The Impact of Task Variables on End-User Computing Configuration and its Success(I)*:
Research Model and Hypotheses

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《**Contents**》

I. INTRODUCTION

1.1. Overview

New developments in computer technology coupled with increasing demand for computing resources by users, and backlogs of systems development and maintenance work, have resulted in a proliferation of end user computing (EUC). EUC provides users with direct control over their own computing activities within an organizational setting. It is reported that in a timesharing environment EUC is growing at a rate of approximately 50~90% per year compared with 5~15% for traditional data processing [Rockart & Flannery,

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* This is the first half of the entire article. The second one will appear in the next issue

1983]. Also Benjamin [1982] reported that EUC grew from an insignificant amount of the processor demand to consuming nearly 40% of the cycles in 1980. Further he projects that EUC will comprise 75% of the available CPU cycles in 1990.

As for personal computers (PC), it is estimated that as many as one-third of all American companies are using PCs in at least some part of their operations [Rhao and Belohlav, 1985]. By 1990, The Diebold Group estimates, microcomputers will account for at least 30% of a firm's data-processing expenditures [Schneiderman, 1985]. A Delphi study on key information systems issues for the 1980's [Dickson et al., 1984], notes that leading information systems professionals ranked the 'facilitation and management of EUC' as a key issue, second only to improving information systems planning. These findings suggest that EUC is spreading throughout organizations and growing in importance. One can expect that it may force changes in the way information resources are provided, organized, and used.

1. 2. End User and End-User Computing

1. 2. 1. End User

The term 'end user' is defined by Martin [1982] as the ultimate user of computer applications either in 'indirect' ways (e.g., an airline passenger purchasing a ticket through his/her travel agent) or in 'direct' ways (e.g., users who employ a terminal or obtain listings/reports). The 'direct' users are further classified into two categories: users who use but do *not* create applications (e.g., conventional terminal users such as bank tellers, clerks, airline agents); and users who use and create applications (e.g., using simple application generators, using procedural languages such as APL, BASIC, etc., or non-procedural 4GL such as FOCUS, RAMIS, etc.) [Martin, 1982].

For the purpose of this study, end users are defined as non-DP personnel who are users of computers (regardless of whether timesharing systems of PCs are used). This definition embraces all the 'direct' users [Martin, 1982] as explicated above.

1. 2. 2. End-User Computing

For the purpose of this study, EUC is defined as the provision of computing support facilities which allow end users to have direct control of their own computing needs within an organization. By focusing on 'computing support facilities,' we do not distinguish timesharing systems [Rockart & Flannery, 1983] from personal computers [Quillard et al., 1983]. Rather, both of these computing facilities are included in this study as manifestations of EUC.

2. PRIOR RESEARCH and RESEARCH MODEL

Leavitt [1964] conceptualizes an organization as consisting of four major interconnected components: task, technology, people, and structure. In Figure 2-1, the organization's Task(s), the Technology it employs to perform this task, the People in the organization, and its Structure are seen as interrelated and mutually adjusting to each other [Leavitt, 1964; Ginzberg, 1980.]

The basic assumption of the model is that organizations will be most effective when these four major components are related in 'congruent' (which will be defined later) ways. To the extent that organizations face problems of effectiveness, these problems will stem from lack of congruence among organizational components [Nadler, 1981]. One of the propositions stemming from this model is that the selection of an appropriate technology configuration is dependent upon the task situation.

EUC is presently becoming an important form of information technology in many organizations. Employing the model of Figure 2-1, we see that in order

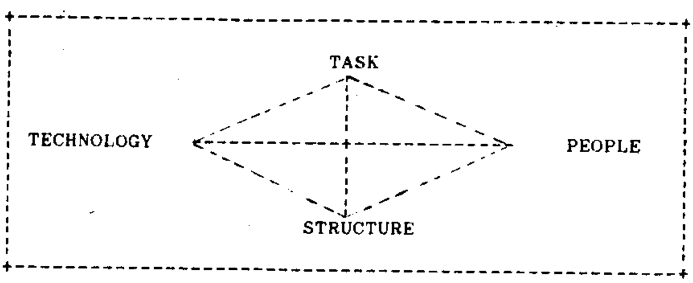

Fig. 2-1. Four Major Components of an Organization

for the technology (in this case EUC) to be effectively utilized, it must match the organization's task, structure, and people. There have been numerous studies which have investigated the relationship between information technology and people [Bariff & Lusk 1977; Benbasat & Taylor 1979; McKenney & Keen 1974; Newell & Simon 1972; Zmud 1979] and between technology and structure [Daft 1982; Ein-Dor & Segev 1978; Galbraith 1973, 1977; Hage & Dewar 1973; Miles 1980; Olson & Chervany 1980; Scott 1981; Whisler 1970; Zaltman et al. 1973]. The present study complements this prior research by exploring the relationship between task and technology, where EUC is the particular form of information technology investigated.

Research into the relationship between information technology and people has focused on the individual's cognitive style and how it influences the acquisition, manipulation and integration of data into his/her decision-making process. Examples include studies of the computer modeling of the decision processes of individuals [Newell & Simon, 1972], the classification of individuals into different cognitive style categories according to their communication mode and appraisal manner [McKenney & Keen, 1974], cognitive and personality tests for the development of MIS [Bariff & Lusk, 1977], the impact of cognitive style on IS design [Benbasat & Taylor, 1978], and the study of individual differences leading to MIS success [Zmud, 1979]. Notwithstanding the criticism of these studies [Huber, 1983], they do shed some light on the 'congruence' between technology and human factors. In other words, they suggest that successful information systems must match the demographic characteristics of organization members (e.g., age, education, skills, job tenure, experience with innovation, and attitudes) which have been found to influence cognitive style.

Research into the relationship between information technology and organizational structure suggests that there is no one best way to relate structure to technology [Galbraith, 1973]. The selection of appropriate organizational structure depends on the characteristics of the particular technology. The

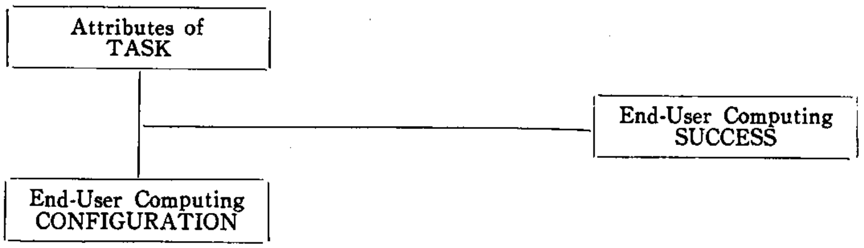

Fig. 2-2. Research Model

implication of this for our study is that the adoption of an appropriate EUC configuration is dependent on the end user's task attributes.

The present research investigates the relationships between perceptions of EUC success and the fit between the end user's task attributes [Tasks in Leavitt's model] and the way EUC is organized (i.e., the EUC configurations) [Technology in Leavitt's model]. This 'fit,' for the purpose of our study, is defined as a state where information processing capacity provided by EUC meets the information requirements imposed by the task. The term 'fit' is used as a synonym with 'congruence' throughout the present study. This study also explores how task attributes and EUC configurations relate directly to EUC success, if any. These questions lead to a research model presented in Figure 2-2. The research model in Figure 2-2 posits that EUC will be positively assessed by the end user when the EUC configuration matches the end user's perceived task attributes.

3. RESEARCH VARIABLES

3.1. Dependent Variable—End-User Computing Success

3.1.1. Definition of EUC Success

This study defines EUC success (*i.e.*, the dependent variable) as the end user's satisfaction with EUC, and enhanced work performance. EUC success in this study is evaluated along two dimensions: the end user's (i) perceived overall satisfaction with EUC activities, and (ii) perceived usefulness of EUC activities in enhancing their work performance.

3.1.2. Linkage between Fit and Dependent Variables

As discussed in the research model, in order to be effective, an organization must have the appropriate technology configurations (*e.g.*, EUC Config) given their task attributes. In other words, the better the fit between these two components, the higher the level of effectiveness that can be achieved. However, effectiveness is one of the most frequently referenced yet least understood concepts in organization theory [Scott, 1981]. This ambiguity has led authors in organization theory to adopt multiple criteria to measure organizational effectiveness, including organizational productivity and profitability at the macro-level, and individual member welfare (*e.g.*, QWL and job satisfaction) at the micro-level (for details, see Campbell [1977] and Cameron [1981]).

The information systems literature suggests a number of 'effectiveness' criteria: profitability, application to major problems of the organization, quality of decisions or performance, user satisfaction, and usage [Ein-Dor & Segev, 1978]. In the present study, EUC success is viewed as individual (micro-level) effectiveness, which is believed to result from the fit between individual task attributes and EUC configurations. In other words, the end user's overall satisfaction with EUC, and enhanced work performance all at the micro-level serve as the EUC success criteria.

3.1.3. End User's Overall Satisfaction with EUC

The end user's overall satisfaction is defined as a composite of attitudes toward particular aspects of EUC such as the man/machine interface, software availability, training and support provided, as well as feelings of participation in and an understanding of EUC activities. There is an extensive MIS literature, in which user IS satisfaction is cited as an indicator of system success. For example, a comprehensive review by Ives and Olson [1984] reported that perceived user satisfaction with IS was one of the most common indicators of MIS success. Ginzberg [1980] argues that satisfaction with the system (in the case where usage is not mandatory) is a prerequisite for use of the system, and thereby a prerequisite for improved task performance. In this tradition, efforts were made to standardize MIS success measures in terms of user information satisfaction [Bailey & Pearson, 1983; Ives, Olson & Baroudi, 1983].

Caution should be exercised when IS satisfaction criteria are applied to EUC success, since some user information satisfaction criteria such as those used for assessing large-scale information systems may not be relevant for EUC. According to Rockart and Flannery [1983], analysis and inquiry applications account for about 70% of EUC timesharing use, while Quillard *et al.* [1983] in their study of personal computers (PC) in the major U.S. corporations, report that the analysis category of EUC alone accounts for about 65% of PC applications. This suggests that EUC is not amenable to the return on investment justification of traditional IS [Gerrity & Rockart, 1984], since analysis and inquiry applications, in general, are hard to quantify. Therefore, a better proxy for EUC success (complementing that of end user satisfaction with EUC) might be a measure of the end user perceptions of the usefulness of EUC technology to their work.

3. 1. 4. Usefulness of EUC to the End Users

The 'usefulness to their work' criterion is defined as the end user's perception of the usefulness of EUC technology in helping them perform their jobs. This includes such aspects as (a) increased work speed, (b) more work accomplished, and (c) improved quality of performance. Although much IS literature suggests that user satisfaction with IS and/or system usage are major indicators of IS success, the causality of user work performance enhancement has never been revealed. For example, Baroudi *et al.*, [1986] in their study of the impact of user involvement on system usage and information satisfaction, provide empirical evidence that user satisfaction with IS leads to greater IS usage. Nevertheless, we do not know how or if user IS satisfaction and/or system usage lead to enhancement of work performance. Therefore, the end user's perception of the usefulness of EUC as a criterion of EUC success will complement the end user's overall satisfaction with EUC.

3.2. Independent Variables—Task Attributes

3.2.1. Task Variability

Task variability refers to the number of exceptional cases, or unexpected and novel events encountered, which require an adjustment in work procedures [Perrow, 1967]. Low variability denotes that subunits are relatively confident about the incidence of future activities, whereas high variability denotes uncertainty associated with the timing and occurrence of future problems or activities.

3.2.2. Task Difficulty

Task difficulty (or analyzability) is the degree of complexity of the search process in performing the task, the amount of thinking time required to solve work-related problems, and the body of knowledge that provides guidelines for performing the task [Perrow, 1967; Van de Van & Delbecq, 1974]. It concerns how individuals respond to problems that arise in the course of their work.

3.2.3. Task Interdependency

Task interdependency is the degree to which end users are dependent upon other individuals to perform effectively [Tushman & Nadler, 1978]. Thompson [1967] classifies interdependency among subunits as pooled, sequential, and reciprocal. In 'pooled' interdependency, each part renders a discrete contribution to the whole (*e.g.*, commercial bank, telephone company, *etc.*). Tasks of one unit are relatively independent of the tasks of another. 'Sequential' interdependency is characterized by a higher degree of work flow dependence. In order to achieve the desired transformation of the object (*e.g.*, mass production assembly line), operation X must be performed before it is possible to perform operation Y, which in turn must precede operation Z. 'Reciprocal' interdependency draws upon a variety of techniques (*e.g.*, tasks involved in a general hospital) in order to achieve a desired change in some object. However, the selection, combination, and order of their application of each technique is determined by feedback from the object itself [Miles, 1980]. If we put these three types of task interdependency along a continuum in accordance with the degree of interdependency, the low end will be 'pooled'; the mid-point will be 'sequential'; and the high end will be 'reciprocal.'

Thus far, task demands of the end user have been conceptualized along three dimensions; namely, task variability, task difficulty, and task interdependency. Next, the implications of the task demands for the information processing requirements of an organization will be examined.

3. 2. 4. Task Demands and Information Processing

Many studies support the notion that task demands are a major source of variation in information processing requirements [Alloway & Quillard, 1983; Culnan, 1983; Daft & Macintosh, 1981; Galbraith, 1973; Ginzberg, 1980; Hackathorn & Keen, 1981; Keen & Scott Morton, 1978; Mann & Watson, 1984; Simon, 1965; Tushman & Nadler, 1978]. Perrow [1967] suggests that task activities organized along variability and analyzability will influence an organizational subunit's information processing activities. For instance, a task with low variability and considerable analyzability can be easily automated and preprogrammed. Similarly, Simon [1965] made a distinction between 'programmed' and 'non-programmed' decisions and argued that a task can be programmed if the nature of the task permits precise rules to be defined for processing information and selecting a solution. Keen and Scott Morton [1978] in their study of decision support systems (DSS) suggest that the degree of the 'structuredness' in the task predefines the procedures, types of computation and analysis, and information to be used. Tushman and Nadler [1978] argue that the more interdependent the subunit's tasks, the more task-related uncertainty there will be, which may require increased information-processing activities in order to reduce the uncertainty. These studies, although they use different terms, conceptually support the basic notion that task attributes determine the information-processing requirements, which in turn should lead to the selection of an appropriate information processing facility (*i.e.*, EUC). Therefore, it is contended that we will have positive assessments of EUC activities when we have an EUC configuration appropriate to the given task attributes of the end user.

Many empirical studies report on the task demands of information processing in organizations. Among others, Culnan [1983] reports a positive relationship between task (complexity) and information use by professionals to reduce the complexity in their work in commercial organizations. Daft and Macintosh [1981] argue that the reported amount of information processing is increased with task variability and difficulty. More directly related to our study, is the appropriateness of an application system for supporting a user. Alloway and Quillard [1983] report that this is obtained when the actual and desired application systems (relevant to the task of the user), are the same. The result of their study of user needs, surveying over five hundred end user managers from finance and manufacturing departments in various corporations shows that only 60% of the application systems are positively assessed a relevant to the user's most important activities. This study suggests that EU will be positively assessed when it matches the end user's task attributes.

4. EUC CONFIGURATION

4.1. Dimensions of Configurations

In describing the configuration of EUC, we focus attention on two maj distinctive features: (1) the application and (2) the scope of EUC. 'Applicatio refers to what the EUC is being used for: analysis and inquiry, or monitori and exception reporting. 'Scope' refers to the decision processes supported EUC: is it for independent decision making or for interdependent coordinat decision making among members of a group. These dimensions of EU configurations are distinguishable in a number of important ways from ot configurations of IS. Gorry and Scott Morton's [1971] DSS framework, example, which combines Simon's [1960] task structuredness and Anthon [1965] level of management activities is specifically oriented toward DSS, EUC. Second, it does not accommodate the notion of interaction among the end users in the decision-making processes within an organization.

In contrast, our configuration focuses on the 'applications' and 'scope' dimensions which have been the major concern of key EUC studies [Alloway & Quillard, 1983; Rockart & Flannery, 1983; Quillard *et al.*, 1983; Hackathorn & Keen, 1981; McLean, 1979]. This classification scheme enables us to categorize EUC as a function of the processes and uses involved, independent of technical characteristics. Therefore, EUC configurations based on these two dimensions can be used to classify real world EUC situations without recourse to technical dimensions.

4. 2. The Applications

The applications being performed by the end user may be grouped into two generic categories: a) analysis and inquiry, and b) exception reporting and monitoring. This classification is adapted from the series of EUC research efforts cited above.

4. 2. 1. Analysis and Inquiry Applications

Analysis applications support the end users' judgmental decision making by providing support for problem finding, strategic planning, and the selection of optimal alternatives. Analysis applications rely upon data handling and modification capabilities (including modeling, simulation, optimization and statistical routines) and an appropriate 'information database' containing information from internal and external sources, as well as both 'hard' and 'soft' data.

Inquiry applications provide end users with a flexible query capability, which enables users to access data and format it into a report or on a screen. This application enables end users to respond to *ad hoc* requests, to customize reports, and to make queries using database management systems and high-level inquiry languages.

Analysis and inquiry applications are grouped together, since in order to do analysis we usually have to conduct an inquiry. Together, these two aspects, analysis and inquiry, form a system similar to a 'managerial support system.' Empirical studies [Benson, 1983; Rockart & Flannery, 1983; Quillard *et al.*, 1983] report that 60-70% of EUC falls into this analysis and inquiry category.

4. 2. 2. Exception and Monitoring Applications

An exception EUC application processes data, highlighting 'exceptions,' where the definition of exception conditions is fixed. 'Management by exception' is a typical case of this application. This application may, for example, help manage accounts receivable, budget variances, and expedite purchase orders.

At prespecified intervals, a monitor application produces activity reports (*e.g.*, daily, weekly, or monthly). Typical applications might include accounts payable, inventory control and order entry.

These two applications support the critical 'backbone' [McFarlan & Mc-Kenney, 1982] operations. The two applications, highlighting exceptions and regular, interval monitoring, are similar to traditional 'transaction processing systems.' These systems are devised to function automatically and consistently. Empirical studies of EUC [Benson, 1983; Rockart & Flannery, 1983; Quillard *et al.*, 1983] suggest that about 30% of applications fall into this category.

Analysis and inquiry applications have greater information processin capacities than monitoring and exception reporting systems. The latter hel to capture, store, manipulate, and report the structured, high volume activitie of daily activities [Alloway & Quillard, 1983]. These monitor and exceptio information processing systems help users to understand and make sense o 'transactions.' Analysis and inquiry applications, however, support user' judgmental decision-making to take actions by capturing information and the providing the user with sophisticated and powerful data analysis such a modeling and simulations, which is beyond the capacity of monitor an exception applications.

4. 3. Scope of EUC

Applications can also be viewed from the perspective of EUC scope. Scop focuses on whether the EUC application is used by end users for independe individual decision-making or for coordinated decision making which spans the entire department or multiple functional areas. For the purpose of this study, the former is called EUC for individual decision-making; the latter EUC for coordinated decision-making.

This dimension of EUC configuration is adapted and modified from the studies of McLean [1979], and Hackathorn and Keen [1981]. The former insists that the size and scope of the application have large bearing on how and by whom the work should be performed in undertaking applications development. Subsequently, he classifies applications development into 'personal,' 'departmental,' and 'corporate.' The latter focuses on interactions among persons based on task and categorizes decision supports into 'personal,' 'group,' and 'organizational.' Rockart and Flannery [1983] and Quillard *et al.* [1983] also use similar classifications (*i.e.*, individual, departmental, and multi-departmental). Elsewhere, the distinction is referred to as 'personal computing' and 'organizational computing' respectively.

4.3.1. EUC for Individual decision-making

EUC for individual decision-making includes computing facilities which provide support to individuals only. This might occur where end users are engaged in a separate and discrete decision situation (*e.g.*, selecting a stock). Here, EUC use may be customized to facilitate the specific tasks carried out by the individual. Examples include presentation graphics and salary review planning [Quillard *et al.*, 1983], which are used by a single individual to prepare a particular report. EUC for individual decision making has been reported to account for about 30% of timesharing systems [Rockart & Flannery, 1983] and about 20% of personal computer applications [Quillard *et al.*, 1983].

4.3.2. EUC for Coordinated decision-making

EUC for coordinated decision-making includes computing facilities which facilitate end users' interaction with other actors. For example, divisional market planning and capital budgeting might necessitate EUC which allows a number of end users to make decisions in a coordinated manner. Other coordinated decision making EUC uses may include project tracking, consolidating capital plans, and profit/loss statements for field offices [Quillard *et al.*, 1983]. This type of EUC has been reported to account for 60~80% of both timesharing [Rockart & Flannery, 1983] and personal computer operations [Quillard *et al.*, 1983].

In reality, the two dimensions of EUC scope are related. Users (*i.e.*, decision-makers) who utilize coordinated applications whose scope span a group of workers must first have been provided with applications for individual decision-making. In this regard, coordinated decision-making may involve both individual decision-making and coordinated decision-making. However, for the purpose of this study, we do categorize this under the umbrella of coordinated decision-making.

4.4. EUC Configurations

Based on the two dimensions, the application and the scope of EUC, a 2×2 matrix of EUC configurations (Figure 4-1) is produced. The dimensions selected for this study help to account for important aspects of EUC activities, namely, the application and scope of EUC. Figure 4-1 is a comprehensive model, *i.e.* all applications will fit into one of the four cells.

Config I deals with EUC which provides end users with analysis and inquiry applications, where the application is operated by a single end user to carry out his/her tasks individually. For example, a Config I application might support decision-making on possible facility locations using input data from a corporate detabase, and a linear programming model to do sensitivity analyses

		APPLICATIONS	
		Analysis & Inquiry	Excepton & Monitor
SCOPE	Individual Decision	Config I	Ⅲ
	Coordinated Decision	Ⅱ	Ⅳ

Figure 4-1: EUC Configurations

for finding a preferred plant location. The nature of information processing in this case falls into the category of analysis/inquiry. The scope of EUC deals with a single, individual end user in an independent decision-making situation. More often than not, this configuration provides customized individual applications for a decision made largely independently of the organization's other subunits.

The EUC Config II supports *coordinated* decision-making, through the use of shared decision models, analytic tools, and databases with flexible inquiry (input/output) capabilities. These applications might support divisional market planning, financial planning, capital budgeting, and advertising media selection, *etc.*, where applications are operated by end users for decision-making which is relevant to the operations of one or more department in a coordinated way. For instance, in an application supporting the development of a divisional marketing plan, end users may use computing facilities to explore data through shared decision models in a coordinated manner. Thus, this system is categorized as an analysis/inquiry application involving coordinated decision-making.

Config III applications monitor or highlight exceptions for isolated decision makers. Examples might include accounts payable, accounts receivable, payroll, stock transfer, and cost allocation. Once the input data from an external source have been made available to the system, the above tasks follow established rules and references to technical manuals, *etc.*, and are less dependent on other subunits. For instance, an application supporting accounts payable is a typical case of a monitor system and there may be little need for a coordination mechanism.

A Config IV application supports whose job necessitates interactions with other subunits by maintaining or highlighting exceptions that require *coordination* of organizational tasks. Order entry and inventory control applications may be based on a monitoring system or may highlight exceptional conditions (*e.g.*, stockouts). They necessitate interactions with other subunits. Order entry, for instance, unlike accounts payable, must be coordinated with production scheduling, shipping, inventory control, and/or standard costing.

5. SPECIFIC HYPOTHESES

The basic research hypothesis of this study is:

EUC success will be experienced when the EUC configurations fit the perceived task demands that characterize an organization's subunits.

Figure 2-2 diagrammatically represents this research hypothesis. Our main interest is whether the primary effect on the dependent variable (*i.e.*, perceived EUC success) occurs through the *interaction* of the independent variables (*i.e.*, perceived end user task attributes and EUC Config). Therefore, even though the task attributes alone may influence success (*i.e.*, main effect), the nature and extent of the difference will depend on configuration (*i.e.*, interaction effect) and *vice versa*.

As discussed in Section 3, the literature cited suggests that different end users' tasks will necessitate different EUC configurations. For example, greater task variability, greater task difficulty, and greater task interdependency will require greater information and processing capacity in order to reduce task-related uncertainty. EUC success will depend, therefore, upon how well the EUC configuration fits the attributes of the end user's tasks.

More specifically,

Hypothesis 1a:

Where end users perceive their tasks as having high variability, high difficulty, and high interdependency, they will be ***most satisfied*** *with EUC Config II.*

Hypothesis 1b:

Where end users perceive their tasks as having high variability, high difficulty, and high interdependency, they will report ***enhanced work performance*** *with EUC Config II.*

A large number of unexpected and novel work cases (high task variability) encountered coupled with a lack of analyzability (high task coping difficulty), creates an information processing load that may exceed the capacity of monitor/exception systems [Daft & Macintosh 1981; Ginzberg 1980; Tushman & Nadler 1978.] The end user in this situation will want to understand and make sense of task related uncertainty so as to take action (*i.e.*, find a solution). Therefore, the 'non-routine' task in this situation will require analysis/inquiry applications.

In addition, a high level of task interdependency suggests that the tasks of end users are cross-functional and the problems dealt with are important to other units within the organization [Thompson 1967]. Consequently, a high degree of task interdependency necessitates group exchanges, which requires a system that supports a *coordinated* decision making process relevant to the operations of an entire department [Alloway & Quillard 1983; Daft & Macintosh 1981; Ginzberg 1980]. The possible EUC configurations necessary to meet this interdependent task environment include EUC Config II.

Figure 5-1 depicts the influence of task variables and matching EUC configurations on two EUC success variables, end users' overall satisfaction with EUC and perceived enhanced work performance.

Hypothesis 2a:

Where end users perceive their tasks as having high variabililty and high difficuculty, but low interdependency, they will be ***most satisfied*** *with EUC Config I.*

Hypothesis 2b:

Where end users perceive their tasks as having high variability and high difficulty, but low interdependency, they will report ***enhanced work performance*** *with EUC Config I.*

The implication of low task interdependency for EUC configuration is that the system serves end users in a discrete task or decision that is relatively

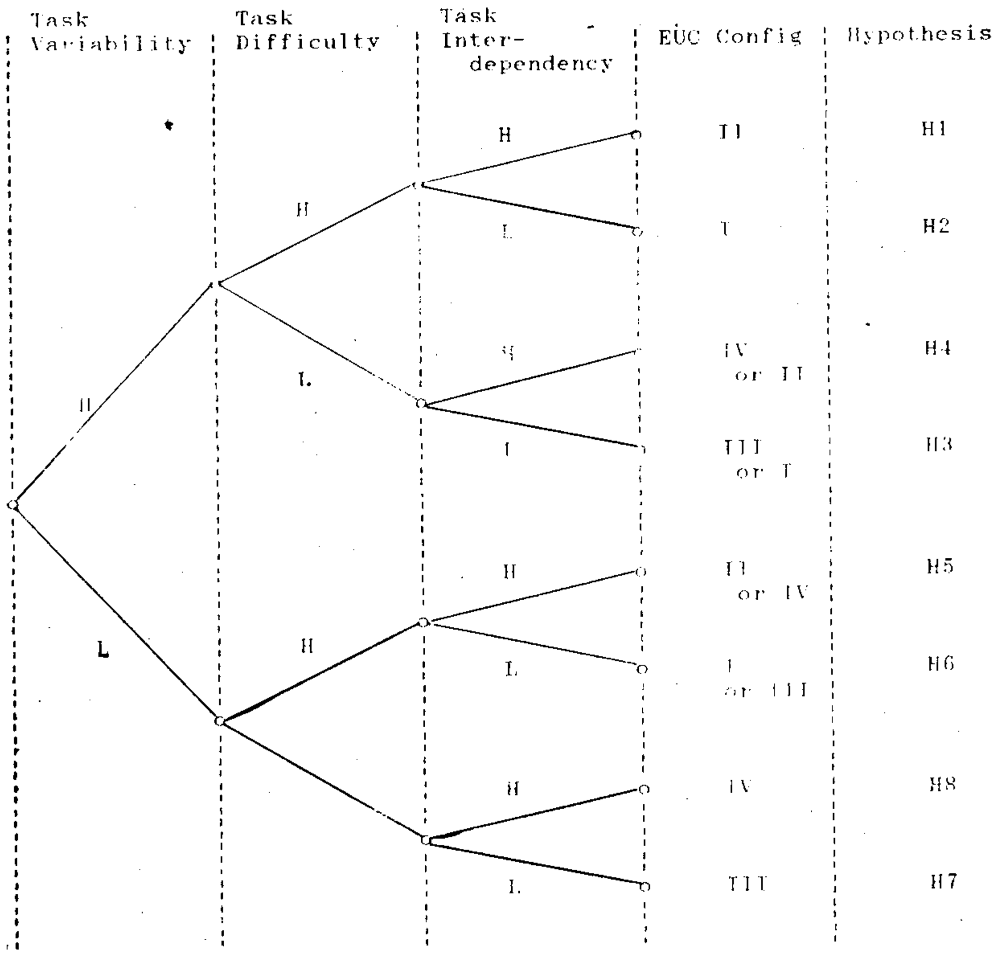

Figure 5-1: Contingencies on EUC Success (Satisfaction & Performance)

independent of other organizational tasks [Hackathorn & Keen 1981]. The situation of low perceived task interdependency suggests that the applications are being carried out by a single person. In addition, as discussed in Hypothesis 1, the high task variability and difficulty require analysis/inquiry applications as an information-processing mechanism. Therefore, the appropriate EUC configuration for this situation will be Config I.

In this situation, the end user is more concerned with understanding and making sense of task uncertainty in order to find a solution. Thus he/she will be most satisfied with EUC Config I (Hypothesis 2a). Also he/she will report enhanced work performance with EUC Config I (Hypothesis 2b).

Hypothesis 3a:

Where end users perceive their tasks as having high variability, but low difficulty and low interdependency, they will be ***most satisfied*** *with EUC Config III or Config I.*

Hypothesis 3b:

Where end users perceive theirs tasks as having high variability, but low difficulty and low interdependency, they will report ***enhanced work performance*** *with EUC Config III or Config I.*

A high degree of variability but low degree of difficulty will be handled by referring to a store of established knowledge and decision making techniques [Macintosh 1981]. Engineers, for instance, must continually modify designs and introduce modifications to meet customers' needs, indicating high task variability [Miles 1980; Perrow 1970]. They, however, can refer to books and technical manuals to discover the correct formulas to use in calculating tolerance and stress loads [Macintosh 1981]. In a service organization, professional accountants, for example, prepare financial statements for clients by referring to generally accepted accounting principles, accounting board pronouncements and S.E.C. requirements [Macintosh 1981].

Information-processing requirements for this task environment are characterized by large amounts of primarily 'quantitative' information [Daft & Macintosh 1981]. Thus they will require a large computer database for modeling/optimizing and flexible inquiry and/or regular statistical reports. That is, EUC applications needed for this situation can be either analysis/inquiry or exception/monitor. The appropriate EUC configuration, thus, depends on either of these two applications and the degree of task interdependency.

High task variability but low difficulty (*i.e.*, the typical task characteristics facing technical-professional subunits) and low degree of interdependency among subunits will necessitate either EUC Config III or Config I. The choice of EUC Config III depends respectively on whether the user typically refers to prespecified rules like written and technical manuals, and employs frequent statistical reports to take action without furthur complex analysis. EUC Config I depends on whether the user's task necessitates more decision tools like modeling, simulation, and optimization to understand and make sense of task uncertainty.

Hypothesis 4a:

Where end users perceive their tasks as having high variability, but low difficulty and high interdependency, they will be ***most satisfied*** *with EUC Config IV or Config II.*

Hypothesis 4b:

Where end users perceive their tasks as having high variability, but low difficulty and high interdependency, they will report ***enhanced work performance*** *with EUC Config IV or Config II.*

As in Hypothesis 3, a high degree of task variability but low degree of task difficulty is a typical work environment facing a subunit with a substantial number of exceptions but with relatively more analyzability than a subunit in Hypothesis 1. Further, Hypothesis 4 is distinguished from Hypothesis 3 in that the subunit's task is more dependent on other actors. This high degree of task interdependency requires an EUC scope, which spans one or more departments (Hypothesis 4). The EUC configuration meeting these requirements will be either Config IV or Config II, depending upon whether the end users take action without making further efforts to understand the situauion, or whether they need to understand and make sense of task uncertainty (Hypothesis 4a and 4b). As in Hypothesis 3, the choice between EUC Config IV and Config II depends on whether the users refer to prespecified rules and frequent statistical reports, or whether their work necessitates better decision tools such as modeling and simulation.

Hypothesis 5a:

Where end users perceive their tasks as having low variability, but high difficulty and high interdependency, they will be ***most satisfied*** *with EUC Config II or Config IV.*

Hypothesis 5b:

Where end users perceive their tasks as having low variability, but high difficulty and high interdependency, they will report ***enhanced work performance*** *with EUC Config II or Config IV.*

Hypothesis 6a:

Where end users perceive their tasks as having low variability, but high difficulty and low inderdependency, they will be ***most satisfied*** *with EUC Config I or Config III.*

Hypothesis 6b:

Where end users perceive their tasks as having low variability, but high difficulty and low interdependency, they will report ***enhanced work performance*** *with EUC Config I or Config III.*

Tasks characterized as having high difficulty and low degree of variability in terms of number of exceptions encountered in the end users' work, are examples of 'mixed-in-routineness' [Miles, 1980]. These fall into the category of 'craft work' in Perrow's [1970] task nonroutineness classification.

In contrast to the task characteristics in Hypotheses 3 and 4, there is no store of rational knowledge and techniques to be applied to the 'conversion process' (*i.e.*, 'search behavior' according to Perrow [1970]). Examples include the tasks of money market managers and those of professional accountants who perform quality control by reviewing audit working papers [Macintosh, 1981]. These individuals work with a limited set of problems, but choosing correct responses involves considerable personal judgment and experience

[Macintosh, 1981], in contrast to the technical-professionals of Hypotheses 3 and 4.

This craft work type of task necessitates an information processing mechanism which can provide small amounts of 'qualitative' information [Daft & Macintosh, 1981] to end users. Personal judgment will be facilitated by an EUC configuration based on analysis and inquiry. Consequently, the candidate for the most pertinent EUC configuration in these situations, will be either Config II or Config I. The choice depends on another dimension of task characteristics, namely interdependency. If the task is characterrzed as having a high degree of interdependency, the most appropriate, and hence successful EUC configuration will be Config II as in Hypothesis 5. Otherwise, it wiłl be Config I as in Hypothesis 6.

However, in situations of 'mixed-in-routineness' we cannot exclude the possibility of monitor and exception application systems forming an appropriate EUC configuration, since under certain situations (*e.g.*, the task at the high routine end of the 'mixed-in-routineness' continuum), personal judgment may be based on monitor/exception applications. In this rare but not impossible case, EUC Config IV or Config III (depending on task interdependency, respectlvely) will be positively assessed by end users.

Hypothesis 7a:

Where end users perceive their tasks as having low variability, low difficulty, and low interdependency, they will be ***most satisfied*** *with EUC Config III.*

Hypothesis 7b:

Where end users perceive their tasks as having low variability, low difficulty, and low interdependency, they will report ***enhanced work performance*** *with EUC Config III.*

Hypothesis 8a:

Where end users perceive their tasks as having low variability, low difficulty, *but high interdependency, they will be* **most satisfied** *with EUC Config IV.*

Hypothesis 8b:

Where end users perceive their tasks as having low variability, low difficulty, but high interdependency, they will report ***enhanced work performance*** *with EUC Config IV.*

Tasks characterized as having low variability and low difficulty require moderate amounts of clear, often 'quantitative' information processing in the form of written reports, rules and procedures, schedules and some statistical reports [Daft & Macintosh, 1981]. Here task coping is relatively programmed (low task coping difficulty) and is sufficient for responding to the relatively few exceptions (low task variability) encountered in the tasks [Miles, 1980]. This will require exception and monitor applications.

The end user's task interdependency differentiates Hypothesis 7a and 7b from Hypothesis 8a and 8b. In Hypothesis 7a and 7b, the low task interdependency requires EUC to support an individual in independent decision making (relatively self-contained tasks). Coufig III will be the most appropriate EUC configuration in this situation (Hypothesis 7a and 7b).

In direct contrast, the high degree of task interdependency posited in Hypothesis 8a and 8b, requires an information processing scope spanning entire departments and subunits. The end user's task characteristics in Hypothesis 8a and 8b requires an EUC configuration which provides end users with increased coordination of such interdependent tasks. Therefore, the most successful EUC configuration in this situation will be Config IV.

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