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THE EFFECT OF MANAGEMENT INFORMATION
SYSTEMS ON SUPERVISORS WITHIN A
MILITARY ENVIRONMENT

THESIS

John L. O'Brien
Captain USAF

AFIT/GIR/LSY/89D-7

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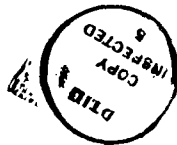
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AFIT/GIR/LSY/89D-7

THE EFFECT OF MANAGEMENT INFORMATION SYSTEMS

ON SUPERVISORS WITHIN A MILITARY ENVIRONMENT

THESIS

Presented to the Faculty of the School of

Systems and Logistics

of the Air Force Institute of Technology

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In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Information Resource Management

John L. O'Brien, B.A., M.P.A.
Captain, USAF

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## Preface

The writing of a thesis is not something one does solo. I am deeply indebted to three individuals for allowing me to use their organizations on Wright-Patterson AFB as a 'living laboratory.' Mr. James Dawson of the 2750 Civil Engineering Squadron, Mrs Judith Cummins of the 2750 Air Base Wing, and Ms. Patty Moore from Air Force Logistics Command Material Management all gave generously of their time and resources. A debt of gratitude is also owed the individual participants of each organization who answered questions of yet another AFIT student. Without them, my research would never have happened.

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A special thanks must be reserved for my thesis advisor, program director, teacher, and friend, Lt Col D. J. McBride. During the last eighteen months, she taught me more than information resource management. Through her quiet example, she taught me the meaning of the word 'master.' The single memory I will carry with me long after I leave AFIT is her look that simply and directly meant... 'John, I know you can do better.'

Finally, I thank the individuals who will always hold the most precious place in my heart, my wife Kathleen and daughters Erin and Eileen. They sacrificed so much for my education; I will not let them down.

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## Abstract

Studies on the effect of management information
systems (MIS) on organizational structure have been
disparate. Research has documented changing spans of
supervisory control and modifications to the number of
levels of hierarchy in public and private sector
organizations. Unfortunately, existing MIS research
does not often apply to public sector/military MIS.
This thesis examined military organizations and studied
user perceptions regarding the relationship between MIS
implementation and organizational structure changes.

Organizational structure changes will be determined
by focusing on two specific characteristics: supervisory
span of control and vertical complexity. Perceived
changes to these characteristics (increases/decreases)
were measured from two levels: top level management and
mid level/first line supervisors.

The study found that, for the specific research
population, a perceived change in span of control did not
occur following MIS implementation. There is some
evidence of both increases and decreases to span of
control but the data is not strong enough to suggest any
direct causal relationship.

The study also found that, for the specific research population, little perceived changes in the vertical complexity of the organizational hierarchy occurred following implementation of MIS. What changes did occur were basically decreases, but the data is not strong enough to suggest any direct causal relationship.

Within a military environment, MIS appear to have little formal effect on span of control or vertical complexity. However, MIS do appear to have stronger informal effect. Military managers found an increased tendency to overlook formal reporting relationships and formal chain of command. MIS provided more opportunities for informal communication with subordinates, regardless of whom they worked for or what department they worked in.

# THE EFFECT OF MANAGEMENT INFORMATION SYSTEMS
# ON SUPERVISORS WITHIN A MILITARY ENVIRONMENT

## I.  Introduction

### General Issue

Studies on the effect of management information systems (MIS) on organizational structure have been disparate. Some research has documented significant differences in structure following MIS implementation; for example, there is evidence of both centralization and decentralization, changing spans of supervisory control, and overall modifications to the number of levels of structural hierarchy in public and private sector organizations.  To illustrate the diversity of the research, one author felt that MIS '...do not cause structural changes in organizations' (93:686), while another concluded the opposite:  MIS lead to situations in which '...both the number of management levels and the number of managers can be sharply cut' (36:46).  Current research is lacking, however, on the effect of MIS on military organizations.  The effect of MIS may be altered by the military environment.

## Background

   **MIS Research and Organizations**.  "From its beginnings
as a province of a few people in the accounting and
billing operations," King and Kraemer write, "computing
has evolved to the point that it is now an essential
component in nearly all aspects of modern organizations"
(65:5).  Smeds, in an investigation of MIS and the
development of organizational structure, noted:

> Business organizations are today facing a period of
> rapid computerization of almost all functions.
> Moreover, the environment of organizations is changing
> because of the new strategic possibilities of
> information technology. (98:90)

The application of MIS as a support for managerial
decision making has shown significant increases since
the computer entered the business community over thirty
years ago.  (96:17)

   One definition of MIS research effort is the
"systematic investigation of the development, operation,
use, and/or impact of an information (sub)system in an
organizational environment" (59:910).  This focus of MIS
research has become particularly significant since major
technological advances in MIS are reported as causing
substantial changes in organizational form and function in
the past half decade (46:229).  Markus and Robey note:

> The relationsh! between information technology and
> organizational change is a central concern in the
> field of Information Systems (IS)....Few researchers
> question the importance of the issue. (78:583)

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Zmud and Cox add:

> The implementation of many MIS's radically alters the duties and responsibilities of organizational members. The resulting impact affects both formal and informal relationships among personnel as well as their particular relationships with and attitudes toward the organization. (117:42)

MIS implementation has been shown to impact formal and informal organizational structure (96:22), affect organizational efficiency and productivity, as well as employee quality of work-life (73:220), and cause social and technical changes (14) (95). Kraut and others note:

> The rapid spread of computer and telecommunications technologies throughout white-collar work has forced social scientists to consider the impact of these technologies on the people who use them directly and on the work force and economy as a whole. (73:220)

Kraemer and King feel the introduction of MIS technology into an organization has a substantial impact on that organization, the consequences of which must be anticipated in order to be dealt with effectively (69:32). In an examination of MIS research literature citation patterns, Culnan identified 'computer impacts' as a clear and consistent subfield of MIS research, describing it as 'research on the social and organizational impacts of computing' (25:162-163).

MIS technology affects organizational structure at multiple-levels (96:18) (98:90). Despite the coupling of MIS and organizations, Markus and Robey note the empirical research literature is not convincing enough at present to confirm consistent relationships between

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information technology and organizational change

(78:583). In suggesting several reasons for this, they

feel the literature...

a) contains works by researchers from several academic
   disciplines and interdisciplinary specialties,
   including organizational theory, management science,
   sociology, and computer science, each with its own
   preferred concepts and theoretical and methodological
   bias...
b) includes conflicting and unclear definitions and
   measures of information technology and organi-
   zational structure...
c) mixes and crosses units and levels of analysis from
   the individual, the workgroup, the department, the
   organization, and society -- a practice which leads
   some observers to fear improperly specified models
   and ungeneralizable findings. (78:583-584)

Robey, in an earlier work, also commented:

Unfortunately, our knowledge of the area [the impact
of MIS on organizational structure] is clouded by
unsystematic research and by speculative armchair
journalism...As a result, it is difficult to separate
what we really know about the impact of computers in
the workplace from popular fiction about
organizations. (93:679)

Williams and Rowe note, "How technology affects an

organisation is, therefore, far less important than how

the organisation handles technology...." (114:3). In an

analysis of office automation and organizational change,

they feel it is important to "....focus on organisational

factors and establish a company's make-up in order to

understand how it is likely to respond to, and be changed

by, the introduction of OA" (114:3). This viewpoint is

summarized by Attewell and Rule who feel:

....evidence on these subjects [computers and
organizations] is actually fragmentary and very
mixed....Virtually none of the studies mounted so

far have been capable of yielding a persuasive and
comprehensive view of computer-induced social
change. (5:1184-1185)

All this dichotomy has led Kraemer and King to describe an
atmosphere in which great speculation exists about the
effect MIS will have on organizations but less research
on the effects an MIS does have on organizations (70:488).

PMIS. The characteristics of MIS research can have
particular application for the public sector (54, 77).
However, Bozeman and Bretschneider (16) criticize much of
the existing theoretical frameworks of MIS research for
failing to accommodate public management information
systems (PMIS). The Federal government has taken several
significant steps to encourage computer applications among
local governments (72:260). In spite of enormous interest,

....available knowledge of MIS is not of equal
service to all managers. Managers working in the
public sector must exercise particular caution as they
seek to draw lessons from MIS literature. (16:475)

The majority of MIS research is based on data drawn from
private sector contexts; therefore, conclusions must be
cautiously applied to the public sector. Despite dramatic
forecasts of revolutionary change in PMIS technology,
research has failed to show evidence that such changes
have improved public sector efficiency or effectiveness
(64:25). Furthermore, while the overall volume of MIS
research and theory has grown as the discipline grew,
'little research and virtually no theory has been
published on public management information systems'

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(16:475). This ignorance of PMIS problems becomes more significant since, as Boger and others note: 'The Federal information systems inventory is a collection of outdated hardware as well as software techniques and systems that were abandoned long ago in the private sector' (13:163).

The problem becomes compounded with the introduction of military administration as a sub-discipline of public administration. Some research has shown that military administrators lack identity with administrators in the 'traditional public sector' (60, 81, 100). Jefferies noted 'the two fields [public administration and military administration] are mutually relevant and important' yet there is 'a lack of interchange between them' (60:321-322).

Bozeman and Bretschneider argued that, of the empirical MIS research, little is applicable to the public sector (16). Jefferies added that, of that available to the public sector, little is applicable to the military (60). Miewald summed up the situation facing the military information resource manager by noting 'Despite the importance of the military today, more scholarly care seems to have been lavished on mosquito abatement districts' (79:1291).

Trends. Much of the research that does exist regarding MIS and organizational structure focuses on the issue of centralization vs. decentralization. Many early

researchers predicted centralization (1,2,20,34,35,40,41,
58,75,80,111,112,113) while others disagreed, favoring a
decentralized trend (10,12,66,87,88,105,110,115). Finally,
there were those who diplomatically recognized both results
(4,9,21,29,30,31,33,48,57,62,63,67,68,70,71,74,89,91,92,93).
Supervisory span of control (19,50,83,86,89,103,106,107)
and the number of management levels in a hierarchy, often
called 'vertical complexity' (27), were singularly
examined, as well as examined in the context of other
variables (10,11,12,52,55,87,90,111,113,115,116,118).

Summary. MIS have impacted organizations in a manner
unimaginable a generation ago. However, empirical
research into the effects of MIS implementation on
organizational structure has been disparate and has
focused primarily on the private sector. Little research
has been done on MIS in public organizations, particularly
in the military. The military environment may influence
perceptions of change to structural characteristics. The
effect of MIS on organizational structure within a
military environment is a valid area of research.

## Problem Statement

What is the perceived impact of Management Information Systems on the structure of military organizations?

## Research Objectives

This study seeks to determine what, if any, user perceptions exist regarding the relationship between MIS implementation and organizational structure changes. 'Organizational structure changes' will be determined by changes in two organizational characteristics: supervisory span of control and vertical complexity.

## Research Questions

Question # 1. In measuring the effect of MIS on military organization structures, has there been a perceived increase or decrease in supervisory span of control, according to the perceptions of military or Department of Defense (DOD) civilian supervisors, following implementation? If so, by how many individuals?

Question # 2. In measuring the effect of MIS on military organization structures, has there been a perceived increase or decrease in vertical complexity within the military organization structure, according to the perceptions of military or Department of Defense (DOD) civilian supervisors, following implementation? If so, by how many levels?

## Definitions

**Management Information System.** 'An integrated, user-machine system for providing information to support operations, management, analysis, and decision-making functions in an organization. The system utilizes computer hardware and software, manual procedures, models for analysis, planning, control and decision making, and a database' (32:6).

**Military Organization.** Any department of Defense (DOD) agency that is staffed with military and/or civilian supervisors.

**Organizational Structure.** The explicit framework that 'describes the allocation of task responsibilities [and] designates formal organizations and reporting relationships, including lines of authority, decision responsibilities, number of levels in a hierarchy, and span of control of managers and supervisors' (27:361).

**Vertical Complexity.** 'The number of management levels in the hierarchy of authority' (27:219).

**Span of Control.** 'The number of subordinates who report directly to any one supervisor' (27:220).

**Centralization/Decentralization.** 'The distance between where a decision problem emerges and where in the organization hierarchy decisions about that problem are made' (70:488-489).

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## Importance of the Research

In 1975, the United States Congress established the Commission on Federal Paperwork:

> to study and investigate statutes, policies, rules, regulations, procedures, and practices of the Federal Government relating to gathering, processing, and disseminating information, and to managing and controlling information activities. (56:4).

The Commission's results led to the Paperwork Reduction Act of 1980 and the introduction of Information Resource Management (IRM), the underlying philosophy of which is to treat information as a valuable organizational resource to be acquired, maintained, and managed like any other basic resource (53:33). Vincent notes

> The information needs of the Air Force have steadily increased with the demands of new complex technology, fewer resources, and the number and magnitude of decisions at senior levels. These demands have necessitated an improved method of keeping the decision makers informed. (109:22)

The Air Force Institute of Technology's IRM program is an attempt to put this philosophy into practice.

An area of concern for Air Force Information Resource Managers is the effect of MIS on organizations. It is important to have a general understanding of structural impacts since MIS permeate government and business organizations to a degree unheard of a generation ago. In addition,

> As computer technology advances and costs decline, the MIS concept becomes even more viable and attractive in public service management....[However], the introduction of MIS into an organization represents a massive intervention into the internalized patterns

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> and expectations of organizational performance, that
> is, intervention into the organization's culture.
> (44:485-486)

An organization's success is based on its ability to manage data in order to process information that reduces uncertainty and clarifies ambiguity (26:5). Edelman notes that managing such organizational resources 'has become a task of literally overwhelming size and mind-boggling complexity' (39:17). Therefore, improvement the overall management of information is one of the most important challenges facing American business (39:17).

The value of a MIS can be measured quantitatively by such criteria as resources saved, but qualitative worth is more difficult to assess. Robey points out that

> ever since the computer was first applied in business
> organizations....managers and management theorists
> have been intrigued by its potential effects on
> employment, job content, managerial work, and
> organization structure. (92:963)

Therefore, 'understanding the change of computing in organizations is important not only to help explain the present but it is essential for improving our ability to predict the future of information systems' (65:5). Do information systems developers focus only on output acceptance while ignoring other concerns? Do senior executives make demands on MIS that cannot be fulfilled while ignoring the capabilities the MIS can provide? Do first-line supervisors gnash their teeth at a system they didn't want and can't use?

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If the undesirable consequence of a MIS is a bloated bureaucracy with increased hierarchical levels or wider spans of control, have we simply exchanged one set of problems for another? However, the problem need not be this 'worst-case' scenario. Any organizational impact caused by the MIS is significant since it may have an ultimate effect on the organization's return on capital investments.

## Scope and Limitations

This research will concern itself with the impact of MIS implementation on organizational change, specifically examining individual supervisor's perceptions regarding changes to their span of control and their level of position within the organization hierarchy. The focus is on formal structure only; no attempt will be made to assess the impact of MIS on informal structures. This study will not attempt to measure changes to the quality of supervision as a result of systems implementation, nor will the issue of supervisory satisfaction be addressed. The study will, through a measurement instrument, identify the perceived effect computing has on military supervision.

Several limitations are inherent in this study. First, military organizations will have a limited corporate memory due to high turnover caused by frequent permanent changes of station. This could be a hindrance

to totally accurate comparisons of the organization before and after the implementation of the MIS. To compensate for this, the study will include both military and DOD civilian supervisors, in the hope that civilians will provide more continuity.

Another limitation is the inclusion of MIS that are primarily electronic data processing (EDP) systems, as specified by the organization selection criteria. Clark and Blazer noted in 1980 that the term MIS is inadequate to describe many of the information systems found in the defense system (22). As this thesis began, it was suspected that the situation hadn't changed, that the vast majority of United States Air Force MIS are EDP-based, transaction processing systems with little decision-making capabilities. This suspicion proved true for the organizations studied; the MIS were, conceivably, little more than office automation systems. A criticism could be made that this thesis shows no MIS effect on military supervision simply because no Air Force supervisor has access to a data-base oriented, decision-making MIS. Further research could expand the selection criteria to include both EDP systems for basic transaction processing and data/model based MIS. The information gathered will have value to the Information Management (IM) career field by showing how several types of MIS impact military organizations. This may affect future IRM program decisions.

## Summary

Chapter two, a review of literature related to organizational change, examines the effect of both general technology and information systems technology on organizational structure. Two key research studies germane to this thesis are examined in detail. The issue of public management information systems is also discussed.

The methodology used in this thesis is described in Chapter three. The case study method is used, consisting of a series of structured interviews with supervisors (both military and civilian) of all levels within a military organization. Chapter four will analyze the findings of these interviews and chapter five will present the conclusions and recommendations.

# II. Literature Review

## Overview of Presentation of Literature

This literature review begins with a short exploration of technology and its general effect on organizational structure. Beginning with the 'proverbs' of Herbert Simon, the relationship between technology and changes in the characteristics of organizations are discussed.

Information systems technology and the relationship between management information systems (MIS) and organizational characteristics is introduced. The widespread and expanding use of management information systems (MIS) in both the public and private sector is reviewed through changes to organizational decision making. These changes are defined by the amount of centralization, decentralization, or a combination of both with moderating influences. Next, the concepts of supervisory span of control and vertical complexity are introduced and examined in relationship with MIS.

The review of related literature concludes with an examination of information systems impacts on organizational structures. Robey's distinction between organizational impact and implementation are discussed as well as Drucker's prediction concerning the coming of the new organization.

## Technology and Organizational Structure

Introduction. Organizational change has been a topic of interest for researchers of MIS, administration, and organizational development. Organizations are "open systems" which interact with the environment's external and/or internal pressures by altering such things as structural characteristics or decision making style (92:966). Structural characteristics (such as span of control or vertical complexity) are often interrelated, with changes in one inevitably leading to changes in others (97). For example, Simon suggested there is an inverse relationship between span of control and hierarchical levels, noting that restrictive span of control inevitably increases hierarchical levels whereas a shorter pyramid can only lead to increased span of control. He suggests an optimum point between two extremes (97). Blau and Scott, acting on Simon's challenge for further study, actually described a model for the mathematical relationship between number of hierarchical levels and span of control (11:168), with an inverse relationship:

$$S = \sqrt[L]{N}$$

S = span of control
L = number of hierarchical levels
N = number of positions in the organization
(11:169)

Pfeffer also used the model in a slightly different form (87:39-40).

Taylor has suggested that technology, i.e. the
techniques and processes of changing materials toward
desired ends or products, is a critical determinant of
organizational structure (101) (102). Blau and others
note that technological developments

> ....have stimulated the evolution of the modern
> economic organization, altered class structures, and
> affected political institutions. (12:20).

Harvey reported findings that show a clear relationship
between organizational technology and organizational
structure (52:256). Whisler hypothesized that technology
has the capacity to modify organizational structure in a
manner that is both systematic and predictable (113:33).
Laudon concludes that, despite literature that 'is both
vast and confused,' research seems to conclude that
technology impacts the modern organization (74:23).

Joan Woodward. The earliest typology of
organizational technology (27:260) and considered one of
the pioneering attempts to examine the structural
implications of technology (12:20), was the work of Joan
Woodward (116). She concentrated her research on the
organizational structure of 100 British manufacturing
firms and attempted to

> determine whether basic structural characteristics,
> such as administrative ratio, span of control,
> formalization, centralization, and number of
> hierarchical levels reflected similar management
> practices across organizations. (27:260)

Woodward identified three types of manufacturing technology, Batch/Unit, Mass Production, and Continuous Production, with parallel increases in technical sophistication and difficulty. She related these to specific organizational characteristics and noted that, for example, 'the number of levels in the management hierarchy, the span of control of first-line supervisors, and the ratio of managers and supervisors to other personnel were all affected by the technology employed' (51:64). Table one depicts some of Woodward's results.

Table 1. Woodward's Technology Framework and Organization Structure/Excerpts (27:261)

| MANUFACTURING TECHNOLOGY (COMPLEXITY) | FORMALIZATION | SUPERVISORY SPAN OF CONTROL | LEVELS IN HIERARCHY |
|---|---|---|---|
| Batch/Unit (Low) | Low | 23 | 3 |
| Continuous (High) | High | 15 | 6 |

As the level of technology increased, the levels of hierarchy increased in a linear fashion but the span of control behaved in a curvilinear manner (85:86), i. e., increasing as technology grew from low to medium, then decreased as the technology became high. (118:65).

Woodward's findings show systematic differences in structural characteristics linked with technology. She felt 'Different technologies impose different constraints on individual members of organizations and on the choice

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of organizational structure' (116:19), and '....those firms in which structure matched the technological requirements tended to be more successful than those in which structure did not match technological requirements as well' (88:242).

The Aston Studies. In an expansion of the Woodward study, the Aston studies developed a scale for classification that incorporated technology in nonmanufacturing (service) organizations. The Aston studies (55,90) supports Woodward's findings that structure was related to technology, but they incorporated an additional factor into the relationship: size of the firm (12:20) (27:264). Woodward's manufacturing firms were somewhat larger (27:264), leading Hickson and other to write:

> The smaller the organization, the more its structure
> will be pervaded by such technological effects; the
> larger the organization, the more these effects are
> confined to variables....linked to the workflow itself
> and will not be detectable in variables of the more
> remote administrative and hierarchical structure
> (55:394-395).

Despite these differences, both Woodward and the Aston studies firmly established that organizational characteristics change with technology and served as a basis for a continuing '....debate between the proponents of size and technology as prime determinants of structure [which] remains largely unsolved' (12:20).

Related Research. Zwerman examined 55 Minnesota firms and reported findings which support Woodward (118).

> Span of control of chief executives, ratio of
> non-supervisionist to supervisory personnel, and

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number of levels in management hierarchy were found
to vary directly with increased technological
complexity.  The differences observed were greater
when only the very successful firms were compared with
one another.  (118:90)

The only contradiction to Woodward's findings Zwerman
reported was first-line supervisor's span of control
which did not vary as a result of production technology
(118:90).  Meyer examined the impact of the introduction
of automation in the administrative sections of several
government finance departments (84).  He reported more
levels of hierarchy and wider span of control for
first-line supervisors as a result of simple knowledge
technology (51:66).

Research has shown that classifying specific
departments of an organization based on technology is
possible.  For example, individual departments of govern-
mental agencies differ systematically based on technology
(27:253).  Hall supports this concept, noting 'It is thus
very possible....that each of the various segments of an
organization can have a structure quite different from
those of other segments....Analyses ofintraorganizational
structural variations empirically verify that different
units of the same organizations have different structural
forms' (51:67).

Charles Perrow.  Perrow 'made technology the basis of
his theoretical scheme for analyzing structure' (88:243)
but focused on the sub-organization (department/branch).

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He dealt with task uncertainty, variability, and unpredictability and felt

> If the task is analyzable and stable, and less differentiated, more centralized structural arrangements can be employed. Uncertainty in the technology affects organizational structure through its impact on the control process. (88:243)

Perrow noted "This analysis made it possible to divide organizations into four types....and allowed us to make some complex predictions regarding the structure of these organizations" (85:90-91). Perrow's department classification model divided technology into four categories (routine to nonroutine) and related them to various structural characteristics. Table two gives a sample of Perrow's findings regarding structural characteristics. Perrow's model measured technology and determined the extent that technology permeated specific organizational departments. This allowed for further classification of the departments as needed.

Table 2. Perrow's Relationship Between Department
Technology and Organization Structure (27:256)

| DEPARTMENT TECHNOLOGY | FORMALIZATION OF STRUCTURE | DECISION MAKING | COMMUNICATION |
|---|---|---|---|
| Routine | High | Centralized | Infrequent Written |
| Craft | Moderate | Some Decentralized | Occasional Verbal |
| Engineering | Moderate | Some Decentralized | Frequent Written |
| Nonroutine | Low | Decentralized | Frequent Written/Verbal |

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James Thompson. In an attempt to "... go beyond Woodward by developing a technology typology that encompasses all organizations" (51:64), Thompson categorized organizational departments according to technical sphere. His tri-part technology ratings are summarized in table three.

Table 3. Thompson's Technology and
Interdependence Framework (27:270)

| TECHNOLOGY | INTERDEPENDENCE | COMPLEXITY | COMMUNICATION |
|---|---|---|---|
| Mediating | Pooled | Low | Low -- Vertical |
| Long-Linked | Sequential | Medium | Medium -- scheduled meetings, feedback |
| Intensive | Reciprocal | High | High -- unscheduled meetings, horizontal |

A mediating technology joins clients with the firm and is characterized by pooled interdependence (27:269). For example, a commercial bank joins depositors with borrowers but each department (savings, investments, loans, and real-estate) are separate units that work independently of each other (104:16). A long-linked technology refers to successive stages of production, such as an assembly line, with each stage using production of the preceding stage and producing materials for the next stage. It is characterized by sequential interdependence (27:269), involving the coordination of several department's

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activities to insure efficiency (104:15). An intensive technology is based on highly specialized skills and is characterized by reciprocal interdependence (27:269). For example, a hospital has many highly technical departments, all of which are involved in the patients treatment. This is the hardest type to manage because of the continuous interaction involved (104:17-18).

Thompson noted that most organizational tasks are divided into small components, resulting in differentiation of departments and individual roles with the organization. He writes:

> While this specialization is beneficial for increasing efficiency, and perhaps even necessary considering the limitations on individual cognitive capacities, the differentiated parts of the organization must be coordinated in order to successfully accomplish the task. (88:243)

One way to ensure this coordinated behavior among elements was in the control provided by the organizational structure

The Systems Approach. A general systems approach definition of technology is 'the organizational process of transforming inputs into outputs' (21:248,47:533). Representative of this is Khandwalla's conceptualization of the three aspects of work, as cited in Carter. Khandwalla distinguished the following:

> a) work flow -- the way in which programs, activities, and events in the input-process-output cycle of the organization are sequenced;
> b) operations technology -- the role of mechanical aids in transforming inputs to the work flow into the outputs of the work flow;

c)   information technology -- the role that mechanical
aids play in transforming information inputs into
information outputs.   (21:248)

Carter expanded Khandwalla's three aspects of work model

by incorporating computer technology into each of the

three components. She writes:

> When the computer has been included in this model, its
> use generally has been seen in information technology
> and, to a much lesser extent, as part of operations
> technology.   It is easy to speculate, however, given
> the touted potential of the computer, how
> computerization could be the predominate means of work
> accomplishment.   (21:248)

The first aspect of work, 'work flow', could be

exemplified by 'the optimal sequencing of programs and

activities [that] can be planned as well as executed

through the use of the computer' (21:248).  Similarly,

computerized operations technology is 'the mechanical

means of transforming inputs into outputs, whether

directly -- that is, paper processing is the outcome --

or indirectly as it 'drives' other machinery' (21:248).

And finally, the third aspect of work 'can act as the

central component of information technology, transforming

information inputs into information outputs' (21:248-249)

It has been noted that computers cause organizations

to become white collar factories (15:27).  Such impact is

not limited to operations technology within manufacturing

but includes general information systems technology.  The

next section will examines this concept.

## MIS and Organization Structure

Introduction. Early studies demonstrated the value of empirical research on manufacturing technology within the business/production arena and served as a model for the inclusion of information systems technology in the research effort. Khandwalla's three aspects of work, as expanded by Carter, assessed computer influence on organization structure but provided mixed results; impact on decision making was directly related to specific tasks but moderated by organizational size (21:266). This was not surprising. Blau and others noted that research on MIS technology and organizational structure follows a strikingly similar course to research on production technology with "impressionistic observations preceding more systematic comparative efforts and yielding inconsistent findings and disagreements" (12:21). "Although the speculative literature regarding computer effects on organizational structure is vast," Robey adds, "the basic positions are represented best by a few writers" (92:964).

Despite this inconsistency, MIS can affect future organizational structure (32:357). The interdependence between the two is so tightly coupled that, as the systems evolve, a diagram drawn to reflect an organization and a diagram drawn to reflect its MIS will ultimately be interchangeable (6:268).

Research into the effect of MIS on organizational structure largely focused on the issue of centralized or decentralized decision making (70:488). Robey delineated the following four positions based on this research:

a) computers lead to greater organizational centralization;
b) computers lead to greater decentralization;
c) computers have no effect on organization structure;
d) the computer's impact on structure is moderated by other influences. (92:964)

These issues will be addressed in turn.

Centralization. Centralization is defined as the distribution of power within organizations (51:114) and is characterized with the hierarchical level where decision making occurs. For example, top level decision making is indicative of a highly centralized organization while middle level decision making denotes decentralization (51:114-115). Davis and Olson depicts this relationship in the following manner:

A flat hierarchy with a wide span of control is more likely to be associated with decentralization of authority and decision making; a tall hierarchy with narrow span of control is likely to be associated with centralization. (32:335)

Research indicates that information systems technology may impact this association.

Early arguments tended to link computerization with an increase in centralization and were best exemplified by the prediction, first made by Leavitt and Whisler, that information systems technology has the greatest impact on

middle and top management (75:41). They reasoned that information will now move swiftly move up the organizational hierarchy, thus allowing for decisions to be made with a more global perspective. Thus, the computer represented the antithesis of decentralization (92:964). Leavitt and Whisler were among the first to use the term information technology when they wrote:

a. Information technology should move the boundary between planning and technology upward.
b. Organizations will recentralize and top management will take on an even larger proportion of the innovative, planning and creative functions.
c. Middle management will radically reorganize and split, moving both upward and downward in status.
d. The distinction between top and middle management will become even more crystallized. (75:42)

Middle management would be replaced with information systems that would monitor the environment and differentiate between routine and exception decisions. Routine decisions would be executed by the computer and exceptions would be passed to top management for action (70:489). Leavitt and Whisler's predictions were strongly criticized through the 1960s, 1970s, and early 1980s (2:128). Applegate and others feel 'Leavitt and Whisler were wise to believe that information technology would influence the structure of organizations, the management processes, and the nature of managerial work' (2:136).

Mumford and Banks supported Leavitt and Whisler's prediction that information systems would alter the decision making process, leading to reduced middle

management, a flatter hierarchical pyramid, and wider span of control for top management (5:1188). This is primarily due to a lessoning of continuous interaction with subordinates (80:174). Ein-Dor and Segev, investigating variables affecting the success of MIS, noted that organizational structure is an uncontrollable variable and propositioned that success is more likely in centralized organizations (41:1069). They further hypothesized that more centralized organizations tend to have centralized MIS structure (40:57). Downs, in an examination of early MIS within the public sector, noted

> City planners and budgetary officials will both eventually espouse centralized data systems. They will view such systems, at least in part, as means of gaining control over information channels vital to all operating departments -- and thereby capturing some of the latter's power. (35:208)

Centralization often results from the traditional tendencies of organizations to consolidate computer operations for economic reasons (63). Therefore, by centralizing the processing and storage of important information that could be used for decision making, the process of centralizing decision making would be easier to accomplish' (70:489). However, King cautions 'The experience in large organizations over the past two decades suggests that decentralization entails organizational changes that are likely to prove costly....' (63:333).

A reduction of middle management positions after MIS implementation is reported in the life insurance industry (111) and in manufacturing (58). Reif reported greater centralization in a utility company and a commercial bank, although most decisions at the bank were made by top level management (91:110). He writes, 'Under these conditions, the computer did not appear to be starting a move towards greater centralization. On the other hand, no evidence was found which might indicate a trend towards greater decentralization' (91:86). Delehanty reported results similar to Reif in nine life insurance firms and noticed a centralizing trend in relationships between home and field offices but none elsewhere (34:91).

> The hard fact is that very few decisions of any significance have been made below the very top echelons. Therefore, one could not expect to find much recentralization since there had never been much decentralization. (34:90)

However, centralization could lead to loss of management control unless some counter-mechanism is established (1:344).

Whisler felt 'The current impact of information technology is to centralize the control structure in organizations or in the parts of them to which it has been applied' (112:47) and 'Increased centralization becomes almost irresistible as more computers are used by more organizations (113:62). Carroll, writing in 1967, felt 'the years that have intervened since the first prophecies

of Leavitt and Whisler...have provided little basis for disagreement with their prophecies" (20:162). Applegate and others support this, noting that "As the 1980's draw to a close, [Leavitt and Whisler's predictions] don't seem so farfetched. In fact, they seem downright visionary" (2:128).

Decentralization. The opposite viewpoint was taken by researchers who felt that decentralizing mechanisms, such as distributed personal computers, time-sharing systems, and networks, would not replace middle management. Instead, decision authority would be delegated downward as information became more widely available and middle managers would exploit the opportunity provided by the technology. Middle management would eventually grow to handle decisions formerly belonging to top management (70:489).

Information technology can be used to support "horizontal management," i.e., the management of peers, using techniques of persuasion rather than leadership and supervisory skills. Tsaklanganos, a strong proponent of this management style, notes "Horizontal management implies decentralization. This simply means that lower management must have the ability and authority to make and implement decisions" (105:33). It stresses cooperation gained by horizontal communication and information flow.

A detailed examination of public and private sector organizations concluded that, although the organizational environment can influence centralization of data processing services (82), "broad organizational centralization does not seem to be occurring because of the computer" (115:127). Automation caused large, centralized information files which made company-wide data, heretofore available only to top management, at the disposal of middle managers (12:36).

> In the past, where the availability of information paralleled the hierarchy of the management structure, authority for originating change was necessarily concentrated at the top. Now with equal information facilities available at all levels of management, authority for originating change is likely to be found where the idea is found, whether this be at the lowest or the highest level. (115:201)

In addition, the sheer volume of data output overwhelms top management and actually encourages middle management to use their decision-making capability (12:36).

These two points, a large volume of data often concentrated at the top, causes a fear that

> While many executives believe fundamentally in the idea of decentralization, some still have lingering doubts about their ability and the ability of their staff offices to control effectively a decentralized operation. (110:25)

To avoid this fear, and the resulting cyclical decentralization-recentralization problem, Wagner suggested continuous monitoring of conditions which "....reflect in a significant, quantitative manner the effectiveness of decentralized units in contributing to over-all corporate objectives" (110:25).

Pfeffer and Leblebici obtained results which directly
contradicted Whisler's 1970 study. They found a positive
statistical relationship between information technology
and both the amount of decentralization and the number of
hierarchical levels (88:258). Although they feel that
information technology is a suitable substitute for
control mechanisms based on human intervention (88),
decision making is delegated

> only to the extent required because of information-
> processing limitations or other constraints, and is
> quickly recentralized...when the information-
> processing or other constraints can be overcome. (87:53)

MIS usage has been related to the degree of centralization/
decentralization measured. Klatzky found office automation

> had a strong positive effect on decentralization
> ....Automation has this effect in that it reduces
> routine problems at the lowest level of the organi-
> zation. This frees first-line supervisors from
> some of their day-to-day problems and allows them to
> accept the responsibility for decisions which had been
> forced back up to higher levels in the hierarchy.
> Each level is, in turn, freed from its more routine
> tasks; and the process repeats itself on up to the
> director.... (66:149)

Information technology increases both upward and downward
information flow, thereby allowing decisions to be made
further down the hierarchy. The quality of the decision
will improve if it is made closer to where the problem
exists, especially if supervisors are provided additional
data from above. (3) (18)

Blau and Schoenherr produced the strongest evidence
for decentralization in The Structure of Organizations

(10) by identifying two principles that affect decision
making responsibilities:

    a.  Administrative pressures engendered by a large
        volume of managerial duties and a complex
        structure exerts constraints to decentralize
        decisions, whether top executives will it or not.
    b.  Top management seeks to minimize the risk
        excessive variability poses for large-scale
        administration by delegating responsibilities to
        middle managers. (10:136)

A 1976 study by Blau and others will be examined in the
next chapter but concludes

    that on-site computer use is associated with
    decentralization of operational decisions supports
    Withington's predictions and contradicts those of
    Whisler and others. (12:37)

To summarize, as computer utilization increases,
particularly in mid level activities, organizational
decision making will become more decentralized (21:251).

    <u>No Impact/Moderating Influences</u>. 'In all the writings
about computers,' Robey muses,

    few have taken the position that computers do not
    affect organization structure. Yet this view should
    be included and actually becomes a rather viable
    position when the morass of conflicting research and
    speculative writing on the subject is reviewed.
    (92:965)

An example of this position is included in research on
four public sector MIS in the areas of social services and
law enforcement. Two systems resulted in centralized
bureaucracies, one system resulted in decentralization,
and one showed no significant change (74:64). In another
case, a study of various British industries reported only
one organization, out of ten, that showed any change in

the amount of centralization/decentralization (99:226).
In an extensive examination of the social aspects of
computing, Kling summarizes the empirical research
findings of no major structural impact on the modern
workplace (67).

Researchers predicting moderation view the computer
as a flexible tool that assists management in creating an
appropriate organizational structure, based on various
other conditions (92:965). Kanter notes:

> The conclusion is that the computer does not affect
> the major reasons for adopting the decentralization
> concept. Thus it does not have a major impact on
> whether a company centralizes or decentralizes....
> Although not the major determinant of whether a
> company centralizes or decentralizes, the computer is
> an aid in proceeding along either route. (92:965)

Davis and Wetherbe felt

> organizations will become increasingly dependent upon
> data processing in every aspect of business life....',
> [thus] 'networks of data processing systems will
> evolve with some applications centralized and some
> decentralized based upon the specific requirements and
> management strategies for specific organizations.
> (31:51)

Kraemer and King, noting the context of the MIS use is a
stronger influence on decision making than mere
technology, write:

> the technology supports either arrangement; which
> arrangement is followed in any particular instance is
> a function of organizational history, management, and
> politics. (70:489)

In essence MIS implementation results in two possible
organizational scenarios: the first scenario is based on
centralized control and an integrated information system;

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the second has a 'traditional' (decentralized) decision

making structure and heterogeneous information system.

Understanding these scenarios is a tool for understanding

MIS impact (89:19).

Centralization and decentralization have been

simultaneously reported in the healthcare industry (48),

in international organizations in Greece (4:201),

and in the British rail industry (33:129). Dawson and

McLoughlin reported both centralization of control for

strategic decisions but delegation of responsibility for

day-to-day decisions to local areas from divisional level

(33:129). They argue that centralization/decentralization

are not simple dichotomies but involve broader choices.

> To understand this, supervision needs to be seen as a
> system of control comprised of a number of supervisory
> roles, formally and informally defined, and concerned
> not just with the direct control of labour but with
> the day-to-day control of production as a whole.
> (33:129)

Howe and Oestreicher, in a similar examination of

centralization/ decentralization and corporate strategies,

presents examples of organizational structures that are

applicable for either approach (57). They feel actual

structure is not an important factor.

> Once a corporate MIS approach is determined, an
> organizational structure can be developed that
> supports the MIS and corporate management approach.
> There is a wide variety of structures that can be
> adopted, dependent upon whether your healthcare
> institution has decided to design the organization in
> a centralized or decentralized manner. (57:24)

In Reif's case study of three firms, he reported evidence of centralization associated with computerization at two of the cases, an electric and gas utility and a commercial bank, but decentralization at the third case, a heavy equipment manufacturer (91).

Why is there this dichotomy of results with much of the research diametrically opposed to each other? Emery feels part of the problem is a definition of terms:

> One reads arguments to the effect that computers will lead to decentralization because they will allow top management to monitor more closely the operations of lower-level management. If close surveillance serves any purpose at all, this means that top management will be in a position to judge the detailed actions of subordinates. Presumably, a lower-level manager can exercise freedom of action as long as he takes the right actions as judged by his superiors. It seems to me that any reasonable definition would have to include such Orwellian surveillance as an aspect of centralization. (42:159)

Another explanation is that 'those studies dated after 1970 tend to support the trend towards decentralization; those dated prior to that time favored centralization' (21:251).

Daniel Robey, a strong proponent of the moderating influence of MIS on organization structure, participated in a study of eight international organizations and examined the effect of MIS on structure (9). The specific findings of this 1981 study will be examined in the next chapter but do indicate 'little uniformity in the way that information systems mesh with formal organization structure' (93:686).

<u>Span of Control/Vertical Complexity</u>.  Luther Gulick,

an early public administration theorist, philosophized

> Just as the hand of man can span only a limited number
> of notes on the piano, so the mind and will of man can
> span but a limited number of immediate managerial
> contacts. (50:42)

Although efforts to operationally define span of control

have been attempted, the exact ratio remains a matter of

debate.  Van Fleet and Bedeian's historical study noted

Napoleon had a maximum span of control for his military

leaders as five, while Clausewitz expanded this to ten

(107:357-359).  The average span of control in the United

States is ten subordinates whereas Japanese managers have

anywhere from 100 to 200 subordinates (86:356).  Peters'

recommendation *for the organizational structure of the*

*future is:*

> Three layers, supervisor (with the job redefined to
> deal with a span of control no smaller than one
> supervisor for twenty five to seventy five people),
> department head, and unit boss should be tops for any
> single facility such as a plant or operations or
> distribution center (86:359).

Literature has recommended spans of control between three

and nine subordinates, although this can be expanded up to

thirty at the transaction level (103:7-8).

Research has supported Simon's original 'proverb' that

the number of hierarchical levels is related to the span

of control (113) (118).  Whisler concluded 'it is simply

a matter of organizational geometry that, when the span

of control declines, the number of levels will have to

increase, barring any change in the number of people involved (111:56).

The concepts of span of control and vertical complexity provide a key illustration of classical management theory and link centralization/decentralization to the examination of structural characteristics. For example, Woodward's studies (116) showed the effect of technology on several organizational characteristics, including span of control and levels of hierarchy, and influenced further organizational research. Indeed, Withington felt one of the primary reasons for decentralization

> has been the inability of central management to control the details of a large enterprise. Only by splitting an organization into units small enough to fall within a single manager's span of control can detailed operations be satisfactorily managed. (115:119)

Davis and Olson note, 'The information processing load imposed on an executive by these and other [decision-making] activities is the major element affecting the span of control that an executive can effectively exercise' (32:341).

Empirical research has suggested that implementation of MIS has an effect on supervisory span of control and hierarchical levels (10,12,111,113), but the direction of the effect is debatable. Lucas, in 1973, noted 'There is no reason why computer systems should result in a drastic change in the number of levels of management. However,

some changes in the composition of departments and the relationships between them should be expected' (76:246). Danzinger and Kraemer feel such changes are limited within public organizations (30) (49). On the other hand, research reported both a marked decrease in the number of clerical staff and the elimination of an entire hierarchical level (99:225), an increased span of control for first line supervisors & decreased span for higher level managers (45:102), and decreased middle-management discretion and authority (8:218-219).

In an examination of potential impacts of office automation on organizations, Olson and Lucas proposed that 'Automated office systems can be utilized to help increase the span of control of managers' (83:844). They note that information technology may increase the efficiency of office functions which should result in more free time for the manager. Some companies elect to fill this free time by '....increasing the number of subordinates reporting to a manager [which] has the distinct advantage of being quantifiable in terms of a reduction in the total number of managers required' (83:844). One such company was Citibank which, in 1976, used information systems technology as a tool to increase the front-line service staff without increasing the number of managers. The increased load on the manager can be seen as a justification for the MIS (19:3). Vergin noted such

structural changes are often a factor of the sophisti-
cation level of decision models. He writes, 'As more
decisions are shifted from managers to computers, the
manager will be able to increase their span of control and
administer larger, more complex units' (108:183). Power
supports this by predicting increased span of control
because of less decision makers and support staff (89:18).
An early study on electronic data processing and local
governments predicted significant increases in supervisory
span of control (29:33).

Whisler, in an examination of electronic-data-
processing (EDP) systems within the insurance industry,
noted evidence of decreases in both span of control and
hierarchical levels among companies following implement-
ation of the system (111). Data was obtained through
examination of organization charts or respondent's
perception estimates. Respondents either provided data for
the entire firm or by department. Tables four and five
summarize:

### Table 4. Whisler's Effect of EDP on Average Span of Control as Determined from Three Different Sources of Information.

| Information Source | Span Of Control | | |
|---|---|---|---|
| | Decreased | Increased | Stayed Constant |
| Examination of organization charts of EDP-affected departments (n=48)* | 19 (40%) | 15 (31%) | 14 (29%) |
| Estimates from 10 companies (n= 10) | 3 (30%) | 0 (0%) | 7 (7%) |
| Estimates from 10 companies for EDP-affected departments, separately (n=98)** | 44 (45%) | 29 (30%) | 25 (25%) |

\* These departments are in the same companies that provided estimates.

** One group of 10 companies    (113:44)

### Table 5. Whisler's Changes in the Number of Organizational Levels in EDP-Affected Areas, reported by Department and Company.

| Affect on number of levels | By Department | By Company |
|---|---|---|
| Decline | 20 | 5 |
| No Change | * | 11 |
| Increase | 9 | 2 |

\* Due to ambiguous reporting; some companies indicated 'no change' without specifying number of departments. (113:41)

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## Ideas for the Future

Cox, in an examination of MIS usage within organizations, notes

> The structure of an organization, whether it is the result of a deliberate plan, or the outcome of years of spontaneous evolution, consists chiefly in the patterns of communication among its constituent groups and individuals. (24:5)

Since MIS has a significant role in the channels of communication within an organization, it is a key factor in effecting organizational structure.

Such issues can be structured into two broad areas, as defined by Robey (94): a) literature on MIS impacts, which is '...concerned with the changes that occur in organizations when computing is introduced,' and b) literature on implementation, which is concerned with 'the best ways to get such systems introduced' (94:73).

> Both areas basically concern the introduction of technical change into organizations. The implementation literature initially reflected a greater interest in the use of operations research studies and management science techniques... [However,] implementation is a process of managing the impacts of systems. (94:73,76)

Linking the two is imperative for accurate research. Robey's solution for doing this is through what he terms development history.

Future MIS research should attempt to explain how systems were implemented. Robey writes,

> Only if we know why and how the system was developed and what meanings the participants attribute to the system can we understand the impact of the system on the organization. I use the term development history

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> to indicate the process by which a system is proposed,
> designed, implemented, and used in an organization...
> Understanding a system's development history includes
> but is not limited to its implementation. (94:73).

It is critical that impacts, such as organizational

structure changes, communication patterns, and

inter-organizational relationships, be anticipated and

managed through the process of implementation.

Since most impacts are largely accidental within

organizations, Robey designed a model that incorporates

both technical and organizational changes in measuring

impact following implementation. Since the two changes

often evolve separately, use of the model helps 'ensure

that the systems solution and the organizational solution

are compatible' (94:83) and unmanageable accidents are

avoided. Table six illustrates Robey's model.

Table 6. Robey's Model for Managing
Information Systems Impacts. (94:77)

**Operating Problems/Opportunities**

↓

**Objectives**

**Organizational Design              Systems Design
Process                              Process**

**Implementation**

↓

**Organizational Impacts**
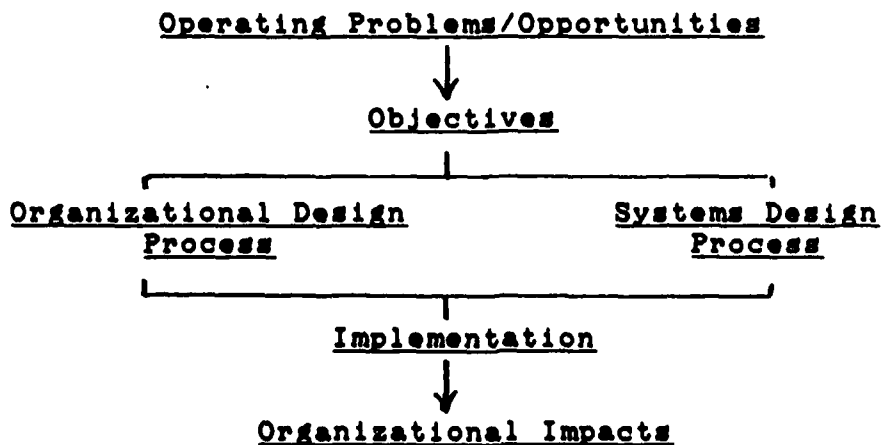
Parallel study of the organization design and systems

design processes is the key to insuring compatibility.

The value of such techniques becomes more visible when,

as Drucker terms it, the "information-based organization"

is considered (36:45). Drucker notes

> The typical large business 20 years hence will...bear
> little resemblance to the typical manufacturing
> company, circa 1950, which our textbooks still
> consider the norm. Instead it is far more likely to
> resemble organizations that neither the practicing
> manager nor the management scholar pays much attention
> to today: the hospital, the university, the symphony
> orchestra. For like them, the typical business will
> be knowledge-based, an organization composed largely
> of specialists who direct and discipline their own
> performance through organized feedback from
> colleagues, customers, and headquarters. (36:45)

He predicts changes to vertical complexity and span of

control because "...whole layers of management neither

make decisions or lead. Instead, their main, if not their

only function is to serve as 'relays'" (36:46).

The changes Drucker speaks of reflect the general

consensus that MIS may change organizations through "...a

rearrangement of organizational structures into shapes

that are not as yet obvious" (45:89). These changes can

be major or minor (108:183), they can occur in the private

sector (12), the public sector (28) (30), or sometimes not

at all (93), but they do merit study and research.

# III. Methodology

## Introduction

This chapter examines the methodology used to answer the research question. The overall structure of the methodology is a synthesis of four previous research efforts, which will now be examined. The Bjorn-Anderson study served as an inspiration for this thesis effort and was heavily drawn upon by this researcher.

The Clowes Study. Clowes' 1982 study, The Impact of Computers on Managers, "....focuses on managers' perceptions of their important work activities and various impacts of computers and information systems" (23:1). Clowes identifies a series of twelve research propositions which focused on manager's' perceptions of computer impacts.

The methodology utilized was a questionnaire distributed to managers of 28 Canadian manufacturing firms and personal interviews with selected managers. Clowes notes:

> The 355 questionnaire respondents and 166 interviewees who participated in this study represented all major functional areas of operations in subject organizations, all three of the managerial reporting levels selected for inclusion in the study and both line and staff positions. The large number of questionnaire respondents resulted in all of these situational categories being reasonably well represented by a large number of individuals. (23:66)

No percentage of respondents to total surveys mailed out was given but Clowes appeared satisfied with his response.

Some of the results of the study showed "....a number
of significant relationships between both managers'
computer impact and work activities perceptions and the
levels of information systems development in
organizations" (23:86). The study also supported the
proposal, first made by Whisler (113), that "....the mix
and variety of senior managers' work activities have
increased in organizations that introduced computers
(23:87). Clowes concluded

> The major barriers to effective information systems
> development in organizations were, are, and will
> continue to be behavioral in nature. The purpose of
> this study has been to investigate a number of these
> behavioral issues. In particular, managers'
> perceptions of their work and of the impact of
> computers on their work have been studied in relation
> to the nature of their organizations, their
> situational roles, and the extent and quality of
> information systems in the organization. (23:93)

The idea of supervisor's perceptions used by Clowes plays
a major role in this present thesis as well.

The Reif Study. An early attempt "....to examine what
structural changes occur following the implementation of
computer systems in business organizations" (91:41) is
Reif's 1968 work Computer Technology and Management
Organization (91). The concern of this research included
the hierarchical level at which decisions are made, the
formal and informal channels of communication, and the
functional integration of organizational activities and
its impact upon the traditional structure of business
organizations. (91:41)

The methodology selected by Reif was the case study method because

".....it is necessary to observe and identify the organizational changes which take place within business firms before normative statements are made as to the type of structure which permits the most efficient utilization of computers and information technology....This provides the investigation the opportunity to view organizational change as a process of adaptation and it permits the researcher to examine in a given situation all the factors which have a bearing upon the problem under investigation. (91:42)

Sources of the data came from three firms: a utility company, a bank, and a manufacturing firm. In selecting the participating firms, Reif followed three criteria:

a.  The firms must reflect a cross section of business experience and computer application.
b.  The firms must be of varying sizes.
c.  The firms must have adequate (defined as two or more years experience) with computer systems. (91)

Personal interviews, both structured and unstructured utilizing both formal and informal techniques, were used. Company records were used whenever possible. (91:43-44)

Reif related his results of organizational changes to their consequential effect on three areas:

a.  The locus of decision making,
b.  Line-staff relationships,
c.  The communications network. (91:91-108)

His findings indicate that computers have the effect of centralized decision making within the management hierarchy and formal channels of communication needed revision in order to provide "....management with the information necessary for planning, coordinating, and controlling organizational activities" (91:110).

Reif also predicted a reduction in the total number of departmental units within an organization, through consolidation and/or the elimination of duplicate staff effort. Finally, Reif pointed out that middle managers would be the group most affected by computers through a serious shift in job responsibilities and a reduction of actual numbers needed. (91:111-113)

The use of the case study method, involving personal interviews and company records to determine organizational change, served as a major influence in this present thesis.

The Blau et al. Study. A specific research effort forming a foundation for this thesis is the 1976 study by Blau, Falbe, McKinley, and Tracy, entitled 'Technology and Organization in Manufacturing' (12). This article examined 'the influence of technology on the structure of white-collar and blue-collar work ...in 110 American manufacturing establishments' (12:21). Technology was operationally defined as the 'substitution of mechanical equipment for human labor' (12:21) and examines two independent variables, production technology and the automation of functions through computers. The first independent variable, production technology, refers to the degree of mechanization of manufacturing equipment on a scale ranging from powered machine tools (controlled by an operator) to computerized equipment (a robot). The second independent variable, automation of functions

through computers, deals with " the administrative support of production, as well as in marketing and distribution" (12:31). The departments examined included accounting, inventory control, sales, and production scheduling. The second independent variable applies directly to this thesis. Relationships between an independent variable (level of computer automation) and three dependent variables (structural differentiation, personnel components, and spans of control of supervisors) are measured using data obtained through interviews and questionnaires (12:22-24).

The results only partially support earlier research. For example, Whisler stated that computer use leads to a smaller number of hierarchical levels and a wider span of control on the lower supervisory level (111), while Withington felt an enlarged hierarchy with smaller spans of control was the inevitable result (115). Blau et al, note, "Contrary to Whisler's assumption...computer use tends to increase rather than decrease the number of administrative levels in the plant hierarchy" (12:32), depicted in Table seven, row 1. The results further indicate the introduction of MIS does narrow the span of control of chief executive officers, has little influence on division heads, widens the span of control of middle management (section heads), and narrows the span of control of first-line supervisors. Table seven summarizes:

Table 7. Blau's Measures of Association Between
Dimensions of Structure and Indices of Technology.

| DEPENDENT VARIABLE | TOTAL COMPUTER USE |
|---|---|
| Number of Hierarchical Levels | .27* |
| | |
| Span of Control | |
|    Chief Executive Officers | -.19* |
|    Division Heads | -.04 |
|    Section Heads | .23* |
|    First Line Supervisors (all) | -.22* |

* = significant at .05 level

(12:25)

The Blau et al. study was a major research effort to correlate computer usage and horizontal/vertical changes to organization structure. Although statistical analysis was heavily used, the study encouraged this thesis effort. Blau's results served as a basis of comparison with the results of this research.

The Bjorn-Anderson et al. Study. Another key research effort was a study by Bjorn-Anderson, Eason, and Robey entitled 'Managing Computer Impact: An International Study of Management and Organizations' (9). This study investigated eight organizations from Austria, Denmark, England, West Germany, and the United States. Described as a 'databased comparative case study' that looked at a 'variety of systems in a variety of settings' (93:679- 680), the project examined '...the impact of computer systems on individual managers and the management structure' (9:3).

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The research population was deliberately varied to insure external validity and generalization but common selection criteria were used to insure standardization of the research. The selection criteria were:

a. systems chosen were fully implemented for between one and two years.
b. systems all support managerial decision making and are not just transaction, data processing systems
c. impact of the system was felt across at least two functional areas of the organization. (93:680)

Data was collected through structured interviews and one self-completion questionnaire administered to a nonrandom sample of users representative of all department levels. Descriptive information about the computer system design process was obtained through unstructured interviews with developers.

The ideal research project would have consisted of extensive 'before' and 'after' analyses but this proved impractical. Therefore, the team was constrained to the assessment of change after the event (9:12). In order to properly assess this change, the individual team members

> realized the practical impossibility of conducting eight parallel longitudinal case studies, although that design would have most accurately identified when changes occurred. Rather, we asked respondents to think retrospectively about changes brought about by the introduction of the computer. (93:680)

To avoid pressure on the respondents to 'find something that has been changed,' the authors '...found it desirable that request about change be made in a less direct manner and embedded in questions of other types' (9:12).

The general approach to questioning avoided vague or socially acceptable answers via the following approach:

a. the respondent was asked to describe the existing situation (e.g., scope of task, amount of influence on decisions, channels of communication)
b. the respondent was asked how the computer system changed the situation
c. the respondent was asked to evaluate the change. (93:680-681)

No attempt was made to exclude changes caused by events other than MIS implementation. Given the constraints of the research, simple oral reports of change were relied upon mostly. The research team asked each respondent to specifically identify those changes resulting from MIS introduction.

The results of the study indicated little uniformity in the effect of organizational structure. The research found that:

a. Information systems do not cause structural changes in organizations.
b. Structural change may or may not accompany systems implementation.
c. When it does, the changes in structure appear as consistent companions to either rational management objectives, political strategies, or both. (93:686)

The authors felt there were 'several different organizational structures compatible with computer information systems' (93:686).

This thesis is, essentially, a partial-replication of the Bjorn-Anderson et al. study. The authors used the case study method to measure the impact of MIS on horizontal and vertical organizational structure. Data

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was gathered from unstructured interviews. The technical

aspects of the study were best summed up by Robey who wrote,

> Because of the nature of these data, no attempt is
> made to perform statistical analyses or to test
> hypothesis in the formal sense. We simply observed
> how the computer system affected formal structure.
> (93:681)

That philosophy permeates this thesis effort as well.


## MIS Impact on Military Organizations

The general approach to solving the research problem

was the case study. The research design was ex post

facto, which is defined by Emory as a design in which

investigators 'can only report what has happened or what

is happening' (43:60). The case study

> attempts to capture the reality of a particular
> environment at a point in time. A particular subject,
> group of subjects or organization is observed by the
> researcher without intervening in any way. No
> independent variables are manipulated, no control is
> exercised over intervening variables and no dependent
> variables are measured. (61:14-15)

The negative features of a case study include having low

external and internal validity, reliability, and

efficiency. It does, however, have a high degree of

naturalness, comprehensiveness, and behavior setting-

dependence (7:53, 61:10-11). Emory further notes that

'ex post facto design is widely used in business research

and often is the only approach feasible...The careful

researcher using the ex post facto design should approach

causal conclusions cautiously' (43:78). Therefore, this

thesis only assumes the perception of causal relationships.

The research by Bjorn-Anderson and others illustrates
an ideal environment for a case study and 'illustrates
primarily the use of comparative qualitative case study
methods' (93:680). This approach was described by Eason:

> The problems of obtaining a meaningful, quantitative
> assessment of user performance can be insurmountable
> and there is a simpler way of obtaining interesting
> and valuable data. Indeed, when the system is
> designed to enhance the way people work and identify
> new ways of operating, this can be a superior
> technique. This method is to seek the perception of
> users of the changes that have taken place in the way
> they work and their assessment of whether these
> changes have been beneficial or detrimental. (38:194)

In this thesis, the investigative questions did specify
quantifiable variables, but the information captured was
based merely on the respondent's perception of change.
Dutton and Kraemer also correlated perception of impact
and degree of computing in their study of local government
(37). Brannen noted perception is based on the managers
evaluation of '...how the MIS will impact the organi-
zational system' (17:235).

Many other 'causes' of structural change, such as
altered mission, could be affecting the environment.
However, as in the original Bjorn-Anderson and others
study, no attempt was made to isolate these other
'causes.' Simple oral reports or the user's perception of
change due to the effects of the MIS were gathered. (9)

Data for this research was obtained from three U. S.
Air Force organizations located on Wright-Patterson AFB,
Ohio. Resource constraints dictated that selected

organizations be located here.  Selection criteria were based on the original MIS requirements of Bjorn-Anderson and others:

a. Systems chosen were fully implemented for between one and two years
b. The impact of the systems was felt across at least two functional areas in the organization
c. The systems all supported managerial decision making; they are not clerical EDP systems. (93:680)

Organizations that have both military and DOD-civilian supervisors were considered.

Specific base organizations that met the selection criteria were determined through consultation with Communication/Computer Systems (SC) advisors.  These individuals were queried using the MIS Implementation Interview Guide: Systems Manager (Appendix B) to gather appropriate data on possible organizations for further investigation.  Once specific sites were determined, these individuals provided contacts and introductions. The specific sites, systems managers and office symbols, and management information systems were:

a) 2750 Civil Engineering Squadron -- Mr. James Dawson (2750 CES/DEI) -- Work Information Management System (WIMS).
b) 2750 Air Base Wing -- Mrs. Judith R. Cummins (2750ABW/IM) -- Base Headquarters Network System (BHANS).
c) Air Force Logistics Command Material Management -- Ms. Patty Moore (AFLC/MMIS) -- Material Management Office Information System (MMOIS).

Data came from on-site interviews using structured questioning procedures based on Bjorn-Anderson and

others' change-assessment guidelines (9). The researcher personally interviewed 88 military and civilian supervisors from a cross section of organizational levels, in the following distribution:

    a) 2750 CES:  27
    b) 2750 ABW:  32
    c) AFLC/MM:   29

Respondents were selected from operational, tactical, and strategic decision making levels of Davis and Olson's management information systems hierarchy (32:7). Emory's techniques for successful interviewing were utilized, including a prearranged questioning sequence, interview guide, and allowance for bias (43:164-169). Before/after organization charts were utilized if available.

As in the Bjorn-Anderson study, respondents were asked to 'think retrospectively about changes brought about by the introduction of the computer' (93:680). Respondents were queried on specifics through the following steps:

    a. The respondents were asked to describe the
       situation prior to implementation of the MIS.
       They were asked to specifically state how many
       individuals reported directly to them and how
       many hierarchical levels separated them from top
       decision makers and transaction processors.
    b. The respondents were asked to describe the
       existing situation, using the same types of
       questions as above.
    c. The respondents were asked how the computer
       system changed the situation.
    d. The respondents were asked to evaluate the
       change. (93:680)

The exact wording of the questions followed the MIS Implementation Interview Guide: Top-Level Management (Appendix C) or Mid-Level/First-Line Supervisors (Appendix D). These interview guides were constructed by the researcher from the sources mentioned at the beginning of this chapter. They specifically incorporated aspects of Van Fleet's research on span of management (106). Van Fleet points out the need for careful wording in order to achieve valid results. He notes, for example, the difference between the questions "How many people report directly to you?" and "How many people do you supervise?" Respondents could rationalize that "Only half a dozen people report directly to me but as Plant Manager, I supervise everyone in the plant" (106:547).

In the original study by Bjorn-Anderson and others, no attempt was made to perform statistical analyses or to test hypotheses in the formal sense because of the nature of the data. In fact, Robey pointed out, "we simply observed how the computer system affected formal structure" (93:681). This research replicated that effort by simply observing and reporting the effect, if any, of MIS on formal structures within military organizations.

## Conclusion

This thesis is, essentially, a partial-replication of the Bjorn-Anderson et al. study with aspects of other studies incorporated. Field interviews were conducted to determine the user's perception of MIS impact within their organization. The next chapter presents the results of these interviews.

# IV. Analysis of Findings

## Introduction

This chapter presents the results of the case study interviews. Although responses were varied, enough similarity existed to allow grouping of answers into clusters, thereby making it possible to discern patterns. Proportions of participants responding in a similar way will be reported and conclusions will be drawn from this.

The MIS background section will report specific information on each MIS; this information came from personal interviews with systems managers. Next, the results of common questions asked of top level management and mid level/ first line supervisors are examined. Interview questions that specifically answer the research questions stated in Chapter One are addressed. Finally, individual questions are discussed. Note: hereafter, top level management will be abbreviated TLM and mid level management/first line supervisors will be MLM/FLS.

## MIS Background Information

This section provides specific background information on the three individual MIS investigated. Systems managers were interviewed using the guide found in Appendix A and appropriate documentation was examined.

The original selection criteria were not satisfied. The first criterion, fully implemented for between one and

two years, proved slightly difficult; WIMS is three years old, as is the present form of BHAN. Only MMOIS, implemented in 1987, met the timetable. All three MIS met the second criterion, system impact felt across at least two functional areas in the organization. The third criterion, supported managerial decision making (not clerical EDP systems), proved most difficult. All three MIS have the capability to provide decision support to management, but this function was not often used to full advantage by all management levels. A majority of participants use their respective MIS for both regular and ad hoc reporting (tables 24 and 25). However, the largest use of MIS was for electronic mail (table 14) with little report-oriented, decision-making functions utilized.

This is due, in large part, to training. Managers appeared to be aware of capabilities of their respective MIS but did not make use of available tools unless they were shown specific applications; there was little evidence of 'playing with the computer.'

Work Information Management System (WIMS). WIMS was originally introduced into the 2750 Civil Engineering Squadron in 1983 in an abbreviated version, replacing another automated system. The system in its present form was installed in 1986. WIMS is found in all eight branches of the organization with the two heaviest users (as defined by the systems manager) being the

Requirements and Logistics sections. There are 500+ access users but the systems manager estimated 100-150 regular users. Access to WIMS is somewhat limited (table 11) yet usage is fairly heavy, particularly among MLM/FLS (table 13). WIMS showed the highest number of interactions per workday among TLM (table 12) and the highest usage of reporting functions among MLM/FLS (table 14).

WIMS is a menu-driven MIS that appears to be 'user-friendly,' requiring a minimum of keystrokes. An example of a main menu for the Base Civil Engineer is found in Appendix F. Basic office automation features, such as word processing, electronic mail, calendar, and phonebook functions are available. In addition, a database is used to track current operations, future projects, and personnel data. Users can access such items as job order/work order information, vehicle data, and leave/TDY status through a report format. Appendix G is a sample of an emergency job order report. WIMS helps expedite a workload of 150 - 200 job/work orders per day.

Base Headquarters Automated Network (BHAN). BHAN was originally introduced into the 2750 Air Base Wing in 1984 in a scaled-down version, replacing a manual system. The BHAN system evolved into its present form by 1986, but is constantly adding more functions and users. At present, there are 350+ users found in nearly all divisions.

BHAN is defined by the systems manager as a wide-area network primarily for office automation. It appears to be a popular system with unlimited access and constant usage (tables 11-13) and high ratings for 'usefulness' and 'time- savings' (tables 20-23). BHAN includes a myriad of features, such as word processing, electronic mail, calendar, spread sheet, graphics, and a limited database. Appendix H is a sample of an equipment inventory roster.

Material Management Office Information System (MMOIS). MMOIS for HQ AFLC/Material Management first appeared as a prototype in 1985 and reached its present format in 1987. Six of 13 departments of the organization have access to MMOIS; approximately 400+ users.

MMOIS tracks project status, such as milestones planned and completed, and provides this information to management in report format. The reporting features of MMOIS, both regular and ad hoc, were utilized most (tables 24-25). Appendix I is a sample template of one format used for the reporting function. MMOIS also functions as an office automation system, featuring electronic mail, suspense tracking, and phone rosters. MMOIS has spreadsheet and graphics capability.

## Responses to Common Questions

This section summarizes answers to common questions asked both levels of participants. There were a total of 88 participants in this research in the following mix:

Table 8. Number and Level of Participants

| LEVEL | WIMS | BHAN | MMOIS | TOTAL |
|-------|------|------|-------|-------|
| TLM | 4 (4.6%) | 11 (12.5%) | 7 (7.9%) | 22 (25.0%) |
| MLM/FLS | 23 (26.1%) | 21 (23.9%) | 22 (25.0%) | 66 (75.0%) |
| TOTAL | 27 (30.7%) | 32 (36.4%) | 29 (32.9%) | 88 (100%) |

Background Information on Participants. Specific demographic information (job title, job description, length of time on job and in organization) was gathered.

TLM consisted of senior level executives, such as Vice Wing Commander, Comptroller, Deputy Civil Engineer, Director of Personnel, and Base Information Manager. Job descriptions consisted of general responsibility for a particular unit of an organization. Composition of the MLM/FLS group was varied, including such job titles as Unit Foreman, Division/Section/Branch Chiefs, and First Sergeant. Job description focused on specific responsibility for a particular sub-unit within an organization. Assignment times are summarized as follows:

Table 9. Average Length of Time on Job
in Years - (Number of Civilians/Military)

| LEVEL | WIMS | BHAN | MMOIS | TOTAL |
|-------|------|------|-------|-------|
| TLM | 5.3 (3/1) | 1.9 (7/4) | 1.5 (5/2) | 2.9 (15/7) |
| MLM/FLS | 2.3 (21/2) | 3.4 (16/5) | 2.0 (20/2) | 2.5 (57/9) |

Table 10. Average Length of Time in Organization
in Years - (Number of Civilians/Military)

| LEVEL | WIMS | BHAN | MMOIS | TOTAL |
|-------|------|------|-------|-------|
| TLM | 17.2 (3/1) | 5.0 (7/4) | 7.3 (5/2) | 9.8 (15/7) |
| MLM/FLS | 9.4 (21/2) | 6.4 (16/5) | 9.4 (20/2) | 8.4 (57/9) |

The average length of time is unusually long for military organizations due to the high percentage of civilians within each organization (15 of 22 or 68.2% of TLM and 57 of 66 or 86.7% of MLM/FLS). For example, one top level manager has held the same job since 1973.

Please describe your access to the MIS. For example, is it very restrictive or unlimited? How often do you use the MIS? The purpose of the two questions was to get a general impression of the participant's accessibility to and use of the MIS. Answers generally fell into three categories: unlimited access, limited or shared access, and never use the MIS. Access is summarized as follows

### Table 11. Access to the MIS

| LEVEL/RATING | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| TLM (UNLIMITED) | 3 | 11 | 5 | 19 |
| TLM (LIMITED) | 0 | 0 | 2 | 2 |
| TLM (NOT USED) | 1 | 0 | 0 | 1 |
| TOTAL | 4 | 11 | 7 | 22 |
| MLM/FLS (UNLIMITED) | 8 | 17 | 22 | 47 |
| MLM/FLS (LIMITED) | 12 | 3 | 0 | 15 |
| MLM/FLS (NOT USED) | 3 | 1 | 0 | 4 |
| TOTAL | 23 | 21 | 22 | 66 |

All three MIS appear to be accessible to both levels, the only exception being the limited access of WIMS to MLM/FLS. 19 of the TLM participants (86.4%) said they had unlimited access with a terminal on their desk, 2 (9.1%) described access as limited, and 1 (4.5%) never used it. Within the MLM/FLS group, 47 (71.2%) said they had unlimited access, 15 (22.7%) described access as limited, and 4 (6.1%) never used the MIS.

Some participants described their MIS usage in terms of numbers of interactions per workday, summarized below:

### Table 12. Average Number of Interactions per Workday

| LEVEL | WIMS | BHAN | MMOIS | MEAN |
|---|---|---|---|---|
| TLM | 12.0 | 7.5 | 5.0 | 8.1 |
| MLM/FLS | 6.4 | 9.8 | 4.8 | 7.0 |

Amount of usage ranged from 'continuously' to 'never use it.' Usage of the MIS is summarized as follows:

Table 13.  Use of the MIS

| LEVEL/RATING | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| TLM (CONSTANTLY) | 1 | 11 | 5 | 17 |
| TLM (RARELY) | 2 | 0 | 2 | 4 |
| TLM (NOT USED) | 1 | 0 | 0 | 1 |
| ----- | ----- | ----- | ----- | ----- |
| TOTAL | 4 | 11 | 7 | 22 |
| | | | | |
| MLM/FLS (CONSTANTLY) | 16 | 20 | 21 | 57 |
| MLM/FLS (RARELY) | 4 | 0 | 1 | 5 |
| MLM/FLS (NOT USED) | 3 | 1 | 0 | 4 |
| ----- | ----- | ----- | ----- | ----- |
| TOTAL | 23 | 21 | 22 | 66 |

All three MIS are being utilized.  17 TLM (77.3%) and 57 MLM/FLS (86.4%) constantly use the MIS (i.e. on a daily basis); 4 TLM (18.2%) and 5 MLM/FLS (7.6%) rarely use it (weekly/monthly basis); only 1 TLM (4.5%) and 4 MLM/FLS (6.1%) never use the MIS.

The average number of interactions on WIMS was well above the mean for TLM, but well below the mean for MLM/FLS.  This relates to the access data in Table 11: less access usually means less numbers of interactions. WIMS appears to be used less constantly than the others, while BHAN is the most heavily used MIS on both levels.

What sort of things do you use the MIS for?  The
results of this question provided a list of tasks for
which the MIS was used.

Table 14.  Functional Usage for the MIS

| FUNCTION LEVEL | WIMS | BHAN | MMOIS | NUMBER/PERCENT of TOTAL |
|---|---|---|---|---|
| **Electronic Mail** | | | | |
| TLM | 2 | 11 | 7 | 20/90.9% |
| MLM/FLS | 9 | 22 | 7 | 53/80.3% |
| | | | | |
| **Word Processing** | | | | |
| TLM | 1 | 6 | 2 | 9/40.9% |
| MLM/FLS | 12 | 12 | 6 | 30/45.5% |
| | | | | |
| **Status Reports** | | | | |
| TLM | 4 | 0 | 0 | 4/18.2% |
| MLM/FLS | 22 | 7 | 1 | 30/45.5% |
| | | | | |
| **Calendar** | | | | |
| TLM | 0 | 3 | 0 | 3/13.6% |
| MLM/FLS | 1 | 4 | 3 | 8/12.1% |
| | | | | |
| **Suspense D-Base** | | | | |
| TLM | 0 | 0 | 1 | 1/ 4.5% |
| MLM/FLS | 7 | 0 | 0 | 7/10.6% |
| | | | | |
| **Spreadsheet** | | | | |
| TLM | 0 | 0 | 1 | 1/ 4.5% |
| MLM/FLS | 1 | 1 | 3 | 5/ 7.6% |
| | | | | |
| **Graphics** | | | | |
| TLM | 0 | 0 | 1 | 1/ 4.5% |
| MLM/FLS | 3 | 0 | 2 | 5/ 7.6% |
| | | | | |
| **Daily Reminder** | | | | |
| TLM | 0 | 1 | 0 | 1/ 4.5% |
| MLM/FLS | 0 | 0 | 1 | 1/ 1.5% |
| | | | | |
| **Requisitions** | | | | |
| TLM | 0 | 0 | 0 | N/A |
| MLM/FLS | 3 | 0 | 0 | 3/ 4.5% |
| | | | | |
| **Phone Listings** | | | | |
| TLM | 0 | 0 | 0 | N/A |
| MLM/FLS | 1 | 0 | 0 | 1/ 1.5% |

The researcher was very careful to keep this question open-ended, i.e. "prompting" of participants as to their usage of the MIS was kept to a minimum. Note: participants listed more than one function. The most common entries among TLM were electronic mail and word processing. Decision making data (such as status reports and spreadsheets) were being utilized more on the MLM/FLS level than by TLM. Note that nearly all WIMS users on both levels used status reports.

Data in this table relates to the third selection criterion; with the exception of WIMS, MIS usage for reporting functions was minimal. Message traffic was the predominant usage. In many ways, all three MIS were nothing more than message-passers.

Do you feel you have the knowledge of how the MIS operates which allows you to accomplish your job? This question was incorporated into the research primarily at the request of the sponsoring agencies. They were eager to determine the level of user's knowledge for the identification of weak areas and design of future training. Answers generally fell into three categories: high degree of knowledge, sufficient degree, and insufficient or nonexistent degree of knowledge:

### Table 15. Level of Knowledge

| LEVFL/RATING | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| TLM (HIGH) | 0 | 10 | 6 | 16 |
| TLM (SUFFICIENT) | 3 | 1 | 1 | 5 |
| TLM (INSUFF/NON) | 1 | 0 | 0 | 1 |
| TOTAL | 4 | 11 | 7 | 22 |
| MLM/FLS (HIGH) | 7 | 14 | 14 | 35 |
| MLM/FLS (SUFFICIENT) | 14 | 7 | 6 | 27 |
| MLM/FLS (INSUFF/NON) | 2 | 0 | 2 | 4 |
| TOTAL | 23 | 21 | 22 | 66 |

TLM had a high degree of job knowledge among 16

participants (72.7%). 5 (22.8%) felt they had sufficient

knowledge, with only 1 (4.5%) describing it as insufficient

or nonexistent. The results were different on the MLM/FLS

level. 35 participants (53.0%), felt they had high

knowledge, 27 (40.9%) termed it sufficient, while 4 (6.1%)

felt their knowledge was insufficient or nonexistent.

The overall level of knowledge of WIMS appears to be the

lowest of the three MIS; this is particularly evident

among TLM. BHAN and MMOIS users indicated high levels of

knowledge.

However, even those that commented favorably did say

that training was only sufficient for what they needed to

know immediately; they didn't feel familiar enough with

the MIS to 'play with it' and expand their utilization.

Have you been a user of other similar, computerized management information systems? If so, was it in this organization? If so, then compared to the best such other system, how would you rate this system? These questions, as well as the two that follow regarding usefulness and time-saving qualities of the MIS, were designed to provide a general impression of the user's feelings and perceptions towards the MIS. They seemed to help 'break the ice' and relax the participant while providing information of value.

Table 16.  Use of Similar MIS (TLM)

| LEVEL/RESPONSE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| TLM (YFS) | 3 | 6 | 4 | 13 |
| TLM (NO) . | 1 | 5 | 3 | 9 |
| TOTAL | 4 | 11 | 7 | 22 |

Table 17.  Use of Similar MIS (MLM/FLS)

| LEVEL/RESPONSE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| MLM/FLS (YES) | 8 | 8 | 6 | 22 |
| MLM/FLS (NO) | 15 | 13 | 16 | 44 |
| TOTAL | 23 | 21 | 22 | 66 |

13 of the TLM participants (59.1%) used a similar system. Of those 13, 6 (46.2%) of the systems were in the same organization.

In contrast, only 22 of the MLM/FLS (33.3%) used a similar system. Of those 22 individuals responding positively, 12 (54.5%) of the systems were in the same organization while 10 (45.5%) were different.

The experience level on a similar MIS is highest among WIMS TLM. All users on the MLM/FLS level lacked experience with similar systems by nearly a two to one margin.

Table 18.  Ratings of Similar MIS (TLM)
Per Organization (n = 13)

| much worse [ | 1 | 2 | 3 | 4 | 5 | ] much better |
|---|---|---|---|---|---|---|
| WIMS (n=3) Mean = 3.0 | 0 | 1 | 1 | 1 | 0 | |
| BHAN (n=6) Mean = 3.5 | 0 | 0 | 4 | 1 | 1 | |
| MMOIS (n=4) Mean = 2.5 | 0 | 2 | 2 | 0 | 0 | |

Overall Mean = 3.1

Table 19.  Ratings of Similar MIS (MLM/FLS)
Per Organization (n = 22)

| much worse [ | 1 | 2 | 3 | 4 | 5 | ] much better |
|---|---|---|---|---|---|---|
| WIMS (n=8) Mean = 2.8 | 0 | 3 | 3 | 2 | 0 | |
| BHAN (n=8) Mean = 3.4 | 0 | 0 | 6 | 1 | 1 | |
| MMOIS (n=6) Mean = 3.5 | 0 | 0 | 3 | 3 | 0 | |

Overall Mean = 3.2

Overall, users of previous systems rated the current
MIS as about the same as previous systems, BHAN users
rated BHAN slightly better than previous systems, and WIMS/
MMOIS users rated their MIS about the same.

How would you finish the following statements:

[A]  I feel the MIS:


### Table 20.  Usefulness Rating (TLM)
### Per Organization

| is of very little real use | [ | 1 | 2 | 3 | 4 | 5 | ] | is very useful |
|---|---|---|---|---|---|---|---|---|
| WIMS (n=4) Mean = 2.5 | | 1 | 1 | 1 | 1 | 0 | | |
| BHAN (n=11) Mean = 4.2 | | 0 | 1 | 2 | 2 | 6 | | |
| MMOIS (n=7) Mean = 3.5 | | 0 | 2 | 1 | 3 | 1 | | |

Overall Mean = 3.6


### Table 21.  Usefulness Rating (MLM/FLS)
### Per Organization

| is of very little real use | [ | 1 | 2 | 3 | 4 | 5 | ] | is very useful |
|---|---|---|---|---|---|---|---|---|
| WIMS (n=23) Mean = 3.6 | | 2 | 1 | 8 | 5 | 7 | | |
| BHAN (n=21) Mean = 4.1 | | 0 | 1 | 4 | 8 | 8 | | |
| MMOIS (n=22) Mean = 3.4 | | 0 | 5 | 7 | 6 | 4 | | |

Overall Mean = 3.7

[B] I feel the MIS

### Table 22. Time-Saving Rating (TLM)
### Per Organization

| costs me additional time | [ | 1 | 2 | 3 | 4 | 5 | ] | saves me time |
|---|---|---|---|---|---|---|---|---|
| WIMS (n=4)<br>Mean = 2.5 | | 1 | 0 | 3 | 0 | 0 | | |
| BHAN (n=11)<br>Mean = 4.3 | | 0 | 0 | 1 | 6 | 4 | | |
| MMOIS (n=7)<br>Mean = 3.6 | | 0 | 2 | 1 | 2 | 2 | | |

Overall Mean = 3.7

### Table 23. Time Saving Rating (MLM/FLS)
### Per Organization

| costs me additional time | [ | 1 | 2 | 3 | 4 | 5 | ] | saves me time |
|---|---|---|---|---|---|---|---|---|
| WIMS (n=23)<br>Mean = 4.0 | | 1 | 1 | 5 | 6 | 10 | | |
| BHAN (n=21)<br>Mean = 4.0 | | 0 | 0 | 7 | 7 | 7 | | |
| AMOIS (n=22)<br>Mean = 3.5 | | 0 | 3 | 8 | 7 | 4 | | |

Overall Mean = 3.8

This data shows fairly high user opinions of all three MIS in terms of usefulness and time-savings, the only exception being WIMS TLM who rated their MIS low for both criteria. Overall, 59.1% of TLM rated the MIS '4' or '5'

73

on usefulness and 63.7% of TLM rated the MIS '4' or '5' on time-savings.  Overall, 57.6% of MLM/FLS rated the MIS '4' or '5' on usefulness and 63.5% of MLM/FLS rated the MIS '4' or '5' on time-savings.

Do you receive regular routine outputs from the MIS, as required by your job?  If so, how often?  Would it be possible to get copies of these?  This question is a follow-up to the earlier query regarding MIS usage.  The purpose of this question is to determine the extent to which management uses screen displays from the MIS as a regular source of data in the context of their job.  Some respondents enthusiastically accept the 'paperless office' while others cling to hard copy reports received via the morning mail.  (Hard copy reports were not counted as routine outputs).

Table 24.  Receipt of Regular Reports

| LEVEL/RESPONSE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| TLM (YES) | 3 | 8 | 4 | 15 |
| TLM (NO) | 1 | 3 | 3 | 7 |
| TOTAL | 4 | 11 | 7 | 22 |
| MLM/FLS (YES) | 19 | 14 | 14 | 47 |
| MLM/FLS (NO) | 4 | 7 | 8 | 19 |
| TOTAL | 23 | 21 | 22 | 66 |

The majority of users appeared to use MIS for regular reporting functions, although not in overwhelming numbers. Among the TLM group, 15 (68.2%) regularly receive routine reports, such as those found in appendix G. Among the MLM/FLS group, 47 participants (71.2%) regularly receive routine reports such as the those found in appendix H.

Users of the WIMS appear to utilize its regular reporting features more than the other two systems. This relates to the functional usage data in Table 14, which showed high usage of status reports among WIMS users. Reception of regular reports varied among users; typical frequency was either a daily or weekly basis. However, paperless transmission of data is still not a complete reality for regular operations.

Do you voluntarily request and receive any optional, ad hoc, reports or special features of the MIS for your job? If so, how often? Would it be possible to get copies of these? This series of question is similar to the previous group of questions but focused on the MIS as an irregular source of data. Many respondents used ad hoc reports to answer 'short suspenses' on an 'as needed' basis.

Table 25. Receipt of Ad Hoc Reports

| LEVEL/RESPONSE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| TLM (YES) | 3 | 9 | 4 | 16 |
| TLM (NO) | 1 | 2 | 3 | 6 |
| TOTAL | 4 | 11 | 7 | 22 |
| MLM/FLS (YES) | 19 | 20 | 20 | 59 |
| MLM/FLS (NO) | 4 | 1 | 2 | 7 |
| TOTAL | 23 | 21 | 22 | 66 |

Ad hoc reporting seems more popular with all three MIS, especially among the MLM/FLS group. Among the TLM group, 16 participants (72.7%) received ad hoc reports, such as appendix I. Among the MLM/FLS group, 59 participants (89.4%) used the MIS for ad hoc reporting. Frequency of reception of ad hoc reports varied almost to the individual participant, and ranged from several times per month to several times per hour. There is very little differentiation among all three MIS.

The nature of the decision might explain this. An ad hoc query typically supports a response of the organization's management to a highly political query, (frequently a complaint). In order to provide his/her commander with an immediate answer, the manager needs instant status information and relies on the MIS. This time pressure is not felt with day-to-day operations.

As previously mentioned, these results seem to show that reporting is a large function of MIS. Yet, the data in table 14 contradicts this. The only explanation this researcher can give is that users, when directly asked about reporting functions, reply in the affirmative. However, when asked general questions regarding MIS usage, (and with no 'prompting' by the interviewer), users fail to think of reports as a critical function of their MIS.

## Conclusions to Common Questions

This section provided data on responses to common questions asked both levels of participants. BHAN and MMOIS showed nearly identical data. Both systems are popular and widely used, predominately *for message traffic*. Users of both systems give high ratings for usefulness and time-savings ability. MMOIS utilizes spreadsheets and graphics to a higher degree.

This research indicates BHAN is being utilized primarily as an electronic mail/word processing system. Many of its 'decision-making' functions are not being used to the fullest degree. The impressions this researcher drew from personal observations were that BHAN users truly liked the system and saw its advantage as a communications tool. Many participants said they wanted for terminals for all their subordinates, as well as data-communications links to other systems (such as WIMS). Perhaps the most common criticism was lack of training. Users seem to be

aware of the potential of MIS but do not know how to tap it. Until that happens, BHAN will remain simply an excellent electronic mail system.

MMOIS users have expanded usage of different functions but are hampered slightly by lack of knowledge and experience. MMOIS is facing an unusual situation. AFLC/ Material Management is a highly volatile organization that has gone through several recent restructurings. It is the observation of this researcher that the organization lacks a corporate identity; some individuals changed job titles so frequently, they had trouble telling me their present one. Until the organization stabilizes, the impact of MIS implementation will be hard to measure.

In the opinion of this researcher, both organizations would improve the overall efficiency of their MIS if more and better training were available.

Of the three systems, WIMS proved the most unique. WIMS has high access (table 11), high average number of interactions (table 12), and high utilization of reporting functions (tables 14, 24, & 25) among top level managers. However, overall usage (table 13) was down and usefulness & time-savings ratings (tables 20 & 22) were low. Among MLM/FLS, access is limited (table 11), yet overall usage was up (table 13) and usefulness & time-savings were high (tables 21 & 23). It appears that the more user access, the less overall usage with lower user opinions.

In addition, users indicated high experience on similar systems (table 16), yet rated their knowledge of WIMS low (table 15). Despite access and training problems, WIMS users on both levels do utilize many decision-making functions. Therefore, WIMS users are highly experienced computer users who do not know their own MIS. Additional user training seems to be needed in order to allow a system that is both available and popular to reach its full potential.

## Response to Research Questions

The next series of questions were designed specifically to meet the research objectives proposed in chapter one. These questions were asked of both levels of management with a slight change in wording between the two. Side-by-side comparison between TLM and MLM/FLS is possible.

The term span of control means the number of subordinates who report directly to any one supervisor. In those organizational units to which the MIS has been applied, has the average supervisory span of control changed in any way? Please identify the affected units and tell me if the average span of control has increased, decreased, or remained unchanged. The purpose of this question is to answer research question one:

> In measuring the effect of MIS on military organization structure, has there been a perceived increase or decrease in supervisory span of control, according to the perceptions of military or Department of Defense (DOD) civilian supervisors, following implementation. If so, by how many individuals?

This question examines the horizontal dimensions of the organization and was designed to detect span of control changes in units throughout the organization. The question (worded in this form) was asked only of top level managers due to their wider area of responsibility. It asks them to consider the average span of control of units throughout their domain and comment on perceived changes; results can be compared with lower levels responses.

Table 26.  Change in Average Span of Control (TLM)

| RESPONSE/TYPE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| YES/INCREASE | 2 | 8 | 6 | 16 |
| YES/DECREASE | 0 | 0 | 0 | 0 |
| NO | 2 | 3 | 1 | 6 |
| ------------------------------------------------- | | | | |
| TOTAL | 4 | 11 | 7 | 22 |

Of the 22 TLM participants, 16 (72.7%) indicated there had been a change (an increase) in the average span of control of units within their area of responsibility. In terms of ratio, the change was most noticeable among MMOIS users, followed closely by BHAN users.  WIMS users were evenly divided over any perceptions of change to span.

If there was a change, how much of the change do you attribute to the implementation of the MIS?  The ratings of the 16 positive participants are as follows:

Table 27.  Ratings of MIS Impact (TLM)
Span of Control - By Organization

| change was not caused by MIS | | | | | change was all caused by MIS | |
|---|---|---|---|---|---|---|
| [ | 1 | 2 | 3 | 4 | 5 | ] |
| WIMS (n=2) Mean = 5 | 0 | 0 | 0 | 0 | 2 | |
| BHAN (n=8) Mean = 3 | 1 | 1 | 4 | 1 | 1 | |
| MMOIS (n=6) Mean = 1.5 | 3 | 2 | 1 | 0 | 0 | |

Overall Mean = 2.7

Overall, participants who indicated a change in average span of control remained non-committal regarding MIS impact. More MMOIS users indicated an increase in average span of control than users of the other MIS, yet they rated MIS impact as negligible. WIMS users felt the increase was completely due to WIMS and BHAN users were evenly divided on the question.

A formal change to span of control is defined as an actual change to the number of subordinates who report directly to any one supervisor. An informal change is a perception on the part of a supervisor that his/her control has changed. Of the 16 that answered positively to a change, 8 (50%) indicated a formal change in span of control while 8 (50%) felt the change was only informal.

Have you perceived any changes in your span of control since the implementation of the MIS? By this I mean has the number of people who report directly to you increased, decreased, or remained unchanged? This question, asked of top level managers, is the follow-up to the previous one. It asks participants to consider their personal span of control, i.e. the number of individuals who directly report to them. Their responses are:

Table 28.  Change in Personal Span of Control (TLM)

| RESPONSE/TYPE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| YES/INCREASE | 0 | 4 | 1 | 5 |
| YES/DECREASE | 0 | 1 | 0 | 1 |
| NO | 4 | 6 | 6 | 16 |
| ------------- | ---- | ---- | ----- | ----- |
| TOTAL | 4 | 11 | 7 | 22 |

16 of 22 participants (72.7%) indicated no change in their personal span of control.  In terms of ratio, the absence of change was most noticeable among WIMS users, followed by MMOIS.  BHAN users were evenly divided over span of control changes.

Note:  Due to an oversight by the researcher, TLM was not asked to attribute any perceived changes to personal span of control to MIS implementation.  This is unfortunate since it would have allowed a side-by-side comparison of responses.

Summary.  The data found in tables 26 - 28 show that a majority of TLM participants (72.7%) feel there have been span of control increases among units within their area of responsibility.  However, the identical percentage feels their personal span hasn't changed, the only exception being BHAN users.  Most participants do not feel the changes were caused by the MIS, with the exception of two WIMS users who attribute changes entirely to WIMS.

The fact that few TLM perceived change in their personal span of control may be due the bureaucratic

nature of the environment.  In military organizations,
formal reporting relationships remain stable for long
periods of time, changing only as a result of infrequent
organizational restructuring.  However, budget cuts and a
'do more with less' atmosphere has led to the following
comments:

- 'Hasn't had a direct impact but lets the survivors
  keep up with the job.'

- 'Hasn't changed things but has the potential to make
  span wider.'

Some BHAN users did indicate increases in both average and
personal span of control, while MMOIS users saw a change
only in average span.  Both organizations saw little
relation between changes and MIS implementation. BHAN and
MMOIS are little more than communications tools whose
existence does not appear to affect organizational
structure.

WIMS users did indicate that average span of control
changes were caused by the MIS.  This may be due, in part,
to the level of sophistication of systems usage.  Earlier
research data showed that WIMS goes beyond message passing
and provides significant decision making information.
WIMS users see more potential in their MIS.

Have you perceived any changes in your span of
control since the implementation of the MIS? By this I
mean has the number of people who report directly to you
increased, decreased, or remained unchanged? This
question asked mid level managers and first line
supervisors to consider their personal span of control and
comment on any perceived changes.

Table 29. Changes in Personal Span of Control (MLM/FLS)

| RESPONSE/TYPE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| YES/INCREASE | 11 | 10 | 11 | 32 |
| YES/DECREASE | 6 | 0 | 5 | 11 |
| NO | 6 | 11 | 6 | 23 |
| --- | --- | --- | --- | --- |
| TOTAL | 23 | 21 | 22 | 66 |

Of the 66 MLM/FLS participants, 43 (65.2%) indicated
there had been a change in personal span of control. This
figure can be compared to TLM's perception that 72.7% of
their units had a change in span of control (table 26).
Of the 43 that answered positively to a change, 32 (74.4%)
indicated there had been an increase in in span of
control.

Changes in personal span of control were perceived by
MMOIS users (as TLM did indicate) and WIMS users (as TLM
did not indicate). But, the majority of BHAN users
reported no change, despite TLM opinions to the contrary.

If there was a change, how much of the change do you attribute to the implementation of the MIS? The ratings of the 43 positive participants are as follows: (n=43)

Table 30. Ratings of MIS Impact (MLM/FLS)
Span of Control - By Organization

| change was not caused by MIS | | | | | change was all caused by MIS | |
|---|---|---|---|---|---|---|
| [ | 1 | 2 | 3 | 4 | 5 | ] |
| WIMS (n=17) | 10 | 0 | 3 | 0 | 4 | |
| Mean = 2.3 | | | | | | |
| BHAN (n=10) | 6 | 0 | 1 | 2 | 1 | |
| Mean = 2.2 | | | | | | |
| MMOIS (n=16) | 11 | 1 | 2 | 2 | 0 | |
| Mean = 1.7 | | | | | | |

Overall Mean = 2.1

Overall, participants who indicated a change in personal span of control showed a tendency to negate MIS impact. The large number of MMOIS users reporting changes to their personal span of control felt such changes were not due to MMOIS. Both WIMS and BHAN users gave results that show an unusual pattern, but indicate MIS impact is not major.

Summary. The data in tables 29 -30 shows that a majority of MLM/FLS participants (65.2%) feel their personal span of control has changed. There is evidence of both increases and decreases in span of control. Earlier data from TLM indicated a large number of users

reported changes in average span of control among units within their area of responsibility, with minimal MIS impact (tables 26 & 27). This was supported by the large number of MLM/FLS who did report changes in personal span of control and minimal MIS impact. Note that MLM/FLS did report a higher number of span of control decreases than anticipated by TLM. These results show the perceptions of MLM/FLS and the perceptions of TLM regarding MLM/FLS are similar.

Users of MMOIS seem to have a clear perception of the impact of MMOIS on their organizational structures. TLM's perception of MIS impact seemed to agree with MLM/FLS's perception.

Results were different in the other two organizations. Among WIMS users, comparisons show that some TLM indicated change in average span of control with high MIS impact. MLM/FLS's results showed a majority of users perceived changes in average span of control (both increases and decreases) with minimal MIS impact. Among BHAN users, a majority of TLM indicated change in average span of control, yet much less MLM/FLS reported, with minimal MIS impact.

This data shows an existence of distorted perceptions regarding organizational structure. Some MIS users tend to either underrate or overrate the impact of MIS on their organizations.

The term vertical complexity means the number of hierarchical levels between a supervisor and other members of his/her organizational hierarchy. In those organizational units to which the MIS has been applied, has the vertical complexity changed in any way? Please identify the affected units and tell me if the vertical complexity has increased, decreased, or remained unchanged. The purpose of this question is to answer research question two:

> In measuring the effect of MIS on military organization structure, has there been a perceived increase or decrease in vertical complexity within the military organization structure, according to the perceptions of military or Department of Defense (DOD) civilian supervisors, following implementation. If so, by how many individuals?

This question was designed to detect vertical complexity changes in units throughout the organization. This question (worded in this form) was also asked only of top level managers because of their wider area of responsibility. It asks them to consider vertical complexity of units throughout their domain and comment on perceived changes. Results can be compared with responses from lower levels.

Table 31. Change in Average Vertical Complexity (TLM)

| RESPONSE/TYPE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| YES/INCREASE | 0 | 0 | 0 | 0 |
| YES/DECREASE | 1 | 4 | 6 | 11 |
| NO | 3 | 7 | 1 | 11 |
| TOTAL | 4 | 11 | 7 | 22 |

Of the 22 TLM participants, 11 (50.0%) indicated there had been a change in average vertical complexity of units within their area of responsibility. In terms of ratio, the change was most noticeable among MMOIS users while the majority of BHAN and WIMS users reported no change. All of the 11 that answered positively to a change indicated there had been a decrease in vertical complexity.

If there was a change, how much of the change do you attribute to the implementation of the MIS? The ratings of the 11 positive participants are as follows: (n=11)

Table 32. Ratings of MIS Impact (TLM)
Vertical Complexity - By Organization

| change was not caused by MIS | | | | | change was all caused by MIS | |
|---|---|---|---|---|---|---|
| [ | 1 | 2 | 3 | 4 | 5 | ] |
| WIMS (n=1) Mean = 5.0 | 0 | 0 | 0 | 0 | 1 | |
| BHAN (n=4) Mean = 3.2 | 0 | 0 | 3 | 1 | 0 | |
| MMOIS (n=6) Mean = 2.2 | 2 | 2 | 1 | 1 | 0 | |

Overall Mean = 2.8

Overall, participants who indicated a change in average vertical complexity remained non-committal regarding MIS impact. The largest percentage of users reporting a

decrease was MMOIS users, yet they rated MIS impact as negligible. The sole WIMS user felt the decrease to his/her vertical complexity was all caused by WIMS. BHAN users were generally neutral.

A formal change to vertical complexity is defined as an actual change to the number of management levels in the hierarchy of authority. An informal change is a perception on the part of the manager that the organizational hierarchy has grown or shrunk. Of the 11 that answered positively to a change, 5 (45.5%) indicated there had been a formal change in vertical complexity while 6 (54.5%) felt the change was only informal.

Have you perceived any changes in the vertical complexity of your organization since the implementation of the MIS? By this I mean are there more levels between you and lower levels? This question, asked of top level managers, was the follow-up to the previous one. It asks participants to consider personal vertical complexity, i.e. the number of layers of management between them and the lowest levels. Their responses are as follows:

Table 33. Change in Personal Vertical Complexity (TLM)

| RESPONSE/TYPE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| YES/INCREASE | 0 | 0 | 1 | 1 |
| YES/DECREASE | 0 | 3 | 0 | 3 |
| NO | 4 | 8 | 6 | 18 |
| TOTAL | 4 | 11 | 7 | 22 |

18 of the 22 participants (81.8%) felt there had been no change in their personal vertical complexity. Only BHAN users identified a decrease. Note: Due to an oversight by the researcher, TLM did not attribute perceived changes to personal vertical complexity to MIS implementation.

Summary. Overall perceptions of changes in vertical complexity were not strongly evident among TLM, although both BHAN and MMOIS users identified decreases in the vertical complexity of subordinate units (table 31). A large percentage of MMOIS users saw decreases but did not attribute them to the MIS. Some BHAN users reported decrease in personal span of control, but few WIMS users perceived changes in either personal or average vertical complexity. The few users that did identify changes were divided as to MIS impact.

This may be due to the fact that changes to vertical complexity are more difficult to perceive in a military environment. The bureaucratic structure tends to stabilize formal hierarchy so that, with few exceptions, the military 'chain-of-command' is closely adhered to.

TLM users of MMOIS and BHAN did report decreases to average vertical complexity of units within their area of responsibility. Comments included:

- 'Does tend to break down barriers of chain of command.'

- 'In years past, couldn't get information from lower levels to the top. Now, get unfiltered information. This is both good and bad.'

Have you perceived any changes in the vertical

complexity of your organization since the implementation

of the MIS?  By this I mean are there more levels between

you and lower levels?  This question, asked only of mid

level managers and first line supervisors, was the

follow-up to the previous one. It asks participants to

consider the vertical complexity of the organization which

directly affects them, and comment on any perceived

changes.

Table 34.  Change in Personal Vertical Complexity (MLM/FLS)

| RESPONSE/TYPE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| YES/INCREASE | 3 | 0 | 2 | 5 |
| YES/DECREASE | 3 | 7 | 5 | 15 |
| NO | 17 | 14 | 15 | 46 |
| TOTAL | 23 | 21 | 22 | 66 |

Of the 66 participants, 20 (30.3%) indicated there had

been a change in personal vertical complexity.  This

differs from the data that indicated 50% of TLM perceived

a change in vertical complexity (table 31).  Of the 20

that answered positively to a change, 15 (75.0%) indicated

there had been a decrease in vertical complexity.

Changes to personal vertical complexity were not

perceived by a majority of users of all three MIS.  This

supports TLM's indications for WIMS & BHAN but contradicts

the perceptions of MMOIS TLM, most of whom felt the

average vertical complexity of their units had decreased.

If there was a change, how much of the change

do you attribute to the implementation of the MIS? The

ratings of the 20 positive participants are as follows:


Table 35. Ratings of MIS Impact (MLM/FLS)
Vertical Complexity - By Organization

change was not                                          change was all
caused by MIS                                           caused by MIS

|  | [ | 1 | 2 | 3 | 4 | 5 | ] |
|---|---|---|---|---|---|---|---|
| WIMS (n=6)<br>Mean = 2.2 | | 3 | 1 | 1 | 0 | 1 | |
| BHAN (n=7)<br>Mean = 3.7 | | 1 | 1 | 0 | 2 | 3 | |
| MMOIS (n=7)<br>Mean = 2.7 | | 3 | 0 | 2 | 0 | 2 | |

Overall Mean = 3.4.


Overall, participants who indicated a change in

personal vertical complexity felt the MIS had some impact

on the change. BHAN users felt the change to their

vertical complexity was largely caused by BHAN. WIMS

users disagreed, indicating minimal MIS impact. MMOIS

users remained non-committal on the question.

Summary. The data found in tables 34 & 35 shows that

a majority of MLM/FLS participants (69.7%) perceived no

change in vertical complexity, although there is evidence

of some increase/decreases. Earlier data from TLM showed

indicated that 50% of TLM perceived no change in average

vertical complexity among units within their area of

responsibility (tables 31 & 32). These results show that the perceptions of MLM/FLS and the perceptions of TLM regarding MLM/FLS are similar.

This agreement between levels of management is most evident among BHAN users: some TLM indicated decreases (36.4%) in average vertical complexity among units within their area of responsibility with minimal MIS impact (tables 31 & 32). This proved to be the case as some MLM/FLS reported decrease (33.3%) in personal vertical complexity with a divided perception of MIS impact (tables 34 & 35). Therefore, users of BHAN seem to have a clear perception of the impact of BHAN on their organizational structures.

Results were different in the other two organizations. Among WIMS users, comparisons show that one TLM indicated changes in average vertical complexity with high MIS impact. A few MLM/FLS did report change in average vertical complexity (both increases and decreases) but deemphasized the impact of WIMS. Users of MMOIS seem to have a disagreement over perceived changes in vertical complexity. Most TLM indicated a decrease in average vertical complexity, yet most MLM/FLS reported no change. Those that indicated a change were split widely in their perception of the impact of MIS.

Have any new departments or sections been created as a result of the MIS?  Have any old departments or sections been eliminated as a result of the MIS?  What changes in the locations of specific functions have been made as a result of the MIS?  For example, has there been any shifting around of activities or people?  These questions were key in determining the perceived structural effects of MIS implementation.  The respondent is asked to recall any development of new/ deletion of old organizational units related to the MIS. This question simply compares the participant's before and after perceptions of organizational structure.

Table 36.  Change in·Organization Structure (TLM)

| RESPONSE/TYPE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| YES/INCREASE | 3 | 3 | 1 | 7 |
| YES/DECREASE | 1 | 1 | 0 | 2 |
| NO | 0 | 7 | 6 | 13 |
| TOTAL | 4 | 11 | 7 | 22 |

Table 37.  Change in Organization Structure (MLM/FLS)

| RESPONSE/TYPE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| YES/INCREASE | 10 | 8 | 9 | 27 |
| YES/DECREASE | 1 | 3 | 5 | 9 |
| NO | 12 | 10 | 8 | 30 |
| TOTAL | 23 | 21 | 22 | 66 |

Of the 22 TLM participants, 9 (40.9%) perceived change
to the organizational structure; of the 66 MLM/FLS
participants, 36 (54.5%) perceived change to the organi-
zation structure. Each organization created a new computer
department to support the MIS; the increases indicated by
users reflect these new departments. The decreases (among
WIMS and BHAN users) were specifically due to elimination
of two word processing centers. All three MIS seemed to
have affected perceptions of organizational structure
changes to a greater degree on the MLM/FLS levels

The data does show an interesting contrast. 100% of
WIMS TLM users felt there had been structural change, yet
the majority of BHAN and MMOIS users saw no change. This
contrasts with the MLM/FLS group, where the pattern seems
to show a fairly even distribution of perceived changes
due to the MIS. Only MMOIS users shows more reports of
change than not.

## Conclusions to Research Questions

This section provided data on responses to questions specifically designed to meet the research objectives proposed in Chapter One. Findings are summarized as follows:

- The personal span of control of top level management has not shown any significant change.

- The personal span of control of mid level management/ first line supervisors has shown significant change. This change is predominantly an increase in span.

- The perceptions of top level management regarding average span of control of their subordinates were distorted in two of the three organizations. The impact of WIMS and BHAN was highly overrated by top level management.

- The personal vertical complexity of top level management has not shown any significant change.

- The personal vertical complexity of mid level management/first line supervisors has not shown any significant change.

- The perceptions of top level management regarding average vertical complexity of their subordinates distorted in two of the three organizations. Top level management users of MMOIS overestimated changes to their sub-units. The impact of WIMS was highly overrated.

- The changes that occurred were generally perceived not to be the direct result of MIS implementation.

These results will be examined further in Chapter Five.

A summary of comparisons of MIS impact between all three organizations yielded unusual results. BHAN appeared to affect both top level management and mid level management/first line supervisors. WIMS and MMOIS, on the other hand, had negligible effect on top level

management but significant effect on mid level management/
first line supervisors.

Table 38.  Differences Between Organizations

| LEVEL/TYPE | WIMS | BHAN | MMOIS |
|---|---|---|---|
| TLM/SPAN | 0.0% increase | 36.4% increase | 14.3% increase |
| OF CONTROL | 0.0% decrease | 9.1% decrease | 0.0% decrease |
| TLM/VTCL | 0.0% increase | 0.0% increase | 14.3% increase |
| COMPLEXITY | 0.0% decrease | 27.3% decrease | 0.0% decrease |
| MLM/SPAN | 47.8% increase | 47.6% increase | 50.0% increase |
| OF CONTROL | 26.1% decrease | 0.0% decrease | 22.7% decrease |
| MLM/VTCL | 13.1% increase | 0.0% increase | 9.1% increase |
| COMPLEXITY | 13.1% decrease | 33.3% decrease | 22.7% decrease |

It is the observation of this researcher that the
broad impact of BHAN is partially due to the level of user
sophistication.  BHAN, as already noted, is not being
utilized to its full potential.  Its role as a simple comm-
unications device means it easily permeates the daily
activities of all management levels.  But the mere presence
of large numbers of reports-of-change does not mean large
changes are taking place.  This researcher feels the
effect of BHAN on the 2750th Air Base Wing, although
extensive in number, is not of major concern.  BHAN users
could do their job just as well without BHAN, just slower.

The effect of WIMS on mid level managers and first
line supervisors has to do with organizational culture.
It is the observation of this researcher that WIMS users
expect more from their MIS.  Perhaps the nature of their

business (Civil Engineering) has something to do with it but, WIMS users seem to have embraced information systems and are hungry for more. They feel they could not do their job without WIMS; too much of their daily activities are stored in that mainframe. As a result, more MIS impact is recognized.

MMOIS users are in the middle of the spectrum. Although basically a communications tool, MMOIS does show some evidence of decision-making capability. MMOIS users are experimenting with applications and demonstrating some computer literacy. But, it is the observation of this researcher that the constant upheaval of the organization has hurt the overall efficiency and effectiveness of the MIS. An information system must fit the organization's mission and goals, not the other way around.

## Individual Questions

The last series of questions are not directly applicable to the research objectives proposed in chapter one. They were asked for the benefit of the sponsoring agencies in order to determine MIS impact on specific managerial characteristics. Since the information gained from these questions does not directly apply to this thesis effort, analysis of responses is found in Appendix E.

# V. Conclusions and Recommendations

## Introduction

This chapter will discuss the results of the case study interviews and apply these findings to the research questions. Conclusions will be drawn based on the findings and recommendations made for future research and Air Force MIS implementations.

This research was designed to gain a basic understanding of MIS impact on organizational structure following systems implementation. The case study method involving three organizations was exploratory in nature and precluded rigorous examination of any one specific area.

## Conclusions (Research Question # One)

Research Question # 1 asks : In measuring the effect of MIS on military organization structures, has there been a perceived increase or decrease in supervisory span of control, according to the perceptions of military or Department of Defense (DOD) civilian supervisors, following implementation? If so, by how many individuals?

This research shows that, according to the perceptions of military and DOD civilian supervisors, there have been both increases and decreases in supervisory span of control. Since only a small minority of participants perceived changes that could be directly attributed to MIS implementation,

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the evidence is not strong enough to suggest any causal relationships. Therefore, this research concludes that the implementation of a MIS does not cause changes in span of control.

This finding is in agreement with the conclusions of the Bjorn-Anderson study (9, 93) that structural change may or may not accompany systems implementation.

The changes that did occur consisted of increases and decreases. This thesis found that top management showed practically no change in personal span of control; what change did occur was an increase (BHAN). This is a contradiction of Blau's findings (12) that the span of control of chief executive officers and division heads decreases following systems implementation (table 7). A likely explanation for this is found in the bureaucratic nature of the military environment. Formal reporting relationships among senior military managers tend to remain stable for long periods of time. Any changes that occur as a result of organizational restructuring are usually not reflected in upper managerial levels.

This thesis also found that mid level management/first line supervisors had evidence of both increases and decreases among all three organizations. This supports Blau's findings (12) that show increases for section heads and decreases for first line supervisors. Within a

bureaucracy, any type of change in organizational structure is apt to occur more readily in lower levels.

Changes in span of control could be in the form of formal organizational restructuring or mere informal expansion of supervisory influence. Changes were perceived in both forms among top level management and mid level/first line supervisors. However, these changes in span of control were not directly attributable to the implementation of the MIS.

## Conclusions (Research Question # Two)

Research Question # 2 asks: In measuring the effect of MIS on military organization structures, has there been a perceived increase or decrease in vertical complexity within the military organization structure, according to the perceptions of military or Department of Defense (DOD) civilian supervisors, following implementation? If so, by how many individuals?

This research shows that, according to the perceptions of military and DOD civilian supervisors, there have been some decreases in hierarchical vertical complexity. Since only a small minority of participants perceived changes that could be directly attributed to MIS implementation, the evidence is not strong enough to suggest any causal relationships. Therefore, this research concludes that the implementation of a MIS does not cause changes in vertical complexity.

This finding is in agreement with the conclusions of the Bjorn-Anderson study (9, 93) that structural change may or may not accompany systems implementation.

The changes that did occur were basically decreases. This thesis found that top level management showed practically no change in personal vertical complexity; what change did occur was a decrease (BHAN). Again, the stable, bureaucratic nature of the military environment is an explanation for this. Mid level management/first line supervisors reported some evidence of both increases and decreases among all three organizations. Blau's findings (12) simply reported an increase in hierarchical levels and does not differentiate among managerial levels.

The change that was indicated by this research was not directly attributable to the implementation of an MIS.

## Recommendations for Future Research

Further research in this area is strongly advised. As indicated in Chapter One, private sector research has significant difficulty in its applicability to public sector situations. This is particularly compounded when the military environment, with its unique demands, is involved. Recommendations for future research include:

    a.   Expand this study with broader organization selection criteria to include both EDP systems for basic transaction processing and data/model based MIS. A limitation of this research is that organizations failed to fully meet selection criteria.

b.   Duplicate this study and examine two military
     organizations that are virtually identical in
     terms of mission, information requirements, and
     management information systems.  This will augment
     the data on differences of perceptions among
     organizational systems users.

c.   Expand this study by incorporating Robey's model
     for managing information systems impact (94) to
     determine why and how systems are implemented.
     This will help predict future systems impact on
     military organizations.

d.   Duplicate this study in a public sector, non-
     military environment to determine if the impact of
     MIS implementation is the same in both types of
     bureaucracies, or if the military environment is
     unique.

## Summary

This thesis attempted to determine the impact of MIS
implementation through the eyes of the military manager/
supervisor.  Two characteristics, supervisory span of
control and hierarchical vertical complexity, served as a
guide to determine organizational changes.  This study was
a partial-replication of an earlier research effort by
Bjorn-Anderson and others.  It only attempted to capture
user's perceptions.  The results of this study seem to
confirm Bjorn-Anderson's conclusions that management
information systems do not _cause_ changes in organization
structures and such changes may or may not accompany
systems implementation.

## Appendix A:  <u>Interview Guide</u>

The following interview guides were used by the researcher in the methodology portion of the thesis. There are three separate guides, corresponding to the different participants:

a) systems manager (appendix B)
b) top-level manager  (appendix C)
c) mid-level manager/first line supervisors (appendix D)

Interview guides will help insure identical questions are asked of all individuals within each organization.

It is extremely critical that the greatest possible effort be made to follow a uniform procedure when conducting a study of organizational change.  It is equally critical to be open to new avenues of exploration through which an individual question may lead.  Finally, obtaining documentary evidence to support specific answers is important. Following these procedures will minimize bias.

## Appendix B:  MIS Implementation
## Interview Guide -- Systems Managers

I.  Introduction and thanks to participants

Date _____.    Time _____.

Organization _____.

Department _____.


II.  Background Information on Participant

A.  What is your present job title?  How long have you had this position?


B.  Give a short job description.



III. Background Information on Organization's MIS

A.  What is the name of the management information system?




B.  When was the MIS first introduced into your organization?




C.  What departments in your organization are affected by the MIS?

D. Was the MIS implemented in stages? If so, what functions were put on the MIS first?

E. Who has access to the MIS? Is a list of specific users available for potential interviewing?

F. What is the primary function of the MIS?

G.   What functions are now computerized or soon will be?

H.   What type of information does the MIS provide?

I.   What types of reports does the MIS provide users?
     Please include both regular and ad-hoc reports?

J.   What system did the MIS replace?

I.  Introduction and thanks to participant

Date _____.     Time _____.

Organization _____.

Department _____.

II.  Background Information on Participant

    A.  What is your present job title?

    B.  Please give me a short job description.

    C.  What is your length of time in this job?

    D.  What is your length of time in the organization?

III. The Management Information System

For purposes of this research, I am calling the

_____

a management information system.  That is, it is  a

method of providing information to support the

operations and management of your organization.  Any

future reference to 'the MIS' is referring to the

_____.

A.  Please describe your access to the MIS?  For
    example, is it very restrictive or unlimited?

B.  How often do you use the MIS?

C.  What sort of things do you use the MIS for?

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D. Do you feel you have the knowledge of how the MIS
operates which allows you to accomplish your job?




E.  1)  Have you been a user of other similar,
computerized management information systems?



    2)  If so, was it in this organization?



    3)  If so, then compared to the best such other
    system, how would you rate this system?

much worse        [  1   2   3   4   5   ]    much better




F.  How would you finish the following statement:
    I feel the MIS


is of very little    [  1   2   3   4   5   ]   is very useful
real use


costs me additional  [  1   2   3   4   5   ]    saves me time
time

G. Do you receive regular routine outputs from the MIS, as required by your job? If so, how often? Would it be possible to get copies of these?

H. Do you voluntarily request and receive any optional, ad hoc, reports or special features of the MIS for your job? If so, how often? Would it be possible to get copies of these?

I. I would like to determine your knowledge of the MIS's effect on your subordinates. Please tell me which subordinates use the MIS and how they use to accomplish their job.

IV.  Organization Structure

   A.  Have any new departments or sections been created
       as a result of the MIS?  Please elaborate.

   B.  Have any old departments or sections been eliminated
       as a result of the MIS?  Please elaborate.

   C.  What changes in the locations of specific functions
       have been made as a result of the MIS?  For example,
       has there been any shifting around of activities or
       people?

D. The term vertical complexity means the number of hierarchical levels between a supervisor and other members of his/her organizational hierarchy. In those organizational units to which the MIS has been applied, has the vertical complexity changed in any way? Please identify the affected units and tell me if the vertical complexity has increased, decreased, or remained unchanged.

E. If there was a change, how much of the change do you attribute to the implementation of the MIS?

change was not          [  1   2   3   4   5   ]          change was all
caused by MIS                                             caused by MIS

F.  The term span of control means the number of
    subordinates who report directly to any one
    supervisor.  In those organizational units to
    which the MIS has been applied, has the average
    supervisory span of control changed in any way?
    Please identify the affected units and tell me if
    the average span of control has increased,
    decreased, or remained unchanged.


G.  If there was a change, how much of the change do
you attribute to the implementation of the MIS?


change was not          [  1  2  3  4  5  ]      change was all
caused by MIS                                    caused by MIS

H.  Have you perceived any changes in your span of
control since the implementation of the MIS?  By this
I mean has the number of people who report directly to
you increased, decreased, or remained unchanged.

I.  Have you perceived any changes in the vertical
complexity of your organization since the
implementation of the MIS?  By this I mean are there
more levels between you and lower levels?

J.  In the organizational units in which the MIS has
been applied, have the number of personnel changed as
a consequence

      1. at the clerical level?  How?

      2. at the first-line supervisor levels?  How?

      3. at the middle/top management levels?  How?

## Appendix D:  MIS Implementation Interview
## Guide -- Mid-Level/First-Line Supervisors

I.  Introduction and thanks to participant

Date _____.    Time _____.

Organization _____.

Department _____.


II.  Background Information on Participant

    A.  What is your present job title?



    B.  Please give me a short job description.





    C.  What is your length of time in this job?




    D.  What is your length of time in the organization?

III. The Management Information System

For purposes of this research, I am calling the

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a management information system.  That is, it is  a

method of providing information to support the

operations and management of your organization.  Any

future reference to 'the MIS' is referring to the

-----------------------------------------------.

A.  Please describe your access to the MIS?  For
    example, is it very restrictive or unlimited?

B.  How often do you use the MIS?

C.  What sort of things do you use the MIS for?

D. Do you feel you have sufficient knowledge of how the MIS operates to allow you to accomplish those things you just described? Please elaborate.

E. 1) Have you been a user of other similar, computerized management information systems?

   2) If so, was it in this organization?

   3) If so, then compared to the best such other system, how would you rate this system?

   much worse       [ 1  2  3  4  5 ]    much better

F. How would you finish the following statement: I feel the MIS

is of very little     [ 1  2  3  4  5 ]    is very useful
real use

costs me additional   [ 1  2  3  4  5 ]    saves me time
time

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G.  Do you receive regular routine outputs from the
    MIS, as required by your job?  If so, how often?
    Would it be possible to get copies of these?

H.  Do you voluntarily request and receive any
    optional, ad hoc, reports or special features of
    the MIS for your job?  If so, how often?
    Would it be possible to get copies of these?

I.  Are you comfortable using the MIS to accomplish
    those things you just described?

IV. Organization Structure

   A. Have you perceived any overall changes in the organ-
   ization since the implementation of the MIS?  By this
   I mean has there been any change to the number of staff or
   the distribution of staff?  For example, has there been
   any shifting around of activities or people?

   B. Have you perceived any changes in the vertical
   complexity of your organization since the
   implementation of the MIS?  By this I mean are there
   more levels between you and top management?

   C. If there was a change, how much of the change do
   you attribute to the implementation of the MIS?

change was not          [ 1  2  3  4  5 ]        change was all
caused by MIS                                    caused by MIS

   D. Have you perceived any changes in your span of
   control since the implementation of the MIS?  By this
   I mean has the number of people who report directly to
   you increased, decreased, or remained unchanged.

   E. If there was a change, how much of the change do
   you attribute to the implementation of the MIS?

change was not          [ 1  2  3  4  5 ]        change was all
caused by MIS                                    caused by MIS

V. Departmental Impact.

   A. Have you perceived any overall changes in the
   following departmental/interdepartmental aspects of
   manager-subordinate relationship since implementation
   of the MIS?  How much of the change do you attribute
   to the MIS?

                         (DEPARTMENTAL)

   1. Subordinates requesting authorization from you.


            change                         no change

change was not     [  1  2  3  4  5  ]     change was all
caused by MIS                              caused by MIS


   2. Subordinates requesting action from you.


            change                         no change

change was not     [  1  2  3  4  5  ]     change was all
caused by MIS                              caused by MIS


   3. Your receiving reports on operations.


            change                         no change

change was not     [  1  2  3  4  5  ]     change was all
caused by MIS                              caused by MIS


   4. Your giving information to subordinates.


            change                         no change

change was not     [  1  2  3  4  5  ]     change was all
caused by MIS                              caused by MIS


   5. Your requesting something from subordinates.


            change                         no change

change was not     [  1  2  3  4  5  ]     change was all
caused by MIS                              caused by MIS

## (INTERDEPARTMENTAL)

**1. Your requesting authorization from colleagues/superiors**

    change                             no change

change was not     [ 1 2 3 4 5 ]     change was all
caused by MIS                               caused by MIS

**2. Your requesting superiors or colleagues for action**

    change                             no change

change was not     [ 1 2 3 4 5 ]     change was all
caused by MIS                               caused by MIS

**3. Your receiving reports on operations**

    change                             no change

change was not     [ 1 2 3 4 5 ]     change was all
caused by MIS                               caused by MIS

**4. Your giving information to superiors or colleagues**

    change                             no change

change was not     [ 1 2 3 4 5 ]     change was all
caused by MIS                               caused by MIS

**5. Superiors and colleagues requesting something from you**

    change                             no change

change was not     [ 1 2 3 4 5 ]     change was all
caused by MIS                               caused by MIS

B. Have you perceived any influence by the implementation of the MIS on your contact or consultations with your supervisor?

C. Have you perceived any influence by the implementation of the MIS on your contact or consultations with your subordinates?

D. Have you perceived any overall changes in the degree of discretion you practice in your organization, regarding influence on specific tasks? How much of the change do you attribute to the MIS?

    1. Degree to which you determine how a task is carried out

       change                      no change

change was not   [ 1 2 3 4 5 ]   change was all
caused by MIS                          caused by MIS

    2. Degree to which you determine when a task is carried out

       change                      no change

change was not   [ 1 2 3 4 5 ]   change was all
caused by MIS                          caused by MIS

    3. Degree to which you determine whether a task has been carried out

       change                      no change

change was not   [ 1 2 3 4 5 ]   change was all
caused by MIS                          caused by MIS

4. Degree to which orders and advice are
   received from superiors


       change                          no change


change was not     [  1  2  3  4  5  ]    change was all
caused by MIS                             caused by MIS


   5. Degree to which requests and demands are
      received from subordinates


       change                          no change

change was not     [  1  2  3  4  5  ]    change was all
caused by MIS                             caused by MIS


   6. Degree to which you are controlled in handling
      tasks


       change                          no change


change was not     [  1  2  3  4  5  ]    change was all
caused by MIS                             caused by MIS


   7. Degree to which you are dependent on the work of
      others


       change                          no change


change was not     [  1  2  3  4  5  ]    change was all
caused by MIS                             caused by MIS


   8. Degree to which there are rules, procedures,
      and methods which are to be followed

       change                          no change


change was not     [  1  2  3  4  5  ]    change was all
caused by MIS                             caused by MIS

Responses to Individual Questions - (Top Level Management)

The following questions were asked only of top level management.  Side-by-side comparison with mid level management/first line supervisors is not possible.

I would like to determine your knowledge of the MIS's effect on your subordinates.  Please tell me which subordinates use the MIS and how they use it to accomplish their job.  The purpose of this question was to capture top level management's awareness of MIS usage within their unit.  Responses from individual participants gave very clear answers regarding actual MIS usage by specific members of their unit.  All TLM participants demonstrated a solid idea of MIS usage within their areas.

In the organizational units in which the MIS has been applied, have the number of personnel changed as a consequence?

Table 39.  Changes at the Clerical Level

| RESPONSE/TYPE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| YES/INCREASE | 1 | 8 | 1 | 10 |
| YES/DECREASE | 0 | 1 | 1 | 2 |
| NO | 3 | 2 | 5 | 10 |
| TOTAL | 4 | 11 | 7 | 22 |

Of the 22 responses, 10 (45.5%) were increases, 2 cases (9.1%) were decrease, while 10 (45.5%) saw no change.

Table 40.  Changes at the First Line Supervisor Level

| RESPONSE/TYPE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| YES/INCREASE | 0 | 2 | 1 | 3 |
| YES/DECREASE | 0 | 0 | 0 | 0 |
| NO | 4 | 9 | 6 | 19 |
| TOTAL | 4 | 11 | 7 | 22 |

Three changes at this level were increases (13.6%) while
19 (86.4%) saw no change.

Table 41.  Changes at the Middle/Top Management Level

| RESPONSE/TYPE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| YES/INCREASE | 0 | 0 | 1 | 1 |
| YES/DECREASE | 0 | 0 | 0 | 0 |
| NO | 4 | 11 | 6 | 21 |
| TOTAL | 4 | 11 | 7 | 22 |

Only one participant (4.5%) indicated a change at this
level and identified it as an increase.

This question discriminated MIS impact on different
levels.  The level affected least by the existence of an
MIS is middle/top management, in contrast to the
predictions of Leavitt and Whisler (75) of a decline in
middle management.  This may be partially explained by the
bureaucratic nature of the military.  The large increase
among BHAN users at the clerical level was due to summer
overhires and not directly caused by the MIS.

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Responses to Individual Questions - (Mid Level Management/ First Line Supervisor) (n=66)

The following questions were asked only of mid level managers and first line supervisors. Side-by-side comparison with top level management is not possible.

Have you perceived any overall changes in the following departmental/interdepartmental aspects of manager-subordinate relationship since implementation of the MIS? How much of the change do you attribute to the MIS? In the following ten questions, participants were asked to think about any changes to different aspects of their relationship with others. If a change was evident, the participant rated how much of the change was attributed to the MIS.

For the first five questions, participants were asked to consider only their own sub-unit or department. The last five questions were phrased basically the same but participants were asked to consider the organization as a whole. The 66 mid level managers/first line supervisors gave the following results:

The first question under departmental relationships concerned subordinates requesting authorization from the participant. 25 (37.9%) participants indicated a change in this aspect.

Of the 25 who indicated a change:

Table 42.  Subordinates Requesting
Authorization From You - By Organization

change was not                                        change was all
caused by MIS                                          caused by MIS

|            | [ | 1 | 2 | 3 | 4 | 5 | ] |
|------------|---|---|---|---|---|---|---|
| WIMS (n=6)<br>Mean = 3.3 | | 1 | 0 | 3 | 0 | 2 | |
| BHAN (n=8)<br>Mean = 3.4 | | 1 | 1 | 2 | 2 | 2 | |
| MMOIS (n=11)<br>Mean = 2.5 | | 3 | 3 | 3 | 1 | 1 | |
| TOTAL | | 5 | 4 | 8 | 3 | 5 | |

Overall Mean = 3.0

Overall, users were non-committal regarding MIS impact.  WIMS and BHAN users showed slight perceptions of MIS impact, but MMOIS users felt the impact of MMOIS was not a large factor.

The second question under departmental relationships concerned subordinates requesting action from the participant. 27 (40.9%) participants indicated a change in this aspect.

Of the 27 who indicated a change:

Table 43.  Subordinates Requesting
Action From You - By Organization

| change was not caused by MIS | | | | | | change was all caused by MIS |
|---|---|---|---|---|---|---|
| | [  1 | 2 | 3 | 4 | 5  ] | |
| WIMS (n=7) Mean = 3.7 | 0 | 0 | 3 | 3 | 1 | |
| BHAN (n=9) Mean = 3.8 | 0 | 1 | 2 | 4 | 2 | |
| MMOIS (n=11) Mean = 2.5 | 2 | 2 | 6 | 1 | 0 | |
| TOTAL | 2 | 3 | 11 | 8 | 3 | |

Overall Mean = 3.3

Overall, participants who indicated a change felt some MIS impact on that change. WIMS and BHAN users felt changes to this aspect of departmental relationships were nearly all caused by the MIS. MMOIS users disagreed.

The third question under departmental relationships
concerned the participants receiving reports on
operations.  34 (51.5%) participants indicated a change
in this aspect.

Of the 34 who indicated a change:


### Table 44.  Your Receiving Reports on Operations - By Organization

| change was not<br>caused by MIS | | | | | | change was all<br>caused by MIS |
|---|---|---|---|---|---|---|
| [ | 1 | 2 | 3 | 4 | 5 | ] |
| WIMS (n=15)<br>Mean = 3.3 | 1 | 4 | 3 | 3 | 4 | |
| BHAN (n=9)<br>Mean = 3.2 | 1 | 1 | 3 | 3 | 1 | |
| MMOIS (n=10)<br>Mean = 3.4 | 0 | 1 | 5 | 3 | 1 | |
| TOTAL | 2 | 6 | 11 | 9 | 6 | |

Overall Mean = 3.3

For this question, all users identified some MIS
impact in connection with change to their receiving
reports on operations.

The fourth question under departmental relationships concerned the participants giving information to subordinates. 41 (62.1%) participants indicated a change in this aspect.

Of the 41 who indicated a change:

Table 45.  Your Giving Information
to Subordinates - By Organization

change was not                                          change was all
caused by MIS                                           caused by MIS

|  | [ | 1 | 2 | 3 | 4 | 5 | ] |
|---|---|---|---|---|---|---|---|
| WIMS (n=13)<br>Mean = 3.1 |  | 0 | 6 | 2 | 3 | 2 | |
| BHAN (n=13)<br>Mean = 4.1 |  | 0 | 1 | 2 | 5 | 5 | |
| MMOIS (n=15)<br>Mean = 2.7 |  | 0 | 6 | 4 | 3 | 2 | |

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--------------------------------------------------------

| TOTAL |  | 0 | 13 | 8 | 11 | 9 | |
|---|---|---|---|---|---|---|---|

Overall Mean = 3.4

Overall, users were slightly committed to MIS impact on changes. BHAN users had strong perceptions that BHAN caused changes to this aspect. WIMS and MMOIS users are divided on their ratings.

The fifth question under departmental relationships concerned the participants requesting something from subordinates. 34 (51.5%) participants indicated a change in this aspect.

Table 46.  Your Requesting Something
From Subordinates - By Organization

| change was not caused by MIS | | | | | | change was all caused by MIS |
|---|---|---|---|---|---|---|
| [ | 1 | 2 | 3 | 4 | 5 | ] |
| WIMS (n=11) Mean = 2.6 | 0 | 7 | 1 | 3 | 0 | |
| BHAN (n=10) Mean = 4.0 | 0 | 1 | 2 | 3 | 4 | |
| MMOIS (n=13) Mean = 3.3 | 2 | 0 | 6 | 2 | 3 | |
| TOTAL | 2 | 8 | 9 | 8 | 7 | |

Overall Mean = 3.3

Overall, users identified some MIS impact on change. BHAN users rated the impact of BHAN very high.  WIMS and MMOIS users are divided on their perceptions.

(INTERDEPARTMENTAL)

The first question under interdepartmental relationships concerned participants requesting authorization from colleagues/superiors. 35 (53.1%) participants indicated a change in this aspect.

Of the 35 who indicated a change:

Table 47.  Your Requesting Authorization
From Colleagues/Superiors - By Organization

| change was not<br>caused by MIS | | | | | change was all<br>caused by MIS | |
|---|---|---|---|---|---|---|
| | [  1 | 2 | 3 | 4 | 5  ] | |
| WIMS (n=7)<br>Mean = 3.6 | 2 | 0 | 0 | 2 | 3 | |
| BHAN (n=15)<br>Mean = 3.4 | 1 | 3 | 3 | 5 | 3 | |
| MMOIS (n=13)<br>Mean = 2.8 | 1 | 5 | 3 | 3 | 1 | |
| TOTAL | 4 | 8 | 6 | 10 | 7 | |

Mean = 3.2

Participants who indicated changes remained slightly more than neutral on MIS impact.  WIMS and BHAN users both perceived slight impact from their MIS on this aspect, but MMOIS users remained non-committed.

The second question under interdepartmental relationships concerned participants requesting action from colleagues/ superiors. 38 (57.6%) participants indicated a change in this aspect.

Of the 38 who indicated a change:

Table 48.  Your Requesting Superiors
or Colleagues for Action - By Organization

| change was not caused by MIS | | | | | | change was all caused by MIS |
|---|---|---|---|---|---|---|
| | [ 1 | 2 | 3 | 4 | 5 ] | |
| WIMS (n=9) Mean = 3.6 | 1 | 2 | 0 | 3 | 3 | |
| BHAN (n=17) Mean = 3.1 | 0 | 6 | 2 | 6 | 3 | |
| MMOIS (n=12) Mean = 2.9 | 1 | 4 | 3 | 3 | 1 | |
| TOTAL | 2 | 12 | 5 | 12 | 7 | |

Overall Mean = 3.3

Overall, user perceived some MIS impact on change. MMOIS and BHAN users remained non-committal, but WIMS users showed stronger perceptions of MIS impact.

The third question under interdepartmental relationships concerned participants receiving reports on operations. 36 (54.5%) participants indicated a change in this aspect.

Of the 36 who indicated a change:

Table 49.  Your Receiving Reports
on Operations - By Organization

change was not
caused by MIS

change was all
caused by MIS

|  | [ | 1 | 2 | 3 | 4 | 5 | ] |
|---|---|---|---|---|---|---|---|
| WIMS (n=12)<br>Mean = 3.5 |  | 1 | 1 | 3 | 5 | 2 |  |
| BHAN (n=10)<br>Mean = 3.0 |  | 0 | 4 | 2 | 4 | 0 |  |
| MMOIS (n=14)<br>Mean = 3.1 |  | 2 | 1 | 6 | 4 | 1 |  |
| TOTAL |  | 3 | 6 | 11 | 13 | 3 |  |

Overall Mean = 3.2

Overall, user perception of MIS impact was slightly more than neutral.  WIMS users tended to feel changes to this aspect of interdepartmental relationships were caused by WIMS.  BHAN and MMOIS users are divided on the question.

The fourth question under interdepartmental relationships concerned participants giving information to superiors/ colleagues. 56 (84.8%) participants indicated a change in this aspect.

Of the 56 who indicated a change:

Table 50.   Your Giving Information to
Superiors or Colleagues - By Organization

| change was not<br>caused by MIS | | | | | | change was all<br>caused by MIS | |
|---|---|---|---|---|---|---|---|
| | [ | 1 | 2 | 3 | 4 | 5 | ] |
| WIMS (n=16)<br>Mean = 3.7 | | 0 | 5 | 1 | 4 | 6 | |
| BHAN (n=21)<br>Mean = 3.6 | | 0 | 5 | 6 | 3 | 7 | |
| MMOIS (n=19)<br>Mean = 3.1 | | 3 | 3 | 6 | 4 | 3 | |
| TOTAL | | 3 | 13 | 13 | 11 | 16 | |

Overall Mean = 3.4


Overall, users were slightly committed to MIS impact regarding change. WIMS and BHAN users had strong perceptions that their MIS caused changes to this aspect. MMOIS users are divided on their ratings.

The fifth question under interdepartmental relationships concerned superiors/colleagues requesting something from participants. 52 (78.8%) participants indicated a change in this aspect.

Of the 52 who indicated a change:

Table 51. Superiors and Colleagues
Requesting Something From You - By Organization

change was not                                          change was all
caused by MIS                                             caused by MIS

|  | [ | 1 | 2 | 3 | 4 | 5 | ] |
|---|---|---|---|---|---|---|---|
| WIMS (n=15) Mean = 3.3 | | 0 | 5 | 3 | 4 | 3 | |
| BHAN (n=19) Mean = 3.6 | | 1 | 5 | 2 | 3 | 8 | |
| MMOIS (n=18) Mean = 3.2 | | 3 | 2 | 5 | 5 | 3 | |
| TOTAL | | 4 | 12 | 10 | 12 | 14 | |

Overall Mean = 3.4

Overall, all three MIS users were slightly committed to MIS impact regarding change, with BHAN users rated the impact of BHAN fairly strong.

Summary. A side-by-side comparison of departmental and inter-departmental questions is given in Table 52. For each question, the percent of participants who indicated a change had occurred is given, along with the mean rating of whether the change was caused by the MIS.

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## Table 52. Summary of Means

| DEPARTMENTAL | | | INTERDEPARTMENTAL | | |
|---|---|---|---|---|---|
| TABLE | PERCENT CHANGE | MEAN RATING | TABLE | PERCENT CHANGE | MEAN RATING |
| 42 | 37.9 | 3.0 | 47 | 53.1 | 3.2 |
| 43 | 40.9 | 3.3 | 48 | 57.ᴗ | 3.3 |
| 44 | 51.5 | 3.3 | 49 | 54.5 | 3.2 |
| 45 | 62.1 | 3.4 | 50 | 84.8 | 3.4 |
| 46 | 51.5 | 3.3 | 51 | 78.8 | 3.4 |

This data shows significant differences between the number of participants who indicated changes in certain aspects of departmental/interdepartmental relationships.

On the departmental level, few participants reported changes in 'subordinates requesting authorization (table 42) or action (table 43) from them.' Some participants did report change in 'requesting information from subordinates (table 46)' and 'receiving departmental reports on operations (table 44).' A large number of participants perceived changes to 'giving information to subordinates (table 45).'

On the interdepartmental level, participants saw some change to 'requesting authorization (table 47) or action (table 48) from superiors or colleagues,' as well as 'receiving reports on interdepartmental operations (table 49).' A large majority of participants saw changes in 'giving information to (table 50) or answering requests of superiors or colleagues (table 51).' This supports the earlier point that the most prominent usage of MIS was

transfer of information, either in message format via electronic mail or in regular/ad hoc report format.

Have you perceived any influence by the implementation of the MIS on your contact or consultations with your supervisor? Have you perceived any influence by the implementation of the MIS on your contact or consultations with your subordinates? The purpose of these questions is to determine any effect on the user's direct personal contact with immediate supervisors or subordinates.

Table 53.  Perceived Changes in
Contact With Supervisors

| RESPONSE/TYPE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| YES/INCREASE | 3 | 6 | 4 | 13 |
| YES/DECREASE | 5 | 1 | 1 | 7 |
| NO | 15 | 14 | 17 | 46 |
| TOTAL | 23 | 21 | 22 | 66 |

Of the 66 participants, 13 (19.7%) indicated there had been an increase in personal contact with their supervisor, 7 (10.6%) felt personal contact had decreased, and 46 (69.70%) said there had been no change.

### Table 54. Perceived Changes in
### Contact With Subordinates

| RESPONSE/TYPE | WIMS | BHAN | MMOIS | TOTAL |
|---|---|---|---|---|
| YES/INCREASE | 4 | 5 | 2 | 11 |
| YES/DECREASE | 2 | 0 | 4 | 6 |
| NO | 17 | 16 | 16 | 49 |
| ----------- | ---- | ---- | ----- | ----- |
| TOTAL | 23 | 21 | 22 | 66 |

Of the 66 participants, 11 (16.7%) indicated there had been an increase in personal contact with their subordinates, 6 (9.1%) felt personal contact had decreased, and 49 (74.2%) felt there had been no change.

Patterns of change seem fairly consistent among all three MIS regarding negative reports of change. However, the largest decrease in contact with supervisors involved WIMS users and the largest decrease in contact with subordinates came from MMOIS users.

Some of the more significant comments regarding personal time with others included: "No change in quantity but contact has more quality," "Able to cut out less important, mundane stuff because that can be sent through E-mail," and "It depends on the boss. Have gone from 'cold-war' (no personal contact at all) to lots of personal time with boss."

Have you perceived any overall changes in the degree of discretion you practice in your organization, regarding influence on specific tasks? How much of the

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change do you attribute to the MIS? The purpose of these eight questions was to identify any perceived changes in the degree of discretion practiced by the manager in the context of their daily work. Participants were asked to think about any changes in their work-style. If a change did occur, they were asked to rate how much of the change was caused by the MIS.

The first question under degrees of discretion concerns the degree to which participant determines how a task is carried out. 34 (51.5%) participants indicated a change in this aspect. Of the 34 who indicated a change:

Table 55. Degree to Which You Determine
How a Task is Carried Out - By Organization

| change was not caused by MIS | | | | | | change was all caused by MIS |
|---|---|---|---|---|---|---|
| [ | 1 | 2 | 3 | 4 | 5 | ] |
| WIMS (n=9) Mean = 3.3 | 1 | 1 | 4 | 0 | 3 | |
| BHAN (n=15) Mean = 2.9 | 3 | 2 | 6 | 1 | 3 | |
| MMOIS (n=10) Mean = 3.3 | 2 | 1 | 1 | 4 | 2 | |
| TOTAL | 6 | 5 | 11 | 5 | 8 | |

Overall Mean = 3.2

Overall, users rated MIS impact as slightly more than neutral. WIMS and MMOIS users felt changes to this

aspect of degrees of discretion were caused somewhat by MIS. BHAN users are divided over the question.

The second question under degrees of discretion concerns the degree to which participant determines when a task is carried out. 31 (47.0%) participants indicated a change in this aspect.

Of the 31 who indicated a change:

Table 56. Degree to Which You Determine
When a Task is Carried Out - By Organization

change was not                                    change was all
caused by MIS                                     caused by MIS

|  | [ | 1 | 2 | 3 | 4 | 5 | ] |
|---|---|---|---|---|---|---|---|
| WIMS (n=12) Mean = 3.1 | | 2 | 2 | 3 | 3 | 2 | |
| BHAN (n=11) Mean = 3.6 | | 1 | 1 | 3 | 3 | 3 | |
| MMOIS (n=8) Mean = 3.6 | | 1 | 0 | 2 | 3 | 2 | |
| TOTAL | | 4 | 3 | 8 | 9 | 7 | |

Overall Mean = 3.4

Overall, users were slightly committed to MIS impact as a factor of change. BHAN and MMOIS users both had strong perceptions that their MIS caused changes to this aspect. WIMS users are divided on their ratings.

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The third question under degrees of discretion concerns the degree to which participant determines whether a task is carried out.  32 (48.5%) participants indicated a change in this aspect.

Of the 32 who indicated a change:


Table 57.  Degree to Which You Determine
Whether a Task Has Been Carried Out - By Organization

change was not                                      change was all
caused by MIS                                        caused by MIS

|  | [ 1 | 2 | 3 | 4 | 5 ] |
|---|---|---|---|---|---|
| WIMS (n=10)<br>Mean = 3.4 | 0 | 2 | 4 | 2 | 2 |
| BHAN (n=6)<br>Mean = 3.0 | 1 | 1 | 2 | 1 | 1 |
| MMOIS (n=16)<br>Mean = 3.1 | 4 | 2 | 3 | 3 | 4 |
| TOTAL | 5 | 5 | 9 | 6 | 7 |

Overall Mean = 3.2


Overall, users were slightly more than neutral regarding MIS impact.  WIMS users showed a slightly stronger perception of MIS impact; BHAN and MMOIS users are nearly identically divided on their ratings.

The fourth question under degrees of discretion concerns the degree to which orders and advice are received from superiors. 33 (50.0%) participants indicated a change in this aspect.

Of the 33 who indicated a change:

Table 58.  Degree to Which Orders and Advice
Are Received From Superiors - By Organization

| change was not<br>caused by MIS | | | | | | change was all<br>caused by MIS |
|---|---|---|---|---|---|---|
| [ | 1 | 2 | 3 | 4 | 5 | ] |
| WIMS (n=7)<br>Mean = 2.7 | 2 | 0 | 3 | 2 | 0 | |
| BHAN (n=14)<br>Mean = 3.7 | 1 | 2 | 1 | 6 | 4 | |
| MMOIS (n=12)<br>Mean = 3.0 | 1 | 5 | 1 | 3 | 2 | |
| TOTAL | 4 | 7 | 5 | 11 | 6 | |

Overall Mean = 3.3

Overall, users perceived some MIS impact on change BHAN users rated the impact of BHAN very high. WIMS and MMOIS users were basically non-committed in their preference.

The fifth question under degrees of discretion
concerns the degree to which requests and demands are received
from subordinates.   23 (34.8%) participants indicated a
change in this aspect.

Of the 23 who indicated a change:


Table 59.   Degree to Which Requests and Demands
Are Received From Subordinates - By Organization

| change was not<br>caused by MIS | | | | | | change was all<br>caused by MIS | |
|---|---|---|---|---|---|---|---|
| | [ | 1 | 2 | 3 | 4 | 5 | ] |
| WIMS (n=6)<br>Mean = 2.8 | | 1 | 0 | 4 | 1 | 0 | |
| BHAN (n=7)<br>Mean = 3.4 | | 1 | 0 | 2 | 3 | 1 | |
| MMOIS (n=10)<br>Mean = 2.9 | | 1 | 2 | 5 | 1 | 1 | |
| TOTAL | | 3 | 2 | 11 | 5 | 2 | |

Overall Mean = 3.0


Overall, users were non-committal on the impact of MIS
regarding this aspect of manager discretion.   BHAN users
showed the only distinct choice with a slight preference
towards MIS impact.

The sixth question under degrees of discretion concerns the degree to which participants are controlled in handling tasks. 21 (31.8%) participants indicated a change in this aspect.

Of the 21 who indicated a change:

Table 60.  Degree to Which You Are
Controlled in Handling Tasks - By Organization

| change was not caused by MIS | | | | | | | change was all caused by MIS |
|---|---|---|---|---|---|---|---|
| | [ | 1 | 2 | 3 | 4 | 5 | ] |
| WIMS (n=9) Mean = 3.5 | | 2 | 0 | 2 | 1 | 4 | |
| BHAN (n=6) Mean = 3.0 | | 0 | 3 | 1 | 1 | 1 | |
| MMOIS (n=6) Mean = 2.8 | | 1 | 1 | 2 | 2 | 0 | |
| TOTAL | | 3 | 4 | 5 | 4 | 5 | |

Overall Mean = 3.2


Overall, users rated MIS impact as slightly more than neutral. WIMS users rated the impact of their MIS very high; BHAN and MMOIS users are divided on their ratings.

The seventh question under degrees of discretion concerns the degree to which participants are dependent on the work of others. 21 (31.8%) participants indicated a change in this aspect.

Of the 21 who indicated a change:


Table 61.   Degree to Which You Are
Dependent on the Work of Others - By Organization

| change was not<br>caused by MIS | | | | | | change was all<br>caused by MIS |
|---|---|---|---|---|---|---|
| [ | 1 | 2 | 3 | 4 | 5 | ] |
| WIMS (n=6)<br>Mean = 3.5 | 1 | 0 | 1 | 3 | 1 | |
| BHAN (n=12)<br>Mean = 2.8 | 3 | 2 | 4 | 0 | 3 | |
| MMOIS (n=3)<br>Mean = 2.3 | 1 | 1 | 0 | 1 | 0 | |
| TOTAL | 5 | 3 | 5 | 4 | 4 | |

Overall Mean = 3.0


Overall, users were non-committed on MIS impact. There are no clear patterns to indicate strong preferences either way.

The eighth question under degrees of discretion concerns the degree to which there are rules, procedures, and methods to be followed. 27 (40.9%) participants indicated a change in this aspect.

Of the 27 who indicated a change:

Table 62. Degree to Which There are Rules, Procedures, and Methods Which are to be Followed - By Organization

change was not
caused by MIS

change was all
caused by MIS

|  | [ 1 | 2 | 3 | 4 | 5 ] |
|---|---|---|---|---|---|
| WIMS (n=11)<br>Mean = 3.1 | 1 | 2 | 4 | 3 | 1 |
| BHAN (n=7)<br>Mean = 3.2 | 1 | 1 | 1 | 4 | 0 |
| MMOIS (n=9)<br>Mean = 3.2 | 0 | 1 | 5 | 3 | 0 |
| TOTAL | 2 | 4 | 10 | 10 | 1 |

Overall Mean = 3.1

Overall, all three groups of users were non-committed as to MIS impact. BHAN and MMOIS users showed slightly higher than WIMS users on their ratings.

Summary.  A summarization of results for the previous
eight questions on task discretion is given in table 63.
For each question, the percent of participants indicating
a change had occurred is given, along with the mean rating
of whether the change was caused by the MIS.

Table 63.   Changes in Task Discretion

| TABLE | PERCENT CHANGE | MEAN RATING |
|-------|----------------|-------------|
| 55 | 51.5 | 3.2 |
| 56 | 47.0 | 3.4 |
| 57 | 48.5 | 3.2 |
| 58 | 50.0 | 3.3 |
| 59 | 34.8 | 3.0 |
| 60 | 31.8 | 3.2 |
| 61 | 31.8 | 3.0 |
| 62 | 40.9 | 3.1 |

Among the MLM/FLS participants of this case study
research, there exists a fairly even perception regarding
changes to the amount of discretion allowed in the
accomplishment of their tasks.  Certain aspects, including
the degree in which participants are controlled (table 60)
or dependent on others (table 61), showed few changes.
The majority of participants do not feel a change had
occurred.  Of those who did indicate a change, there is
no strong evidence that the change was caused by the
respective MIS.  There are no significant differences
among the three organizations.

## Conclusions to Individual Questions

These sections provided data on responses to questions asked of either top level management or mid level/first line supervisors. Results show that MIS appear to have little effect on the number of personnel within each organization, regardless of level. This is most likely due to the relative stability of manning levels within military organizations given the bureaucratic nature of the environment. In some cases, the addition of a MIS may affect immediate manning (due to the additional staff necessary to support the MIS), further changes are unlikely. There has been minimal change in personal contact with superiors or subordinates as a result of MIS.

In terms of departmental/interdepartmental relationships, MIS appear to have some effect on supervisors. Approximately half of participants indicated a change in six of the ten aspects of these relationships (table 52). There was an increase in two cases: giving information to or answering requests from superiors/colleagues. The only areas that showed minimal impact involved subordinates requesting authorization or action from the manager. It is the observation of this researcher that people seemed to by-pass the MIS and resort to the old-fashioned personal touch.

In terms of the degrees of discretion practiced by managers, MIS appear to have minor affect. Of the eight questions asked in this area, only one showed a majority

of participants indicating change (table 55 with 51.5%).
Even the use of management tools (i.e. status reports and
on-line queries) do not appear to change this managerial
duty.

Appendix F:  Sample WIMS Menu:  Base Civil Engineer

```
********************************************************************************
****      1         2         3         4         5         6         7         8    ****
**** 1234567890123456789012345678901234567890123456789012345678901234567890 ****
********************************************************************************
*  *                                                                         *  *
* 1*  Wang Office - Version 01.61.01          Monday     07/31/89   9:33 am  * 1*
* 2*                                                                         * 2*
* 3*  Hello: Jim Dawson                                                      * 3*
* 4*                                                                         * 4*
* 5*  PF Key  Action                        PF Key  Action                   * 5*
* 6*                                                                         * 6*
* 7*     1    Read Mail                       17    Vehicles Out of Commission * 7*
* 8*     2    Send Memo                       18    Fire Vehicles In Commission * 8*
* 9*     3    Send Phone Msg                  19    Review Emergency Fire Log * 9*
*10*     4    All Mail Functions          Operations Information:            *10*
* 1*                                         21    Job Order Reports         * 1*
* 2*     6    Time Management                 22    Work Order Reports        * 2*
* 3*     7    Personal Phonebook             *23    Update/Review Job Orders  * 3*
* 4*                                         *24    Update/Review Work Orders * 4*
* 5*     8    Run VS Graphics                                                * 5*
* 6*     9    User Administration         Project Information:               * 6*
* 7*    10    General Information             26    Project Reports          * 7*
* 8*    11    Branch Information             *27    Update/Review Project Data * 8*
* 9*    12    Run Word Processing             28    Open WO, JO, Projects     * 9*
*20*    13    Personnel By Chosen FAC                For a Selected Facility *20*
* 1*                                                                         * 1*
* 2*  16/32 Logoff                 (*Provides quick access to Information)    * 2*
* 3*                                                                         * 3*
* 4*  Base Civil Engineer's Menu                                    bcemenu  * 4*
*  *                                                                         *  *
********************************************************************************
****      1         2         3         4         5         6         7         8    ****
**** 1234567890123456789012345678901234567890123456789012345678901234567890 ****
********************************************************************************
```

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Appendix G: <u>Sample WIMS Regular Report: Emergency Job Orders</u>

REPORT DATE 89/08/29

COMPLETED EMERGENCY JOB ORDERS RECEIVED - ELECTRICAL SHOPS
FROM: 890822 TO 890829
VERSION 2.01.000.000 88/01/14     MJOBEELC MJOBRPT

| JOB ORDER | FCLTY | DATE OPEN | DATE COMPLETE | SHOP | | TYPE SVC | EPS DESCRIPTION |
|---|---|---|---|---|---|---|---|
| 2037 | 34041 | 890824 | 890824 | 468 | 1 | E | INSTALL/REPAIR THERMOSTAT |
| 2171 | 10856 | 890825 | 890825 | 468 | 1 | E | CENTRAL UNIT, RECHARGE/REPAIR |
| 2313 | 20640 | 890828 | 890828 | 468 | 1 | E | CENTRAL UNIT, SERVICE & START UNIT |
| 2429 | 10829 | 890828 | 890828 | 468 | 1 | E | CENTRAL UNIT, RECHARGE/REPAIR |

TOTAL JOB ORDERS FOR THIS SHOP = 4

| JOB ORDER | FCLTY | DATE OPEN | DATE COMPLETE | SHOP | | TYPE SVC | EPS DESCRIPTION |
|---|---|---|---|---|---|---|---|
| 1822 | 21630 | 890823 | 890825 | 469 | 1 | E | COIL & ELEMENTS - REPAIR |
| 1973 | 30168 | 890824 | 890828 | 469 | 1 | E | SECURITY ALARM - REPAIR |
| 2283 | 10262 | 890827 | 890828 | 469 | 1 | E | WIRING - REPAIR |

TOTAL JOB ORDERS FOR THIS SHOP = 3

| JOB ORDER | FCLTY | DATE OPEN | DATE COMPLETE | SHOP | | TYPE SVC | EPS DESCRIPTION |
|---|---|---|---|---|---|---|---|
| 1792 | 20489 | 890823 | 890824 | 471 | 1 | E | SECURITY ALARM - REPAIR |
| 1793 | 34042 | 890823 | 890823 | 471 | 1 | E | ELECTRICITY OUT - RESTORE |
| 1819 | 20050 | 890823 | 890824 | 471 | 1 | E | SECURITY ALARM - REPAIR |
| 1820 | 20020 | 890823 | 890824 | 471 | 1 | E | SECURITY ALARM - REPAIR |
| 1821 | 34071 | 890823 | 890824 | 471 | 1 | E | SECURITY ALARM - REPAIR |
| 1824 | 10262 | 890823 | 890824 | 471 | 1 | E | SECURITY ALARM - REPAIR |
| 1832 | 10866 | 890823 | 890824 | 471 | 1 | E | SECURITY ALARM - REPAIR |
| 1836 | 31230 | 890823 | 890824 | 471 | 1 | E | WIRING - REPAIR |
| 1856 | 20194 | 890823 | 890828 | 471 | 1 | E | REACTIVATE |
| 1934 | 20020 | 890823 | 890824 | 471 | 1 | E | CHECK SYSTEM |
| 1953 | 20016 | 890823 | 890824 | 471 | 1 | E | SECURITY ALARM - REPAIR |
| 1955 | 30256 | 890823 | 890824 | 471 | 1 | E | SECURITY ALARM - REPAIR |
| 1975 | 20248 | 890824 | 890825 | 471 | 1 | E | SECURITY ALARM - REPAIR |
| 1977 | 20050 | 890824 | 890824 | 471 | 1 | E | SECURITY ALARM - REPAIR |
| 1978 | 30174 | 890824 | 890828 | 471 | 1 | E | SECURITY ALARM - REPAIR |
| 1989 | 20125 | 890824 | 890824 | 471 | 1 | E | REPAIR OUTLET/SWITCH |
| 1995 | 30210 | 890824 | 890824 | 471 | 1 | E | WIRING - REPAIR |
| 2034 | 31214 | 890824 | 890824 | 471 | 1 | E | WIRING - REPAIR |
| 2049 | 30002 | 890824 | 890825 | 471 | 1 | E | BALLAST - REPAIR/REPLACE |
| 2067 | 20653 | 890824 | 890824 | 471 | 1 | E | ELEVATORS - REPAIR |
| 2069 | 20065 | 890824 | 890825 | 471 | 1 | E | CHECK BOX |
| 2075 | 20125 | 890824 | 890824 | 471 | 1 | E | REACTIVATE |

Appendix H: Sample BHAN Roster: Chemical Equipment Inventory

## CHEMICAL WARFARE DEFENSE EQUIPMENT

| NSN | ITEM | DESCRIPTION | SIZE | MAX BOI | COST |
|---|---|---|---|---|---|
| 4230-01-101-3984 | M-258A1 | Decon Kit | ---- | 5 each | 3.60 |
| 4240-00-165-5026 | M-13A2 | Filter Element | ---- | 5 sets | 10.68 |
| 4240-00-542-4450 | M-17 | Protective Mask | Small | 1 each | depot funded |
| 4240-00-542-4451 | M-17 | Protective Mask | Medium | 1 each | depot funded |
| 4240-00-542-4452 | M-17 | Protective Mask | Large | 1 each | depot funded |
| 4240-01-106-0485 | M-17A1 | Protective Mask | X-Small | 1 each | depot funded |
| 4240-00-926-4199 | M-17A1 | Protective Mask | Small | 1 each | depot funded |
| 4240-00-926-4200 | M-17A1 | Protective Mask | Large | 1 each | depot funded |
| 4240-00-926-4201 | M-17A1 | Protective Mask | Medium | 1 each | depot funded |
| 4240-01-143-2017 | M-17A2 | Protective Mask | X-Small | 1 each | depot funded |
| 4240-01-143-2018 | M-17A2 | Protective Mask | Small | 1 each | depot funded |
| 4240-01-143-2019 | M-17A2 | Protective Mask | Medium | 1 each | depot funded |
| 4240-01-143-2020 | M-17A2 | Protective Mask | Large | 1 each | depot funded |
| 4240-01-175-3443 | MCU-2/P | Protective Mask | Small | 1 each | depot funded |
| 4240-01-175-3444 | MCU-2/P | Protective Mask | Medium | 1 each | depot funded |
| 4240-01-175-3445 | MCU-2/P | Protective Mask | Large | 1 each | depot funded |
| 4240-00-999-0420 | M-6A2 | Hood | ---- | 10 each | 7.96 |

Appendix I:   Sample MMOIS Report:   Template

```
Project Number:  00-0-000
Title:
Project Manager:
Sponsor:
Project Priority:  00 of 00          Phone:  -
                           Functional Area:

     Planned Milestones          ECD          Status / New ECD

1.                             **/**/**
2.                             **/**/**
3.                             **/**/**
4.                             **/**/**
5.                             **/**/**
6.                             **/**/**
7.                             **/**/**

Planned Project ECD: **/**/**        Revised ECD: **/**/**

Rationale:

Mgr Int:              Date:  **/**/**
Branch Ch. Int:      Date:  **/**/**
MMIS Int:            Date:  **/**/**


Project Number:  00-0-000
Title: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
Project Manager: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxPhone:x  -
Sponsor: xxxxxxxxxxxxxxxxxxxxxxxxx
Project Priority:  00 of 00     Functional Area: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

     Planned Milestones          ECD          Status / New ECD

1. xxxxxxxxxxxxxxxxxxxxxxxxx     **/**/**     xxxxxxxxxxxxxxxxxxxxxxxxxx
2. xxxxxxxxxxxxxxxxxxxxxxxxx     **/**/**     xxxxxxxxxxxxxxxxxxxxxxxxxx
3. xxxxxxxxxxxxxxxxxxxxxxxxx     **/**/**     xxxxxxxxxxxxxxxxxxxxxxxxxx
4. xxxxxxxxxxxxxxxxxxxxxxxxx     **/**/**     xxxxxxxxxxxxxxxxxxxxxxxxxx
5. xxxxxxxxxxxxxxxxxxxxxxxxx     **/**/**     xxxxxxxxxxxxxxxxxxxxxxxxxx
6. xxxxxxxxxxxxxxxxxxxxxxxxx     **/**/**     xxxxxxxxxxxxxxxxxxxxxxxxxx
7. xxxxxxxxxxxxxxxxxxxxxxxxx     **/**/**     xxxxxxxxxxxxxxxxxxxxxxxxxx

Planned Project ECD: **/**/**        Revised ECD: **/**/**

Rationale: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

Mgr Int: xxx          Date:  **/**/**
Branch Ch. Int:  xxx  Date:  **/**/**
MMIS Int: xxx         Date:  **/**/**
```

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## Bibliography

1.  Adams, Carl R. "How Management Users View Information Systems," *Decision Sciences, 6*: 337-345 (April 1975).

2.  Applegate, Lynda M. and others. "Information Technology and Tommorrow's Manager," *Harvard Business Review, 66*: 128-136 (November-December 1988).

3.  Ashen, Melvin. "The Manager and the Black Box," *Harvard Business Review, 38*: 85-92 (November-December 1960).

4.  Assimakopoulos, Nikitas. "The Influence of New Technology in Organization and Management," *Information and Management, 14*: 195-202 (April 1988).

5.  Attewell, Paul and James Rule. "Computing and Organizations: What We Know and What We Don't Know," *Communications of the ACM, 27*: 1184-1192 (December 1984).

6.  Beers, L. W. (Roy). "Organizational Influence on Future Information Systems Architecture," *Systems Research, 2*: 263-268 (1985).

7.  Benbasat, Izak. "An Analysis of Research Methodologies," *The Information Systems Research Challenge*, edited by F. Warren McFarlan. Harvard Business School Research Colloquium, Boston: Harvard Business School Press, 1984.

8.  Benton, F. Warren. *EXECUCOMP -- Maximum Management With the New Computers*. New York: John Wiley and Sons, Inc., 1983.

9.  Bjorn-Anderson, Niels and others. *Managing Computer Impact: An International Study of Management and Organizations*. Norwood NJ: Ablex Publishing Corp., 1986.

10. Blau, Peter M. and Richard A. Schoenherr. *The Structure of Organizations*. New York: Basic Books Inc., 1971.

11. Blau, Peter M. and W. Richard Scott. *Formal Organizations: A Comparative Approach*. San Francisco: Chandler Publishing Co., 1962.

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12. Blau, Peter M. and others. "Technology and Organization in Manufacturing," _Administrative Science Quarterly, 21_: 20-40 (March 1976).

13. Boger, Dar C. and others. "Improving Federal Information Systems Management: Technological Opportunities and Social Constraints," _Proceedings of the Fourth International Conference on Information Systems_. 163-174. Houston: Research and Education in Information Systems, The Society for Information Management, 1983.

14. Bostrom, Robert P. and J. Stephen Heinen. "MIS Problems and Failures: A Socio-Technical Perspective. Part I: The Causes," _MIS Quarterly, 1_: 17-32 (September 1977).

15. -----. "MIS Problems and Failures: A Socio-Technical Perspective. Part II: The Application of Socio-Technical Theory," _MIS Quarterly, 1_: 11-28 (December 1977).

16. Bozeman, Barry and Stuart Bretschneider. "Public Management Information Systems: Theory and Prescription," _Public Administration Review, 46_: 475-487 (Special Issue/November 1986).

17. Brannen, Kathleen C. "Management Information Systems: View Them as an Innovation for Successful Implementation," _Proceedings and Abstracts of the American Institute for Decision Sciences Annual Meeting, Western Regional Conference_. 234-236. Atlanta: American Institute for Decision Sciences, 1982.

18. Burlingame, John F. "Information Technology and Decentralization," _Harvard Business Review, 39_: 121-126 (November/December 1961).

19. Canning, Richard G. "The Automated Office: Part 2" _EDP Analyzer, 16_: 1-13 (October 1978).

20. Carroll, Donald C. "Implications of On-Line, Real-Time Systems for Managerial Decision-Making," _The Impact of Computers on Management_, edited by Charles A. Myers. Cambridge MA: MIT Press, 1967.

21. Carter, Nancy M. "Computerization as a Predominate Technology: Its Influence on the Structure of Newspaper Organizations," _Academy of Management Journal, 27_: 247-270 (June 1984).

22. Clark, Lt Col Thomas D. and Capt Douglas J. Blazer. "Designing a Flexible Management Information System," <u>Defense Management Journal, 16</u>: 44-48 (First Quarter 1980).

23. Clowes, Kenneth W. <u>The Impact of Computers on Managers</u>. Ann Arbor MI: UMI Research Press, 1982.

24. Cox, Bruce B. "Management Information Systems and Organizational Structure," <u>Library Software Review, 6</u>: 5-10 (January/February 1987).

25. Culnan, Mary J. "The Intellectual Development of Management Information Systems, 1972 - 1982: A Co-Citation Analysis," <u>Management Science, 32</u>: 156-172 (February, 1986).

26. Daft, Richard L. and Robert H. Lengel. <u>Information Richness: A New Approach to Mangerial Behavior and Organization Design: Technical Report TR-ONR-DG-02</u>. College Station TX: Texas A & M University, May 1983 (AD-A128980).

27. Daft, Richard L. and Richard M. Steers. <u>Organizations: A Micro/Macro Approach</u>. Glenview IL: Scott, Foresman and Co., 1986.

28. Danziger, James N. "Computers and the Frustrated Chief Executive," <u>MIS Quarterly, 1</u>: 43-53 (June 1977).

29. -----. "Computers, Local Governments, And the Litany to EDP," <u>Public Administration Review, 37</u>: 28-37 (January/February 1977).

30. Danziger, James N. and Kenneth L. Kraemer. <u>People and Computers: The Impacts of Computing on End-Users in Organizations</u>. New York: Columbia University Press, 1986.

31. Davis, Charles K. and James C. Wetherbe. "An Analysis of The Impact of Distributed Data Processing on Organizations in the 1980's," <u>MIS Quarterly, 3</u>: 47-56 (December 1979).

32. Davis, Gordon B. and Margrethe H. Olson. <u>Management Information Systems: Conceptual Foundations, Structure, and Development</u> (Second Edition). New York: McGraw-Hill, Inc., 1985.

33. Dawson, Patrick and Ian McLoughlin. "Computer Technology and the Redefinition of Supervision: A Study of the Effects of Computerization on Railway Freight Supervisors," Journal of Management Studies, 23: 116-132 (January 1986).

34. Delehanty, George E. "Organization Structure in Insurance Firms," The Impact of Computers on Management, edited by Charles A. Myers. Cambridge MA: MIT Press, 1967.

35. Downs, Anthony. "A Realistic Look at the Final Payoffs from Urban Data Systems," Public Administration Review, 27: 204-210 (September/October 1967).

36. Drucker, Peter F. "The Coming of the New Organization," Harvard Business Review, 66: 45-53 (January/February 1988).

37. Dutton, William H. and Kenneth L. Kraemer. "Management Utilization of Computers in American Local Government," Communications of the ACM, 21: 206-218 (March 1978).

38. Eason, Ken. Information Technology and Organizational Change. London: Taylor and Francis, Inc., 1988.

39. Edelman, Franz. "The Management of Information Resources -- A Challenge for American Business," MIS Quarterly, 5: 17-27 (March 1981).

40. Ein-Dor, Phillip and Eli Segev. "Organizational Context and MIS Structure: Some Empirical Evidence," MIS Quarterly, 6: 55-67 (September 1982).

41. -----. "Organizational Context and the Success of Management Information Systems," Management Science, 24: 1064-1077 (June 1978).

42. Emery, James C. "The Impact of Information Technology on Organizations," The Impact of Information Technology on Management Operations, edited by William C. House. Princeton: Auerbach Publishers, Inc., 1971.

43. Emory, C. William. Business Research Methods (Third Edition). Homewood IL: Richard D. Irwin, Inc., 1985.

44. Eno, Eric J. 'The Administrative Generalist and MIS,' Public Administration Review, 39: 485-488 (September/October 1979).

45. Federico, Pat-Anthony. Management Information Systems and Organizational Behavior (Second Edition). New York: Praeger Publishers, 1985.

46. Foster, Lawrence W. and David M. Flynn. 'Management Information Technology: Its Effects on Organizational Form and Function,' MIS Quarterly, 8: 229-235 (December 1984).

47. Fry, Louis W. 'Technology-Structured Research: Three Critical Issues,' Academy of Management Journal, 25: 532-552 (September 1982)

48. Girard, Raymond E. 'Productivity and Information Systems,' Computers in Healthcare, 10: 26-30 (February 1989).

49. Gorr, Wilpen L. 'People and Computers,' (Book Review). Public Administration Review, 48: 823 (July/August 1988).

50. Gulick, Luther. 'Notes on the Theory of Organization,' Classics of Public Administration, edited by Jay M. Shafritz and Albert C. Hyde. Oak Park IL: Moore Publishing Co. Inc., 1978.

51. Hall, Richard H. Organizations: Structure and Process (Third Edition). Englewood Cliffs NJ: Prentice-Hall, Inc., 1982.

52. Harvey, Edward. 'Technology and the Structure of Organizations,' American Sociological Review, 33: 247-259 (February 1968).

53. Head, Robert V. Federal Information Systems Management: Issues and New Directions. Washington: The Brookings Institution, 1982.

54. Henderson, John C. and David A. Schilling. 'Design and Implementation of Decision Support Systems in the Public Sector,' MIS Quarterly, 9: 157-168 (June 1985).

55. Hickson, David J. and others. 'Operations Technology and Organizational Structure: An Empirical Reappraisal,' Administrative Science Quarterly, 14: 378-397 (1969).

56. Horton, Forest W. and Donald A. Marchand.
    Information Management in Public Administration.
    Arlington VA: Information Resources Press, 1982.

57. Howe, Richard C. and Veronica Oestreicher.
    "Corporate Strategies: Organizational Structure,"
    Computers In Healthcare, 9: 24-27 (June 1988).

58. Huse, Edgar F. "The Impact of Computerized
    Programs on Managers and Organizations: A Case
    Study in an Integrated Manufacturing Company,"
    The Impact of Computers on Management, edited by
    Charles A. Myers. Cambridge MA: MIT Press, 1967.

59. Ives, Blake and others. "A Framework For Research
    in Computer-Based Management Information Systems,"
    Management Science, 26: 910-934 (September 1980).

60. Jefferies, Chris L. "Public Administration and
    the Military," Public Administration Review, 37:
    321-333 (July/August 1977).

61. Jenkins, A. Milton. Research Methodologies and
    MIS Research: Discussion Paper No. 277. Bloomington
    IN: Division of Research, School of Business,
    Indiana University, November 1984.

62. Kanter, Jerome. Management-Oriented Management
    Information Systems (Second Edition). Englewood
    Cliffs NJ: Prentice-Hall, Inc., 1977.

63. King, John Leslie. "Centralized Versus Decentral-
    ized Computing: Organizational Considerations
    and Management Options," Computing Surveys, 15:
    319-349 (December 1983).

64. -----. "Local Government Use of Information
    Technology: The Next Decade," Public Administration
    Review, 42: 25-36 (January/February 1982).

65. King, John Leslie and Kenneth L. Kraemer. "The
    Dynamics of Change in Computing Use: A Theoretical
    Framework," Computers Environment and Urban
    Systems, 11: 5-25 (Fall 1986).

66. Klatzky, S. R. "Automation, Size, and the Locus of
    Decision Making: The Cascade Effect," The Journal of
    Business, 43: 141-151 (April 1970).

67.  Kling, Rob.  "Social Analyses of Computing:
     Theoretical Perspectives in Recent Emperical
     Research,"  ACM Computing Surveys, 12: 61-110
     (Mar 1980).

68.  Kraemer, Kenneth L. and James N. Danziger.
     "Computers and Control in the Work Environment,"
     Public Administration Review, 44: 32-42
     (January/February 1984).

69.  Kraemer, Kenneth L. and John Leslie King.
     Computers and Local Government.  Volume 1: A
     Managers Guide. New York: Praeger Publishers,
     Inc., 1977.

70.  Kraemer, Kenneth L. and John Leslie King.
     "Computing and Public Organizations," Public
     Administration Review, 46: 488-496  (Special
     Issue/November 1986).

71.  Kraemer, Kenneth L. and John Leslie King.
     Computers, Power, and Urban Management:  What
     Every Local Executive Should Know.  Sage
     Professional Papers in Administrative and Policy
     Studies, vol. 3, series no. 03-031.  Beverly
     Hills CA: Sage Publications, Inc., 1976.

72.  Kraemer, Kenneth L. and James L. Perry.  "The
     Federal Push to Bring Computer Applications to
     Local Governments,"  Public Administration Review,
     39: 260-270. (May/June 1979).

73.  Kraut, Robert, and others.  "Computerization,
     Productivity, and Quality of Work-Life,"
     Communications of the ACM, 32: 220-238 (February
     1989).

74.  Laudon, Kenneth C.  Computers and Bureaucratic
     Reform:  The Political Functions of Urban
     Information Systems.  New York: John Wiley and
     Sons, 1974.

75.  Leavitt, Harold J.  and Thomas L. Whistler.
     "Management in the 1980's," Harvard Business
     Review, 36: 41-48  (November/December, 1958).

76.  Lucas, Henry C. Jr.  Computer-Based Information
     Systems in Organizations.  Chicago: Science Research
     Associates, Inc., 1973.

77.  Maish, Alexander M. "A User's Behavior Toward His
     MIS," MIS Quarterly, 3: 39-52 (March 1979).

78. Markus, M. Lynne and Daniel Robey. "Information Technology and Organizational Change: Causal Structure in Theory and Research," Management Science, 34: 583-598 (May 1988).

79. Miewald, Robert D. "Weberian Bureaucracy and the Military Model," Public Administration Review, 30: 129-133 (March/April 1970).

80. Mumford, Enid and Olive Banks. The Computer and the Clerk. London: Routledge and Kegan Paul, Limited, 1967.

81. O'Brien, John L. Mutual Misperceptions: A Comparision of Public Administration Education and Professional Military Education. MFA thesis. Governors State University, Park Forest South IL, December 1986

82. Olson, Margrethe H. and Norman L. Chervany. "The Relationship Between Organizational Characteristics and the Structure of the Information Services Function," MIS Quarterly, 4: 57-68 (June 1980).

83. Olson, Margrethe H. and Henry C. Lucas Jr. "The Impact of Office Automation on the Organization: Some Implications for Research and Practice," Communications of the ACM, 25: 838-847 (November 1982).

84. Meyer, Marshall W. "Automation and Bureaucratic Structure," American Journal of Sociology, 74: 256-264 (November 1968).

85. Perrow, Charles B. Organizational Analysis: A Sociological View. Belmont CA: Wadsworth Publishing Co., Inc., 1970.

86. Peters, Tom. Thriving on Chaos: Handbook For a Management Revolution. New York: Alfred Knopf, Inc., 1987.

87. Pfeffer, Jeffrey. Organizational Design. Arlington Heights IL: AHM Publishing Corp., 1978.

88. Pfeffer, Jeffrey and Huseyin Leblebici. "Information Technology and Organizational Structure," Pacific Sociological Review, 20: 241-261 (April 1977)

89. Power, Danial J. "The Impact of Information Management on the Organization: Two Scenarios," MIS Quarterly, 7: 13-20 (September 1983).

90. Pugh, Derek S. and others. "Dimensions of Organizational Structure," <u>Administrative Science Quarterly, 13</u>: 65-105 (1968).

91. Reif, William E. <u>Computer Technology and Management Organizations</u>. Iowa City: Bureau of Business and Economic Research, College of Business Administration, University of Iowa, 1968.

92. Robey, Daniel. "Computers and Management Structure: Some Empirical Findings Re-examined," <u>Human Relations, 30</u>: 963-976 (1977).

93. Robey, Daniel. "Computer Information Systems and Organization Structure," <u>Communications of the ACM, 24</u>: 679-687 (October 1981).

94. Robey, Daniel. "Implementation and the Organizational Impacts of Information Systems," <u>Interfaces, 17</u>: 72-84 (May-June 1987).

95. Robey, Daniel and M. Lynne Markus. "Rituals in Information Systems Design," <u>MIS Quarterly, 8</u>: 5-15 (March 1984).

96. Senn, James A. "Essential Principles of Information Systems Development," <u>MIS Quarterly, 2</u>: 17-26 (June 1978).

97. Simon, Herbert J. "The Proverbs of Administration," <u>Public Administration Review, 6</u>: 53-67 (Winter 1946).

98. Smeds, Riitta. "The Role of Computerized Information Systems in the Development of Organizational Structure," <u>International Studies of Management and Organizations, 17</u>: 90-104 (Winter 1988).

99. Stewart, Rosemary. <u>How Computers Affect Management</u>. Cambridge MA: MIT Press, 1971.

100. Stupak, Ronald J. "Military Professionals and Civilian Careerists in the Department of Defense," <u>Air University Review, 32</u>: 68-75 (July/August 1981).

101. Taylor, James C. <u>Technology and Planned Organizational Change</u>. Ann Arbor MI: Center for Research on Utilization of Scientific Knowledge, The University of Michigan, 1971.

102. Taylor, James R. and Jo Mulamba Katambwe. "Are New Technologies Really Reshaping Our Organizations?" Computer Communications, 11: 245-252 (October 1988).

103. Thayer, Frederick C. Organizing the Politics and Economics of Survival. New York: Franklin Watts, Inc., 1973.

104. Thompson, James D. Organization in Action. New York: McGraw-Hill Inc., 1967.

105. Tsaklanganos, Angelos A. "Peers, Persuasion, and Horizontal Management," Management Accounting, 60: 33-37 (August 1978).

106. Van Fleet, David D. "Span of Management Research and Issues," Academy of Management Review, 26: 546-552 (September 1983).

107. Van Fleet, David D. and Arthur G. Bedeian. "A History of the Span of Management," Academy of Management Review, 2: 356-372 (July 1977).

108. Vergin, Roger C. "Computer-induced Organizational Changes," The Impact of Information Technology on Management Operations, edited by William C. House. Princeton NJ: Auerbach Publishing Inc., 1971.

109. Vincent, Maj. C. E. "MIS -- Lessons Learned," The Air Force Comptroller, 13: 22-23 (July 1979).

110. Wagner, L. G. "Computers, Decentralization, and Corporate Control," California Management Review, 9: 25-32 (Winter 1966).

111. Whisler, Thomas L. The Impact of Computers on Organizations. New York: Praeger Publishers Inc., 1970.

112. Whisler, Thomas L. "Impact on Organizational Control" The Impact of Computers on Management, edited by Charles A. Myers. Cambridge MA: MIT Press, 1967.

113. Whisler, Thomas L. Information Technology and Organization Change. Belmont CA: Wadsworth Publishing Co. Inc., 1970.

114. Williams, Anne and Christopher Rowe. "Office Automation and Organisational Change -- The Need for a New Kind of Manager?" Industrial Management and Data Systems, unknown volume: 3- 7 (May/June 1988).

115. Withington, Frederic G.  The Real Computer: Its Influences, Uses, and Effects.  Reading MA: Addison-Wesley Publishing Co. Inc., 1969.

116. Woodward, Joan.  Industrial Organization: Behavior and Control.  London: Oxford University Press, 1970.

117. Zmud, Robert W. and James F. Cox.  "The Implementation Process: A Change Approach," MIS Quarterly, 3: 35-43 (June 1979).

118. Zwerman, William L.  New Perspectives on Organizational Theory.  Westport CN: Greenwood Publishing Corp., 1970.

## Vita

Captain John L. O'Brien enlisted in the United States Air Force on 16 August 1979 and served for six years as a guitarist with the 505th Air Force Band, Chanute AFB IL. He received his commission on 30 July 1985 and served as administration officer and executive officer for the 71st Student Squadron, Vance AFB OK until his selection for the Air Force Institute of Technology's Information Resource Management program. Captain O'Brien holds a Masters Degree in Public Administration.


Permanent Address:   6024 West Waveland Avenue
                     Chicago IL  60634

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Studies on the effect of management information systems (MIS) on organizational structure have been disparate. Research has documented changing spans of supervisory control and modifications to the number of levels of hierarchy in public and private sector organizations. Unfortunately, existing MIS research does not often apply to public sector/military MIS. This thesis examined military organizations and studied user perceptions regarding the relationship between MIS implementation and organizational structure changes.

Organizational structure changes will be determined by focusing on two specific characteristics: supervisory span of control and vertical complexity. Perceived changes to these characteristics (increases/decreases) were measured from two levels: top level management and mid-level/first line supervisors.

The study found that, for the specific research population, a perceived change in span of control did not occur following MIS implementation. There is some evidence of both increases and decreases to span of control but the data is not strong enough to suggest any direct causal relationship.

The study also found that, for the specific research population, little perceived changes in the vertical complexity of the organizational hierarchy occurred following implementation of MIS. What changes did occur were basically decreases, but the data is not strong enough to suggest any direct causal relationship.

Within a military environment, MIS appear to have little formal effect on span of control or vertical complexity. However, MIS do appear to have stronger informal effect. Military managers found an increased tendency to overlook formal reporting relationships and formal chain of command. MIS provided more opportunities for informal communication with subordinates, regardless of whom they worked for or what department they worked in.