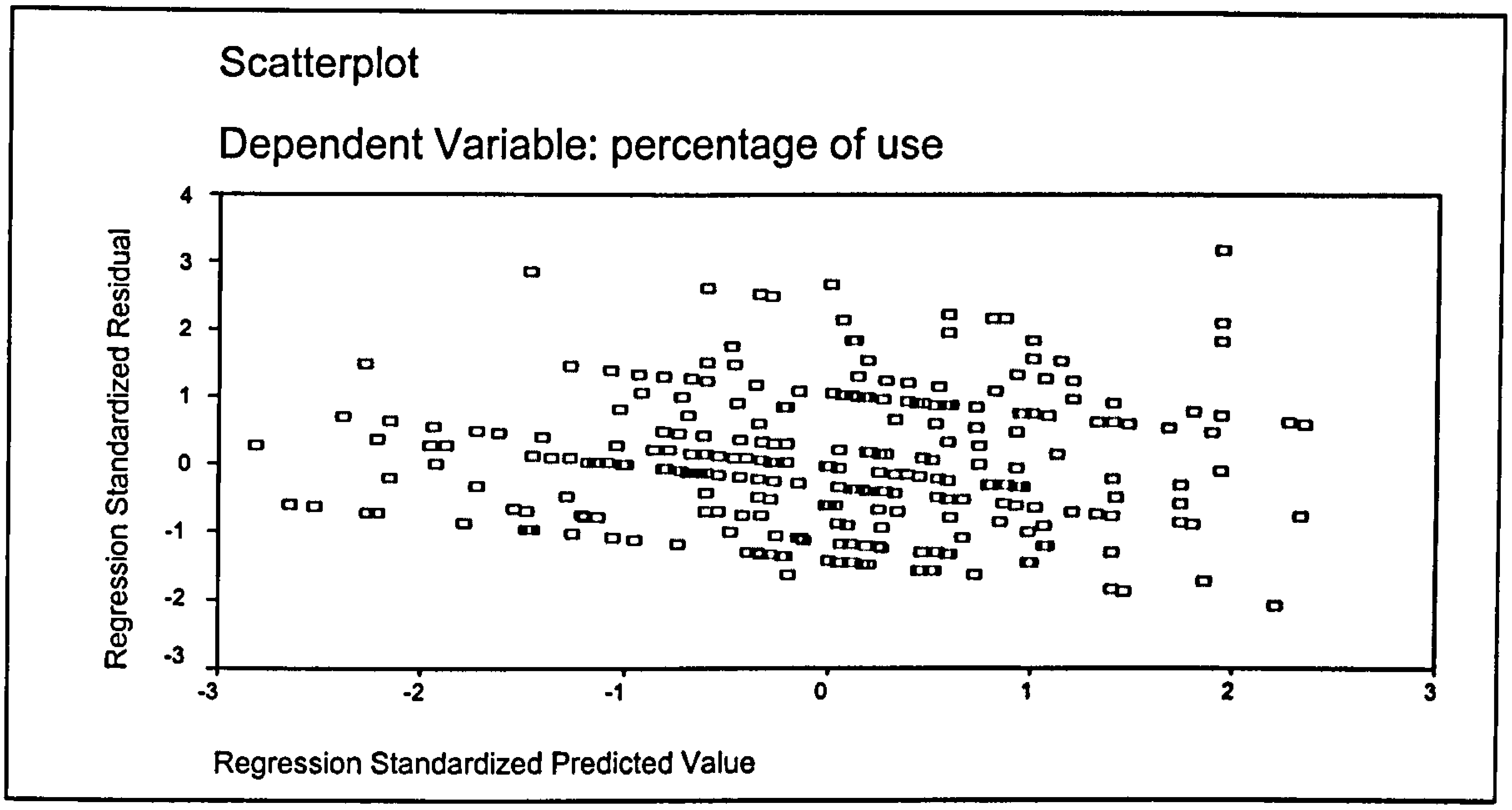
To test the ***normality of residual***, the observed frequencies (indicated by the bars) with normal distribution superimposed indicates normality of the shape of the curve, although there is a slight skew towards the left, but the curve is still a sign for the normality of the normality of the residuals.



Also, the vast proportion of residuals appears to be on the line or marginally little below it, indicating that the observed residuals cumulative proportion is normally distributed.



Linearity and equality of variance does clearly exist due to most of the residuals being randomly distributed in a band cluster around the horizontal line through 0.



6.23.9 Variables relating to top management characteristics

In the UK group, three variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was developing core of internal experts. The second variable that has significant effect according to beta value was offering funds. The third variable that has significant effect according to beta value was top management understanding for DSS. Developing core of internal experts' accounts for 5.9 % of the variation in DSS usage in making strategic decisions according to R^2 value. However, when the second variable included the value of R^2 increased to 10.7 % and of the variance in DSS usage respectively. Finally, the third variable itself accounts for 6.4 of the variation in DSS usage in making strategic decisions. The difference between R^2 and the adjusted R^2 for this data is 0.174 - 0.141 = .033 (about 3.3 %). This shrinkage means that, if the model were derived from the population rather than a sample, it would account for approximately 3.3 % less variance in the outcome. The Durbin-Watson test for this sample was 1.443, which is close to 2, which means that the assumption of independent errors has almost certainly been met.

H 9.3: There is no direct relationship between DSS usage and top management characteristics variables in both the UK group and Egypt group.

The data indicated in tables 6.84 and 6.85 provide a partial support to hypothesis 9.3.

Table 6.84 The regression model for top management characteristics and the Durbin-Watson test

Model Summary [d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.242[a]	.059	.046	.2868	
2	.327[b]	.107	.084	.2812	
3	.417[c]	.174	.141	.2722	1.443

a. Predictors: (Constant), developing a core of internal experts

b. Predictors: (Constant), developing a core of internal experts, offering funds

c. Predictors: (Constant), developing a core of internal experts, offering funds, top management understanding

d. Dependent Variable: percentage of use

To test the assumption of ***multicollinearity*** for the current data sample, the VIF values are all well below 10 and the tolerance is well above 0.2; therefore, it can be safely concluded that there is no collinearity within the data for this sample.

Table 6.85 Test the assumption of multicollinearity

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	.730	.159		4.586	.000		
	developing a core of internal experts	-8.92E-02	.041	-.242	-2.189	.032	1.000	1.000
2	(Constant)	.933	.185		5.036	.000		
	developing a core of internal experts	-8.24E-02	.040	-.223	-2.054	.043	.993	1.007
	offering funds	-6.37E-02	.031	-.221	-2.032	.046	.993	1.007
3	(Constant)	.637	.216		2.956	.004		
	developing a core of internal experts	-9.80E-02	.039	-.266	-2.491	.015	.967	1.034
	offering funds	-7.61E-02	.031	-.264	-2.475	.016	.966	1.035
	top management understanding	9.515E-02	.039	.266	2.467	.016	.944	1.059

a. Dependent Variable: percentage of use

Also, the variance proportions for each of the four variables, developing core of internal experts, offering funds and top management understanding for DSS, are distributed across different dimensions (or eigenvalues). For this group of variables developing core of internal experts has most of its variance (56 %) loading onto dimension 3. While offering funds and top management understanding for DSS have most of their variances (89 %) and (58 %) loading onto dimension 2 and 3 respectively. The variance proportions of developing core of internal experts and top management understanding loaded in the same dimension which means that there is a minor problem for these two variables regarding multicollinearity assumption. Although top management understanding loaded about 39 % of the variance onto dimension 4 but this score still suggests that collinearity problems exist for these two variables.

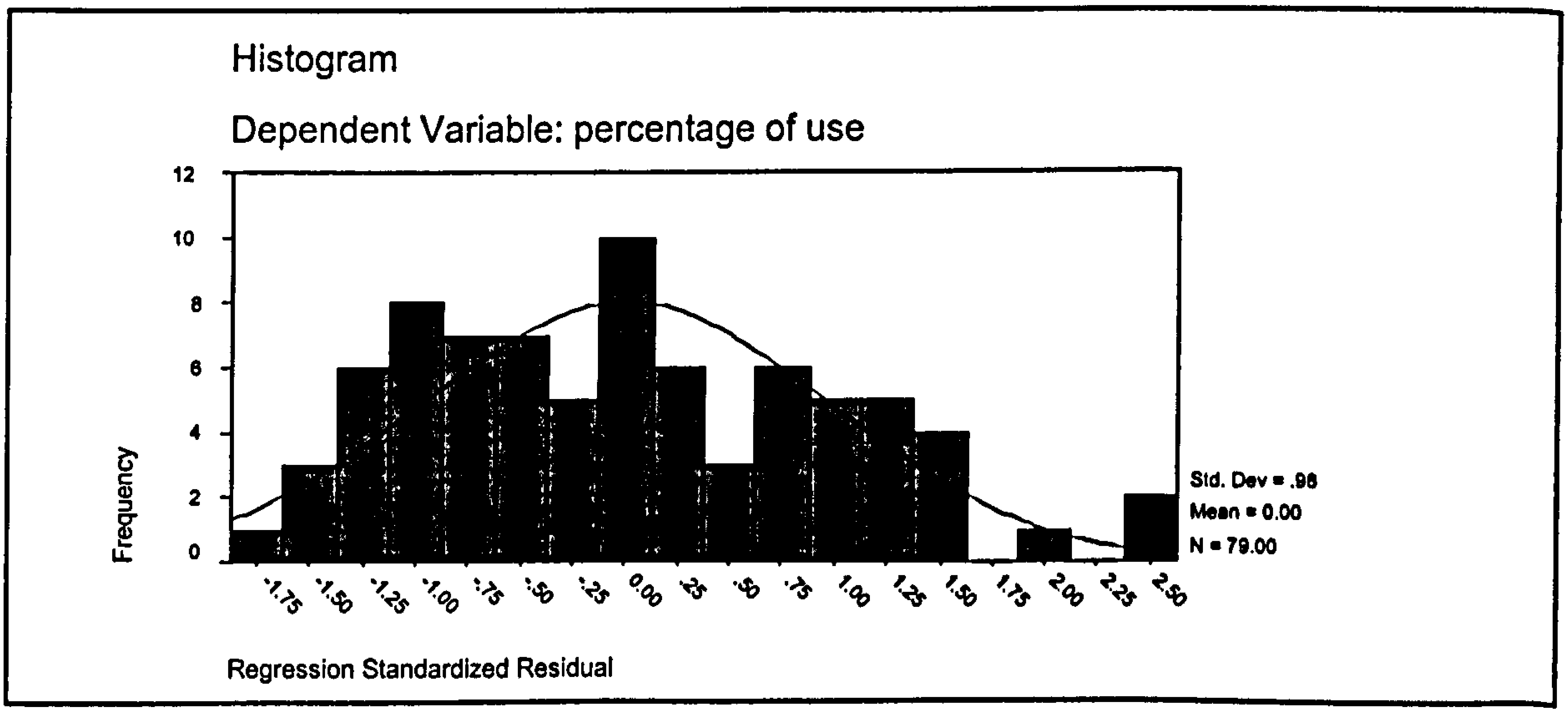
Table 6.86 Collinearity diagnositics

Collinearity Diagnostics [a]

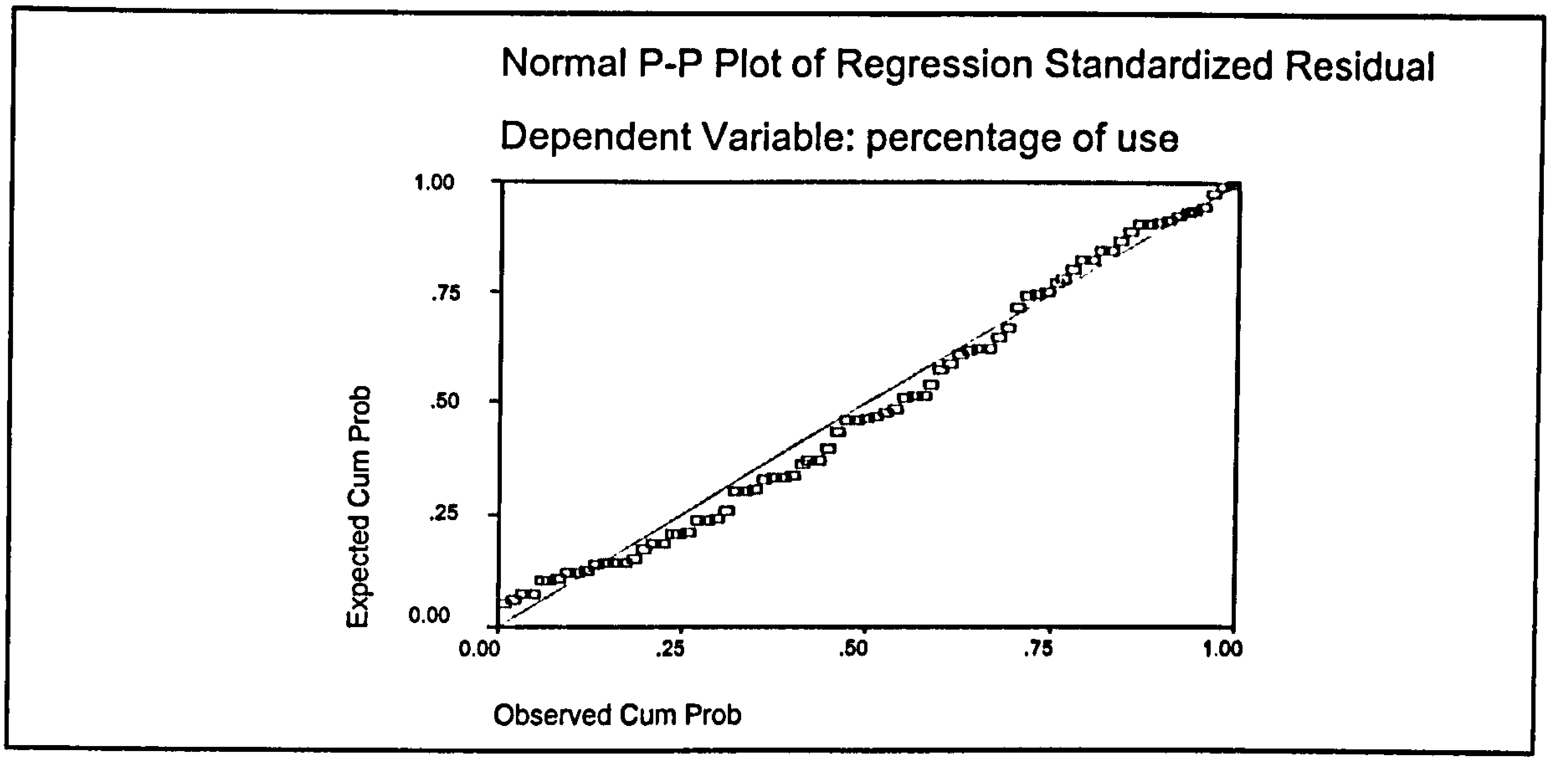
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	developing a core of internal experts	offering funds	top management understanding
1	1	1.979	1.000	.01	.01		
	2	2.078E-02	9.759	.99	.99		
2	1	2.926	1.000	.00	.00	.01	
	2	5.552E-02	7.260	.03	.24	.83	
	3	1.849E-02	12.581	.97	.76	.16	
3	1	3.896	1.000	.00	.00	.00	.03
	2	5.755E-02	8.228	.01	.13	.89	.03
	3	3.156E-02	11.111	.00	.56	.04	.58
	4	1.459E-02	16.339	.99	.30	.06	.39

a. Dependent Variable: percentage of use

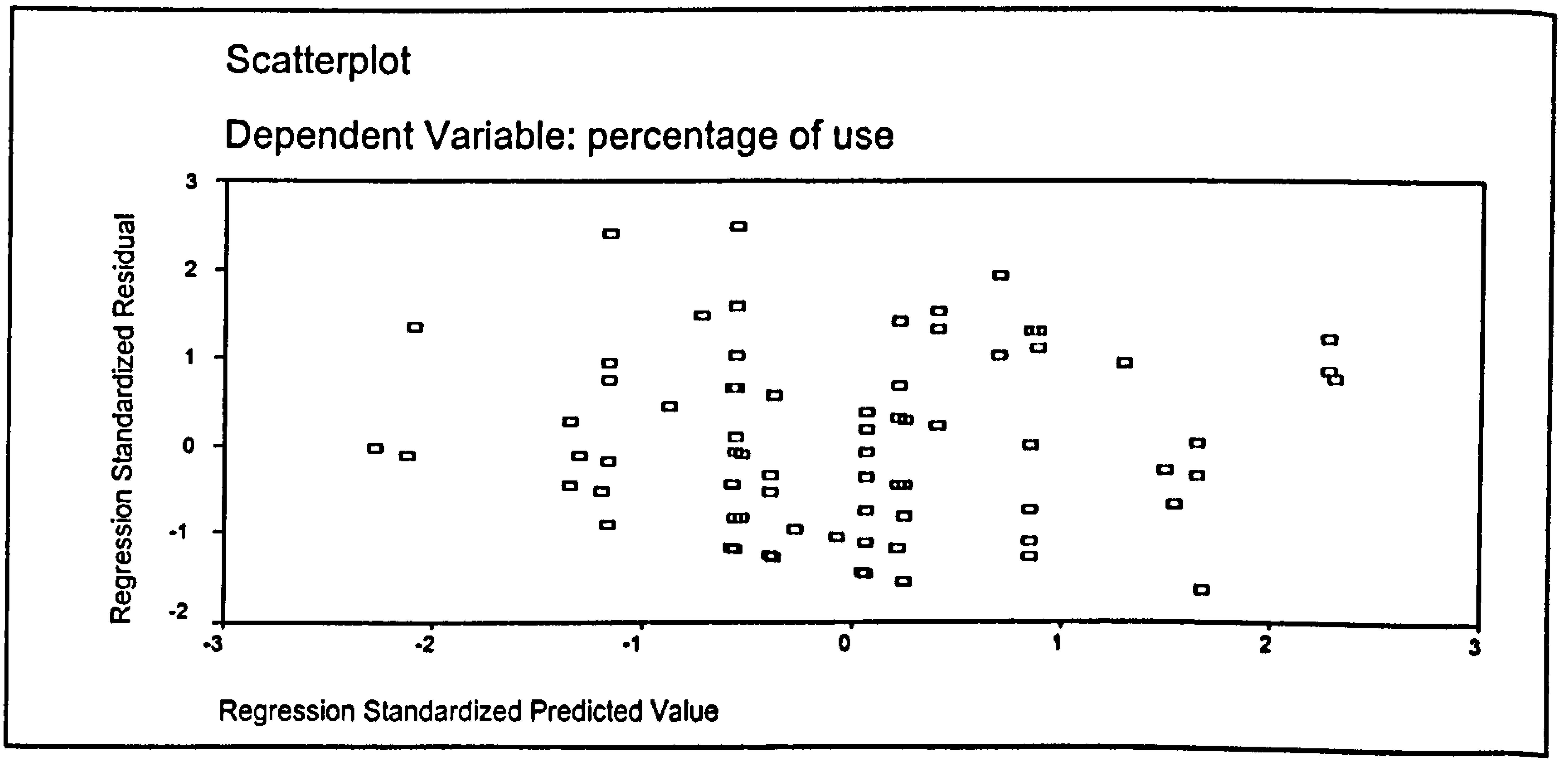
To test the ***normality of residual***, the observed frequencies (indicated by the bars) with normal distribution superimposed indicates normality of the shape of the curve, although there is a slight skew towards the left, but the curve is still a sign for the normality of the residuals.



Also, the vast proportion of residuals appears to be on the line or marginally below it, indicating that the observed residuals cumulative proportion is normally distributed



Linearity and equality of variance does clearly exist due to most of the residuals being randomly distributed in a band cluster around the horizontal line through 0.



For the same group of variables in the ***Egypt group***, three variables were found significant using the stepwise regression. The first variable that has the most significant effect according to beta value was developing core of internal experts. The second variable that has significant effect according to beta value was DSS design and development. The third variable that has significant effect according to beta value was top management understanding for DSS. Developing core of internal experts' accounts for 1.7 % of the variation in DSS usage in making strategic decisions according to R^2 value. However, when the second variable included the value of R^2 increased to 3.3 % and of the variance in DSS usage, respectively. Finally, the third variable itself accounts for 1.3 % of the variation in DSS usage in making strategic decisions. The difference between R^2 and the adjusted R^2 for this data is $0.064 - 0.037 = .027$ (about 2.7 %). This shrinkage means that, if the model were derived from the population rather than a sample, it would account for approximately 2.7 % less variance in the outcome. The Durbin-Watson test for this sample was 1.396, which is close to 2, which mean that the assumption of independent errors has almost certainly been met.

Data indicated in tables 6.87 and 6.88 provide partial support for hypothesis 9.3 in relation to the Egypt group.

Table 6.87 The regression model for top management characteristics and the Durbin-Watson test

Model Summary [d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.132[a]	.017	.014	.1896	
2	.182[b]	.033	.026	.1884	
3	.215[c]	.046	.037	.1875	1.396

a. Predictors: (Constant), developing a core of internal experts

b. Predictors: (Constant), developing a core of internal experts, DSS design and development

c. Predictors: (Constant), developing a core of internal experts, DSS design and development, top management understanding

d. Dependent Variable: percentage of use

To test the assumption of ***multicollinearity*** for the current data sample, the VIF values are all well below 10 and the tolerance is well above 0.2; therefore, it can be safely concluded that there is no collinearity within the data for this sample.

Table 6.88 Test the assumption of multicollinearity

Coefficients [a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std Error	Standardized Coefficients Beta	t	Sig	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	.203	.048		4.256	.000		
	developing a core of internal experts	2.630E-02	.012	.132	2.278	.023	1.000	1.000
2	(Constant)	.151	.053		2.840	.005		
	developing a core of internal experts	2.594E-02	.011	.130	2.261	.024	1.000	1.000
	DSS design and development	1.900E-02	.009	.125	2.170	.031	1.000	1.000
3	(Constant)	4.928E-02	.073		.674	.501		
	developing a core of internal experts	2.403E-02	.011	.121	2.098	.037	.993	1.007
	DSS design and development	1.850E-02	.009	.122	2.123	.035	.999	1.001
	top management understanding	2.630E-02	.013	.116	2.010	.045	.992	1.008

a. Dependent Variable: percentage of use

Also, the variance proportions for each of the four variables, developing core of internal experts, DSS design and development and top management understanding for DSS, are distributed across different dimensions (or eigenvalues). For this group of variables developing core of internal experts has most of its variance (70 %) loading onto dimension 3, while DSS design and development and top management understanding for DSS have most of their variances (93 %) and (60 %) loading onto dimension 2 and 4, respectively, which means that there is no multicollinearity between the independent variables.

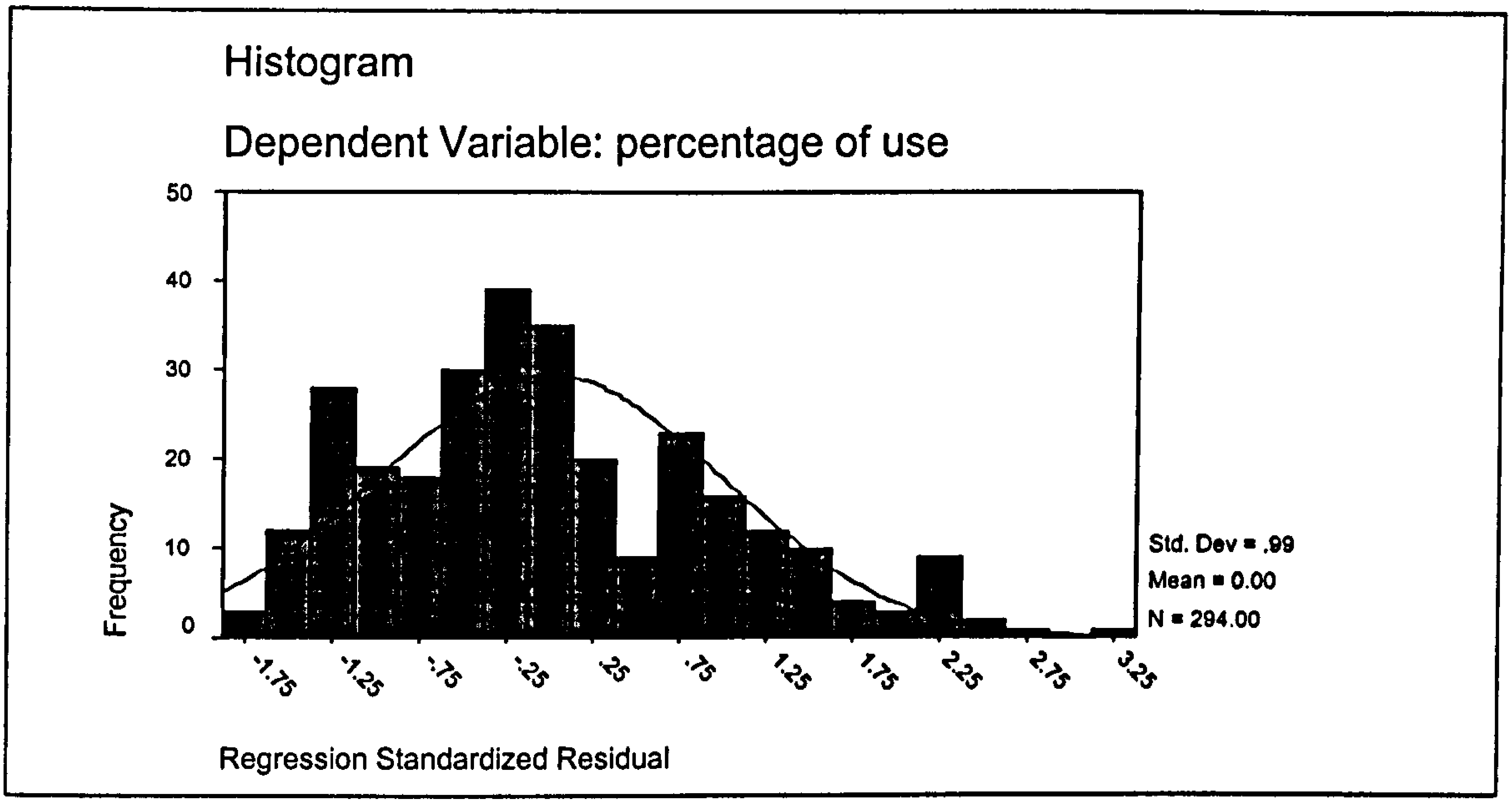
Table 6.89 Collinearity diagnostics

Collinearity Diagnostics [a]

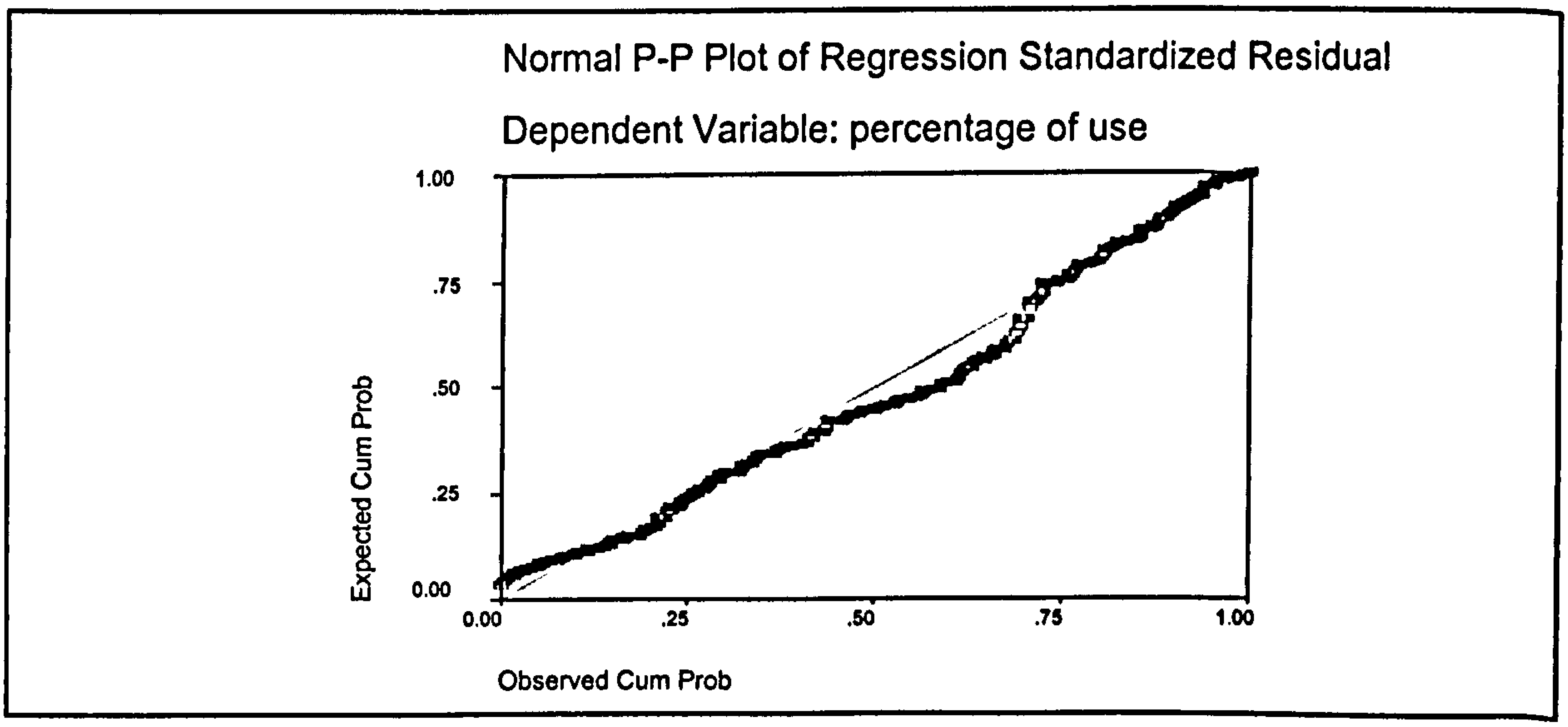
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	developing a core of internal experts	DSS design and development	top management understanding
1	1	1.973	1.000	.01	.01		
	2	2.724E-02	8.510	.99	.99		
2	1	2.851	1.000	.01	.01	.02	
	2	.123	4.806	.03	.11	.89	
	3	2.526E-02	10 625	.96	.89	.09	
3	1	3 808	1.000	.00	.00	.01	.03
	2	.134	5.326	.01	.05	.93	.02
	3	4.272E-02	9.441	.01	.70	.01	.37
	4	1 542E-02	15 713	98	25	05	63

a. Dependent Variable: percentage of use

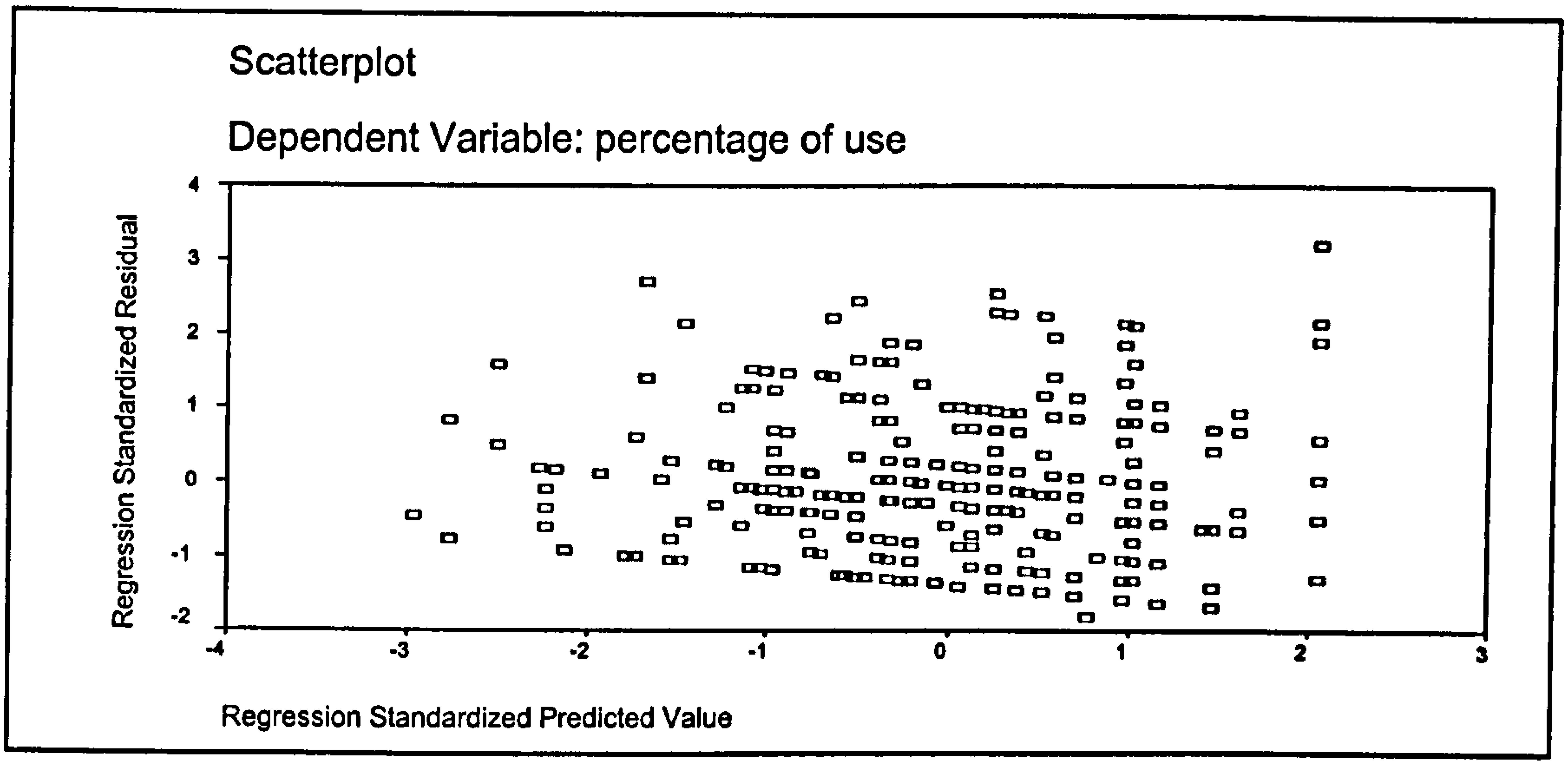
To test the ***normality of residual,*** the observed frequencies (indicated by the bars) with normal distribution superimposed indicates normality of the shape of the curve, although there is a slight skew towards the left, but the curve is still a sign for the normality of the residuals.



Also, the vast proportion of residuals appears to be on the line or marginally below it, indicating that the observed residuals cumulative proportion is normally distributed.



Linearity and equality of variance does clearly exist due to most of the residuals being randomly distributed in a band cluster around the horizontal line through 0.



6.24 Results related to the problems of DSS usage in strategic decision making

Thirty-eight problems were used in the survey instrument to assess their relative severity as perceived by chief executive officers in local governments in both the UK and Egypt. The results are discussed below.

6.24.1 <u>Relative severity of the problems of DSS usage in making strategic decisions</u>

To appreciate the relative severity of the various DSS usage problems, the 38 potential problems are ranked according to their "severity score": that is, the percentage of respondents who rated them as either a major problem or an extreme problem (i.e., 4 or 5 on a 5-point scale). The resulting ranking, as shown in table 8.100, indicates that 51.9 % of the respondents considered "Absence of appropriate training for decision- makers to use DSS" a major or an extreme problem, putting this at the top of the list in terms of severity in the UK sample. The next most severe problems were second (48.1 %), difficulty in modeling and simulating the strategic decisions by DSS usage; third, failure to commit the required resources to DSS usage; fourth, difficulty in financially justifying benefits of DSS usage, fifth, lack of alignment between corporate strategy and DSS planning.

Table 6.90 Severity of the problems of DSS usage in making SD in the UK

Rank	Score %	Problem
1	51.9	Absence of appropriate training for decision- makers to use DSS.
2	48.1	Difficulty in modeling and simulating the strategic decisions by DSS usage.
3	46.8	Failure to commit the required resources to DSS usage.
4	45.6	Difficulty in financially justifying benefits of DSS usage.
5	45.5	Lack of alignment between corporate strategy and DSS planning.
6	44.3	Top management's insufficient understanding about DSS.
7	41.8	Qualitative information which is important in making SD is not available in the DSS.
8	39.2	Lack of senior management leadership for DSS efforts
9	36.7	When it is necessary to compare or aggregate data/information from two or more different sources, there may be unexpected or difficult inconsistencies.
10	35.5	Unreasonable expectations attributed to DSS as a solution for all organizational problems
11	35.4	Incompleteness of information or data.
12	34.2	Failure to continually asses emerging DSS capabilities
13	34.2	Lack of appropriate planning for adopting DSS.
14	34.1	Lack of expertise in DSS in the organization.
15	32.9	Insufficient understanding about existing data and applications
16	31.6	Lack of timeliness of information or data.
17	30.4	Lack of strategic vision for decision-makers.
18	30.4	Failure to assess DSS effectiveness in the early stages of implementation.
19	29.2	Absence of appropriate training for DSS staff
20	29.1	Lack of reliability of information or data.
21	27.8	Lack of experience to be able to use DSS in making SD.
22	26.6	Lack of internal support for DSS implementation and use.
23	25.3	Difficulty of changing the legacy of making SD because of rigid regulations
24	22.8	Poor communication between decision- makers and DSS staff unit.
25	21.5	Insufficient telecommunication infrastructure capabilities.
26	21.5	Lack of flexibility in the DSS software to meet decision-makers' changing data needs.
27	21.5	The available DSS does not actively participate in my SD.
28	20.3	Difficulty in finding DSS staff who have the required skills and knowledge.
29	19.0	Lack of accuracy of output (information/data)
30	19.0	Irrelevant information or data for the different decisions I usually make.
31	19.0	Lack of external consultant support for DSS implementation and use.

32	17.8	It is not easy to learn how to use the DSS software.
33	17.7	I did not get involved in the development of the DSS that I use.
34	16.5	Lack of authority given to the DSS team.
35	15.2	The available DSS software does not support learning and creativity.
36	12.7	DSS provide DM with more information/ reports than they need.
37	9.2	Rushing of DSS adoption and implementation process.
38	2.6	The database that would be useful to me is unavailable because it is centralized.

In the *Egypt group*, the resulting ranking, as shown in table 8.101, indicates that 61.9 % of the respondents considered, as in the UK group, "absence of appropriate training for decision- makers to use DSS" a major or an extreme problem, putting this at the top of the list in terms of severity in both the two countries, although the percentage of the severity of the problem in the Egypt group was more than the same one in the UK group. The next most severe problems were second (58.9 %), "failure to commit the required resources to DSS usage" which came third in UK group. The third problem (52.7 %) in this group was "lack of appropriate planning for adopting DSS". The fourth problem (49.7 %) was "qqualitative information which is important in making SD is not available in DSS" was while the fifth problem (49.3 %) was "rushing of DSS implementation process".

Table 6.91 Severity of the problems of DSS usage in making SD in Egypt

Rank	Score	Problem
1	61.9	Absence of appropriate training for decision- makers to use DSS.
2	58.9	Failure to commit the required resources to DSS usage.
3	52.7	Lack of appropriate planning for adopting DSS.
4	49.7	Qualitative information which is important in making SD is not available in DSS.
5	49.3	Rushing of DSS implementation process.
6	47.6	The available DSS software does not support learning and creativity.
7	46.6	The available DSS software does not actively participate in my SD.
8	44.3	Lack of flexibility in the DSS software to meet decision-makers' changing data needs.
9	43.2	Insufficient telecommunication infrastructure capabilities.

10	41.8	When it is necessary to compare or aggregate data/information from two or more different sources, there may be unexpected or difficult inconsistencies.
11	41.2	Lack of internal support for DSS implementation and use.
12	41.1	Difficulty in finding DSS staff who have the required skills and knowledge.
13	39.8	Lack of experience to be able to use DSS in making strategic decisions.
14	39.1	Failure to continually asses emerging DSS capabilities
15	38.7	Top management's insufficient understanding about DSS.
16	38.1	Absence of appropriate training for DSS staff
17	36.7	Lack of expertise in DSS in the organization.
18	36.0	Failure to assess DSS effectiveness in the early stages of implementation.
19	35.3	The database that would be useful is unavailable because it is centralized.
20	31.6	Lack of strategic vision for decision-makers.
21	30.6	DSS provide decision-makers with more information/ reports than they need
22	27.9	Difficulty in financially justifying benefits of DSS usage.
23	27.5	Lack of senior management leadership for DSS efforts
24	26.2	Lack of external consultant support for DSS implementation and use.
25	25.5	Lack of authority given to the DSS team.
26	23.4	Poor communication between decision- makers and DSS staff unit.
27	21.1	Irrelevant information or data for the different decisions I usually make.
28	19.7	Incompleteness of information or data.
29	19.4	Difficulty in modeling and simulating the strategic decisions by DSS usage.
30	18.3	Difficulty of changing the legacy of making SD because of rigid regulations.
31	18.1	Insufficient understanding about existing data and applications
32	17.7	Lack of alignment between corporate strategy and DSS planning.
33	15.7	I did not get involved in the development of the DSS software that I use.
34	15.3	Unreasonable expectations attributed to DSS as a solution for all organisational problems
35	14.9	Lack of timeliness of information or data.
36	14.6	It is not easy to learn how to use the DSS software.
37	11.3	Lack of accuracy of output (information/data)
38	10.9	Lack of reliability of information or data.

6.24.2 Problem categories

As described earlier, the seven categories of DSS usage in making strategic decisions problems were developed, prior to data collection via conceptual analysis as well as fieldwork, to make sure from the homogeneity of the previous categories and there is no "hidden" grouping of problems within a category. Surfacing these subcategories would enhance the richness in interpreting and discussing the results. For each of the seven categories, principal component analysis was performed on the items. There were three general rules in determining factors in the analysis. First, the "the eigenvalue greater than one" rule was used as a criterion to determine the number of factors. Second, the scree test was used to confirm the results of the eigenvalue rule. Third, loadings greater than 3 for the Egypt sample and 6 for UK sample (in absolute value) depending on the sample size in each group were used in deciding whether an item was considered part of a factor, to enhance the chances of separating items into conceptually sound factors (Hair, et al., 1998).

The following are the results of this analysis in both the UK and the Egypt group. As can be seen in tables 6.92 and 6.93, the three items making up the management support problems category load onto one factor in the two groups.

Table 6.92: Rotated component matrix for top management problems in the UK

Problem	Loadings
Lack of senior management leadership for DSS implementation efforts	.909
Top management's insufficient understanding about DSS	.923
Lack of strategic vision for decision makers	.699

Percent of variance explained = 72.188 %; Eigenvalue = 2.166; mean severity score = 37.97 for this category of problem.

Table 6.93 Rotated component matrix for top management problems in Egypt

Problem	Loadings
Lack of senior management leadership for DSS implementation efforts	.574
Top management's insufficient understanding about DSS	.697
lack of strategic vision for decision makers	.603

Percent of variance explained = 39.272 %; Eigenvalue = 1.187; mean severity score = 32.6 for this category of problems.

For the DSS characteristics related problem, as can be seen from tables 6.94 and 6.95, the items loaded significantly onto two factors the first one can be related to the interaction between the DSS software and the decision maker while the second factor can be related to the overestimated expectation from DSS or its benefits to the organization. One of the items which loaded onto factor 1 by .393 is dropped, although Stevens' (1992) suggested that loadings greater than 0.4 represent a substantive values. For the Egypt group the items loaded significantly onto 5 factors and none-of the items was dropped.

Table 6.94 Rotated component matrix for DSS characteristics related problems in the UK

Problem	Component	
	1	2
Qualitative information which is important in making SD is not available in the DSS.	.393	.378
DSS provide more information than decision maker need	.504	-4.945E-02
Difficulty in financially justifying benefits of DSS	-.109	.741
Unreasonable expectations attributed to DSS	-.143	.848
Difficulty in modeling and simulating SD	.423	.579
Lack of flexibility in the DSS	.565	.376
DSS does not support learning and creativity	.774	-.195
The available DSS software does not actively participate in strategic decisions.	.806	5.386E-03
It is not easy to learn how to use DSS	.452	.326

Percent of variance explained = 49.181 %; Eigenvalue = 4.426; mean severity score = 27.53 for this category of problems.

Table 6.95: Rotated component matrix for DSS characteristics related problems in Egypt

Problem	Component				
	1	2	3	4	5
Qualitative information which is important in making SD is not available in the DSS	-.129	.428	.239	-.691	.150
DSS provide more information than decision maker need	.133	.267	-.124	6.442E-03	-.739

Difficulty in financially justifying benefits of DSS	-.125	.240	.206	.720	.118
Unreasonable expectations attributed to DSS	.453	.131	.366	.299	.168
Difficulty in modeling and simulating SD	-4.366E-02	2.123E-02	.821	2.959E-02	-2.186E-02
Lack of flexibility in the DSS	.122	.152	-.103	3.603E-02	.669
DSS does not support learning and creativity	.612	-.347	.335	-.127	-.178
The available DSS software does not actively participate in strategic decisions.	5.669E-02	.810	2.272E-02	3.333E-02	-6.864E-02
It is not easy to learn how to use DSS	.716	.138	-.278	-3.913E-02	4.843E-02

Percent of variance explained = 62.654 %; Eigenvalue = 5.388; mean severity score = 32.9 for this category of problem.

As can be seen in tables 6.96 and 6.97, the items making up the data related problems category load onto one factor in the UK group and onto two factors in the Egypt group although most of the items loaded in factor 1 except, one item, loaded in factor 2 and another item loaded in both two factors.

Table 6.96 Rotated component matrix for data related problems in the UK

Problem	Loadings
insufficient understanding about existing data and applications across the organization	.695
lack of accuracy of output	.811
irrelevant information or data for the different decisions	.781
incompleteness of information or data	.873
lack of reliability of information or data	.863
lack of timeliness of information or data	.799

Percent of variance explained = 64.908 %; Eigenvalue = 3.894; mean severity score = 27.83 for this category of problem.

Table 6.97 Rotated component matrix for data related problems in Egypt

Problem	Component	
	1	2
Insufficient understanding about existing data and applications across the organization	-9.959E-02	.824
Lack of accuracy of output	.631	.202
Irrelevant information or data for the different decisions	.602	-.291
Incompleteness of information or data	.340	.185
Lack of reliability of information or data	.471	.565
Lack of timeliness of information or data	.669	-3.767E-02

Percent of variance explained = 64.908 %; Eigenvalue = 2.714; mean severity score = 28.703 for this category of problem.

As can be seen in tables 6.98 and 6.99, the items making up managing the process of DSS implementation problems category load onto two factors in the UK group and three factors in the Egypt group.

Table 6.98 Rotated component matrix for managing the process of DSS implementation problems in the UK

Problem	Component	
	1	2
Rushing of DSS adoption	8.732E-02	.828
Lack of appropriate planning for adopting DSS	.905	.144
Failure to continually assess emerging DSS capabilities	.575	.294
Failure to assess DSS effectiveness in early stages of implementation	.512	.548
Involvement in the development of DSS	.126	.722
Lack of alignment between corporate strategy and DSS planning	.912	3.221E-02

Percent of variance explained = 64.967 %; Eigenvalue = 3.88; mean severity score = 28.53 for this category of problem.

Table 6.99 Rotated component matrix for managing the process of DSS implementation problems in Egypt

Problem	Component		
	1	2	3
Rushing of DSS adoption	-.164	.831	2.755E-04
Lack of appropriate planning for adopting DSS	.712	.171	-5.262E-02
Failure to continually assess emerging DSS capabilities	.107	.234	.770
Failure to assess DSS effectiveness in early stages of implementation	.656	-.207	5.989E-02
Involvement in the development of DSS	.107	.269	-.713
Lack of alignment between corporate strategy and DSS planning	.374	.479	-1.975E-02

Percent of variance explained = 55.89 %; Eigenvalue = 3.35; mean severity score = 35.083 for this category of problem.

As can be seen in tables 6.100 and 6.101, the items making up the availability of trained DSS staff and decision-maker problems category load onto one factor in the UK group and two factors in the Egypt group. Only one item in the Egypt group loaded onto the two factors at the same time, this item was "Lack of experience for using DSS in making SD".

Table 6.100 Component matrix for trained DSS staff and decision-maker problems in UK

Problem	Loadings
Absence of appropriate training for decision makers to use DSS	.814
Absence of appropriate training for DSS staff	.847
Lack of experience for using DSS in making SD	.783
Difficulty in finding DSS staff who have the required skills and knowledge	.600
Lack of expertise in DSS in the organization	.738

Percent of variance explained = 57.94 %; Eigenvalue = 2.89; mean severity score = 32.66 for this category of problem.

Table 6.101 Rotated Component Matrix for trained DSS staff and decision-maker problems in Egypt

Problem	Component	
	1	2
Absence of appropriate training for decision makers to use DSS	-7.412E-02	.577
Absence of appropriate training for DSS staff	-.519	.227
Lack of experience for using DSS in making SD	.597	.582
Difficulty in finding DSS staff who have the required skills and knowledge	-.220	.648
Lack of expertise in DSS in the organization	.722	-9.052E-02

Percent of variance explained = 47.027 %; Eigenvalue = 2.35; mean severity score = 43.52 for this category of problem.

As can be seen in tables 6.102 and 6.103, the items making up the environmental related problems category load onto two factors in both the UK and the Egypt groups.

Table 6.102 Rotated component matrix for environmental related problems in the UK

Problem	Component	
	1	2
Insufficient telecommunication infrastructure capabilities	7.988E-02	.917
Failure to commit the required resources to DSS usage	.726	.232
Lack of external consultant support for DSS implementation and use	.639	-.435
Difficulty of changing the legacy of making SD because of rigid regulations	.720	-7.156E-03

Percent of variance explained = 63.609 %; Eigenvalue = 2.544; mean severity score = 28.15 for this category of problem.

Table 6.103 Rotated component matrix for environmental related problems in Egypt

Problem	Component	
	1	2
Insufficient telecommunication infrastructure capabilities	.221	.821
Failure to commit the required resources to DSS usage	.754	-8.073E-02
Lack of external consultant support for DSS implementation and use	-.626	-3.688E-02
Difficulty of changing the legacy of making SD because of rigid regulations	.304	-.584

Percent of variance explained = 53.117 %; Eigenvalue = 2.125; mean severity score = 36.65 for this category of problem.

As can be seen in tables 6.104 and 6.105, the items making up the availability of trained DSS staff and decision-maker problems category load onto one factor in the UK group and three factors in the Egypt group. Only one item can be dropped from the UK sample and at least two of the items in the Egypt group are loaded in more than one factor.

Table 6.104 Component matrix for organizational related problems in the UK group

Problem	Loadings
Lack of authority given to the DSS team so they can not get access to the data/ they need	.766
Lack of internal support for DSS implementation	.617
Poor communication between decision-makers and DSS staff unit	.596
Difficulty in comparing or aggregate data due to inconsistencies	.361
The database that would be useful to me is unavailable because it is centralized	.700

Percent of variance explained = 38.87 %; Eigenvalue = 1.944; mean severity score = 21.4 for this category of problem.

Table 6.105 Component matrix for organizational related problems in Egypt

Problem	Component		
	1	2	3
Lack of authority given to the DSS team so they can not get access to the data / information they need	.380	-.647	.243
Lack of internal support for DSS implementation	.463	.550	3.532E-02
Poor communication between decision-makers and DSS staff unit	-.672	.363	-5.203E-02
Difficulty in comparing or aggregate data due to inconsistencies	.518	.214	-.678
The database that would be useful to me is unavailable because it is centralized	.292	.425	.711

Percent of variance explained = 65.418 %; Eigenvalue = 3.3; mean severity score = 33.44 for this category of problem.

The average of severity scores for each of the seven categories is indicated in figure 1. The three most severe categories are the problem related to the availability of trained DSS staff and decision-maker (mean score 43.52), environmental related problems (mean score 36.65) and managing the process of DSS implementation problems (mean score 53.083) in the Egypt group, while the three most severe categories in the UK group are the top management problem (mean score 37.97), the problem related to the availability of trained DSS staff and decision-makers (mean score 32.66) and environmental related problems (mean score 28.35).

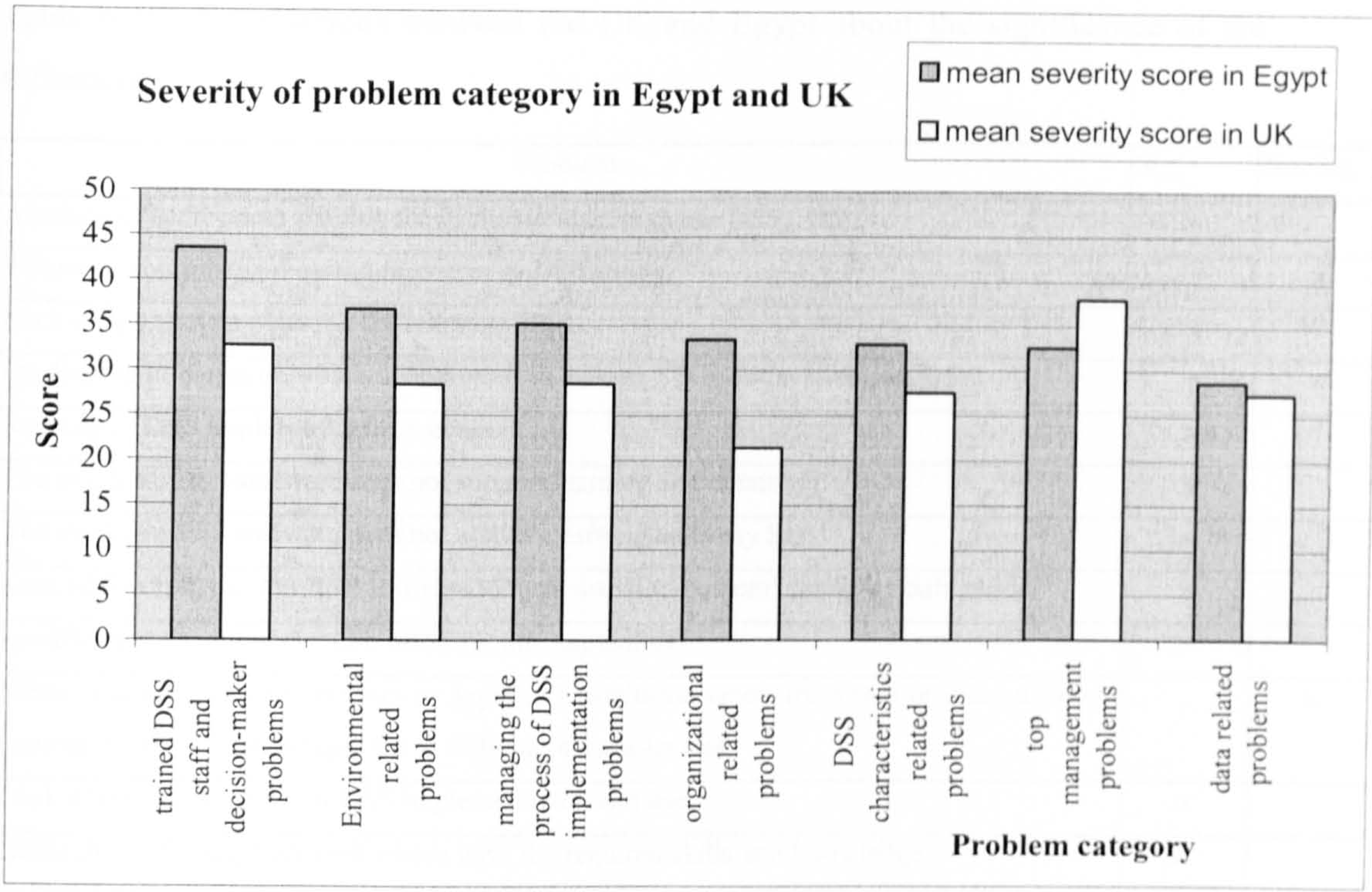


Figure 6.25 severity of problem category in both the UK and Egypt

6.24.3 Difference between the two groups about the severity of the problems

To compare the similarities and differences between the UK and Egypt about the severity of the different categories of problems of DSS usage in making strategic decisions T-test analysis has been used. T-tests are the most appropriate for such analysis. They provide a method for comparing the two independent groups. The following table highlights the different problems and whether the difference between the UK and Egypt is statistically significant or not. As can be seen from table 6.106, there is a significant difference the two groups in most of the problem categories except there was a similarity between the two groups in two categories which are the managing the process of DSS implementation and the problems related to the availability of trained and expert DSS and decision-makers staff. Also, there is a similarity between the two groups about only two items of top management and organisational related problems.

Table 6.106 Comparisons between the UK and Egypt about the significance of the difference

Problem	Sig.	Not Sig.
Absence of appropriate training for decision- makers to use DSS.	×	
Failure to commit the required resources to DSS usage.		×
Lack of appropriate planning for adopting DSS.	×	
Qualitative information which is important in making SD is not available in DSS.		×
Rushing of DSS implementation process.	×	
The available DSS software does not support learning and creativity.	×	
The available DSS software does not actively participate in my SD.	×	
Lack of flexibility in the DSS software to meet decision-makers' changing data needs.	×	
Insufficient telecommunication infrastructure capabilities.	×	
When it is necessary to compare or aggregate data/information from two or more different sources, there may be unexpected or difficult inconsistencies.		×
Lack of internal support for DSS implementation and use.	×	
Difficulty in finding DSS staff whom have the required skills and knowledge.	×	
Lack of experience to be able to use DSS in making strategic decisions.		×
Failure to continually asses emerging DSS capabilities		×
Top management's insufficient understanding about DSS.		×
Absence of appropriate training for DSS staff		×
Lack of expertise in DSS in the organization.		×
Failure to assess DSS effectiveness in the early stages of implementation.		×
The database that would be useful is unavailable because it is centralized.	×	
Lack of strategic vision for decision-makers.	×	
DSS provide decision-makers with more information/ reports than they need	×	
Difficulty in financially justifying benefits of DSS usage.	×	
Lack of senior management leadership for DSS efforts		×
Lack of external consultant support for DSS implementation and use.	×	
Lack of authority given to the DSS team.	×	
Poor communication between decision- makers and DSS staff unit.		×
Irrelevant information or data for the different decisions I usually make.		×
Incompleteness of information or data.	×	
Difficulty in modeling and simulating the strategic decisions by DSS usage.	×	
Difficulty of changing the legacy of making SD because of rigid regulations.	×	
Insufficient understanding about existing data and applications	×	

Lack of alignment between corporate strategy and DSS planning.		×
I did not get involved in the development of the DSS software that I use.		×
Unreasonable expectations attributed to DSS as a solution for all organizational problems	×	
Lack of timeliness of information or data.	×	
It is not easy to learn how to use the DSS software.		×
Lack of accuracy of output (information/data)	×	
Lack of reliability of information or data.	×	

6.24.4 Relating DSS usage in making strategic decisions problems and success of the DSS implementation

To assess the relationship between various sources of DSS usage problems and the success of DSS implementation in the organization, the score of each category of the problems is correlated to the success of the DSS usage process. The results of the correlational analysis are shown in table 6.106. As expected, all correlation coefficients are negative, as more success should be associated with fewer (or less severe) problems. As can be seen from tables 6.107 and 6.108, in the UK group most of the correlation coefficients were significant, except the data related problems and the inappropriate managing of the process of DSS implementation. Also 4 of the items of data related problem were not significant with helping the organization achieving the objectives but significant with quality of strategic decisions. From the other side in Egypt group, most of the correlation coefficients were not significant except some of the items related to data characteristics and DSS characteristics. These results in Egypt group can be due to the little use of DSS in making strategic decisions. These can be seen from the result of the Egypt group about the mean percentage of use, which were 30 %, and the mean level of use, which were 2.2. While the same measures in the UK were 40 % for mean percentage of use and 3 for the mean level of use, which is an indication for a moderate use.

Table 6.107 Correlation between the problems and the success of DSS usage in the UK group

Problem	Quality of strategic decision	DSS helpful
Lack of senior management leadership	-.464	-.361
Sig. (2-tailed)	.000***	.001***
Top management's insufficient understanding	-.514	-.458
Sig. (2-tailed)	.000***	.000***
Lack of strategic vision for decision makers	.097	.067
Sig. (2-tailed)	.396	.555
Quality of strategic decision	1.000	.874
Sig. (2-tailed)	.	.000***
Is DSS helpful	.874	1.000
Sig. (2-tailed)	.000***	.
Insufficient understanding	-.150	-.101
Sig. (2-tailed)	.188	.375
Failure to assess emerging DSS capabilities	-.107	-.027
Sig. (2-tailed)	.346	.816
Lack of appropriate planning for adopting DSS	-.296	-.256
Sig. (2-tailed)	.008***	.023**
Lack of alignment between corporate strategy and DSS planning	-.301	-.260
Sig. (2-tailed)	.007***	.021**
Lack of expertise in DSS	-.040	.036
Sig. (2-tailed)	.724	.753
Insufficient telecommunication infrastructure	.132	.205
Sig. (2-tailed)	.247	.070*
Absence of appropriate training for DSS staff	-.135	-.124
Sig. (2-tailed)	.236	.276
Absence of appropriate training for decision makers	-.302	-.337
Sig. (2-tailed)	.007***	.002***
Failure to commit the required resources	-.355	-.397
Sig. (2-tailed)	.001***	.000***
Difficulty in finding DSS staff	.184	.274
Sig. (2-tailed)	.104*	.014***
Lack of authority given to the DSS team	-.058	-.005

Sig. (2-tailed)	.614	.968
Lack of experience for using DSS	-.437	-.419
Sig. (2-tailed)	.000***	.000***
It is not easy to learn how to use DSS	.034	.024
Sig. (2-tailed)	.765	.831
Qualitative information	.019	.080
Sig. (2-tailed)	.870	.482
DSS provide more information than decision maker need	.011	-.010
Sig. (2-tailed)	.927	.932
Lack of accuracy	-.055	-.051
Sig. (2-tailed)	.631	.655
Irrelevant information	-.029	.042
Sig. (2-tailed)	.801	.710
Incompleteness of information	.195	.157
Sig. (2-tailed)	.085*	.167
Lack of reliability	.063	.139
Sig. (2-tailed)	.580	.223
Lack of timeliness	.114	.207
Sig. (2-tailed)	.316	.067*
Lack of external consultant support	-.476	-.487
Sig. (2-tailed)	.000***	.000***
Lack of internal support	-.213	-.119
Sig. (2-tailed)	.059*	.295
Difficulty in financially justifying benefits of DSS	-.391	-.433
Sig. (2-tailed)	.000***	.000***
Unreasonable expectations attributed to DSS	-.265	-.245
Sig. (2-tailed)	.018***	.030**
Failure to assess DSS effectiveness	-.115	-.078
Sig. (2-tailed)	.314	.497
Poor communication	-.287	-.309
Sig. (2-tailed)	.010***	.006***
Difficulty in modeling and simulating	-.232	-.207
Sig. (2-tailed)	.040**	.067*
Difficulty of changing because of rigid regulation	-.106	-.149
Sig. (2-tailed)	.353	.190
Difficulty in comparing or aggregate data due to inconsistencies	.320	.315

Sig. (2-tailed)	.004***	.005***
Involvement in the development of DSS	.029	.011
Sig. (2-tailed)	.800	.925
Data that I need is unavailable because it is centralized	-.113	-.079
Sig. (2-tailed)	.323	.491
Lack of flexibility in the DSS	-.131	-.033
Sig. (2-tailed)	.249	.773
Rushing of DSS adoption	.099	.054
Sig. (2-tailed)	.387	.634
DSS does not support learning and creativity	.155	.165
Sig. (2-tailed)	.173	.145
The available DSS software does not actively participate in strategic decisions.	.070	.079
Sig. (2-tailed)	.539	.487

Table 6.108 Correlations between the problems and the success of DSS usage in Egypt

Problem	Quality of strategic decision	DSS helpful
Lack of senior management leadership	-.049	-.039
Sig. (2-tailed)	.402	.506
Top management's insufficient understanding	.024	.002
Sig. (2-tailed)	.683	.971
Lack of strategic vision for decision makers	.002	.044
Sig. (2-tailed)	.975	.449
Quality of strategic decision	1.000	.098
Sig. (2-tailed)	.	.095
Is DSS helpful	.098	1.000
Sig. (2-tailed)	.095*	.
Insufficient understanding	.025	.045
Sig. (2-tailed)	.668	.445
Failure to assess emerging DSS capabilities	-.028	-.089
Sig. (2-tailed)	.635	.130
Lack of appropriate planning for adopting DSS	.047	-.009
Sig. (2-tailed)	.426	.874

Lack of alignment between corporate strategy and DSS planning	-.017	.036
Sig. (2-tailed)	.767	.538
Lack of expertise in DSS	-.045	-.023
Sig. (2-tailed)	.445	.692
Insufficient telecommunication infrastructure	-.035	-.029
Sig. (2-tailed)	.552	.619
Absence of appropriate training for DSS staff	-.028	.014
Sig. (2-tailed)	.637	.817
Absence of appropriate training for decision makers	-.092	-.027
Sig. (2-tailed)	.114	.647
Failure to commit the required resources	.037	.072
Sig. (2-tailed)	.527	.220
Difficulty in finding DSS staff	-.041	.058
Sig. (2-tailed)	.484	.322
Lack of authority given to the DSS team	-.013	.060
Sig. (2-tailed)	.831	.304
Lack of experience for using DSS	-.012	-.008
Sig. (2-tailed)	.837	.895
It is easy to learn how to use DSS	-.026	.093
Sig. (2-tailed)	.656	.112
Qualitative information	.080	-.025
Sig. (2-tailed)	.172	.669
DSS provide more information than decision maker need	.008	.031
Sig. (2-tailed)	.898	.592
Lack of accuracy	.001	-.058
Sig. (2-tailed)	.985	.326
Irrelevant information	.024	-.028
Sig. (2-tailed)	.682	.628
Incompleteness of information	.098	.091
Sig. (2-tailed)	.092*	.119
Lack of reliability	.047	.103
Sig. (2-tailed)	.426	.077
Lack of timeliness	.013	.044
Sig. (2-tailed)	.831	.452

Lack of external consultant support	.060	-.106
Sig. (2-tailed)	.306	.070*
Lack of internal support	-.071	.078
Sig. (2-tailed)	.225	.181
Difficulty in financially justifying benefits of DSS	.031	.052
Sig. (2-tailed)	.598	.371
Unreasonable expectations attributed to DSS	.017	.075
Sig. (2-tailed)	.767	.198
Failure to assess DSS effectiveness	.041	.078
Sig. (2-tailed)	.487	.182
Poor communication	-.095	.031
Sig. (2-tailed)	.105	.598
Difficulty in modeling and simulating	-.024	.037
Sig. (2-tailed)	.682	.523
Difficulty of changing because of rigid regulations	-.069	.072
Sig. (2-tailed)	.241	.219
Difficulty in comparing or aggregate data due to inconsistencies	.019	-.043
Sig. (2-tailed)	.748	.461
Involvement in the development of DSS	-.081	.042
Sig. (2-tailed)	.168	.477
Data that I need is unavailable because it is centralized	-.112	-.004
Sig. (2-tailed)	.054**	.946
Lack of flexibility in the DSS	.031	.110
Sig. (2-tailed)	.600	.059*
Rushing of DSS adoption	-.008	.002
Sig. (2-tailed)	.885	.968
DSS does not support learning and creativity	-.004	.132
Sig. (2-tailed)	.945	.024**
The available DSS software does not actively participate in strategic decisions.	.014	.023
Sig. (2-tailed)	.808	.689

* Correlation is significant at the 0.10 level (2-tailed).

* * Correlation is significant at the 0.05 level (2-tailed).

** *Correlation is significant at the 0.01 level (2-tailed).

Summary

This chapter presented the topics related to various statistical analysis tools employed and their corresponding results to test the hypotheses of this research. SEM was used to test the validity of each construct of the research model and the total research model in both the research groups. To test the hypotheses regarding the differences between the two research groups in relation to the problems that CEOs encountered when they use DSS to make their strategic decisions, T-test was used. In addition to the relative importance of each problem were identified in both research groups. To complete the test of the ray of hypotheses of this research regarding the direct relationship between the constructs of the model and DSS usage, regression analysis procedures were completed for the two research groups.

Chapter 7 Discussion of Research Results

7.1 Introduction

In this chapter the results of statistical analysis reported in the previous chapter are discussed in relation to the existing literature and the theory development underlying the research model. In addition to that, the results of the quantitative approach combined with the results of the interviews conducted in both countries to consolidate the research results.

7.2 Task Characteristics

Strategic decisions are often ill structured, novel and consequential (Mintzberg, Raisinghani et al. 1976). The complexity of SDM can decrease by increased knowledge about its information requirements, process and outputs. The more the decision-maker knows about the dimensions of the task, the less complex it becomes, and the easier it is to accomplish (Vakkari 1999). These suggest that, with more information, more modelling capabilities and better alternative-generation tools, better strategic decisions, which could result in superior outcomes, could be achieved (Sauter 1997). DSS, by providing decision makers with more and better information as well as a better way for processing that information, can reduce both determinability and structuredness of the task (i.e. SDM). The results of this research confirm this for the UK group because there is a direct relationship between DSS usage and complexity of analysis and evaluation of alternatives. Also, managers in this group perceived that DSS could be used effectively in making strategic decisions, as indicated in figure 7.1.

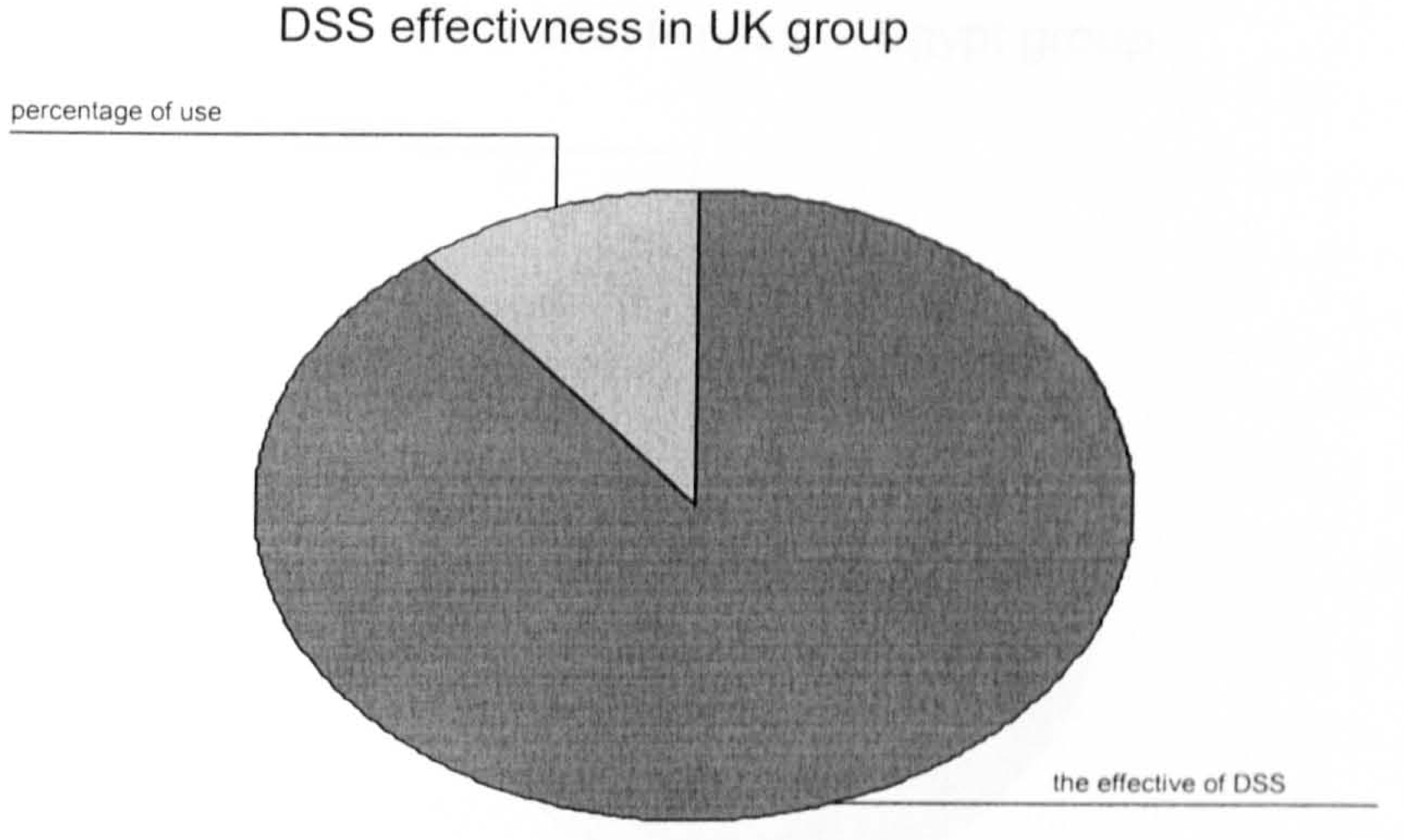


Figure 7.1 DSS effectiveness in SDM as perceived by mangers in the UK group

While in the Egypt group managers perceived SDM as too person centred to be computerised and too complex to be computerised. Several participants in the interviews expressed the same viewpoint but from another angle by mentioning that strategic decisions made in local authorities were based on the experience and knowledge of the decision makers. One of the heads of city described his experience,

> *"Using a computer to help you make strategic decisions, where uncertainty in political/legal, economic, technological, and soci-cultural factors, is extremely complex. I'm interested in knowing how others in other developed countries are using DSS in making strategic decisions".*

Although DSS usage in both countries is low in comparison to the perceived effectiveness of DSS usage, the percentage of this effectiveness was much lower in Egypt than the UK, as indicated in figure 7.2, and there was a significant difference between the two countries in relation to the effectiveness of DSS usage in SDM.

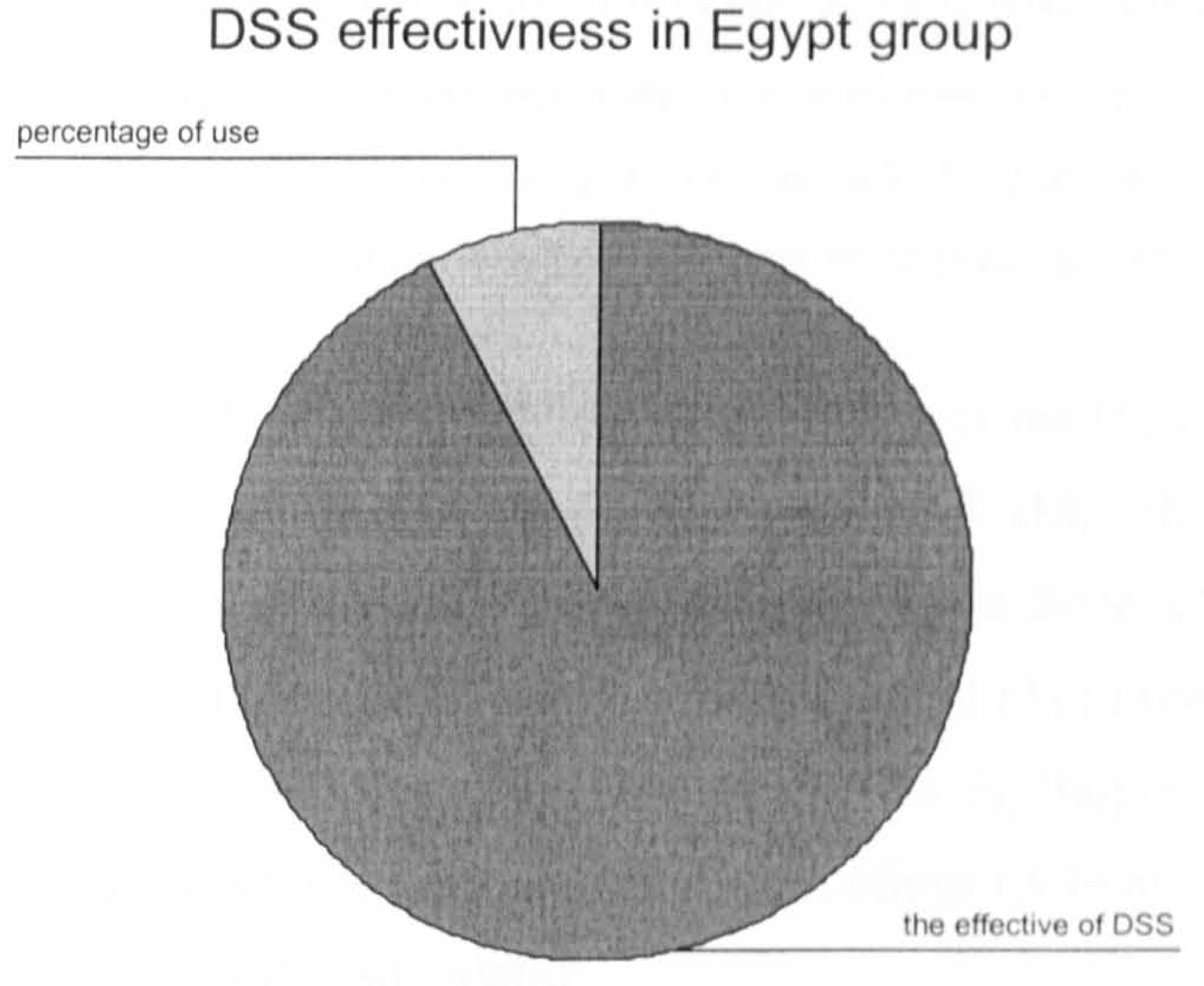


Figure 7.2 DSS effectiveness in SDM in relation to DSS usage as perceived by mangers in Egypt

It is notable that neither of the two groups mentioned that executives use DSS in problem formulation although it is one of the most important stages in the SDM process. Problem formulation creates a solution space and determines the information requirements of the task (Bystrom and Jarvelin 1995). This may be due to the nature of this stage of SDM which needs more qualitative data than quantitative one which most of the DSS available software showing inefficiency in dealing with this type of data. This result is confirmed by what Cats-Baril and Huber said:

> *"Although some DSSs support the problem-identification phase of the overall problem-solving process by making performance or environmental data readily available, the great majority primarily support the relatively well-structured phase of alternative evaluation by carrying out computations. Very seldom do DSSs support less-structured decision-related tasks such as choosing objectives, generating alternatives, or prioritising alternatives whose value or utility has not been computed" (Cats-Baril and Huber 1987).*

From another point of view, the results of this study confirmed that task characteristics play an important role in DSS usage in SDM. These results are supported by Sanders and Courtney, who concluded that user satisfaction with DSS could be affected by task variety, difficulty, newness, interdependence, standardisation and authority (Sanders and Courtney 1985).

Also, these results are continued by Bilili, Raymond and Rivard when they said:

> *"The of task uncertainty demonstrate the importance of considering this variable in the process of allocating information processing resources: those users who have the most uncertain tasks should have access to better resources because they have more important information needs" (Blili, Raymond et al. 1998).*

In relation to SEM results, PU showed significant direct effect on DSS usage in the UK group which confirmed all earlier cited studies about TAM, while it has no significant effect in the Egypt group. PEU showed no significant direct effect on DSS usage in SDM in both countries as indicated from table (1) and (2) in the appendices. This would seem to contradict earlier studies (Davis 1989; Davis, Bagozzi et al. 1989; Igbaria, Zinatelli et al. 1997) yet seem to confirm other findings (Adams, Nelson et al. 1992; Chau 1996; Agarwal and Prasad 1998b).

7.3 Cultural characteristics

Organisational culture has been mentioned as a critical success factor in IS implementation (Bradley 1993; Pliskin, Romm et al. 1993). Many researchers agree that culture is a complex factor, especially in very large organisations where several subcultures might exist simultaneously. According to Sathe (Sathe 1985), every group, corporate or otherwise, has a unique culture that is shaped by its members' shared history and experience (Schein 1985).

As the results of this research showed there are culture gaps between DSS and IT people on one side and decision-makers on the other side in both research groups. This result is consistent with Hatten and Hatten when they notice that this gap may be due to the fact that professionals do not speak the language of business, and on the other side, that the business people are too often separated from IS by what many be perceived as "a priesthood IS, off limits to mortal managers" (Hatten and Hatten 1997). Integrating with this view another researcher stresses the mutual understanding between professionals and managers as a crucial variable. In addition to that, there was a significant difference between the two groups in relation to the effect of organisational culture on DSS usage in SDM as indicated from the following two figures. As these two figures indicated the percentage of use in the UK group is bigger than in the Egypt group, but the cultural effect is much bigger in the Egypt group more than in the UKgroup.

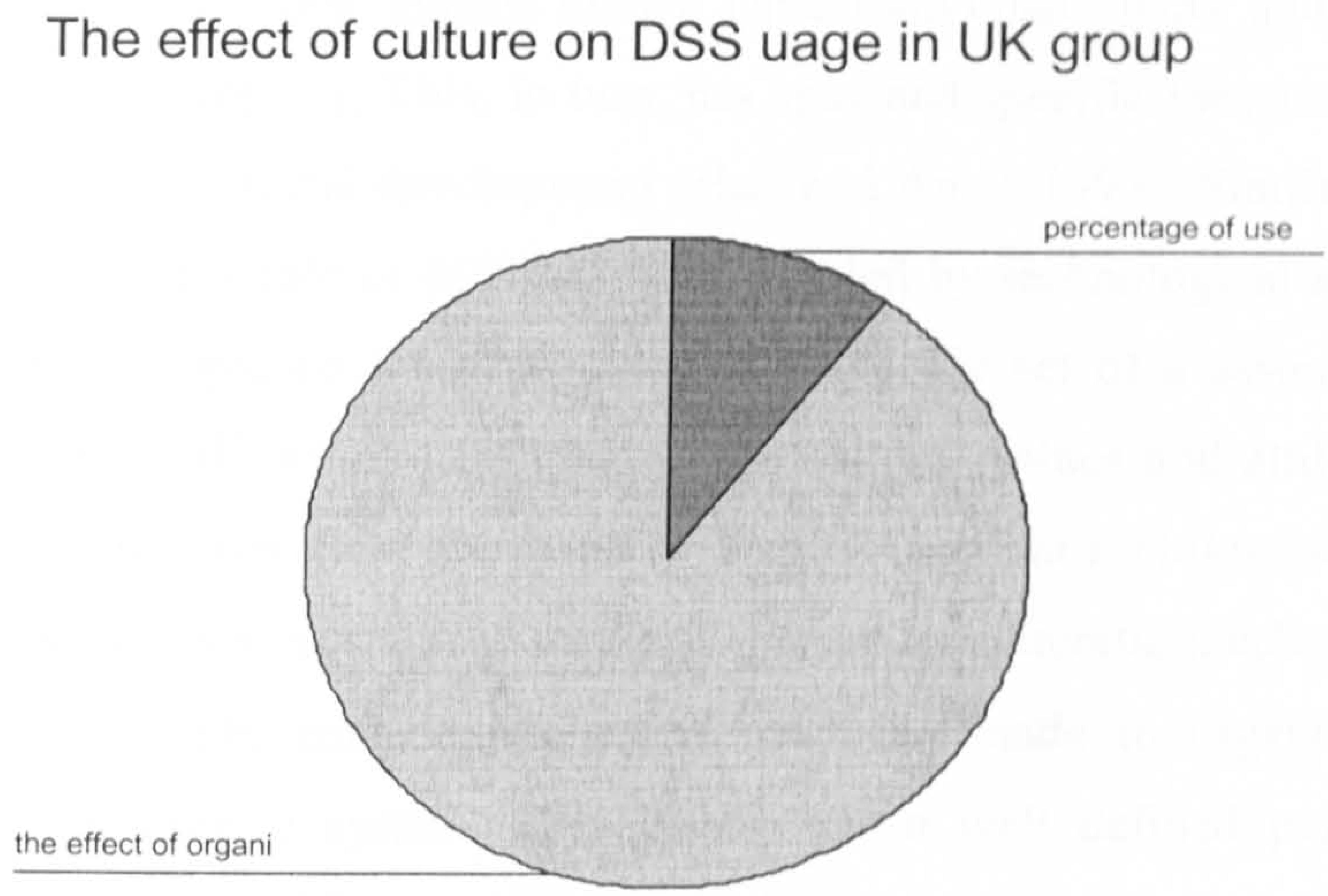


Figure 7.3 The effect of organisational culture on DSS usage in SDM as perceived by mangers in the UK

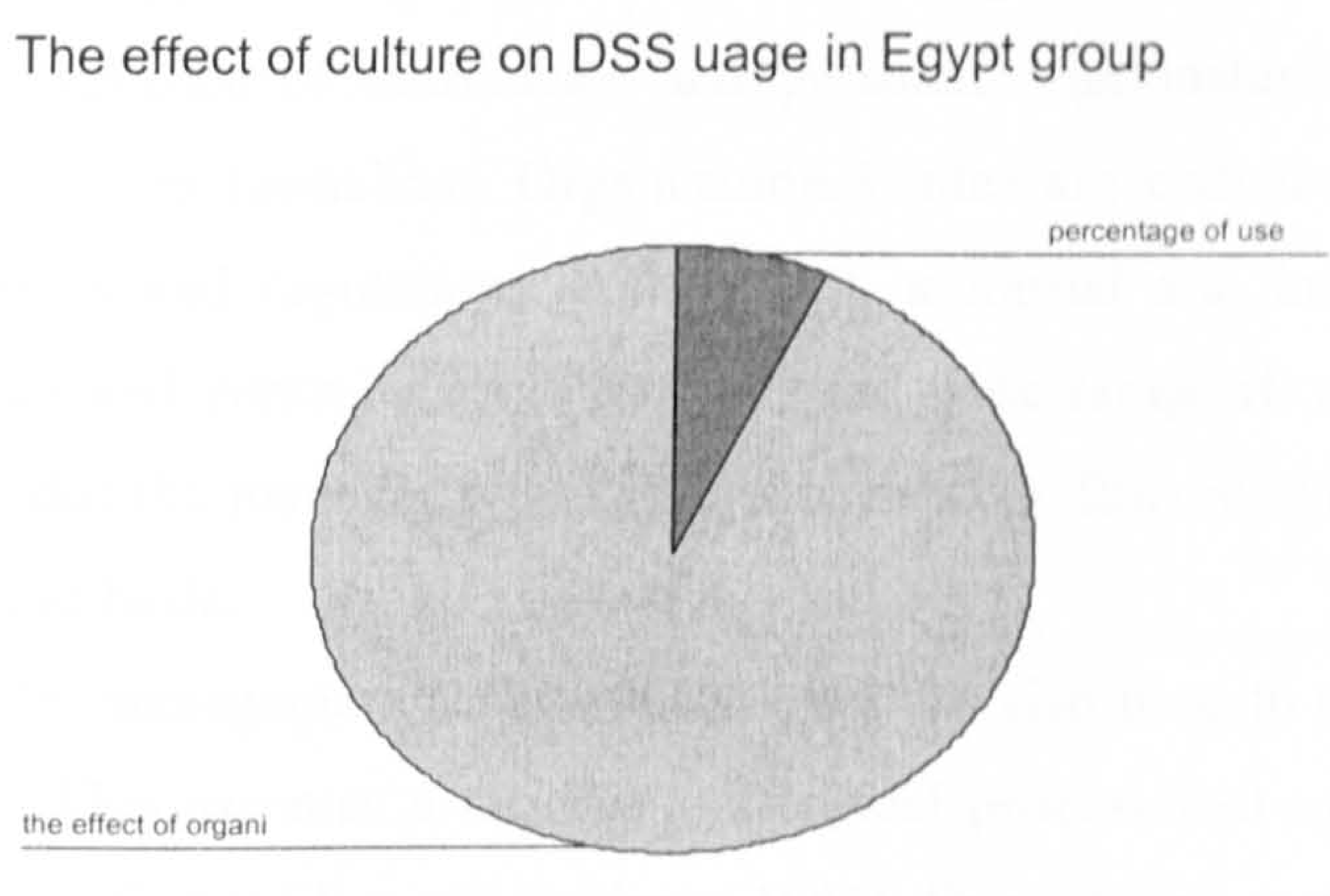


Figure 7.4 The effect of organisational culture on DSS usage in SDM as perceived by mangers in the Egypt group

To understand the differences in the effect of culture on DSS usage in SDM, the researcher will illustrate how the prevailing philosophies, values and beliefs of western and Egyptian societies have led to these different patterns. There is a dominant and resolute western belief that human beings have individual rights and a legitimate appetite for private property. This, in turn, has spawned specific forms of democracy, capitalism and technological development (Hall and Ames 1993). Similarly, although the increasing business role of MIS has been enabled by technological advances, this development has hinged on the acceptance of a specific set of a assumptions. The rationale for using MIS stems largely from the cultural values and attitudes that are associated with western (and particularly Anglo-American) philosophical beliefs. These beliefs have been crystallised in the Weberian bureaucratic idealisation (Weber 1947) and, as a result, considerable effort has been made to organise economic activities into an orderly system. This system has a well defined purpose and is governed by a rational and impersonal set of rules. This impersonalism is critical. The organisation takes on a distinct identity, separate from that of its owners, with a structure based on an abstractly ordered set of positions. The relationships between these positions result from the need to achieve specific and objective business goals. Information, which as Drucker (1973) points out is objective, logical, formal and specific, naturally supports the achievement of these goals. Such a cognitive model diminishes the relevance of individuals and personal relationships. A bureaucratic tradition also promotes formalism. Organisational rules are codified into systematic policies, procedures and regulations. As a result, a formal and impersonal MIS is needed to monitor and control a large number, and wide range of, activities. The IT application provides the manager with compressed and/or filtered symbolic data on a timely and frequent basis.

From another side, management science techniques are also used to enhance business decision-making. This assumes a rational and logical process that can be effectively modelled and quantified (Miller and Feldman 1983). Quantitative methods are used to develop a better understanding of complex relationships between organisational and environmental variables. These methods require extensive data collection and analysis, so their efficiency can be greatly enhanced by computers. Meanwhile, the multifaceted and complex nature of the modelled relationships encourages integration of the resulting information systems.

The use of scientific methods further implies that nature is subject to man rather than vice versa. The environment is considered to be explainable, predictable, and controllable. As Thomas Jefferson stated, " a man's future is in his own hands". The natural world can be investigated and analysed, enabling individuals to forecast the future and make decisions accordingly. This logic can also be extended to business planning. Business managers assume that they can influence environmental events and circumstances. Uncertainty may be hard to eliminate, but it can be mechanistically reduced. The assumed relationship between uncertainty and lack of information suggests that, with sufficient data, there is a basis for predicting the future.

The mainstream American management literature further implies that using information processing to reduce uncertainty simply requires obtaining sufficient data to solve the focal problem (Lin 1994). This is confirmed by the results of this research where there was a significant relationship between uncertainty avoidance (the extent to which people feel uncomfortable with uncertainty) and DSS usage in SDM. DSS meets the analytic need of the decision-makers to ease the risk of the unpredictable future. So, DSS, from this cultural viewpoint, is inevitable.

From another side, the Egyptian culture is less inclined to use systematic and formal planning procedures than its western counterparts. Instead, they will rely more on extrapolations from experience and intuition. This was clear from one of the interviews with the head of one of city councils; he stated:

> *"DSS and IT in general is like a sledge hammer waiting to fall on our heads. We have managers that thy think they know how to use it and don't. We deal with people interest in their daily and future life and these systems could be very dangerous if we depend on it in making our SD. They trained the IT staff to use this system but the city managers. And if any one is going to train me around its use, it is better to be an experienced head of city council who has used the system. I don't understand why we needed it, what it can do for us, so I have no intention to use it".*

As the results of this research showed, there was a significant relationship between DSS usage and individualism. Strategic decisions in most of the cities are made by powerful individuals (rather than groups), who frequently rely on personal knowledge and intuition rather than objective criteria or formal and quantitative method. One of the DSS staff expressed his negative feelings about the way that decision makers made their decisions; he stated:

> *"Most of managers seek the information that they need by their own personal way. Much of this information remains in a soft form, in the mind of the manager, and is verbally communicated mainly in private meetings rather than written memos or reports. In the formal meeting, employees will compete for privileged confidence of the boss and manoeuvre to get close to him by showing the agreement with what he is saying and the decision will be at the end what the boss think is right and suitable according to his viewpoint "*

So, in most of the cases, heads of city councils in Egypt are widely perceived to have natural right to determine the strategic direction of their cities according to their individual interpretation of the general policy of the state.
These results agree with two of Hofstede's dimensions which are power distance where, "less powerful should be dependent on the more powerful", "subordinates expect to be told what to do" and individualism, where individual interests come first (Hofstede 1997).

In relation to SEM results, PU showed a significant direct effect on DSS usage in the UK group which confirmed all earlier cited studies about TAM while it has no significant effect on in the Egypt group on P= .05 while it is significant on level p= .10. PEU showed no significant direct effect on DSS usage in SDM in both countries as indicated from tables 3 and 4 in the appendices. This was the case with task characteristics in both countries.

7.4 DSS characteristics

The results of this research show a relationship between DSS characteristics and DSS usage in SDM specially ease of DSS usage, ease of finding the required information/data and adequacy of DSS modelling capacity in the UK group, as indicated in figure 7.5.

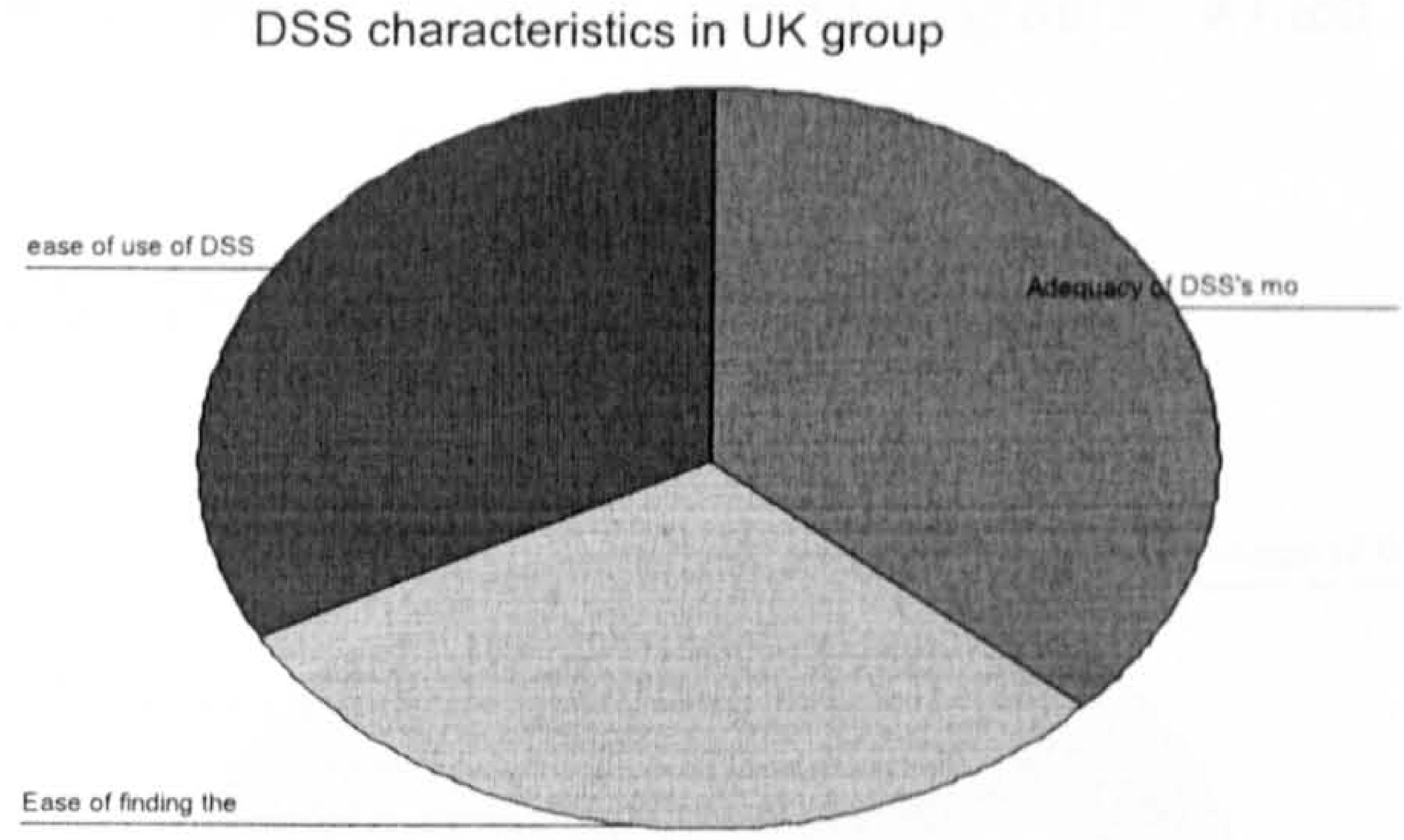


Figure 7.5 The effect of DSS characteristics on DSS usage in SDM as perceived by mangers in the UK group

These results confirmed several previous studies which showed the effects of system characteristics on DSS usage (Cats-Baril and Huber 1987; Davis 1993; Igbaria, Guimaraes et al. 1995). As noted earlier, most decision-makers use DSS to analyse and evaluate alternatives and do not use it at the stage of problem or issue recognition because of the nature of the data required at this stage, but this will allow more time for managers personally to gather soft, qualitative data. This notion is contradicted by what Drucker said: " the impact of IT on strategic decision making is limited by the inability of IT to access the relevant strategic information" (Drucker 1992).

Since the majority of DSS users are not computer experts, an effective DSS should include a simple way of interaction. This is consistent with the results of this study and other studies that found that past usage influences the ease of use of the system which is a key factor in determining future usage (Bidgoli and Attaran 1988; Bajaj and Nidumolu 1998). DSS that decision makers do not use are no help at all. Managers will only use DSS if it gives them the information that they require with the least possible effort (ease of use). This is consistent with Dishaw and Strong, who suggested integration with technology acceptance model and task-technology fit (Dishaw and Strong 1999).

For the Egypt group the results of this research showed a significant relationship between DSS usage in SDM and DSS reliability, whether DSS usage is voluntary or compulsory and the cost of adopting and using DSS, as indicated in figure 7.6. There was only one item common between the two groups which is DSS meets the requirements of DM.

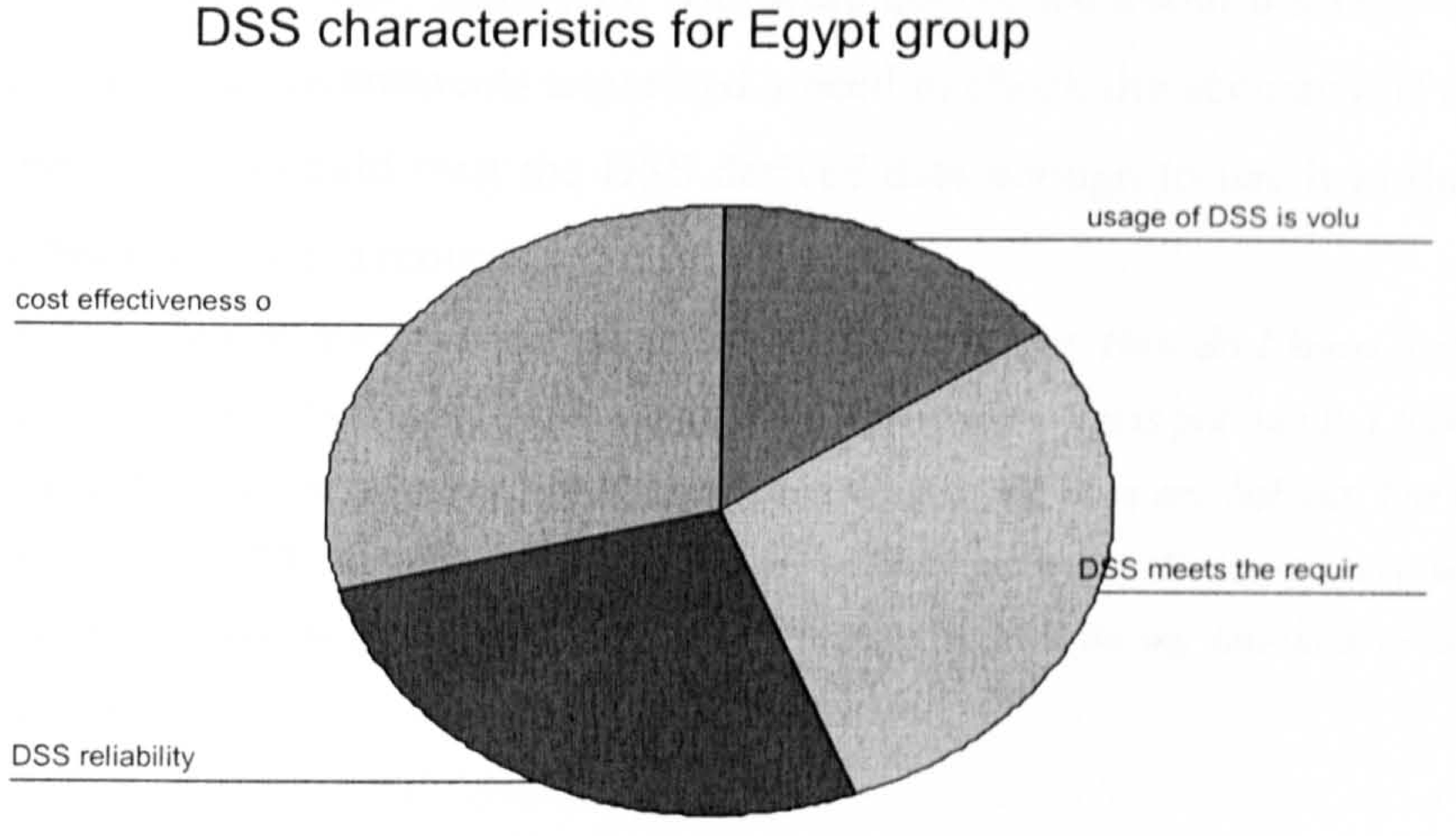


Figure 7.6 The effect of DSS characteristics on DSS usage in SDM as perceived by managers in the Egypt group

In many cases, people are unwilling to use IS in general, and DSS in particular, even if it could improve their job performance (Nickerson 1981). The reason for this may be because some developers can force some workers to use the systems, if only by not providing any other way to access data; but, of course, forcing people to use poor systems breeds resentment and mistrust. Further more, developers are seldom able to force executives, middle managers and other key-knowledge workers to use their systems. They must make their systems sufficiently attractive so that decision-makers use them voluntarily (Mathieson and Keil 1998). One of the ways to make decision makers voluntarily use DSS is to involve them in the different stages of the development of the system and research results in DSS necessitating a higher degree of user involvement in system design. Consistent with these results, studies of user involvement in design have found that higher user participation results in favourable perceptions of usefulness as well as lower rate of system rejection (Benbasat and Nault 1990).

In relation to the reliability of DSS output, this item comes as one of the most important factors in two studies (Bailey and Pearson 1983; Montazemi 1988). However, from another side, managers, who were concerned about the DSS data entry by DSS staff in local governments expressed a need to check the accuracy of data entry by others before they could trust the DSS derived data enough to use it in their SDM. One of the heads of cities recounts,

> *"You know how busy we get, and the pace we are all working. How do I know that what was entered is correct. The system is only good as the information that is put into it, I think there's a potential for error or deletion if important components of the data are left out. For the system to make sound SD, the data entry needs to be entirely accurate. Because there is always a potential for some margins of human error, I mainly depend on my intuition in making this decisions"*

Due to the scarcity of resources, adopting and using DSS software is an important issue in developing countries in general. DSS can either be purchased as a commercial package or developed in the organisation. The trade-off is between faster implementation and lower costs, with a commercially and more flexible better fit with the specific situation for a customer-developed systems (Lucas, Jr et al. 1988). In most of the cases the better choice is the one with the lowest cost which, in consequence, affects the quality of decisions made by using it; in turn this withdraws suspicions about the benefit of DSS in SDM.

In relation to SEM results, PU showed significant direct effect on DSS usage in the UK group which is confirmed by all earlier cited studies about TAM, while it has no significant effect in the Egypt group. PEU showed no significant direct effect on DSS usage in SDM in both countries as indicated in tables 5 and 6 in the appendices. This would seem to contradict earlier studies (Davis 1989; Davis, Bagozzi et al. 1989; Igbaria, Zinatelli et al. 1997) yet seem to confirm other findings (Adams, Nelson et al. 1992; Chau 1996; Agarwal and Prasad 1998b).

7.5 Environmental characteristics

Different environments experience different types of DSS applications and development problems. In relation to the UK and, as mentioned earlier in this chapter, the UK mangers are characterised with uncertainty avoidance and this make them use DSS tools to alleviate the uncertainty that prevailed in SDM. It is notable that there is a significant relationship between DSS usage and availability of favourable government policies in both groups. Favourable government policies was noted as a facilitator for the strategic use of IT in either developed or developing countries (King and Teo. 1996). In Egypt the government dominates the shape of IT development in the country so, control over the computing infrastructure has frequently been associated with the political control of information, particularly to reinforce the power of the government (Nidumolu, Goodman et al. 1996). Although the results showed the importance of government policies in the two groups, there is a difference in the applications and the outcomes. The government in Egypt is highly centralised and the public administration system is dominant. So the heads of cities ought to follow closely the central government plans and priorities, and therefore, most of the important decisions are made centrally. These views were formed based on the interviews with the head of cities that do not use DSS in their SDM. The most important reasons for this were as follows:

1. there are very few important decisions to be made; most of the decisions have always been made by the centralised government;
2. most of the decisions are quite simple and managers used to it for long time, so that required evaluation can be done mentally;
3. important factors affecting SDM are qualitative in nature; therefore, they can not be incorporated into computer mode as the results of this research showed earlier in the task characteristics.

While in the UK the local authorities are much more decentralised and this give the CEOs more room to evaluate the benefits of DSS and use it according to the requirements of the situation.

In relation to the Egypt group the research results showed a relationship between DSS usage and competition among local government. This result is consistent with Nidumolu et al., where they found that, although the governors perceived that putting a long term investment in computerising the governorate's information and decision making processes as a low priority, and there was a lack of clarity of benefits, it is nevertheless noteworthy that only because adopting DSS in the governorates will give the governors a considerable political and symbolic value as a rational decision maker on the governorates and on the national levels, they chose to go for the adoption of this system (Nidumolu, Goodman et al. 1996).

In relation to SEM results, PU showed significant direct effect on DSS usage in the UK group which confirmed all earlier cited studies about TAM, while it has no significant effect in the Egypt group. PEU showed no significant direct effect on DSS usage in SDM in both countries as indicated in tables 7 and 8 in the appendices, which is consistent with all the previous results in relation to SEM.

7.6 Organisational characteristics: -

The results of this research showed that there is a relationship between size of the organisation and planning integration on one side and DSS usage on the other side in the UK group. It was noted by many researchers that organisational factors play an important role in respect to DSS usage. For example, Ein-Dor and Segev reported that MIS structure is significantly correlated with organisational structure which, in turn, is closely related to organisational size (Ein-Dor and Segev 1982). The organisation size was one of the most important attributes of the organisational characteristics. This result is supported by many studies that investigated the influence of organisational characteristics on the effectiveness of information systems in general (Lind, Zmud et al. 1989; Yap 1990), and DSS in particular (Guimaraes, Igbaria et al. 1992). This result is supported also by the telephone interviews where several participants acknowledged that one of the most important reasons for not adopting DSS is that their council is small. From another side the results showed that planning integration between DSS and overall planning process play an important role in using DSS in SDM. This result is supported by many other previous studies (Johnston and Carrico 1988; Neo 1988). King and Teo found that integration of IS with business planning was one of the facilitators of the strategic use of IT (King and Teo. 1996). Also some other studies show that integration between IS plans and organisation plans is necessary to ensure that the IS function supports organisational goals and activities at every level (Lederer and Mendelow 1989) in order to achieve business value from the IT (Teo and King 1996) and better exploitation of IT for strategic advantage (Goldsmith 1991). Degree of decentralisation was found to have a significant relationship with using DSS strategically in both the UK and the Egypt groups. Decentralisation is often seen as a way of increasing the ability of central government officials to obtain better and more reliable information about local or regional developments, to plan local programmes more responsively and to react more quickly to unanticipated problems that inevitably arise during implementation. DSS is foreseen to ease the communication between the different local authorities on one side and central government on the other side. It is however, worth noting that the industrialised countries tended to be more decentralised than those with agricultural economies.

In relation to the Egypt group, the results of the study showed that there is a relationship between information intensity and DSS usage in SDM. The degree to which information is present in the organization and its services reflects the level of information intensity of that organisation. Businesses in different sectors have different information processing needs and those in more information intensive sectors are more likely to adopt IT than those in less information intensive sectors(Yap 1990). Further more, the greater the information intensity, the greater the potential for strategic use of IT in the organisation (Thong and Yap 1995).

In relation to the final variable, the results of the study showed that there is a relationship between availability of computer facilities and DSS usage in SDM in the Egypt group. This result is consistent with the findings of Nidumolu et al. They notice that, in the governorates project, training associated with computers and problem analysis had to be centralised in Cairo because of lack of computer facilities in the other governorates on one side and lack of trainers on the other side. Egypt as a developing country, in Africa, long considered 'the lost continent' of information technology (Odedra, Lawrie et al. 1993).

In relation to SEM results, PU showed significant direct effect on DSS usage in the UK group which confirmed all earlier cited studies about TAM, while it has no significant effect in the Egypt group. PEU showed no significant direct effect on DSS usage in SDM in both countries as indicated in tables 7 and 8 in the appendices which is consistent with all the previous results in relation to SEM.

7.7 Internal support characteristics

The first significant item in its relation with DSS usage in SDM in the UK group was the availability of experience of DSS staff in the organisation. This result is consistent with King and Teo, who found that the lack of adequate IT related support (availability of expertise in the organisation) was one of the important inhibitors for using IS strategically (King 1996). Also, Harris and Katz found that unsuccessful users of IT usually do not have the technical skills and infrastructure to use IT strategically (Harris and Katz 1991).

The second variable in this group was access to a help desk. At one time, employees had little direct interaction with companies' network and IT infrastructures. Today, mobile workers and decision-makers expect more from IT in general, and DSS in particular. Delays, outages or other problems are clearly visible outside the organization. Meanwhile, DSS software continues to grow more complex. The proliferation of loosely connected laptop computers for an increasingly mobile work force makes internal IT environments more volatile. E-Government initiatives target customers beyond the boundaries of IT's control. Decision-makers and knowledge workers depend on strategic information contained in enterprise resource planning systems and data warehouses. In addition end users are demanding alternative communications channels into the IT service desk, such as e-mail, the internet, and so forth, rather than being forced to use the phone. These problems have put a spotlight on the IT help desk. For help desks, the challenge is to rework support processes and service-level agreements to handle increased call volumes and problem complexity without incurring runaway costs. Traditional help desk products are fast being eclipsed by emerging e-support offerings from vendors of many DSS softwares. Access to help desk and providing software library were mentioned before in relation to end user computing success but not in any other study related to DSS (Shayo, Guthrie et al. 1999). Also, end user support has been investigated by many researchers; they argued that higher support level will be promoted within the organisations (Mirani and King 1994) which is supported by the results of this research, where internal support was significantly related to DSS usage in SDM.

In relation to the Egypt group the results showed that there was a significant relationship between advice provided by other colleagues or friends and providing library on one side and DSS usage in SDM on the other side. Since DSS has already been adopted in Egypt since early 1980s the lack of DSS use strategically can be explained in terms of knowledgeable decision-makers and availability of expertise DSS staff. However, the researcher believes that the lack of knowledgeable decision-makers and expertise DSS staff is only a symptom. The underlying causes may be quite complex. On the one hand, many potential DSS users may lack of true understanding of DSS capabilities; on the other hand, the educational systems in Egypt, like those in other developing countries, may be lagging behind developed countries in introducing DSS technology. These views were based on the interview results where one of the heads of cities that he retired from the military, as most of the head cities in local authorities in Egypt are, clearly described his experience with DSS:

> *"As you see I am on my early fifty, at this time when I graduated my the university there were not this type of knowledge available. According to my experience I used to make decision according to following the rules and regulations. When I heard about DSS I read a book about it and I did not feel that it can do much to me. I am willing to learn even at this age but when I find the proper way of doing that"*

Another DSS staff mentions that: "he depends totally on his own self development in relation to DSS and he used his own personal relations to get the facilities to his department".

In relation to SEM results, PU showed a significant direct effect on DSS usage in the UK group which confirmed all earlier cited studies about TAM, while it has no significant effect on the Egypt group. PEU showed significant direct effect on DSS usage in SDM in the UK group while no significant effect showed on DSS usage in Egypt group. Consistent with most prior related studies, there is a strong, positive and statistically significant link from PEU to PU in the UK group which is translated into a direct effect in DSS usage in both constructs in this group. Indeed, Davis, (1989) suggested that, when controlled for usefulness, PEU, as a direct effect, becomes non-significant. In Egypt none of these links were significant which needs more investigations and research in this area of the world in this particular application. These results are showed in tables 11 and 12 in the appendices.

7.8 External support characteristics

The results of this research showed that the recommendations from consultants in the UK group, and support from vendors, have a significant relationship with DSS usage in SDM. Vendors / consultants support refers to the extent to which vendors / consultants involve and participate in the development, maintenance and enhancement of DSS. Past research suggests that, when new computer-based technology is complex and knowledge difficult to transfer, mediating institutions (i.e. vendors and consultants) play an important role in the diffusion of the technology innovation (Attewell 1992). Also, good relationships with external vendors or consultants was one of the facilitators of success of end user computing (Shayo, Guthrie et al. 1999). It is worth noting that in the Egypt group the research results showed the importance of vendors support while in the UK group the concentration is on consultant support. The reason behind that may be due to the lack of resources allocation from the central government for DSS implementation, although in the Egypt group, they solely depend on vendors support, but, during the interviews, managers and IT people were dissatisfied regarding the support that they get from the vendors. One of the participants said:

> *"We were wrong to depend on the help that we get from the vendors, because all what they care about is to get the goods delivered and that's it in most of the cases. This may be because most of them are agencies serving many manufacturers. So they are all salesmen and not a real expertise".*

It is notable that there was a relationship between support from government agencies and DSS usage in SDM in both groups. Many researchers argue that direct intervention in the process of innovation may distort the market (Stiglitz 1987). However, the findings of Lai and Reeh indicated that government intervention and financial support was one of the key factors which pushed one of the information systems software to success (Lai and Reeh 1995).

In relation to SEM results, PU showed significant direct effect on DSS usage in the UK group which confirmed all earlier cited studies about TAM, while it has no significant effect on the Egypt group when the level of significance = 5% but it was significant on alpha =10%. PEU showed non-significant direct effect on DSS usage in SDM in the UK group when alpha = 5%, while it has marginal significant when alpha = 10%. PEU in the Egypt group was not significant. Consistent with most prior related studies, there is a strong, positive and statistically significant link from PEU to PU in UK group while in Egypt the link even does not exist, which needs more investigations and research in this area of the world in this particular application. These results are shown in tables 13 and 14 in the appendices.

7.9 Decision-maker characteristics

The results of this research showed that there was a relationship between decision-maker involvement in the development of DSS and their attitude toward DSS on one side and usage of DSS in SDM on the other side in the two groups. Involvement refers to decision maker participation in DSS design and implementation activities (Alavi and Joachimsthaler 1992). End user involvement has been advocated from a number of different perspectives. In addition to its contribution to DSS success, it can be justified from an ethical perspective and may be required as part of a trade union agreement (Blackler and Brown 1985). The positive influence of user involvement on IS success in general, and DSS in particular, has been extensively studied in recent decades and that literature has been reviewed by many researchers (Ives and Olsen 1984; Allingham and O'connor 1992; Barki and Hartwick 1994). Decision participation in the DSS development is believed to provide many benefits, including a more accurate and complete definition of decision-makers' information requirements, a better user understanding of the system and feelings of ownership (Robey and Farrow 1982). Beside these potential benefits, decision-makers will also have more realistic expectations about the system and there will be greater commitment from them towards the system. This, in turn, is expected to increase DSS usage in SDM. According to Barki and Hartwick (1994), user attitude refers to a psychological state reflecting the affective or evaluative feelings concerning a new system. The results of Moore and Benbasat's study are consistent with the results of the current study in relation to the effect of user attitudes towards systems where they found that attitude factors affect the hours of actual use and the extent to which different applications or functions were used (Moore and Benbasat 1991). Also, the results of the study of Babcock et al, provide support and explanation to some of the results of this study where they found that organisations that enjoy a higher level of IT use tend to have managers who have positive attitudes toward IT (Babcock, Bush et al. 1995). They concluded that these positive attitudes do not grow with age, but are obtainable by way of education, which explains why there is under utilisation of DSS in SDM in both countries where education does not give enough support to DSS understanding and usage. This phenomena is more obvious in Egypt, as a developing country, where the education system still gives very little and introductory courses till the student finish secondary education and at the university level, nothing about IT except for students who study specialised courses in computer sciences or in specialised departments in schools of engineering. Also, the under utilisation may be due, in part, to a preponderance of executives from the pre-computer age and, in part, to a distrust of the technology and a reflexive opposition to change.

Two variables were found significant in their relation to DSS usage in SDM in the UK group. Those variables were ability to interpret DSS output and years of experience of decision-makers. From the DSS design and development point of view, understandable output means that decision-makers understand the output. Characteristics, such as format, labelling and context, make the output comprehensible for decision-making. From the decision-maker point of view, usage of computer-based systems by them appear to be limited due, in part, to a fear of computers, confidence and ability and perceived difficulty of use (Thompson, Higgins et al. 1991). Both sides are important to get the expected benefits from DSS usage. Availability of the required information with the suitable output format were mentioned in many studies as a key factor for user satisfaction with IS (Tafti 1992; Udo and Guimaraes 1994). In relation to experience of decision-makers, there are two types of experience: DSS experience and work related experience. Alvi and Joachimsthaler found, from their meta-analysis research, that performance is more strongly related to DSS experience than to work experience, which is consistent with the results of this study (Alavi and Joachimsthaler 1992).

In relation to the Egypt group, level of training, confidence in DSS usage and innovativness of decision maker have a significant relationship with DSS usage in SDM. In relation to training, Alvi and Joachimsthaler found that training was essentially limited to providing the specific computer and software skills needed to interact effectively with particular DSS and they suggested that a more comprehensive approach to training through interaction with other user-situational factors, such as involvement and experience, would exert a stronger influence on DSS implementation success (Alavi and Joachimsthaler 1992). These results are consistent with the results of this study where the interviews showed the limitations of training programme in most of the local authorities in Egypt, apart from Cairo and Giza, where the IDSC is located. One of the heads of cities described his experience with DSS and how he learned about DSS:

> *"I'm not ready to use the DSS in making SD until I have enough experience with it and I see how accurate the data is. At the moment I know very little about the system through little reading I had done. I can assure you that the available training even in Cairo is a very limited concept of training. But if they told us why a DSS is being introduced and how it will affect our way of making decisions, this may lead to increase loyalty to the system and we will feel then it belongs to us not just we are enforced to use it"*

In relation to confidence in DSS usage, Gist et al. discovered that computer experience is likely to improve a decision maker's perceptions and beliefs about using the technology by increasing their beliefs in their ability to master the challenge and to reduce any fears they may have (Gist, Schwoerer et al. 1989). The researcher can add to this that, beside experience, training can lead to increasing confidence in DSS usage in SDM.

In relation to innovativeness, the results of this study are consistent with Gatian et al where they found that more innovative decision makers are more receptive to change and are, thus, more likely to be successful in using IT strategically to achieve competitive advantage (Gatian, Brown et al. 1995). For a developing country, where there are severe constraints on resources, such as finance and in-house technical expertise, adoption of DSS and its usage in SDM represent a radical innovation that not only requires a large outlay of financial resources, but also involves complex technology. In this context, adoption of DSS would be regarded as a risky venture that not many decision-makers would be willing to undertake as potential losses would be substantial, both in terms of tangible and non-tangible losses. It is quite likely that the less innovative decision-makers will look for other solutions that are less radical and, therefore, less risky. Only decision makers who are more innovative would be willing to do things differently by taking the risk of adopting and use DSS in their SDM. This finding is significant because previous studies on adoption and use of IS have tended to focus on decision-maker characteristics, like experience and training and age, without giving due emphasis to those particular decision-makers characteristics, such as those studied here.

In relation to SEM results, the hypothesised model for the UK group was not significant so there is no point in investigating the internal links in the model. For the Egypt group there were no significant links found between PEU, PU and DSS usage.

7.10 Top management characteristics

The results of this research showed that there were relationship between top management understanding of DSS and a developing core of internal experts on one side and usage of DSS in SDM on the other side in the two groups. Most studies recognise the importance of top management support which will make them both sufficiently committed to the system to invest time and effort in guiding its development and have a realistic understanding of the capabilities and limitations of the system. (Newman and Sabherwal 1996). Top management support is rated as the most important factor in IS planning in general, and DSS in particular (Galliers and Land 1987). Top management support to DSS involves doing what is necessary throughout the stages of development; installation and use to assure that the system meet the expectations from its adoption. A high level of commitment and support to a DSS system reflects the belief that the system will make a valuable contribution to the organisation (Weill 1992). Without such commitment and support, necessary resources may not be dedicated (Weill and Olson 1989), which agrees with the results of this study. One of the most important critical success factors, as mentioned by Poon and Wagner, is the quality of the expert staff who support IS for senior executives. Top management should have technical as well as business knowledge and the ability to communicate with senior management. Support staff must be sophisticated enough to interact with top management and able to master the technologies required for the system (Poon and Wagner 2001). As the results of this study showed, top management should invest in developing the internal support staff if they need to get the appropriate support. As mentioned earlier, top management should have enough knowledge about the system that they use, which is consistent with the results of this study in both research groups. Also, this variable, the understanding of decision-maker of the system, investigated by other studies beside top management involvement in designing the policies of the system that they will use (Drury and Farhoomand 1998). One of the reasons why top management should be supportive of DSS implementation is that implementation involves huge investment and, often, organisation-wide implications (Yap 1989). This agrees with the results of this study in the UK group where the results showed that one of the characteristics of top management in relation to DSS usage is offering funds. Financial resources were mentioned as one of the most important restraints for using DSS in SDM in both the UK and Egypt. In one of the telephone interviews one of the chief executives of a district council stated that:

> *"As to restraints, it is quite simply money. Within the last financial year on a core revenue expenditure, in general terms £10 million IT investment accounted for £ 1/2 million. The authority is currently debating the proposal to increase that area of expenditure for the coming year by another £1/3 million. Even with that level of investment the systems fall woefully short of desired levels"*

In relation to SEM results, PU showed significant direct effect on DSS usage in the UK group which is confirmed by all earlier cited studies about TAM, while it has no significant effect in the Egypt group. PEU showed significant direct effect on DSS usage in SDM in the UK group when alpha = 10%, while no significant effect on DSS usage in the Egypt group. Consistent with most prior related studies, there is a strong, positive and statistically significant link from PEU to PU in the UK group while this link was not significant in the Egypt group. This may be due to another factors affecting DSS usage.

In relation to the whole research model in the UK group PU showed significant direct effect on DSS usage while PEU showed significant negative effect on DSS usage which might mean that, in contradiction with CEOs in Egypt, strategic managers in the UK are interested mainly with the functionality and benefits of DSS. This is confirmed with percentage of direct effect of both PU and PEU where it was 98 % regarding PU while it was negative in PEU.

In relation to the whole research model in the Egypt group PU and PEU showed significant direct effect on DSS usage at 0.001 and 0.10 levels, repectively, confirmed all earlier cited studies about TAM (Davis 1989; Igbaria, Zinatelli et al. 1997). As TAM proposes, both PU and PEU are important in technology acceptance and usage. However, their relative importance in the acceptance process has been shown to be different in previous studies. For instance, (Davis 1993) found that usefulness dominated ease of use, whereas (Adams, Nelson et al. 1992) found ease of use to be more influential than usefulness. The results of this research showed that PEU direct effect on DSS usage was (0.95) while PU was (0.72) which may suggest that decision-makers, managers in local authorities use DSS technologies primarily on the basis of ease of use and user friendliness and second because of the functions it perform for them. Decision-makers with difficulties in using the system might, as a consequence of their lack respective skills or the training that they get, be discouraged from using the system and may not be able to observe the potential benefits. This emphasises the importance of features and services that are supporting the usability of the system, which seem to be very important from the viewpoint of decision makers in local authorities in Egypt. The previous result is consistent as well with (Agarwal and Prasad 1999) and many other researchers where ease of use predicts usefulness, which may suggest that a reduction in effort is a significant component of the utility an individual derives from a system. The reduction in effort expended can, in turn, free up time for decision makers to perform other tasks, thereby increasing overall productivity and effectiveness of SDM (Agarwal and Prasad 1999).

Further results in the study have shown that the top management characteristics, i.e. understanding of DSS and involvement in the process of design and development, influences PEU, while none of the research constructs affect PU. From the other side, the research results indicated that all the research construct variances are significant, as indicated in table 5 in the appendix.

The results showed a strong, direct and positive relationship between perceived usefulness on one side and DSS characteristics and PEU on the other side. Also, there was a negative, direct relationship between PU and both top management and external support characteristics. These results for PU are somewhat surprising because it was expected that top management characteristics and support would have a positive direct effect on PU. These expectations were supported by an earlier result of this research regarding the relation between PEU and top management where it was a positive relationship. One plausible explanation for this result might be that decision makers think that central government represents a barrier for them to benefit from the functionality that DSS could offer to them by making most of the strategic decisions centrally which was obvious from the interviews with the CEOs and IT managers.

7.11 Problems related to DSS usage in strategic decision-making

The study results provide important insights into the research question concerning the relative severity of the various DSS usage problems and how these problems are similar or different in severity in both the UK and Egypt, also, how these problems are related to the quality of strategic decisions made by using DSS and how it helps the organization achieve its goals by adopting it. Two of the first five problems were similar in both the two countries: absence of training for decision-makers to use DSS and failure to commit the required resources. As many studies showed, computer training is one of the essential contributors to the success of organisational computing in the information age (Chou 2001). The results of this research, as well, highlighted the need for well-trained and experienced decision-makers and DSS staff which agrees with some studies that have been done on local governments in developed countries (Middleton 2000; Safai-Amini 2000) and in developing countries (Lu, Hsieh et al. 1989), when both problem severity and its relationship to the quality of the strategic decisions made by using DSS the results showed the significance of the relation between those two problems and the two variables that have been used to measure the success of using DSS. There were significant differences between the two countries about the first problem while there were no significant differences about the second problem. This may be due to the quality and quantity of what could be considered satisfactory from the viewpoint of both groups of the two countries.

On the other hand, the last five problems in both groups, only one problem was similar between the two countries; this was about the involvement of decision-makers in the process of the development of DSS and there was no significant difference between the two countries about this problem. The interesting thing about this result is that when this problem related to the quality of strategic decision made by using DSS it was positively related with it in the UK group while negatively related with the quality of the strategic decisions in the Egypt group. This means that UK managers can still use DSS effectively even if he/she is not involved in the process of development, while Egyptian managers need to be involved in the process of development. The rest of the five least severe problems in the Egypt group was related to the data characteristics while they were relating to different categories in the UK group, but the most common one was DSS characteristics.

Interestingly, if the severity of the problems taken in consideration as a category two of the first three in both groups were similar which they were the availability of trained DSS staff and decision-makers and the environmental related problems.

Summary

This chapter highlighted the interpretation of the results presented in chapter six in light of the existing literature and the theory development underlying the research model. Through the analysis of the results of this research, the concentration was to link the results with the literature to consolidate the objectives of this study. Also a detailed analysis of the differences and similarities between the two research groups and the reasons behind this phenomenon was highlighted.

Chapter 8 Conclusions, Limitations and Future Research

8.1 Introduction

The goal of this research was to define and examine the various variables that affect DSS usage in SDM. The research model began by looking at each construct piece-by-piece, including TAM constructs (PEU and PU), and then the research model as a whole, to make a general vision. The study also examined the model without TAM constructs to see the effects of external variables, task characteristics, cultural characteristics, DSS characteristics, environmental characteristics, organisational characteristics, internal support characteristics, external support characteristics, decision maker characteristics and, finally, top management characteristics, on DSS usage in SDM. In addition to that, because the problem of under-utilised systems remains as one of the most important underlying causes behind the so called "productivity paradox", the study identified the most severe problems that the CEOs encounter when they use DSS in SDM.

To summarise this research several findings and implications are revealed. In addition, limits of the research and implications for the research that need to be recognised are identified.

8.2 Conclusions

The direct effects of the constructs on DSS usage in SDM:

1. As expected, there was a direct relationship between DSS usage and complexity of analysis and evaluation of alternatives in the UK group, while, in the Egypt group, managers perceived SDM as too person centred and too complex to be computerised. This result reflected on the utilisation of DSS usage where it was higher in the UK than in Egypt. This result could be of importance to local authorities in the UK and Egypt. For the UK, DSS should be designed taking into consideration specific characteristics to extend its use to the intelligence phase of strategic decision process and not limit its use to only analysis and evaluating the alternatives, as is now the case. These characteristics could be introducing distinct cognitive agents which co-operate to solve the problems enabling the processing of

more complex and ill-structured problems (Pinson, Anacleto Louca et al. 1997). For Egypt, it is recommended to involve decision-makers from the early stage of developing DSS; this will make them realise the possibilities of using this system in SDM and that it is capable of supporting the 'intelligence' and design phases of the problem solving process rather than the later 'choice phase' (Chung, Lang et al. 1989).

2. The results of this research showed that there are culture gaps between DSS and IT people on one side and decision-makers on the other side in both research groups. This is highlighted by the result that organisational culture plays an important role in the effective implementation and usage of DSS in SDM. So, high culture differences between IT people and decision makers may cause a culture clash between the two groups and reflect on the effective usage of the system. Therefore, it is recommended that local authorities in both countries should pay much attention to issues of cultural fit during the implementation of DSS. This recommendation is much more important in the Egypt group than the UK group, where individualism is the dominant culture among managers and where this should be replaced by collectivism instead.
3. The findings of this study help to explain why decision-makers in both countries do not use DSS in SDM to the expected level. There was one common reason in both groups which was that DSS must meet the requirements of decision makers. One of the most important requirements in using DSS in SDM is that the system should provide qualitative data required to overcome the uncertainty and equivocality of strategic decision processes. There were some specific variables affecting DSS usage in SDM which is materialised in the compulsory use of the systems and some doubts about the reliability of the data provided by the system. Regarding the UK group, there was an important role for the direct relationship between the usability of DSS and its use in SDM. This relationship needs to be given more care in designing and developing DSS.
4. This study clearly demonstrates that favourable government polices play an important role in using DSS in SDM in both research groups, but this government policy should be different in both countries according to the current situation of

each. For example, in Egypt in the way in which DSS is managed centrally by the CIDSS and which impact upon the effectiveness of managing and using the systems for the local authorities located far away from Cairo because of longer response time and excessive control by CIDSS. So, government policy needs to change to be more decentralised, thereby allowing local decision-makers more room for making strategic decisions and using the systems more effectively. For the UK the situation for government policies is slightly different where the system is already decentralised. So, according to the interviews the local authorities in the UK need the government to dedicate a considerable portion of resources for investment in DSS development.

5. The findings of this research suggest the necessity of integration between planning for implementing DSS with business planning, because it was obvious from this study that there was a lack of alignment between corporate strategy and DSS planning which reflected on DSS being adopted but not used as it should be. In relation to the Egypt group, it was obvious that, as a developing country, there was a lack of computer facilities and communication infrastructure which has an effect on DSS usage in SDM.
6. The findings of this research suggest the necessity for availability of internal support in both countries especially a help desk in the UK and this service in Egypt needs to be analysed and planned well because the lack of availability of this service in an organised way make decision-makers and different users of the system depend on informal ways of getting help, such as advice from a friend or colleagues, which of course, has a negative effect on using the system in SDM.
7. The results of this research showed that recommendations from consultants in the UK group and support from vendors in the Egypt group were the main variables in the external support characteristics construct. In addition to that, the research highlighted the importance of the support that local authorities get from the government agencies in using DSS in SDM in both research groups. Lack of capacity to undertake large information systems development like DSS, especially in developing countries and small and medium size councils in the UK, due to the dearth of skills and experience in DSS development and implementation,

necessitate central and other government agencies role in providing consultancy and funds to local authorities to support them in reaching the optimal level of utilisation.

8. The results of this research showed that there was a relationship between decision makers' involvement in development of DSS and their attitudes toward DSS on one side and DSS usage in SDM on the other side in the two groups. So it is suggested to enhance the level of involvement and commitment up to central ministers (including the prime minister) and all other stakeholders in local authorities in both countries. Such commitment has to be tangible, rather than merely symbolic as is normally the case, by providing the required resources the systems need and contributing in developing a core of experts within the local authorities.
9. Given the fact that all local governments, either in developed or developing countries, are operating in an information age, and technological innovations are almost daily happenings, it can still be seen that training plays an important role in using DSS in making strategic decisions. The previous observation, supported by the results of the study, clearly demonstrated the central importance of the availability of trained DSS staff and decision-makers that are able to use DSS strategically in both countries and, much more importantly, in Egypt because the severity of the problems is higher. It also showed the importance of the problems related to the DSS implementation in Egypt and the top management problems in the UK. On the other hand, the study showed a similarity between the two countries in some of the problems. This similarity was so obvious in two of the problems: managing of the process of DSS implementation and the problems related to the availability of trained and expertise DSS staff and decision-makers. This is an indication of the importance of the availability of the human resource factor, which is able to use DSS strategically, not only the technological competence, although there is no doubt about its criticality.
10. This research posited and found support for a theory of TAM as an adequate and parsimonious conceptualisation of acceptance and usage of DSS in SDM. Most empirical studies of TAM have examined relatively simple end-user technologies

(Agarwal and Prasad 1999) but this research examined the application of the main constructs embodied in TAM which are PEU and PU on the actual usage of DSS in SDM. Also, the study makes some amendments on TAM to make it suitable for the context of local authorities.

8.3 Research Limitations

Every research has some limitations, and this one is no exception. While the goal of this research is to examine the factors that affect DSS usage in SDM and define the problems that CEO encounter when they use DSS, DSS technology was widely defined because participants used different packages as well as different applications for different levels of decision making in local authorities in both Egypt and the UK.

Also the sample size in the UK group, though certainly valid for the techniques and methods required by this research, is smaller than many other samples taken for previous research. (Davis 1989; Davis 1993; Taylor and Todd 1995) used samples approximately three times greater than those used in this research, but for different IT applications.

The instrument used to measure the constructs of this study is based on previously devised instruments for studies conducted in the technologically advanced world with native English speakers. These instruments were validated within their own context and did not account for culturally dependent differences or social norms. This is why when the researcher undertook the reliability and validity tests for the Egypt group. The results were not that significant in comparison to the UK group, although the latter group was smaller. This study however, was conducted in the UK and Egypt, where there were differences between the two countries in relation to cultural and social norms. So, in order to enhance future research, researchers are encouraged to construct instruments that could account for, and reduce culturally dependant effects and social norms.

Another limitation is related to over generalisation. Developing countries, especially Arab countries, are somewhat similar. This why Hofstede (1980), in his classification, put all Arab countries in one category. This fact supports the applicability of the research results to other parts of the Arab world. However, each country still has its own unique social, political, and cultural structure. Accordingly, generalising the applicability of this study to include all Arabic countries must be taken with caution until future studies of TAM and the problems of DSS usage are conducted in other Middle Eastern countries. This can be applied to all the developing countries.

This study was limited to local authorities in both the UK and Egypt, so caution should be exercised in generalising these results to other kind of organisations for, example manufacturing or private sector organisations.

Another limitation of this study is that it did not tie DSS usage to measurable indicators of performance. This may be due to the fact that most recent studies consider DSS usage as a surrogate to user satisfaction and DSS success (DeLone 1988; DeLone and McLean 1992; Doll and Torkzaseh 1994).

8.4 Research Implications

- From the perspective of theory development, this research posited and found support for a theory of how TAM could be adequate and parsimonious conceptualisation of acceptance and usage of DSS in SDM. Most empirical studies of TAM have examined relatively simple end-user technologies (Agarwal and Prasad 1999) but this research examined the application of the main constructs embodied in TAM, which are PEU and PU, on the actual usage of DSS in SDM.
- Perhaps the most significant implication of the findings of this research is the necessity of moving towards decentralisation regarding making strategic decisions where top management was found to have a negative relationship with PU. Also, integrating technical improvements and functionality of DSS on one side and usability and decision maker support on the other side is imperative if success of DSS in SDM in local authorities is to be insured. The results also showed a negative relationship between external support and PU suggesting dependence on internal support to guarantee productive usage of DSS.

8.5 Future Research

Taking into consideration the outcomes as well as the limitations of this study, the research identified a number of potential issues and opportunities that represent directions and grounds for future research in the areas related to DSS diffusion and utilisation.

- The extension of the research to cover additional activities and sectors, such as the private sector or manufacturing and services industries, to assess and define the different variables that could affect the utilisation of DSS in SDM and other volatile activities.
- Evidence for the assumption of mediation of PEU and PU between DSS usage and new external constructs raises some intriguing implications for the construction of research models related to examining information technology adoption phenomena. These new constructs need to be re-examined in different contexts to confirm the validity of these constructs. Another implication follows when the results of this research are juxtaposed with other results obtained from previous research with regard to the relative importance of PEU and PU. It appears that the relative importance of PEU is higher than PU, although both were so important, suggesting that usability of DSS is crucial for its actual use in SDM in local authorities in developing countries in general, and in Egypt in particular. This may intrigue other researchers to link between the relative importance of these two constructs and the stage of DSS implementation and the environment of implementation as well.

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Appendices

Appendix A - Survey Instrument

Evaluating the use of Decision Support Systems in making strategic decisions in local government: a comparative study

10 February, 2000

Dear / Chief Executive

This international survey is focused on a comparative study of local government use of Decision Support Systems in making strategic decisions in the UK and in Egypt. The study is intended to identify both similarities and differences and as a consequence provide guidelines for the adoption of best practice principles.

Hopefully you feel the study is of value to your organization and you will be able to participate. Your completion of the questionnaire is of the utmost importance to the study. On completion of the study a copy of the results will be distributed to participants who desire this.

Attached with this letter is a copy of the questionnaire to be answered by your self or your delegate. Also enclosed is a prepaid envelope for return to:

Mr Ibrahim Elbeltagi
Dept. of Economics & Business Studies
Huddersfield University
Business School
Queensgate
Huddersfield
HD1 3DH

Thank you in advance for your time and co-operation.

Yours sincerely

Ibrahim Elbeltagi

HUDDERSFIELD UNIVERSITY

BUSINESS SCHOOL

Department of Economics and Business studies

Evaluating the use of Decision Support Systems in making strategic decisions in local government: a comparative study

This survey is designed to assess the use of Decision Support Systems in making strategic decisions from the viewpoint of senior management. The main aims are to achieve a better understanding of the variables affecting the use of DSS in making strategic decisions and to define the relative severity of the various problems associated with the use of DSS in making strategic decisions.

It is hoped that the questionnaire can be answered by senior managers who are involved in making strategic decisions and IT/IS department managers.

Basic Definitions:

The following definitions are to cover the basic expressions used in this questionnaire:

1- **Strategic decision:** A decision is strategic if it involves a significant commitment of resources and/or affects the overall direction of the organization. In the first question of this survey please indicate the percentage of using DSS in making strategic decisions in comparison to the whole strategic decisions made in your organisations.

2- **Decision Support Systems:** Decision Support Systems (DSS) use suitable computer technology to support and improve the effectiveness of managerial decision-making in semi-structured and unstructured tasks (for example, spreadsheet/ financial report preparation, data base applications, graphics applications, and modelling applications...etc.).

Completion of this questionnaire should only take about twenty minutes and the form is not difficult to complete. Please return the questionnaire in the self addressed stamped envelope provided. Be assured that all information will be held in strict confidence. Thank you in advance for completing the questionnaire. If you have any queries please feel free to contact me,

Mr Ibrahim Elbeltagi
Dept. of Economics & Business Studies
Huddersfield University
Business School
Queensgate
Huddersfield
HD1 3DH
01484-472772
E-mail: i.m.el-beltagi@hud.ac.uk.

1. Please indicate the approximate percentage of the use of data or information that you get from the DSS in making strategic decisions ------%

2. Please indicate, where appropriate, How do you describe your level of DSS usage in making strategic decisions:

No use (1)	Little use(2)	Moderate use(3)	High use (4)	Extensive use (5)

3. Please indicate, where appropriate, the frequency of DSS usage in making strategic decisions:

Never use (0)	Once a year (1)	(2)	(3)	(4)	Several times a month (5)

Implication of DSS usage in making strategic decisions in your organization:

4. Please rate the extent to which you encountered the following problems in DSS usage in making strategic decisions in your organization:

Item	Not a problem (1)	(2)	(3)	(4)	An extreme problem (5)
Insufficient understanding about existing data and applications across the organization.					
Failure to continually assess emerging DSS capabilities.					
Lack of senior management leadership for DSS efforts.					
Top management's insufficient understanding about DSS.					
Lack of strategic vision for decision-makers.					
Lack of appropriate planning for adopting DSS.					
Lack of alignment between corporate strategy and DSS planning.					

Lack of expertise in DSS in the organization.					
Insufficient telecommunication infrastructure capabilities.					
Absence of appropriate training for DSS staff					
Absence of appropriate training for decision-makers to use DSS.					
Failure to commit the required resources (financial, human resources, etc.) to DSS usage.					
Difficulty in finding DSS staff who have the required skills and knowledge.					
Lack of authority given to the DSS team, so they cannot get access the data/information I need to make strategic decisions.					
Lack of experience to be able to use DSS in making strategic decisions.					
It is not easy to learn how to use the DSS software.					
Qualitative information which is important in making strategic decisions is not available in the DSS software that I use.					
DSS provide decision-makers with more information/ reports than they need to make strategic decisions effectively.					
Lack of accuracy of output (information/data)					
Irrelevant information or data for the different decisions I usually make.					
Incompleteness of information or data.					
Lack of reliability of information or data.					
Lack of timeliness of information or data.					

Lack of external consultant support for DSS implementation and use.					
Lack of internal support for DSS implementation and use.					
Difficulty in financially justifying benefits of DSS usage.					
Unreasonable expectations attributed to DSS as a solution for all organisational problems					
Failure to assess DSS effectiveness in the early stages of implementation.					
Poor communication between decision-makers and DSS staff unit.					
Difficulty in modelling and simulating the strategic decisions by DSS usage.					
Difficulty of changing the legacy of making strategic decisions because of rigid regulations.					
When it is necessary to compare or aggregate data/information from two or more different sources, there may be unexpected or difficult inconsistencies.					
I did not get involved in the development of the DSS software that I use.					
The database that would be useful to me is unavailable because it is centralised.					
Lack of flexibility in the DSS software to meet decision-makers' changing data needs.					
Rushing of DSS adoption and implementation process.					

The available DSS software does not support learning and creativity.					
The available DSS software does not actively participate in my strategic decisions.					
Other (please state)					

5. Overall how would you rate the quality of the strategic decisions that were made by DSS usage?

Excellent (5)	Good 4)	Average (3)	Fair (2)	Poor (1)	Never use (0)

6. So far has the use of DSS in making strategic decisions helped the organization achieve its objectives?

Very helpful (5)	Helpful (4)	Neutral(3)	Unhelpful (2)	Very unhelpful 1	Never use (0)

Perceived ease of use and perceived usefulness in your organization:

7. To what extent do you agree or disagree that the following statements about perceived ease of use of DSS affect DSS usage in making strategic decisions in your organization?

Item	Strongly disagree (1)	2	3	4	Strongly agree (5
Ease of learning DSS software.					
The interaction with DSS software is clear and understandable					
The interaction with DSS software does not require a lot of mental effort					
The interaction with DSS software does not require a lot of time to get the information that I need					
The interaction with DSS is flexible					
It would be easy for me to become skilful at DSS usage.					

8. Please indicate if DSS usage affects any of the following factors in your organization:

Factors of perceived usefulness	No improvement (1)	2	3	4	Significant improvement (5
Timely / accurate information					
Make new information available to me that was not previously available.					
Improving customer service					
Organization image / reputation					
Lowers cost					
Improves efficiency / effectiveness of decision making process					
Makes it easier to do my job in general.					

Variables affecting DSS usage in making strategic decisions in your organization:

9. Please indicate to what extent do you agree or disagree that the following task characteristics have an effect on DSS usage in making strategic decisions

Statement	Strongly disagree (1)	(2)	(3)	(4)	Strongly agree (5)
Complexity of problem or issue recognition					
Complexity of analysis and evaluation of alternatives in strategic decisions					
Complexity of choice and implementation in strategic decisions					
Strategic decision processes as a whole are too complex to be computerised					

Strategic decision making tasks are too 'person centred' to be computerised					

10. How effective is DSS usage in complex tasks (non-routine tasks)?

Very effective (5)	Effective (4)	Neutral (3)	Ineffective (2)	Very ineffective (1)

11. To what extent do you agree or disagree that the following cultural characteristics have an effect on DSS usage in making strategic decisions

Statement	Strongly disagree (1)	(2)	(3)	(4)	Strongly agree (5)
Individualism (extent to which people act solely in their own interest).					
Masculinity (extent to which assertive behaviour is desired over modest behaviour).					
The cultural gap among decision-makers and DSS staff (education, training, experience and background).					
Uncertainty avoidance (extent to which people feel uncomfortable with uncertainty).					

12. To what extent do you agree or disagree that an organisation's culture affects DSS usage in making strategic decisions:

Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)

13. To what extent do you agree or disagree that the following DSS characteristics have an effect on DSS usage in making strategic decisions

Statement	Strongly disagree (1)	(2)	(3)	(4)	Strongly agree (5)
Overall cost effectiveness of DSS					
Ease of use of DSS.					
Adequacy of DSS's data storage capacity.					
Adequacy of DSS's modelling capacity.					
Adequacy of DSS's processing speed.					
Accessibility of DSS.					
Ease of use of built-in help facility for assistance.					
Usage of DSS is voluntary/compulsory.					
DSS meets the requirements of decision-makers.					
DSS reliability.					
Ease of finding the required data.					
Tangible/intangible benefits of DSS usage.					

14. To what extent do you agree or disagree that the following environmental characteristics have an effect on DSS usage in making strategic decisions:

Item	Strongly disagree (1)	(2)	(3)	(4)	Strongly agree (
Competition among local governments					
Favourable government policies.					
Uncertainty in local government environment.					
Favourable market conditions.					

15. To what extent do you agree or disagree that the following organisational characteristics have an effect on DSS usage in making strategic decisions:

Item	Strongly disagree (1)	(2)	(3)	(4)	Strongly agree (
Size of the organization					
Location of DSS staff /department in the organisational structure.					
Degree of decentralisation.					
Information intensity.					
Integration among departments in relation to data/information exchange and sharing experience.					
Planning integration between using DSS and overall planning process.					
Computer facilities					

16. To what extent do you agree or disagree that the following external support characteristics have an effect on DSS usage in making strategic decisions:

Statement	Strongly disagree (1)	(2)	(3)	(4)	Strongly agree (5
Recommendations from outside consultants.					
Advice and support from the vendors.					
Support from government agencies.					

17. How would you rate the quality of external support you receive from external sources about DSS usage in making strategic decisions?

Excellent (5)	Good (4)	Average (3)	Fair (2)	Poor (1)

18. To what extent do you agree or disagree that the following decision-maker characteristics have an effect on DSS usage in making strategic decisions:

Item	Strongly disagree (1)	(2)	(3)	(4)	Strongly agree (
Years of experience.					
Cognitive style (analytical/heuristic)					
Self-efficiency.					
Attitudes towards DSS.					
Involvement in the development of DSS					
Level of training and education.					
Innovativeness of decision-maker.					
Fear from using DSS in making strategic decisions					
Familiarity with DSS usage.					
Ability to interpret DSS output.					
Ability to change and use new methods to make strategic decisions.					
Confidence in DSS usage					

19. To what extent do you agree or disagree that the following internal support characteristics have an effect on DSS usage in making strategic decisions:

Statement	Strongly disagree (1)	(2)	(3)	(4)	Strongly agree (5
Training/consultation within organization.					
Advice provided by other colleagues/friends.					
Providing library (books and software manuals).					

Access to help desk or hotline.					
Experience of DSS staff in implementation of DSS technology and supporting decision-makers.					

20. How would you rate the quality of the internal support you receive about DSS usage in making strategic decisions?

Excellent (5)	Good (4)	Average (3)	Fair (2)	Poor (1)

21. To what extent do you agree or disagree that the following top management characteristics have an effect on DSS usage in making strategic decisions:

Item	Strongly Disagree (1)	(2)	(3)	(4)	Strongly agree (
Top management understanding of DSS.					
Rewarding efforts of using DSS to meet set goals at sectional, department, divisional, and corporate level.					
Setting policies and goals for DSS					
Offering funds					
DSS design and development					
Developing a core of internal experts who will train others (local resident expert).					

22. The results of this study will be sent to you as soon as possible. Please indicate your biographical details including the address to which the report could be sent:

Name: ---

Job Title:--

Years of experience in your current job: ------------------------------ Organization: ------
----

Address: ---

Phone No.---------------------------------- E-mail address (if available)----------------
----

Any Comments:-

Appendix B - regression weights for the different variables for both the UK and Egypt

Table 0.1 regression weights for tak characteristics for UK

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PEU	<--	Q09A	0.06	0.07	0.88	0.38	par-21
PEU	<--	Q09B	-0.05	0.09	-0.60	0.55	par-22
PEU	<--	Q09C	0.11	0.08	1.35	0.18	par-23
PEU	<--	Q09D	0.06	0.07	0.94	0.35	par-24
PEU	<--	Q09E	-0.08	0.07	-1.12	0.26	par-25
PU	<--	Q09A	-0.01	0.09	-0.06	0.95	par-26
PU	<--	Q09B	0.02	0.10	0.22	0.83	par-27
PU	<--	Q09C	0.09	0.10	0.94	0.35	par-28
PU	<--	Q09E	-0.06	0.08	-0.67	0.50	par-29
PU	<--	Q09D	-0.01	0.08	-0.11	0.91	par-30
PU	<--	PEU	0.25	0.18	1.39	0.16	par-41
Q08C	<--	PU	0.68	0.19	3.65	0.00	par-10
DSS usage	<--	PU	0.89	0.23	3.82	0.00	par-31
DSS usage	<--	PEU	-0.27	0.26	-1.05	0.29	par-32
Q08C	<--	Q09D	0.19	0.07	2.91	0.00	par-34
DSS usage	<--	Q09B	0.31	0.15	2.05	0.04	par-35
Q07E	<--	PEU	1.07	0.26	4.03	0.00	par-1
Q07D	<--	PEU	1.44	0.32	4.45	0.00	par-2
Q07C	<--	PEU	1.19	0.29	4.12	0.00	par-3
QO7B	<--	PEU	1.06	0.21	5.09	0.00	par-4
Q08E	<--	PU	0.75	0.18	4.13	0.00	par-5
Q08D	<--	PU	1.00	0.22	4.53	0.00	par-6
Q03	<--	DSS usage	1.00				
Q02	<--	DSS usage	0.96	0.08	11.86	0.00	par-8
Q01	<--	DSS usage	0.97	0.09	10.44	0.00	par-9
Q08B	<--	Q08C	0.33	0.08	3.90	0.00	par-11
Q08B	<--	PU	0.52	0.14	3.64	0.00	par-12
Q08A	<--	PU	1.00				

Q08G	<--	PU	1.00				
Q07A	<--	PEU	1.00				
Q07F	<--	PEU	0.91	0.25	3.67	0.00	par-14
Q08F	<--	PU	0.84	0.16	5.35	0.00	par-33
Q03	<--	Q08C	0.31	0.09	3.57	0.00	par-43
Q08F	<--	Q09E	-0.27	0.07	-3.64	0.00	par-44
Q08E	<--	Q09E	-0.15	0.09	-1.67	0.09	par-45

Table 0.2 regression weights in relation to task characteristics for Egypt

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PU	<--	Q09C	0.02	0.03	0.81	0.42	par-7
PU	<--	Q09D	-0.03	0.03	-0.83	0.41	par-8
PEU	<--	Q09D	0.01	0.02	0.48	0.63	par-16
PEU	<--	Q09C	0.01	0.02	0.44	0.66	par-17
PEU	<--	Q09A	0.01	0.02	0.53	0.60	par-18
PU	<--	Q09E	-0.02	0.02	-0.77	0.44	par-25
PEU	<--	Q09E	0.01	0.02	0.50	0.62	par-26
PU	<--	Q09A	0.00	0.01	0.01	0.99	par-28
PEU	<--	Q09B	0.00	0.01	0.05	0.96	par-29
PU	<--	Q09B	0.02	0.02	0.81	0.42	par-30
Q08C	<--	PU	2.24	3.00	0.75	0.46	par-4
DSS usage	<--	PU	1.68	2.02	0.83	0.41	par-9
DSS usage	<--	PEU	-0.44	1.00	-0.44	0.66	par-33
Q07C	<--	PEU	4.57	8.67	0.53	0.60	par-35
Q07F	<--	PEU	1.54	3.52	0.44	0.66	par-36
Q07D	<--	PEU	5.05	9.55	0.53	0.60	par-1
Q08G	<--	PU	1.00				
Q08F	<--	PU	4.01	4.81	0.83	0.41	par-2
Q08E	<--	PU	0.88	1.94	0.46	0.65	par-3

Q08B	<--	PU	1.19	2.12	0.56	0.57	par-5
Q08D	<--	PU	4.47	5.33	0.84	0.40	par-6
Q03	<--	DSS usage	1.00				
Q02	<--	DSS usage	2.04	0.32	6.46	0.00	par-19
Q01	<--	DSS usage	2.84	0.65	4.40	0.00	par-20
Q08F	<--	Q07F	0.15	0.06	2.56	0.01	par-27
Q08A	<--	PU	1.00				
Q08B	<--	Q08C	-0.02	0.06	-0.28	0.78	par-31
Q08A	<--	Q07C	0.17	0.06	2.96	0.00	par-32
Q07E	<--	PEU	7.33	13.74	0.53	0.59	par-34
QO7B	<--	PEU	0.05	2.28	0.02	0.98	par-37
Q08A	<--	Q09B	-0.29	0.08	-3.68	0.00	par-38
Q07A	<--	PEU	1.00				

Table 0.3 regression weights in relation to cultural characteristics for Egypt

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PEU	<--	Q11B	0.07	0.04	1.85	0.06	par-12
PEU	<--	Q11D	0.01	0.03	0.40	0.69	par-23
PEU	<--	Q11C	-0.14	0.05	-2.78	0.01	par-24
PEU	<--	Q11A	-0.02	0.05	-0.52	0.60	par-26
Q07D	<--	PEU	0.31	0.43	0.72	0.47	par-3
PU	<--	Q11C	-0.14	0.05	-2.81	0.00	par-13
PU	<--	Q11D	0.03	0.03	1.13	0.26	par-14
PU	<--	Q11A	0.06	0.04	1.52	0.13	par-22
PU	<--	Q11B	0.04	0.03	1.40	0.16	par-25
PU	<--	Q07D	0.01	0.02	0.52	0.60	par-34
DSS usage	<--	PEU	-0.35	0.31	-1.14	0.25	par-15
DSS usage	<--	PU	0.59	0.33	1.82	0.07	par-31

Q07F	<--	PEU	0.54	0.43	1.26	0.21	par-1
Q07E	<--	PEU	0.00	0.42	0.01	0.99	par-2
Q07C	<--	PEU	-0.32	0.41	-0.78	0.43	par-4
QO7B	<--	PEU	0.90	0.52	1.74	0.08	par-5
Q07A	<--	PEU	1.00				
Q08F	<--	PU	1.66	0.78	2.13	0.03	par-6
Q08E	<--	PU	-0.18	0.36	-0.50	0.62	par-7
Q08C	<--	PU	0.34	0.33	1.02	0.31	par-8
Q08B	<--	PU	0.40	0.34	1.20	0.23	par-9
Q08A	<--	PU	-0.27	0.33	-0.80	0.42	par-10
Q08D	<--	PU	0.62	0.37	1.68	0.09	par-11
Q03	<--	DSS usage	1.00				
Q02	<--	DSS usage	2.04	0.31	6.50	0.00	par-27
Q01	<--	DSS usage	2.68	0.56	4.78	0.00	par-28
Q08F	<--	Q11C	0.39	0.13	3.07	0.00	par-29
Q08G	<--	PU	1.00				
Q08G	<--	Q11D	-0.19	0.06	-3.21	0.00	par-30

Table 0.4 regression weights in relation to cultural characteristics for UK

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PEU	<--	Q11B	-0.17	0.12	-1.39	0.16	par-10
PEU	<--	Q11D	-0.12	0.11	-1.12	0.26	par-20
PEU	<--	Q11C	0.15	0.15	1.02	0.31	par-21
PEU	<--	Q11A	0.09	0.13	0.72	0.47	par-23
PU	<--	Q11C	0.00	0.19	0.02	0.98	par-11
PU	<--	Q11A	0.13	0.16	0.82	0.41	par-19
PU	<--	Q11B	-0.04	0.15	-0.29	0.77	par-22
PU	<--	Q11D	0.21	0.14	1.48	0.14	par-32
PU	<--	PEU	0.25	0.19	1.30	0.19	par-36

Q08F	<--	PU	0.86	0.16	5.52	0.00	par-6
DSS usage	<--	PEU	-0.47	0.27	-1.70	0.09	par-12
DSS usage	<--	PU	1.01	0.23	4.43	0.00	par-39
Q07F	<--	PEU	0.99	0.27	3.69	0.00	par-1
Q07E	<--	PEU	1.08	0.28	3.90	0.00	par-2
Q07D	<--	PEU	1.39	0.33	4.23	0.00	par-3
Q07C	<--	PEU	1.35	0.32	4.16	0.00	par-4
QO7B	<--	PEU	1.10	0.22	4.96	0.00	par-5
Q08G	<--	PU	1.00				
Q08E	<--	PU	0.79	0.18	4.47	0.00	par-7
Q08C	<--	PU	0.62	0.17	3.67	0.00	par-8
Q08B	<--	PU	0.86	0.14	6.13	0.00	par-9
Q08A	<--	PU	1.00				
Q03	<--	DSS usage	1.00				
Q02	<--	DSS usage	0.92	0.07	12.38	0.00	par-24
Q01	<--	DSS usage	0.94	0.09	10.93	0.00	par-25
Q07D	<--	Q08F	0.27	0.10	2.78	0.01	par-28
Q08D	<--	PU	1.01	0.20	4.93	0.00	par-30
Q07A	<--	PEU	1.00				

Table 0.5 regression weights in relation to DSS characteristics for Egypt

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PEU	<--	Q13G	-0.04	0.03	-1.54	0.12	par-7
PU	<--	Q13H	-0.03	0.02	-1.32	0.19	par-8
PU	<--	Q13I	0.00	0.02	-0.02	0.99	par-9
PU	<--	Q13F	0.04	0.04	1.15	0.25	par-17
PU	<--	Q13G	-0.02	0.02	-1.14	0.26	par-18
PEU	<--	Q13F	0.02	0.05	0.41	0.68	par-19
PEU	<--	Q13I	0.06	0.04	1.51	0.13	par-79

PEU	<--	Q13H	-0.06	0.03	-1.70	0.09	par-80
PEU	<--	Q13B	0.03	0.05	0.56	0.58	par-81
PEU	<--	Q13C	-0.02	0.02	-0.77	0.44	par-82
PEU	<--	Q13D	0.04	0.03	1.50	0.13	par-83
PEU	<--	Q13E	0.00	0.03	-0.11	0.91	par-84
PEU	<--	Q13J	0.02	0.03	0.69	0.49	par-85
PEU	<--	Q13K	-0.07	0.04	-1.88	0.06	par-86
PEU	<--	Q13L	-0.03	0.03	-1.10	0.27	par-87
PU	<--	Q13J	0.04	0.03	1.38	0.17	par-88
PU	<--	Q13K	-0.01	0.02	-0.52	0.61	par-89
PU	<--	Q13L	0.00	0.01	-0.25	0.80	par-90
PU	<--	Q13E	-0.01	0.02	-0.78	0.43	par-91
PU	<--	Q13D	0.01	0.01	1.00	0.32	par-92
PU	<--	Q13C	0.00	0.01	-0.34	0.73	par-93
PU	<--	Q13B	-0.03	0.03	-1.04	0.30	par-94
PEU	<--	Q13A	-0.02	0.04	-0.46	0.65	par-102
PU	<--	Q13A	0.04	0.03	1.30	0.19	par-104
Q07C	<--	PEU	0.33	0.50	0.66	0.51	par-2
DSS usage	<--	PU	-1.42	0.99	-1.43	0.15	par-10
DSS usage	<--	PEU	0.42	0.29	1.43	0.15	par-101
Q07D	<--	PEU	0.84	0.62	1.36	0.17	par-1
QO7B	<--	PEU	1.12	0.70	1.61	0.11	par-3
Q07A	<--	PEU	1.00				
Q08F	<--	PU	-1.51	1.19	-1.27	0.20	par-4
Q08E	<--	PU	1.00				
Q08C	<--	PU	-1.24	1.09	-1.14	0.25	par-5
Q08D	<--	PU	-1.60	1.25	-1.29	0.20	par-6
Q02	<--	DSS usage	2.03	0.31	6.57	0.00	par-20
Q02	<--	Q13C	0.12	0.03	3.55	0.00	par-98
Q07F	<--	PEU	-1.56	0.81	-1.92	0.06	par-99
Q07E	<--	PEU	-0.53	0.55	-0.96	0.34	par-100

Q03	<--	DSS usage	1.00				
Q08G	<--	PU	-2.15	1.54	-1.39	0.16	par-103
Q01	<--	DSS usage	2.66	0.53	5.01	0.00	par-105
Q08A	<--	PU	1.00				
Q08B	<--	PU	-0.92	0.96	-0.95	0.34	par-106
Q08A	<--	Q07C	0.17	0.06	2.93	0.00	par-108

Table 0.6 regression weights in relation to DSS characteristics for UK

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PEU	<--	Q13G	0.08	0.21	0.40	0.69	par-7
PEU	<--	Q13F	0.10	0.10	1.04	0.30	par-19
PEU	<--	Q13I	-0.14	0.09	-1.56	0.12	par-79
PEU	<--	Q13H	0.01	0.09	0.10	0.92	par-80
PEU	<--	Q13A	0.07	0.09	0.79	0.43	par-81
PEU	<--	Q13B	-0.07	0.16	-0.43	0.67	par-82
PEU	<--	Q13C	0.08	0.10	0.77	0.44	par-83
PEU	<--	Q13D	-0.19	0.11	-1.84	0.07	par-84
PEU	<--	Q13E	0.24	0.10	2.45	0.01	par-85
PEU	<--	Q13J	-0.06	0.27	-0.20	0.84	par-86
PEU	<--	Q13K	-0.02	0.07	-0.24	0.81	par-87
PEU	<--	Q13L	-0.17	0.10	-1.64	0.10	par-88
PU	<--	Q13H	0.15	0.11	1.45	0.15	par-8
PU	<--	Q13I	-0.13	0.10	-1.23	0.22	par-9
PU	<--	Q13F	0.07	0.11	0.60	0.55	par-17
PU	<--	Q13G	0.44	0.24	1.80	0.07	par-18
PU	<--	Q13J	-1.06	0.34	-3.10	0.00	par-89
PU	<--	Q13K	0.08	0.08	0.99	0.32	par-90
PU	<--	Q13L	-0.08	0.11	-0.68	0.50	par-91
PU	<--	Q13E	0.29	0.11	2.54	0.01	par-92

PU	<--	Q13D	-0.01	0.12	-0.06	0.95	par-93
PU	<--	Q13C	0.04	0.11	0.34	0.74	par-94
PU	<--	Q13B	0.41	0.19	2.20	0.03	par-95
PU	<--	Q13A	0.22	0.11	2.12	0.03	par-96
PU	<--	PEU	0.36	0.19	1.89	0.06	par-101
Q08C	<--	PU	0.87	0.20	4.31	0.00	par-5
DSS usage	<--	PU	0.83	0.21	3.94	0.00	par-10
DSS usage	<--	PEU	-0.21	0.26	-0.81	0.42	par-99
DSS usage	<--	Q13I	0.53	0.14	3.70	0.00	par-103
DSS usage	<--	Q13K	0.40	0.12	3.31	0.00	par-104
Q07E	<--	PEU	1.17	0.31	3.81	0.00	par-1
Q07D	<--	PEU	1.62	0.38	4.23	0.00	par-2
Q07C	<--	PEU	1.43	0.35	4.06	0.00	par-3
Q08E	<--	PU	0.89	0.20	4.38	0.00	par-4
Q08D	<--	PU	1.04	0.23	4.44	0.00	par-6
Q03	<--	DSS usage	1.00				
Q01	<--	DSS usage	0.97	0.08	11.97	0.00	par-20
Q03	<--	Q08C	0.28	0.09	2.98	0.00	par-100
QO7B	<--	PEU	1.14	0.24	4.83	0.00	par-107
Q07A	<--	PEU	1.00				
Q07F	<--	PEU	0.96	0.28	3.42	0.00	par-108
Q08F	<--	PU	1.01	0.19	5.17	0.00	par-109
Q02	<--	DSS usage	0.95	0.07	13.80	0.00	par-111
Q08A	<--	PU	0.86	0.21	4.16	0.00	par-112
Q08B	<--	Q13I	0.29	0.09	3.11	0.00	par-113
Q08B	<--	PU	0.99	0.20	4.83	0.00	par-114
Q02	<--	Q08C	-0.08	0.07	-1.24	0.21	par-119
Q02	<--	Q13C	-0.05	0.08	-0.65	0.52	par-121
Q08G	<--	PU	1.00				

Table 0.7 regression weights in relation to environmental characteristics for Egypt

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PU	<--	Q14D	0.10	0.04	2.23	0.03	par-12
PEU	<--	Q14A	0.03	0.03	0.85	0.39	par-19
PU	<--	Q14C	-0.06	0.05	-1.17	0.24	par-22
PU	<--	Q14B	0.11	0.06	1.91	0.06	par-23
PEU	<--	Q14D	-0.02	0.03	-0.86	0.39	par-24
PEU	<--	Q14C	0.04	0.04	0.88	0.38	par-25
PEU	<--	Q14B	0.00	0.01	-0.11	0.91	par-26
PU	<--	Q14A	0.10	0.06	1.84	0.07	par-27
DSS usage	<--	PEU	0.24	0.44	0.53	0.59	par-13
DSS usage	<--	PU	0.25	0.13	1.84	0.07	par-14
Q07F	<--	PEU	-2.79	3.39	-0.82	0.41	par-1
Q07E	<--	PEU	5.84	6.75	0.87	0.39	par-2
Q07D	<--	PEU	0.20	1.39	0.15	0.88	par-3
Q07C	<--	PEU	-4.26	4.98	-0.86	0.39	par-4
QO7B	<--	PEU	0.08	1.38	0.06	0.96	par-5
Q07A	<--	PEU	1.00				
Q08G	<--	PU	1.00				
Q08F	<--	PU	0.93	0.43	2.14	0.03	par-6
Q08E	<--	PU	0.50	0.36	1.38	0.17	par-7
Q08C	<--	PU	0.78	0.40	1.95	0.05	par-8
Q08B	<--	PU	0.23	0.32	0.73	0.47	par-9
Q08A	<--	PU	-0.24	0.33	-0.72	0.47	par-10
Q08D	<--	PU	0.55	0.36	1.53	0.13	par-11
Q03	<--	DSS usage	1.00				
Q02	<--	DSS usage	2.02	0.31	6.48	0.00	par-20
Q01	<--	DSS usage	2.81	0.66	4.27	0.00	par-21

Table 0.8 regression weights in relation to environmental characteristics for UK

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PEU	<--	Q14A	-0.06	0.07	-0.90	0.37	par-18
PEU	<--	Q14D	0.01	0.07	0.20	0.84	par-23
PEU	<--	Q14C	0.04	0.10	0.43	0.66	par-24
PEU	<--	Q14B	0.01	0.08	0.07	0.94	par-25
PU	<--	Q14D	-0.11	0.09	-1.19	0.24	par-11
PU	<--	Q14C	-0.09	0.14	-0.63	0.53	par-21
PU	<--	Q14B	0.02	0.10	0.20	0.84	par-22
PU	<--	Q14A	0.15	0.09	1.66	0.10	par-26
PU	<--	PEU	0.50	0.22	2.31	0.02	par-35
Q08C	<--	PU	0.68	0.17	4.00	0.00	par-7
DSS usage	<--	PEU	-0.42	0.27	-1.58	0.11	par-12
DSS usage	<--	PU	0.80	0.21	3.82	0.00	par-13
DSS usage	<--	Q14B	-0.45	0.12	-3.74	0.00	par-34
Q07E	<--	PEU	1.13	0.29	3.95	0.00	par-1
Q07D	<--	PEU	1.58	0.36	4.45	0.00	par-2
Q07C	<--	PEU	1.36	0.32	4.31	0.00	par-3
QO7B	<--	PEU	1.14	0.23	5.04	0.00	par-4
Q08G	<--	PU	1.00				
Q08F	<--	PU	0.82	0.15	5.31	0.00	par-5
Q08E	<--	PU	0.73	0.17	4.24	0.00	par-6
Q08B	<--	PU	0.68	0.16	4.38	0.00	par-8
Q08A	<--	PU	0.77	0.17	4.62	0.00	par-9
Q08D	<--	PU	0.88	0.20	4.39	0.00	par-10
Q03	<--	DSS usage	1.00				
Q02	<--	DSS usage	1.02	0.08	12.33	0.00	par-19
Q01	<--	DSS usage	0.96	0.09	10.31	0.00	par-20
Q01	<--	Q14D	-0.03	0.08	-0.38	0.70	par-40

Q02	<--	Q14D	0.14	0.06	2.43	0.01	par-41
Q07F	<--	PEU	0.93	0.26	3.53	0.00	par-42
Q07A	<--	PEU	1.00				
Q03	<--	Q08C	0.39	0.09	4.47	0.00	par-44

Table 0.9 regression weights in relation to organisational characteristics for Egypt

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PEU	<--	Q15C	0.00	0.01	-0.36	0.72	par-8
PEU	<--	Q15D	0.01	0.01	0.56	0.58	par-18
PEU	<--	Q15B	0.03	0.02	1.23	0.22	par-19
PEU	<--	Q15A	-0.03	0.02	-1.17	0.24	par-22
PEU	<--	Q15E	0.03	0.02	1.28	0.20	par-42
PEU	<--	Q15G	-0.01	0.02	-0.64	0.52	par-43
PEU	<--	Q15F	0.00	0.01	0.02	0.98	par-44
PU	<--	Q15F	0.04	0.04	0.93	0.35	par-9
PU	<--	Q15B	-0.02	0.05	-0.43	0.67	par-38
PU	<--	Q15C	0.11	0.05	2.25	0.02	par-39
PU	<--	Q15D	0.05	0.04	1.15	0.25	par-40
PU	<--	Q15E	-0.07	0.06	-1.23	0.22	par-41
PU	<--	Q15G	0.08	0.06	1.44	0.15	par-45
PU	<--	Q15A	0.11	0.06	1.82	0.07	par-51
PU	<--	PEU	2.44	2.15	1.14	0.26	par-52
DSS usage	<--	PEU	0.15	0.18	0.80	0.43	par-10
DSS usage	<--	PU	0.04	0.07	0.57	0.57	par-11
Q07E	<--	PEU	2.10	1.68	1.25	0.21	par-1
Q07D	<--	PEU	1.76	1.48	1.19	0.24	par-2
Q07C	<--	PEU	2.83	2.11	1.34	0.18	par-3
QO7B	<--	PEU	-0.25	0.88	-0.29	0.77	par-4
Q08E	<--	PU	-0.23	0.39	-0.59	0.55	par-5

Q08C	<--	PU	1.17	0.53	2.20	0.03	par-6
Q08D	<--	PU	0.59	0.41	1.43	0.15	par-7
Q03	<--	DSS usage	1.00				
Q02	<--	DSS usage	2.15	0.35	6.10	0.00	par-20
Q01	<--	DSS usage	3.81	1.26	3.01	0.00	par-21
Q03	<--	Q15C	0.17	0.05	3.55	0.00	par-46
Q07A	<--	PEU	1.00				
Q07F	<--	PEU	3.28	2.40	1.37	0.17	par-47
Q08A	<--	PU	0.77	0.45	1.70	0.09	par-48
Q08G	<--	PU	1.00				
Q08F	<--	PU	1.11	0.51	2.16	0.03	par-49
Q08B	<--	PU	1.31	0.57	2.32	0.02	par-50

Table 0.10 regression weights in relation to organisational characteristics for UK

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PEU	<--	Q15C	-0.05	0.08	-0.61	0.54	par-9
PEU	<--	Q15D	-0.04	0.10	-0.47	0.64	par-19
PEU	<--	Q15B	-0.07	0.07	-0.93	0.35	par-20
PEU	<--	Q15A	0.10	0.07	1.37	0.17	par-23
PEU	<--	Q15E	0.12	0.10	1.14	0.25	par-43
PEU	<--	Q15F	-0.08	0.09	-0.99	0.32	par-44
PEU	<--	Q15G	0.09	0.09	1.07	0.28	par-46
PU	<--	Q15F	0.09	0.07	1.21	0.23	par-10
PU	<--	Q15G	0.14	0.08	1.72	0.09	par-22
PU	<--	Q15B	0.03	0.06	0.42	0.67	par-39
PU	<--	Q15C	0.06	0.07	0.85	0.40	par-40
PU	<--	Q15D	0.11	0.08	1.33	0.18	par-41
PU	<--	Q15E	-0.07	0.09	-0.74	0.46	par-42
PU	<--	PEU	0.33	0.15	2.21	0.03	par-56

PU	<--	Q15A	0.10	0.06	1.61	0.11	par-60
DSS usage	<--	PEU	-0.45	0.28	-1.63	0.10	par-11
DSS usage	<--	PU	1.19	0.34	3.50	0.00	par-12
Q07E	<--	PEU	1.03	0.26	4.00	0.00	par-1
Q07D	<--	PEU	1.41	0.32	4.47	0.00	par-2
Q07C	<--	PEU	1.26	0.30	4.26	0.00	par-3
QO7B	<--	PEU	1.06	0.20	5.42	0.00	par-4
Q08E	<--	PU	1.16	0.29	3.96	0.00	par-5
Q08C	<--	PU	0.75	0.22	3.34	0.00	par-6
Q08B	<--	PU	0.89	0.17	5.13	0.00	par-7
Q08A	<--	PU	1.00				
Q08D	<--	PU	1.06	0.28	3.74	0.00	par-8
Q03	<--	DSS usage	1.00				
Q01	<--	DSS usage	0.91	0.08	11.26	0.00	par-21
Q07A	<--	Q15F	0.27	0.10	2.74	0.01	par-47
Q08D	<--	Q15D	0.32	0.11	2.95	0.00	par-49
Q07A	<--	PEU	1.00				
Q07F	<--	PEU	0.89	0.24	3.68	0.00	par-50
Q08G	<--	PU	1.46	0.31	4.73	0.00	par-57
Q08F	<--	PU	1.04	0.24	4.34	0.00	par-58
Q02	<--	DSS usage	0.93	0.07	12.91	0.00	par-63
Q02	<--	Q15G	-0.17	0.07	-2.55	0.01	par-64

Table 0.11 Regression weights in relation to internal support characteristics for Egypt

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PEU	<--	Q19B	0.04	0.04	1.06	0.29	par-11
PEU	<--	Q19D	0.01	0.02	0.77	0.44	par-27
PEU	<--	Q19C	0.01	0.02	0.73	0.47	par-28
PEU	<--	Q19A	-0.05	0.04	-1.39	0.17	par-30

PEU	<--	Q19E	0.00	0.01	0.04	0.97	par-31
PU	<--	Q19C	0.01	0.03	0.49	0.62	par-12
PU	<--	Q19D	0.00	0.01	0.41	0.68	par-13
PU	<--	Q19E	0.00	0.01	0.16	0.87	par-14
PU	<--	Q19A	0.00	0.02	-0.18	0.86	par-26
PU	<--	Q19B	-0.01	0.03	-0.50	0.62	par-29
PU	<--	PEU	1.46	1.29	1.13	0.26	par-36
DSS usage	<--	PEU	-4.70	9.94	-0.47	0.64	par-15
DSS usage	<--	PU	2.96	5.95	0.50	0.62	par-16
Q07E	<--	PEU	-0.84	1.21	-0.69	0.49	par-1
Q07D	<--	PEU	1.30	1.39	0.94	0.35	par-2
Q07C	<--	PEU	-0.74	1.14	-0.65	0.52	par-3
QO7B	<--	PEU	-1.15	1.34	-0.86	0.39	par-4
Q07A	<--	PEU	1.00				
Q08G	<--	PU	1.00				
Q08F	<--	PU	1.46	0.86	1.70	0.09	par-5
Q08E	<--	PU	0.17	0.53	0.31	0.76	par-6
Q08C	<--	PU	1.14	0.75	1.53	0.13	par-7
Q08B	<--	PU	0.15	0.51	0.30	0.77	par-8
Q08A	<--	PU	-0.79	0.64	-1.23	0.22	par-9
Q08D	<--	PU	1.54	0.90	1.71	0.09	par-10
Q03	<--	DSS usage	1.00				
Q02	<--	DSS usage	1.99	0.30	6.61	0.00	par-32
Q01	<--	DSS usage	2.88	0.63	4.56	0.00	par-33
Q07F	<--	PEU	1.00				

Table 0.12 Regression weights in relation to internal support characteristics for UK

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PEU	<--	Q19B	-0.31	0.11	-2.86	0.00	par-9

PEU	<--	Q19D	-0.05	0.10	-0.48	0.63	par-25
PEU	<--	Q19C	0.00	0.08	0.02	0.98	par-26
PEU	<--	Q19A	0.26	0.10	2.50	0.01	par-28
PEU	<--	Q19E	0.17	0.11	1.56	0.12	par-29
PU	<--	Q19C	0.05	0.07	0.73	0.47	par-10
PU	<--	Q19D	-0.03	0.08	-0.34	0.74	par-11
PU	<--	Q19E	-0.04	0.10	-0.41	0.69	par-12
PU	<--	Q19A	-0.05	0.09	-0.57	0.57	par-24
PU	<--	Q19B	0.27	0.11	2.53	0.01	par-27
PU	<--	PEU	0.35	0.16	2.21	0.03	par-43
Q07A	<--	PEU	1.00				
Q08C	<--	PU	1.18	0.29	4.03	0.00	par-7
DSS usage	<--	PEU	-0.54	0.23	-2.34	0.02	par-13
DSS usage	<--	PU	0.96	0.27	3.56	0.00	par-14
Q08F	<--	PU	0.98	0.20	4.85	0.00	par-35
Q07A	<--	Q19A	-0.37	0.11	-3.33	0.00	par-45
Q08C	<--	Q19E	0.31	0.09	3.28	0.00	par-51
Q07F	<--	PEU	1.00	0.23	4.27	0.00	par-1
Q07E	<--	PEU	0.96	0.22	4.31	0.00	par-2
Q07D	<--	PEU	1.21	0.25	4.76	0.00	par-3
Q07C	<--	PEU	1.11	0.25	4.43	0.00	par-4
QO7B	<--	PEU	0.98	0.17	5.67	0.00	par-5
Q08E	<--	PU	1.03	0.28	3.69	0.00	par-6
Q08D	<--	PU	1.27	0.31	4.08	0.00	par-8
Q03	<--	DSS usage	1.00				
Q02	<--	DSS usage	0.99	0.08	11.70	0.00	par-30
Q01	<--	DSS usage	0.87	0.09	9.21	0.00	par-31
Q08A	<--	PU	1.17	0.31	3.83	0.00	par-33
Q08B	<--	PU	1.04	0.27	3.89	0.00	par-34
Q08G	<--	PU	1.00				
Q03	<--	Q08C	0.34	0.09	3.84	0.00	par-39

Q08B	<--	Q19B	0.32	0.09	3.52	0.00	par-44
Q07D	<--	Q19D	0.25	0.11	2.19	0.03	par-46
Q07F	<--	Q19A	-0.32	0.12	-2.79	0.01	par-48
Q03	<--	Q07A	0.18	0.09	2.13	0.03	par-52
Q07D	<--	Q08F	0.25	0.09	2.68	0.01	par-54

Table 0.13 regression weights in relation to external support characteristics for Egypt

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PEU	<--	Q16A	0.03	0.03	0.93	0.35	par-12
PU	<--	Q16C	0.04	0.09	0.43	0.66	par-15
PU	<--	Q16B	0.09	0.06	1.33	0.18	par-16
PEU	<--	Q16C	-0.06	0.06	-0.96	0.34	par-17
PEU	<--	Q16B	0.02	0.03	0.87	0.39	par-18
PU	<--	Q16A	-0.02	0.06	-0.38	0.70	par-19
DSS usage	<--	PEU	0.73	0.83	0.87	0.38	par-8
DSS usage	<--	PU	0.11	0.06	1.84	0.07	par-9
Q07F	<--	PEU	2.43	2.77	0.88	0.38	par-1
Q07E	<--	PEU	-2.71	3.06	-0.89	0.38	par-2
Q07D	<--	PEU	-1.24	1.80	-0.69	0.49	par-3
Q07C	<--	PEU	2.06	2.44	0.85	0.40	par-4
QO7B	<--	PEU	1.25	1.81	0.69	0.49	par-5
Q08E	<--	PU	0.39	0.21	1.83	0.07	par-6
Q08D	<--	PU	0.14	0.19	0.74	0.46	par-7
Q03	<--	DSS usage	1.00				
Q02	<--	DSS usage	2.03	0.31	6.51	0.00	par-13
Q01	<--	DSS usage	2.68	0.59	4.51	0.00	par-14
Q07A	<--	PEU	1.00				
Q08C	<--	PU	0.30	0.20	1.52	0.13	par-21
Q08A	<--	PU	-0.06	0.20	-0.29	0.77	par-22

Q08B	<--	PU	0.11	0.19	0.59	0.55	par-23
Q08G	<--	PU	1.00				
Q08F	<--	PU	0.35	0.20	1.76	0.08	par-24

Table 0.14 Regression weights in relation to external support characteristics for UK

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PEU	<--	Q16A	-0.04	0.09	-0.46	0.65	par-12
PEU	<--	Q16C	0.08	0.07	1.14	0.25	par-17
PEU	<--	Q16B	0.07	0.09	0.76	0.44	par-18
PU	<--	Q16C	-0.08	0.08	-0.96	0.34	par-15
PU	<--	Q16B	0.02	0.11	0.16	0.88	par-16
PU	<--	Q16A	0.31	0.11	2.90	0.00	par-19
PU	<--	PEU	0.43	0.19	2.20	0.03	par-29
Q07E	<--	PEU	1.10	0.28	3.93	0.00	par-1
Q08C	<--	PU	0.69	0.17	4.04	0.00	par-6
DSS usage	<--	PEU	-0.49	0.29	-1.69	0.09	par-8
DSS usage	<--	PU	0.91	0.24	3.83	0.00	par-9
Q07D	<--	PEU	1.50	0.35	4.35	0.00	par-2
Q07C	<--	PEU	1.24	0.31	4.03	0.00	par-3
QO7B	<--	PEU	1.09	0.22	4.99	0.00	par-4
Q08E	<--	PU	0.71	0.18	4.05	0.00	par-5
Q08D	<--	PU	0.96	0.21	4.68	0.00	par-7
Q03	<--	DSS usage	1.00				
Q02	<--	DSS usage	0.97	0.09	11.26	0.00	par-13
Q01	<--	DSS usage	0.96	0.10	10.02	0.00	par-14
Q07A	<--	PEU	1.00				
Q07F	<--	PEU	0.91	0.26	3.55	0.00	par-24
Q08A	<--	PU	0.79	0.17	4.57	0.00	par-25
Q08B	<--	PU	0.74	0.16	4.49	0.00	par-26

Q08G	<--	PU	1.00				
Q08F	<--	PU	0.78	0.16	4.92	0.00	par-27
Q03	<--	Q08C	0.32	0.09	3.43	0.00	par-28
Q08D	<--	Q07E	-0.21	0.09	-2.32	0.02	par-32

Table 0.15 Regression weights in relation to decision maker characteristics for Egypt

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PEU	<--	Q18G	-0.12	0.07	-1.82	0.07	par-12
PEU	<--	Q18F	0.11	0.07	1.57	0.12	par-25
PEU	<--	Q18H	-0.03	0.06	-0.46	0.64	par-85
PEU	<--	Q18A	-0.18	0.09	-2.03	0.04	par-86
PEU	<--	Q18B	-0.02	0.06	-0.38	0.70	par-87
PEU	<--	Q18C	-0.05	0.06	-0.81	0.42	par-88
PEU	<--	Q18D	-0.03	0.07	-0.51	0.61	par-89
PEU	<--	Q18E	0.01	0.06	0.17	0.86	par-90
PEU	<--	Q18J	0.01	0.07	0.14	0.89	par-91
PEU	<--	Q18K	-0.01	0.06	-0.17	0.87	par-92
PEU	<--	Q18I	0.00	0.07	-0.07	0.94	par-103
PEU	<--	Q18L	0.04	0.06	0.66	0.51	par-104
PU	<--	Q18H	-0.02	0.03	-0.95	0.34	par-13
PU	<--	Q18I	-0.01	0.02	-0.38	0.71	par-14
PU	<--	Q18F	-0.03	0.03	-1.07	0.29	par-23
PU	<--	Q18G	0.00	0.02	-0.14	0.89	par-24
PU	<--	Q18J	0.02	0.03	0.62	0.54	par-93
PU	<--	Q18K	-0.01	0.02	-0.27	0.78	par-94
PU	<--	Q18L	0.04	0.03	1.35	0.18	par-95
PU	<--	Q18E	-0.01	0.02	-0.30	0.76	par-96
PU	<--	Q18D	0.06	0.04	1.54	0.12	par-97
PU	<--	Q18C	0.00	0.02	0.02	0.99	par-98

PU	<--	Q18B	0.02	0.02	0.96	0.34	par-99
PU	<--	Q18A	0.04	0.04	1.01	0.31	par-100
PU	<--	PEU	0.04	0.03	1.27	0.21	par-111
DSS usage	<--	PEU	0.05	0.07	0.78	0.44	par-15
DSS usage	<--	PU	-0.02	0.03	-0.75	0.45	par-16
DSS usage	<--	Q18F	0.19	0.07	2.77	0.01	par-110
Q08F	<--	PU	0.06	0.04	1.45	0.15	par-6
Q02	<--	DSS usage	0.23	0.07	3.43	0.00	par-26
Q07F	<--	PEU	0.06	0.07	0.89	0.37	par-1
Q07E	<--	PEU	0.06	0.08	0.81	0.42	par-2
Q07D	<--	PEU	0.03	0.08	0.43	0.67	par-3
Q07C	<--	PEU	0.07	0.07	0.94	0.34	par-4
QO7B	<--	PEU	-0.02	0.08	-0.30	0.77	par-5
Q08G	<--	PU	1.00				
Q08E	<--	PU	0.08	0.05	1.62	0.11	par-7
Q08C	<--	PU	-0.04	0.03	-1.08	0.28	par-8
Q08B	<--	PU	0.03	0.03	0.97	0.33	par-9
Q08A	<--	PU	2.97	1.67	1.78	0.08	par-10
Q08D	<--	PU	-0.02	0.03	-0.78	0.44	par-11
Q03	<--	DSS usage	1.00				
Q01	<--	DSS usage	0.45	0.08	5.93	0.00	par-27
Q07A	<--	PEU	1.00				
Q01	<--	Q02	-0.30	0.04	-8.40	0.00	par-107
Q08B	<--	Q18D	0.29	0.07	3.82	0.00	par-108
Q07F	<--	Q08F	0.16	0.06	2.81	0.00	par-114

Table 0.16 Regression weights in relation to top management characteristics for Egypt

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PEU	<--	Q21B	0.02	0.03	0.94	0.35	par-9

PEU	<--	Q21A	0.01	0.02	0.70	0.48	par-22
PEU	<--	Q21F	0.02	0.02	0.90	0.37	par-32
PEU	<--	Q21E	0.00	0.01	-0.15	0.88	par-33
PEU	<--	Q21D	0.02	0.02	0.88	0.38	par-34
PEU	<--	Q21C	-0.01	0.02	-0.86	0.39	par-35
PU	<--	Q21C	0.02	0.01	1.39	0.16	par-10
PU	<--	Q21D	-0.01	0.02	-0.85	0.39	par-11
PU	<--	Q21E	0.02	0.01	1.80	0.07	par-12
PU	<--	Q21F	0.03	0.02	1.60	0.11	par-25
PU	<--	Q21A	0.02	0.02	1.12	0.26	par-36
PU	<--	Q21B	0.02	0.02	1.29	0.20	par-37
PU	<--	PEU	1.40	1.55	0.91	0.37	par-39
DSS usage	<--	PEU	-1.31	1.47	-0.90	0.37	par-13
DSS usage	<--	PU	1.00				
Q07F	<--	PEU	6.40	6.60	0.97	0.33	par-1
Q07E	<--	PEU	0.45	1.31	0.34	0.73	par-2
Q07D	<--	PEU	3.39	3.61	0.94	0.35	par-3
Q07C	<--	PEU	2.44	2.70	0.90	0.37	par-4
QO7B	<--	PEU	0.08	1.25	0.07	0.95	par-5
Q07A	<--	PEU	1.00				
Q08E	<--	PU	0.16	0.61	0.26	0.80	par-6
Q08C	<--	PU	1.34	0.73	1.82	0.07	par-7
Q08D	<--	PU	1.10	0.69	1.59	0.11	par-8
Q03	<--	DSS usage	1.00				
Q02	<--	DSS usage	2.14	0.33	6.48	0.00	par-23
Q01	<--	DSS usage	3.13	0.70	4.45	0.00	par-24
Q03	<--	Q21B	0.19	0.06	3.20	0.00	par-38
Q08G	<--	PU	1.00				
Q08F	<--	PU	1.87	0.85	2.19	0.03	par-40
Q08A	<--	PU	1.00				
Q08B	<--	PU	1.11	0.69	1.61	0.11	par-41

Table 0.17 Regression weights in relation to top management characteristics for UK

Regression Weights

			Estimate	S.E.	C.R.	P	Label
PEU	<--	Q21B	0.05	0.09	0.57	0.57	par-9
PEU	<--	Q21A	0.01	0.09	0.09	0.93	par-23
PEU	<--	Q21F	0.05	0.09	0.54	0.59	par-33
PEU	<--	Q21E	-0.11	0.07	-1.57	0.12	par-34
PEU	<--	Q21D	0.10	0.08	1.25	0.21	par-35
PEU	<--	Q21C	0.06	0.09	0.73	0.47	par-36
PU	<--	Q21C	-0.17	0.09	-1.84	0.07	par-10
PU	<--	Q21D	0.03	0.08	0.42	0.68	par-11
PU	<--	Q21E	0.22	0.08	2.84	0.00	par-12
PU	<--	Q21F	-0.13	0.10	-1.30	0.19	par-26
PU	<--	Q21A	0.10	0.09	1.12	0.26	par-37
PU	<--	Q21B	-0.13	0.09	-1.36	0.17	par-38
PU	<--	PEU	0.39	0.17	2.25	0.02	par-49
Q08C	<--	PU	1.12	0.26	4.33	0.00	par-7
DSS usage	<--	PEU	-0.44	0.24	-1.83	0.07	par-13
DSS usage	<--	PU	0.84	0.23	3.63	0.00	par-14
Q07F	<--	PEU	0.90	0.25	3.63	0.00	par-1
Q07E	<--	PEU	1.05	0.27	3.97	0.00	par-2
Q07D	<--	PEU	1.52	0.34	4.52	0.00	par-3
Q07C	<--	PEU	1.16	0.29	4.02	0.00	par-4
QO7B	<--	PEU	1.23	0.22	5.52	0.00	par-5
Q07A	<--	PEU	1.00				
Q08E	<--	PU	0.96	0.23	4.23	0.00	par-6
Q08D	<--	PU	1.24	0.29	4.20	0.00	par-8
Q03	<--	DSS usage	1.00				
Q02	<--	DSS usage	1.04	0.09	11.30	0.00	par-24

Q01	<--	DSS usage	1.01	0.10	9.84	0.00	par-25
QO7B	<--	Q21D	-0.25	0.08	-3.15	0.00	par-40
Q03	<--	Q21A	0.32	0.10	3.06	0.00	par-41
Q03	<--	Q08C	0.36	0.09	4.09	0.00	par-42
Q02	<--	Q21C	0.14	0.05	2.65	0.01	par-43
Q08E	<--	Q21B	0.31	0.10	3.05	0.00	par-44
Q08E	<--	Q21C	-0.43	0.10	-4.48	0.00	par-45
Q08A	<--	PU	1.06	0.26	4.10	0.00	par-46
Q08B	<--	PU	1.07	0.24	4.43	0.00	par-47
Q08F	<--	PU	0.84	0.18	4.57	0.00	par-48
Q08G	<--	PU	1.00				
Q08G	<--	Q21F	0.39	0.10	3.99	0.00	par-50

Table 0.18 Indirect effect ot top management characteristics on DSS usage for Egypt

Indirect Effects - Estimates

	Q21F	Q21A	Q21E	Q21D	Q21C	Q21B	PEU	PU	DSS usage
PEU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PU	0.03	0.02	0.00	0.03	-0.02	0.03	0.00	0.00	0.00
DSS usage	0.03	0.02	0.02	-0.01	0.02	0.02	1.40	0.00	0.00
Q01	0.09	0.06	0.07	-0.04	0.06	0.07	0.29	3.13	0.00
Q02	0.06	0.04	0.05	-0.03	0.04	0.05	0.20	2.14	0.00
Q03	0.03	0.02	0.02	-0.01	0.02	0.02	0.09	1.00	0.00
Q08A	0.06	0.04	0.02	0.01	0.00	0.05	1.40	0.00	0.00
Q08B	0.06	0.04	0.02	0.01	0.00	0.06	1.55	0.00	0.00
Q08C	0.07	0.05	0.03	0.02	0.00	0.07	1.87	0.00	0.00
Q08D	0.06	0.04	0.02	0.01	0.00	0.06	1.54	0.00	0.00
Q08E	0.01	0.01	0.00	0.00	0.00	0.01	0.22	0.00	0.00
Q08F	0.10	0.07	0.04	0.02	0.00	0.10	2.62	0.00	0.00
Q08G	0.06	0.04	0.02	0.01	0.00	0.05	1.40	0.00	0.00
Q07A	0.02	0.01	0.00	0.02	-0.01	0.02	0.00	0.00	0.00

QO7B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q07C	0.05	0.03	0.00	0.05	-0.03	0.06	0.00	0.00	0.00
Q07D	0.07	0.04	0.00	0.06	-0.05	0.08	0.00	0.00	0.00
Q07E	0.01	0.00	0.00	0.01	-0.01	0.01	0.00	0.00	0.00
Q07F	0.13	0.07	-0.01	0.12	-0.09	0.15	0.00	0.00	0.00