Strategic IT, but not by ITself

On the relevance of the organizational context for strategic success with IT

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Rijksuniversiteit Groningen

Strategic IT, but not by ITself

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Ad Breukel
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GUIDE AND GLOSSARY

Guide to the thesis

This thesis is the result of a scientific research. The main part of the text is of a theoretical (literature and modelling) and methodological nature. However, the thesis can not only be used by researchers and students, but also by practicians such as (IT) managers and consultants in the fields of (Management) Information Systems and Organizational Studies. This guide will give recommendations about the most relevant chapters for these three groups of readers. The actual content of the chapters is found in the outline of the thesis (subsection 1.4.4). Therefore, this guide only provides the number, sequence and a rough sketch of the recommended chapters.

Practicians: 1, 5 and 8 (including appendix A)
A concrete picture for the use of IT in the organization is acquired by reading the following chapters: 1,5 and 8 (including appendix A). In these chapters, the impact of IT is described (1), the research model and research questions are stated (5), and the conclusions (including the practical use of the results) are depicted (8).

Theoretical researchers and students: 1-5 and 8 (including appendix A)
Insight into the literature regarding the use of IT in the organization can be gained by reading chapters 1-5. After the introductory chapter (1), the uni-variate research (the impact of IT, strategy, or structure on the strategic performance) is treated (2), followed by bi-variate researches (3) and multi-variate models concerning Information Systems and Organization Studies (4). The theoretical implications of the results are dealt with in chapter 8.

Methodologists: 1 and 5-8 (including appendix B)
The use of IT is mostly studied via case studies. In this study, another method is applied: a survey (6), based on the characteristics of the research questions (5). In chapter 7 (and appendix B), the results are generated, based on the method of data analysis in chapter 6.

Glossary of the abbreviations and their meaning

For the sake of clarity, the following abbreviations are explained:

ANOVA	Analysis of variance
BeMI	Business administration approach for information policy (in Dutch: Bedrijfskundige methode voor informatiebeleid)
BPR	Business process re-engineering (or redesign)
BSP	Business systems planning
CAD	Computer-aided design
CAM	Computer-aided manufacturing
CBS	Central bureau of statistics (in Dutch: Centraal bureau voor de statistiek)
CEO	Chief executive officer
CIO	Chief information officer
CSF	Critical success factor
CT	Contingency theory
DSS	Decision support system
EDI	Electronic data interchange
EwIM	Enterprise-wide information management
FPA	Flexible production automation
IE	Information economics
IEM	Information engineering method
IS	Information system(s)
ISP	Information systems planning
IT	Information technology
KvK	Chamber of commerce (in Dutch: Kamer van koophandel)
MANOVA	Multi-variate analysis of variance
MIS	Management information system(s)
NOP	Net operating profit
PCA	Principal component analysis
ROA	Return on assets
ROI	Return on investment
SBI	Standard company classification (in Dutch: standaard bedrijfsindeling)
SAM	Strategic alignment model
SAP	Strategic alignment process
SISP	Strategic information systems planning

SPSS	Statistical package for the social sciences

CHAPTER 1

INTRODUCTION

1.1 SUBJECT OF THE STUDY: STRATEGIC IT

1.1.1 Strategic IT: competitive advantage with IT

Founded in 1953, a cooperative association of cotton farmers (PCAA) in the southern USA started as a small organization to help market the cotton produced by its members. Twenty years later, in the early 1970's, PCAA was in big trouble. It handled less than 20% of its members' cotton, nearly 70% down on the previous decade. The members no longer considered PCAA to be a useful organization for selling their goods anymore. In order to survive, PCAA had to supply a better service to their members. It developed a computer-based system (TELCOT) to market the cotton electronically. Starting in 1975, TELCOT provided several enhancements for the marketing of cotton. Currently, it handles 115,000 to 240,000 computer transactions a day, and it provides a marketing service to more than 20,000 producers and 40 buyers. By exploiting the technological opportunities, PCAA grew from a $ 50 million to a $ 500 million business enterprise in only 15 years (Lindsey et al. 1990).

This is only one of the numerous examples of organizations that have used information technology (IT) successfully to gain a competitive advantage. The 1980s showed many cases of firms using IT successfully; organizations improved their performance using IT, so that their competitive position was strengthened (Dos Santos & Peffers 1993, pp. 517-518; Simon & Grover 1993, p. 30; Wilkes 1991, p. 54).

The strategic relevance of IT appears to be one of the main issues for managers in the field of information systems (Earl 1993, p. 1). Furthermore, case studies have not only drawn the concern of managers but also the attention of theorists. Also since the 1980s, many frameworks trying to explain the strategic effects have been developed (see subsection 1.2.2.4). Besides, the impact of IT is still rising; the ever-improving technology creates new opportunities (Benjamin et al. 1984; Benjamin & Scott Morton 1988; Parsons 1983).

The subject of this thesis is the topic of strategic advantage associated with IT. IT's contribution to the improvement in performance of organizations, resulting in strategic advantage, is one of the vital issues these days (Boersma 1989, pp. 165, 167; Earl 1993, p. 1). Nolan & Schotgerrits refer to the decades to come as the 'information society' (Nolan & Schotgerrits 1989, p. 991).

1.1.2 Strategic IT: a short introduction to theory and cases

The strategic importance of information technology (IT) to companies has become a major theme in the theoretical field of Information Systems research during the last decade (Cash et al. 1988; Johnston & Carrico 1988; McFarlan 1984). This is shown in the short historical overview given below.

In 1983-1984, the subject really started to attract attention in the literature. In his well-known article 'Information technology changes the way you compete', McFarlan was among the first scholars to describe the need to link IT with opportunities for a competitive edge (McFarlan 1984, p. 98; see also: Bakos & Treacy 1986; Benjamin et. al 1984; Ives & Learmoth 1984; Parsons 1983; Rockart & Crescenzi 1984; Rockart & Scott Morton 1984). He could build upon the work of Michael Porter, who wrote his very influential 'Competitive strategy' in 1980. In this work, Porter drew attention to the (competitive) position of companies within their industries. The goal of the various competitive strategies (low costs, differentiation and focus) was to find a defendable position with above-average returns (Porter 1980, pp. 4-6). Later he called this 'competitive advantage' (Porter 1985, p. 3). McFarlan used this idea to reach competitive advantage with IT; he linked the generic strategies with the usage of IT. Using an example of a magazine distributor, he stated that IT had enabled a strategy of lower costs by means of which the organization reached a competitive edge. Some other examples were:

- a one-line network that was installed by a distributor to its key customers;
- a reservations system that gave national carriers a competitive advantage over regional airlines.

In the following ten years, these examples, described elaborately in subsection 1.2.2.2, would repeatedly appear in publications to illustrate the strategic importance of IT (Cecil & Hall 1988; Rackoff et al. 1985). However, there were more successful examples. Sabherwal & King listed 34 successful case studies, Kettinger et al. also gathered some 30 cases (Kettinger et al. 1994, p. 56; Sabherwal

& King 1991, pp. 204-211).

1.1.3 Strategic IT: a starting point for the study

Despite the successful cases, recent surveys in the USA have shown a fading interest in the competitive advantage with IT, although in the Netherlands the interest is still at maximum level (Bots & Van Putten 1994; Niederman et al. 1991). The subject of strategic IT as a separate topic may decline in importance in the Netherlands too over the next few years in the Netherlands.

A plausible reason for the possibly declining focus on the strategic use of IT as a separate subject could be the difficulty of realizing the advantages, although the examples and theories have been at the center of attention for a long time. Practicians and scholars have still not found how to use IT in a proper way so that it benefits competitive position (Bakos & Treacy 1986, p. 107; Van Dissel & Park 1989, p. 753; Sabherwal & King 1991, p. 191). Moreover, in contrast to the successful case studies, other research has produced disappointing results concerning the strategic usage of IT (Galliers 1992, p. 97; NNC 1992, p. 40; Wilkes 1991, p. 50; Wilson 1993, p. 477). It appears that organizations have difficulty in effectively exploiting the strategic opportunities of the technology (Gerstein & Reisman 1982, p. 52; Singh 1993, pp. 133-135).

This problem is also important because of the high costs involved. Currently, the annual investment in IT represents onethird to onehalf of the total capital spending (Earl 1991, p. 6; Saunders & Jones 1992, p. 64). Davenport & Short used the figure of approximately $ 100 billion annual IT spending in the USA (Davenport & Short 1990, pp. 11-12). These high investments should deliver effective IT for the individual organizations, otherwise their financial position will be heavily damaged.

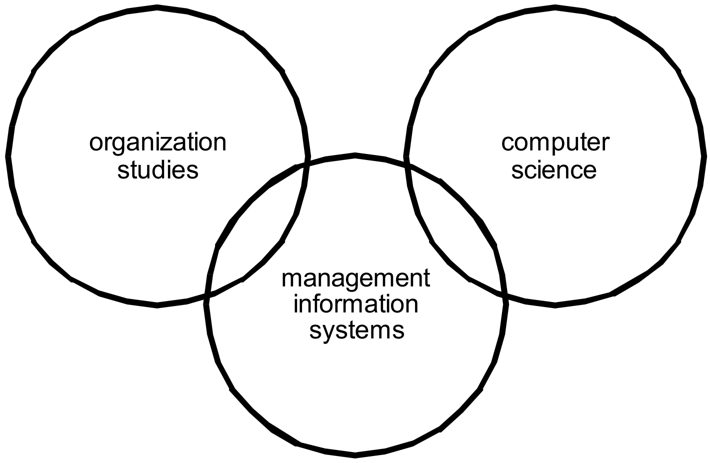
These observations form the starting point for the study. IT is often under-exploited and does not always contribute to the functioning of the organization in accordance with its potential (Benjamin et al. 1984, p. 3). This loss of potential is especially important because of the high investments. We need to know more about the realization of the strategic benefits that can be gained from IT.

1.1.4 Strategic IT: field of study

Research on an organization's usage of IT is found at the intersection of at least two fields of study. Firstly, there are the Organization Studies, which help one gain a more comprehensive understanding of organizational life (Davis & Olson 1985,

p. 14; Astley & Van de Ven 1983, p. 245). This field combines (descriptive) theories about the way organizations function with (prescriptive) theories about the management of organizations (see also Gazendam 1993, p. 18). Secondly, there is the field of Computer Science, which deals with the representation and processing of data by computers (Boersma 1989, p. 4; see also Bots et al. 1990, p. 22). The interface between these fields is formed by the so-called field of (Management) Information Systems. This field is concerned with the planning, development and use of information systems for the performance, management and support of organizational activities (see also Boersma 1989, p. 4; Gazendam 1993, p. 18). Combining ideas from the fields of Organization Studies and Information Systems, we want to add the explanation of the strategic use of IT to the field of Information Systems (see Figure 1.1: Fields of study).

Figure 1.1 FIELDS OF STUDY



The topic of successful use of IT has been on the research agenda of the field of Information Systems for a long time. Research has emphasized the successful use of certain specific applications. Furthermore, the general effect of IT on the functioning of organizations has also been under scrutiny. Research into that area has concentrated on the fit of the IT with the organization (Van Irsel & Swinkels 1992, p. 634; Meier & Sprague 1991, p. 364). This research used an organizational measure as a dependent variable: the organization's performance or competitive position (see for instance Mahmood 1993). As long ago as 1965, Leavitt launched the conceptual idea of a fit (or match) between organizational and technical entities (Rockart & Scott Morton 1984, p. 90). Researchers who built upon his work described a fit in qualitative terms only, and have made few attempts to quantify this concept. Therefore, it is not precisely known what this fit looks like (Chan & Huff 1992, p. 195; Leifer 1988, p. 63). Our research deals with that question and will operationalize IT, competitive strategy and organizational structure to investigate the effect of any fit on the competitive position.

1.1.5 Outline of this chapter

This first chapter has the following structure. Now that we have introduced the subject, section 1.2 goes into more detail. It comprehensively discusses the strategic opportunities, the large investments and also the problems of exploiting the IT opportunities. Combining these elements, we notice a need for effective management of IT. So far, the management of IT has not been able to solve the problem of using IT strategically. This topic still remains on the research agenda. In section 1.3, the goal of this research, which is based on how to deal with that problem, is presented. To reach for this goal, the research uses a classical scientific approach. In section 1.4, the focus is on that approach. The organization of the thesis follows the classical scientific approach, and is presented at the end of the chapter.

1.2 ISSUES IN THE FIELD OF STRATEGIC IT: OPPORTUNITIES, INVESTMENTS, EXPLOITATION AND THE MANAGEMENT OF IT

1.2.1 Introduction

As we already mentioned before, an organization's strategic usage of IT is the theme of this study. Therefore, the function of IT and its strategic potential usage by the organization needs first to be described in this section. Subsequently, several practical examples of the strategic importance of IT are given and theoretically founded. Next, we consider the investments in IT to further illustrate the importance of IT as a means of production.

The investments in IT do not always deliver the returns expected. In these situations, the strategic opportunities of IT are not well exploited. Because of the high IT investments, the strategic opportunities and the difficulties in exploiting these opportunities, it becomes clear that IT is an asset that requires careful management. Therefore, we shall discuss the relevance of the management of IT, especially as it is studied and applied in the field of Strategic Information Systems Planning (SISP). Indeed, exploiting IT for competitive advantage is one of the areas that SISP targets (Earl 1993, p. 1). However, the present use of SISP in organizations does not answer the question of how to gain strategic advantage with IT (Galliers 1993, p. 287). We conclude with the observation that the problem of the strategic use of IT is still a current item.

1.2.2 Strategic opportunities of IT

1.2.2.1 Strategic IT: two schools of thought

The function of IT in an organization is deduced from the function of the information services (see also NNC 1992, p. 35). IT is defined as the technology (i.e. hardware, commutations technology, software) for the automation of the information services (see also: Davis & Olson 1985, p. 62; Scott Morton 1989, pp. 21-22; in the next chapter we shall go into more detail on this definition). Information services concern the input, storage, processing, and distribution of information for the execution, the planning and control, and the support of the primary processes of organizations (see also Cecil & Hall 1988; Greveling & Kokke 1989; Theeuwes 1988). The performance of these primary processes determines the functioning of the organization and the resulting competitive position (Van Irsel & Swinkels 1992, p. 630; Porter 1985, pp. 33-34). Via the automation of the information services, IT contributes to the performance of the primary processes and therefore to the success of the organization (NNC 1992, pp. 7, 35). Some authors even consider information to be of such importance to our society that they regard information as a new production factor, in addition to the traditional macro production factors, viz. land, labor and capital (Theeuwes 1988, p. 15; Wilkes 1991, p. 53). This notion supports the relevance of IT as a strategic means of production for the organization.

Strategic use of IT has, obviously, the element of strategy. 'Strategic' refers to purposeful management so that the firm can achieve a competitive advantage (Weill & Broadbent 1990, p. 207). According to Porter there are two basic types of competitive advantage: cost leadership and differentiation (Porter 1985, p. 3). Organizations should try to reach one of these positions via generic strategies of lower costs, differentiation (by offering higher quality, better distribution and marketing) or focus, in order to shape their primary processes. Wiseman adds innovation to these strategies (Wiseman 1985; see also Miller 1987).

This concept of competitive advantage is close to (comparative) economic performance. In 'Competitive strategy' (1980), Porter explained a good competitive position in terms of above average returns on investment, on assets and so on (see also Caves 1980, p. 64; Miller 1988). Five years later, he called this superior position 'competitive advantage'. Several authors argue that competitive advantage should be expressed in terms of profitability and market share (Kettinger et. al 1994; Sabherwal & King 1992; Weill & Olson 1989; Wiseman 1985). Kettinger et al. relate the business performance to competitive advantage (Kettinger et al. 1994, p. 33). Bakos & Treacy describe competitive advantage as the power to create and exploit a market position via comparative efficiency and bargaining market power (Bakos & Treacy 1986). Mahmood finally joins these elements to form one construct (Mahmood 1993, p. 187).

The strategic use of IT has various meanings in the literature. Huff & Beattie distinguish two points of view (Huff & Beattie 1985; see also Wilkes 1991, pp. 51-54):

1. the use of IT for the support of the strategic decision-making process of firms (supporting the making of a strategic plan);
2. the use of IT for the realization of a better competitive position.

The second point of view has a broader scope than the first one. Not only do decision support systems for top management influence the competitive position of the organization, but also other kinds of IT can influence the competitive position of the firm. Galliers quotes Senn when he states that competitive advantage with IT often evolved without it being recognized beforehand as strategic (Galliers 1993, p. 287). Not only strategic (planned) IT can have a strategic impact (Weill & Broadbent 1990, p. 206). All kinds of IT can have profound strategic effects. It is the use of IT that matters, and not the type (Galliers 1993, p. 287). Transactional IT, in particular, proved to have strategic consequences (Benjamin et al. 1984, p. 5). In fact, most of the examples of strategic IT concerned applications that developed spontaneously at lower levels (Benjamin et al. 1984, p. 5; Ciborra 1991, pp. 286-287; Galliers 1993). These were not applications for decision-making support at the top (see also the examples of AHS and American Airlines below).

Due to its evolving character, strategic IT, in this study, was based on an approach that looked back upon the results of the use of IT. Strategic IT means that IT contributed to a better competitive position (see also Holland & Locket 1992, pp. 134-135). Separate applications bring about changes in business functions of the value chain and in the forces of the industry via the information services, creating extra benefits: the company performance improves. This implies that performance measures and competitive advantage are comparable (Kettinger et al. 1994, p. 41). The accumulated benefits therefore result in strategic advantages, depending on the costs of the IT and the behavior of the competitors.

In this research, we proceed from the assumption that when IT favors the business functions and therefore influences the competitive position in a significant way, then there has been effective exploitation of IT. This assumption is in line with the observations of diverse authors who maintain that to gain competitive advantage with IT, the opportunities of IT have to be exploited (Baets 1992, pp.

205-206; Benjamin et al 1984, p. 3; Gerstein & Reisman 1982, p. 52). This assumption also takes IT into account in cases where organizations decreased their disadvantage.

Now that the subject of strategic IT has been positioned, several practical and theoretical issues on this matter will be discussed to reach the preliminary research goal.

1.2.2.2 Examples of strategic success with IT

Two of the probably most well-known examples of successful strategic usage of IT will be presented as clear illustrations. Firstly, there is the example of the supplier system of American Hospital Supplies (AHS) (Benjamin et al. 1984, p. 5; Neo 1988). Secondly, there is the SABRE system of American Airlines (Hopper 1991; Neo 1988; Rackoff et al. 1985).

In the mid 1970s, AHS (now Baxter) started to use a new order-entry distribution system that directly connected many of its customers with the computers of AHS. In 1984, over 4000 customer terminals at several locations were linked to this ASAP (Analytic Systems Automatic Purchasing) system. By placing these terminals, AHS made ordering easier for its customers: it simplified ordering processes. Moreover, it helped the customers in controlling their inventories. Compared with the AHS system, the costs of ordering from other suppliers were relatively higher, so that the customers stayed with AHS. ASAP led to an increase of customer loyalty. In the end, the effect of ASAP was a reduction of costs for customers and AHS (a win-win situation) and a sharp rise in the AHS market share. This is typical strategic IT that subsequently evolved; a system that was not meant to be strategic in advance. Its aim was to solve some operational problems, such as incomplete orders and late delivery, with one of its biggest customers, Stanford Medical Center. Later a senior manager championed the system, and the newer technologies enhanced the system.

The second example concerns the reservations systems of American Airlines (SABRE) and United Airlines (Apollo). In the beginning of the 1960s, American Airlines did not have a clear overview of the seats available. A reservation system was needed for their inventory control. At first, in 1950, their previous systems were only aimed at the reduction of clerical costs. The number of reservations increased so much that these could not be handled without automation. And the amount of reservations continued to increase.

In 1963, there were 85,000 telephone calls, 40,000 reservations and 20,000 ticket sales. But the system was not only used for handling the large amount of data. The goals of this kind of system changed. After a while it became clear that an accurate count of the number and the names of passengers for each flight was essential to the management of the primary process: the airline operations.

In the beginning of the 1970s, the industry structure changed dramatically when travel agents, whose importance as point-of-sale increased from 40% in 1976 to over 80% in 1991, tried to develop an industry-wide reservations system. Knowing that a reservations system owned by travel agencies meant a dramatic change in power relations in the industry, United and American started to develop a common reservation system, having much experience with this kind of system. But their partnership failed, and American and United separately developed SABRE and Apollo. These systems provided increased revenues to the developer airlines in various ways:

- advantage in terms of booking via displaying the services of the developer airlines favorably;
- charging fees for bookings with other airlines;
- getting marketing information for new strategies.

Their competitive advantage over the rivals became so great that the other airlines appealed to the court for relief.

In the mid 1970s, SABRE was extended with all sorts of other applications: flight schedules, spare parts, management decision support. The system occupied a central place within the organization. Also other non-airline services became available via SABRE: hotel reservations, car rentals and so on. Nowadays, the major role of the SABRE system does not lie in favoring American Airlines in reservations, but in the revenues of the system itself. It has become a new business. Eventually, in 1991, there were 40 million reservation entries a month. We can conclude that this system too had a non-strategic aim at the beginning; the strategic advantages for American evolved while using it.

1.2.2.3 Strategic IT as a main issue for IT managers

The strategic relevance of IT not only becomes clear from the anecdotical examples of firms gaining competitive advantage while using IT, it also appears to be one of the main managerial issues in the field of information systems (Earl 1993, p. 1).

The main dimension in assessing the IT performance is the impact of IT on the strategic position (Saunders & Jones 1992, pp. 71, 72).

IT managers were questioned about their ideas on the key issues in IT management. Brancheau and Wetherbe conducted a series of delphi surveys in the USA in the 1980s (Niederman et al. 1991). In addition, Hartog & Herbert surveyed the ten most important IT management issues as seen by leading information systems professionals (Hartog & Herbert 1986, p. 352). In the Netherlands, Mantz conducted a series of researches. The results of these studies concerning competitive advantage with IT were as follows:

- In 1983 and 1985, competitive advantage with IT was not on the list of important issues. Another issue topped the lists, namely strategic information systems planning (SISP). SISP refers to "the (...) portfolio of computer-based applications (...) realizing its business goals" (Lederer & Sethi 1988, p. 446). Flynn & Goleniewska, however, assert that SISP aims to seek competitive advantage for IT (Flynn & Goleniewska 1993, p. 292). Also Liang & Ta state that matching SISP and corporate planning is a key to the organization's competitiveness (Liang & Ta 1994, p. 265). Effective (strategic information) systems planning is the key to capitalizing on the (strategic) opportunities of IT (Lederer & Mendelow 1988a, p. 73);
- In 1986, after some years of progressively gaining attention, competitive advantage with IT really burst up on the information systems scene (Brancheau & Wetherbe 1987, p. 25). It ranked second in importance, after SISP;
- In 1991, IT was as a strategic weapon still high on the list (ranked third), but again as a component of SISP (Niederman et al. 1991, p. 480). Competitive advantage itself dropped to the eighth place;
- In 1991, Mantz et al. found that a growing number of organizations in the Netherlands related IT with their competitive position (Mantz et al. 1991, p. 848). This is especially true in the so-called information-intensive industries like transport and financial services;
- In 1994, Bots and Van Putten confirmed this conclusion in their survey with information managers. Strategic IT and SISP ranked second and first on their list (Bots and Van Putten 1994, p. 96).

We see that strategic advantage with IT is a major theme for IT managers. Hence the question of defining a theoretical foundation of this subject is legitimate in the field of Information Systems.

1.2.2.4 Theoretical foundation

As stated before, there is a whole list of case studies on the use of IT. In the 1980s, several scholars analyzed these cases in an attempt to understand why advantages were gained and in which ways IT could be used to reach new advantages. Many frameworks, models and theories emerged. Porter & Millar wrote a leading article on this issue (Porter & Millar 1985). They explained this important role of IT via modelling the business functions and the environment of the firm. In this model, known as the value chain model, IT can not only improve the business functions of the firm, but can also add more information (technology) to the products the company offers. This value chain model, as depicted in Figure 1.2, will now be discussed in more detail.

Figure 1.2 THE USE OF *IT* IN THE VALUE CHAIN

support activities	firm infrastructure	planning models					
	human resource management	automated personnel scheduling					
	technology development	computer-aided design	electronic market research				
	procurement	on-line procurement of parts					
		automated warehouse	flexible manufacturing	automated order processing	telemarketing remote terminals for salespersons	remote servicing of equipment computer scheduling and routing of repair trucks	
		inbound logistics	operations	outbound logistics	marketing and sales	service	
		primary activities and services					margin

In the model, the business functions, like logistics and production, are linked by primary flows of (physical and informational) products and secondary flows for the support, planning and control of the business processes (see also Rockart & Scott Morton 1984, pp. 92-94). In the information-intensive industries, in particular, the optimalization of information flows by means of IT contributes to lower costs and differentiation of business functions. Besides, IT is used there as a mechanism to coordinate the business functions. Therefore, IT also enhances the performance of the organization. Finally, IT often is part of the organizational products in diverse industries (watches, telecommunications). In that situation, improvement to IT is a directly added value for the customer. In addition to these internal changes, IT can change the nature of the industry. In the industry, where organizations compete, various forces forming various stakeholders are present:

- suppliers;
- customers;
- organizations that deliver substitution products;
- organizations that are not (yet) present in the industry due to the entry barriers.

The industry thus consists of competing organizations. This competition is heavily influenced by the forces mentioned and by the existence of exit barriers. Linked to each other, the value chains form a production chain, connecting basic materials to end users.

The industry forms the environment for the value chain of an individual organization (see Figure 1.3: Competition in the industry). If IT lowers the entry barriers from the industry, or when IT makes new services possible, then the nature of the industry can change in a dramatic way, even to the extent that a new industry emerges.

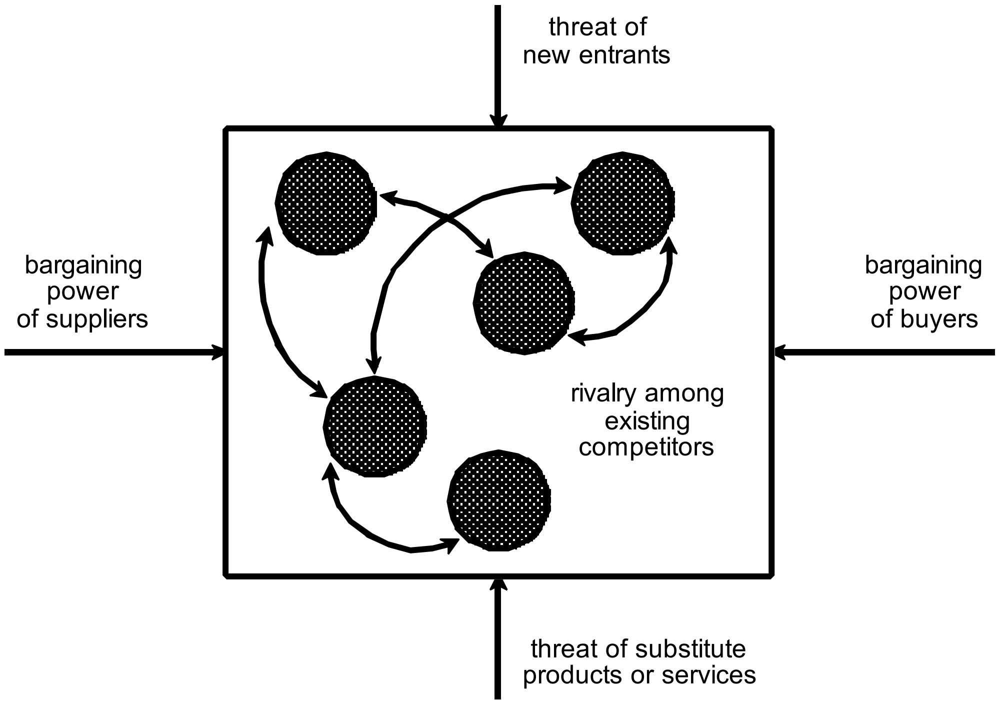
Concluding, IT can:

- improve the execution and coordination of the business functions of the firm to produce a better competitive performance, based on lower costs or on differentiation;
- create new products and services to (new) customers;
- change the industry in which it competes.

Many descriptive conceptual frameworks like that of Porter and Millar are present in the literature (Weill & Broadbent 1990, p. 205). So far, there is no systematic theory to explain and predict IT exploitation (Bakos & Treacy 1986, p. 107;

Sabherwal & King 1991, p. 191). They have a classifying function, and do not form a sound basis for a plan to gain competitive advantage with IT (Van Dissel & Park 1989).

Figure 1.3 COMPETITION IN THE INDUSTRY



Earl divides these theories into three categories (Earl 1991):

- awareness: these models help practicians to become aware of the importance of IT in creating strategic advantage. Their character is abstract, and their role is educative:
  - Benjamin et al. 1984: strategic opportunities;
  - Parsons 1983: three stage model;
  - Porter & Millar 1985: information-intensity matrix;
- opportunities: these prescriptive models are analytic tools for the identification of strategic opportunities with IT. They are more to the point than the awareness models:
  - Porter & Millar 1985: value chain model;
  - Ives and Learmoth 1984: resource life cycle model, a 13-point checklist of prescribed activities;
  - Rackoff et al. 1985: Wiseman's strategic option generator;
  - Benjamin & Scott Morton 1988: integration chain;
- positioning: the assessment of the status of IT in the organization:
  - McFarlan & McKenney 1983: strategic grid.

Summarizing, several experiences and ideas regarding strategic IT are described in both practice and theory. And the opportunities of IT are still rising, as we shall see in the following subsection.

1.2.2.5 New developments in IT

The cases and models make apparent that IT can and should play an important role in the organization's functioning. Although not always planned as strategic, IT has often been the necessary enabler for the strategic opportunities. The impact of IT is still increasing. That is due to improvements in one or more of the following (Benjamin et al. 1984, p. 3; Wilkes 1991, p. 57):

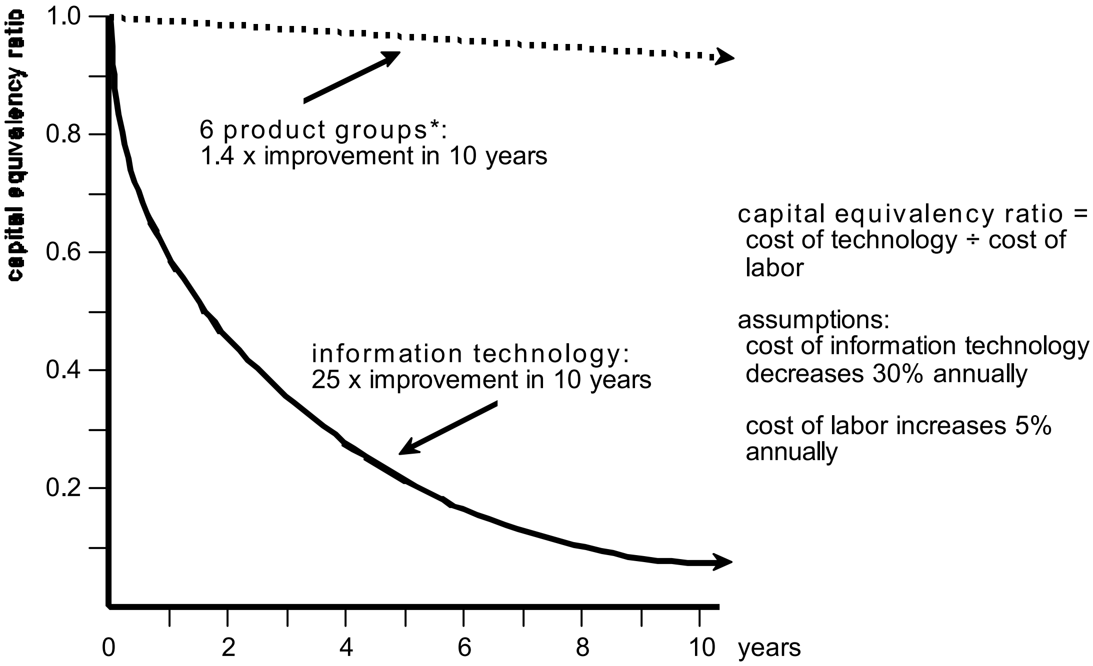
a. the functionality of IT, especially linked with the related costs;
b. the need and knowledge of using IT in and between organizations;
c. the integration of IT in society.

with respect to a.

- processors: it took 25 years for a vacuum tube to develop into a chip that used less operation time (a factor of 10,000,000) and cost less dollars per unit (100,000) or per logic (10,000). A $ 1 million computer in the 1960s had the same capability as a $ 5,000 PC in 1984 (this PC costs $ 1,000 in 1994). Developments like these not only made IT relatively cheaper, they also made stand-alone systems possible (Cash et al. 1988, p. 84);
- new applications: CAD/CAM, expert systems, EDI (Benjamin & Scott Morton 1988);
- telecom: fiber makes communication circuits 10 times cheaper than the conventional circuits (Benjamin et al. 1984);
- not only do technical changes improve the opportunities of the various IT components, but opportunities also arise when computers, telecommunications and office automation are integrated (Van Engelen 1989, p. 1). This integration will continue at an accelerating rate (Earl 1991, p. 19).

Most authors point to the rigorous decline in the costs of IT keeping the functionality constant (or a rising functionality with constant costs). For IT, these costs are defined by the costs per MIP (millions of instructions per second). This relative drop in IT costs makes this technology economically attractive compared with other technologies (Scott Morton 1989). Benjamin & Scott Morton used a ratio to express this attractiveness: capital equivalence ratio, the costs of technology divided by the costs of labor (Benjamin & Scott Morton 1988). IT has become 12 times cheaper compared with other technologies. Scott Morton gives an example: a computer in 1980 was equivalent to 210 persons working, in 1990 to 2 persons and in 2000 this will be 0.125 persons. This indicates the drop in IT costs, which is shown in Figure 1.4 and Table 1.1.

Figure 1.4 THE RELATIVE DROP IN IT COSTS



* source: U.S. Bureau of Labor Statistics, producer price index, compensation per hour, nonfarm, business sector, 1950-1980

with respect to b.

The business environment is also changing (Benjamin et al. 1984, p. 4). This encourages new ideas for the exploitation of IT opportunities. The goal becomes one of finding new ways for organizing business activities and making use of IT opportunities instead of automatizing the old routines (Hammer 1990, p. 104). A clear illustration of this is shown in the area of business process reengineering (BPR). In the early 1980s, Ford needed 400 clerks for their accounts payable organization, where Mazda just needed 5. Although Ford did outsize Mazda, the relative difference between their account payable organizations was very great. Radical changes in the Ford value chain processes were enabled by IT, so that a reduction of 75%

in head count was achieved.

Table 1.1 IMPROVEMENTS IN THE COMPUTING PERFORMANCE RELATED TO THE COSTS

	1980	1990	2000
constant functionality*	4.5 MIPS	4.5 MIPS	4.5 MIPS
cost original projection (1981) modified projection (1988)	$ 4.5 million	$ 300,000 $ 100,000	$ 10,000
number of people of equivalent cost original projection (1981) modified projection (1988)	210	6 2	0.125

* metaphor for constant functionality is millions of instructions per second (MIPS)

with respect to c.
Since the introduction of information systems, there has always been the difficulty of communication between technical specialists and users of IT. More and more people in society, and thus in organizations, are getting used to IT. This can be observed in the personal use of IT. In 1984, owning a PC was a rarity for students. These days, the lack of a PC is strange; it has become a consumer good. But the communication problems will only disappear when the 'Nintendo generation' finally is takes charge (Intermediair 1994, p. 17).

Though the relative costs of IT may be shrinking, the absolute costs are still huge. The next subsection expands upon this theme.

1.2.3 IT investments

Now that we have outlined the present and future IT opportunities for strengthening the competitive position of organizations, as well as the theoretical backgrounds of IT, we want to stress the magnitude of the investments involved:

- In 1983, Parsons estimated a total investment of $ 1 trillion up in the following five years (Parsons 1983, p. 3);

- Davenport & Short quoted a Business Week survey from 1987 reporting that almost 40% of all US capital spending went to information systems: $ 97 billion a year (Davenport & Short 1990);
- Wilson referred to the US Commerce Department saying that the domestic investment in hardware and software equalled $ 80 billion (Wilson 1993, p. 472);
- Earl stated that investments in IT amount to 60% of the total capital investments (Earl 1991);
- Keen stated that half of the growth in investments is caused by IT (Keen 1991);
- Saunders & Jones reported that the annual investment in IT and related technology represented approximately onethird of the total corporate capital spending, and that expenditures on information processing and communications rose 4.6% annually from 1975 to 1985 (Saunders & Jones 1992).

Despite the differences in the figures, due to different methods and definitions, the picture is becoming clear: the expenses for IT are substantial. Considering these expenses, it is necessary for management to asses the future returns on the IT investments. On the one hand, knowing the high costs, it is sensible to be careful with the investments. If the investments are not cost-effective, then the organization's financial position could be heavily damaged. On the other hand, if management is too careful, and the investments are not being made, then the organization could lose ground compared with the competitors. Organizations where IT investments have not been made since the 1960s are probably no longer in business. In the field of Information Economics (IE), investigators search for IT investment criteria and methods (see chapter 2). So far, not one single method grasps the precise costs and possible returns of the IT investments (Van Irsel & Swinkels 1992, p. 636).

1.2.4 Disappointing results

Some examples of the dangers of investment in IT are shown in disappointing cases of IT usage. As long ago as 1984, Benjamin et al. noticed the gap between IT opportunities and utilization (Benjamin et al. 1984; see also Parsons 1983).

In 1992, NNC reported that the potential of IT was hardly being used to strengthen the competitive position of Dutch organizations (NNC 1992, p. 40). The low expectation regarding the IT was stated as the main cause. If IT is only considered as a tool for efficiency improvements, then its potential is scarcely being exploited (NNC 1992, p. 43). On the other hand, if an organization is geared to innovating its business processes, and if it views IT as an important enabler for this and integrates SISP in the overall strategic decision making process, then it is more successful with IT (NNC 1992, p. 37).

In spite of the success cases, hardly any attention is paid to unsuccessful cases (Johnston & Carrico 1988, p. 37). One of the few published cases that described failing IT originated from Jaikumar, who compared identical applications in the USA and Japan. He researched FPA (flexible production automation) application and observed that in both countries the same technology from the same supplier made the same products (Jaikumar 1986). All the contingencies of the technology were equal, but the production floor the differences were striking:

- in Japan there were 18 fully automated production processes, in the USA none;
- in the USA they needed 4 times more staff as compared to Japan.

The different way of using the applications caused differences in returns on the applications. In Japan, the technology was aimed at flexibility: many (93 kinds of products) small (250 pieces) series of products. In the USA, IT was used to reach economies-of-scale: less series (10 kind of products) of a large size (1700 pieces). Due to a lack of change in organizational thinking, the opportunities were not exploited.

Another failure case is adopted from Galliers (1992, p. 97). In 1984, Lansman showed that the management of the Bank of America was convinced that their SISP would be successful. This plan eventually led to a dedicated accounting system. However, the bank could not achieve advantages with this new system. Having invested over $ 80 million, the failure of the system resulted in the loss of 30 of its most prominent clients.

Elsevier's weekly presented some failure stories in 1992. One of these cases concerned the VVV (the Dutch Tourist Information Office). In 1983, the aim of the project was to collect information on the products and services of several participants, such as the VVV and hotels. The failure was due to technical and organizational reasons. The project was finally stopped.

In addition to cases like these, many negative publications have appeared in the newspapers. A short list:

NRC (1991): Groosman (former chairman of NGI) stated a startling absence of knowledge on the importance of IT, in reaction to the Butler Cox report on the strategic opportunities of IT;

- Elsevier (1992): billions of investments did not deliver results. The solution: start all over again;
- Intermediair (1994): there have been many failures with automation.

Several studies originated from the 1980s, so that failures could be relativized because of the lack of experience with large IT projects. Research studies on the results of IT investments, however, confirm the difficulty of gaining success with IT. Researchers did not find significant relations between IT investments and productivity measures (Thurow 1990), although other studies supported this relationship (Hitt & Brynjolfsson 1994, see also subsection 2.3.2.4).

The problem of the return on the IT investments should perhaps be considered in a broader scope. The 'Economist' compared the introduction of IT into society with that of electricity into production organizations at the beginning of this century. It took 20 years before the new means of production earned return on investment (Brynjolffson 1994, p. 57; Intermediair 1994, p. 17). New technology needs around 20 years to pay off (Nolan & Schotgerrits 1989). Hammer, Davenport and Short plead for a fundamentally different way of using IT in organizations. This has become known as the BPR approach (Davenport and Short 1990; Hammer 1990). In chapter 4, we shall go into more detail on this subject.

1.2.5 Strategic Information Systems Planning (SISP)

Because of high opportunities, high investments but also great difficulties with exploiting IT, managing IT has become the focus of attention for both authors and practicians. Via SISP, an attempt has been made to manage IT effectively (see subsection 1.2.2.3).

SISP assumes that purposeful management has a positive effect: the planning of IT has a positive effect on the strategic usage of IT. This assumption is questioned in the literature (Galliers 1993; Simons & Verheijen 1991, p. 51). Disappointing results of SISP are known, concerning the strategic impact of the applications (Earl 1993; Flynn and Goleniewska 1993; Lederer & Sethi 1988). Although the satisfaction of IT management with IT was generally quite reasonable, the output of the SISP was dissatisfying. In chapter 4 we shall elaborate on these results.

On the one hand, Galliers takes an extreme point of view by claiming that the competitive gains are as much a result of coincidence as of strategic (information systems) planning (Galliers 1993, p. 286; see also Benjamin et al. 1984, p. 5). The question is raised as to whether SISP is useful for the realization of competitive advantage with IT at all. Simons suggests the following (information policy) paradox (Simons & Verheijen 1991, p. 51; see also Bots et al. 1990, p. 605):

- organizations which want to implement SISP (because their information services are poorly organized) are not capable of implementing (successful) SISP;
- organizations which are capable of implement (successful) SISP (because their management is well-organized), do not require to do so.

On the other hand, a degree of planning is believed to be useful, according to McFarlan. He found that an information systems plan is most useful when the IS developers are made aware of the objectives of the firm (Lederer & Mendelow 1987, p. 390). When business plans were available, then the results were better (Lederer & Mendelow 1988b, p. 455). Earl also reached the conclusion that the availability of business strategies is one of the success factors for SISP (Earl 1993, p. 6). Academic writers assume that the alignment of SISP to business goals (guided to competitive advantage) is a necessary condition for identifying applic-ations with strategic opportunities (Baets 1992; Boersma 1989). This topic regarding the possible success of SISP will be fully discussed in chapter 4.

1.2.6 Conclusion

The relevance of the research has been made clear. Trying to explain the utilization of strategic IT opportunities adds insight into one of the main issues in Strategic Information Systems (Planning) research.

1.3 PRELIMINARY RESEARCH GOAL

By discussing this issue of strategic IT, we reach the aim of this research. It has become clear that:

- IT has strategic opportunities;
- IT requires enormous investments;
- IT is difficult to exploit;
- SISP is no guarantee for strategic IT usage.

This is an important problem that we should know how to deal with, in order to prevent continually disappointing results and declining IT investments. In the Netherlands, we have already seen a reduction in IT investments (Intermediair 1994; Mantz 1991).

Therefore, the preliminary goal of the research is: to gain insight into the strategic usage of IT. We may conclude that strategic IT opportunities are successfully exploited if IT strengthens the competitive position of organizations. This result can be used in the field of (Strategic) Information Systems (Planning), where practicians and authors are concerned about the strategic impact of IT. In chapter 5, the preliminary goal will be worked out in a more detailed (operational) goal with corresponding research questions. This elaboration will be based on the theoretical model that will be developed in chapters 2, 3, 4 and 5.

1.4 RESEARCH APPROACH AND OUTLINE OF THE THESIS

1.4.1 Introduction

In this section, the outline of the dissertation is presented. This outline is deduced from a suitable research approach. The research approach systematically describes the activities that have to be performed to reach the research goal. Basically, there are two approaches: the fundamental research approach, which follows De Groot's empirical cycle, and the applied research approach, which follows the regulating cycle as described by Van Strien (De Groot 1961; Van Strien 1986). We shall first compare these two approaches, and then the choice for the fundamental approach will be justified. Accordingly, the outline is developed.

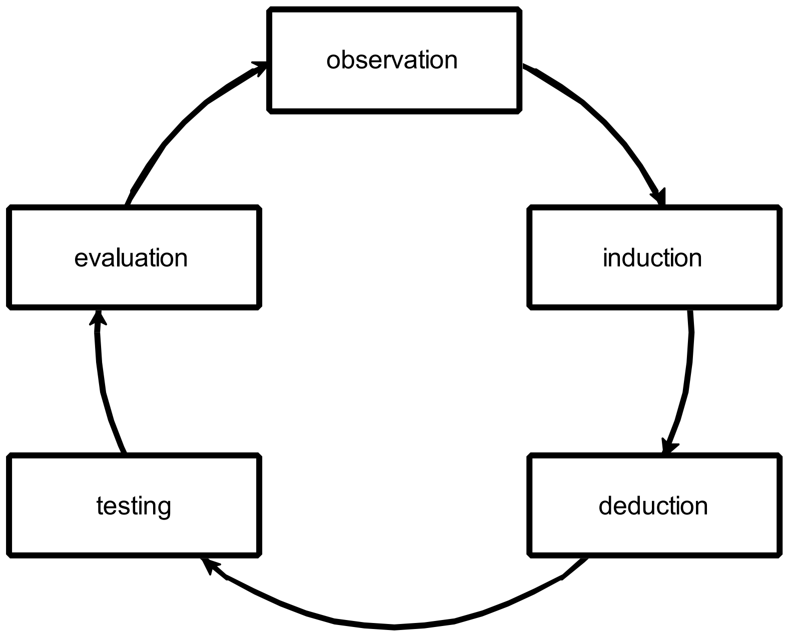
1.4.2 Research approaches

Developing theories, or at least having the ambition to develop theories, is an essential part of scientific research. If we compare scientific knowledge with knowledge developed in another way (common sense for instance), it becomes clear that understanding why phenomena occur is of vital importance to scientific knowledge. This understanding is reflected in a theory about this phenomenon, in which the phenomenon is explained. This theory consists of a set of related statements that can be verified (Swanborn 1984, pp. 89-90; compare Huber 1990, pp. 237-240). Research in the (scientific) field of Organization Studies (and Information Systems) needs an on-going process of theory development and theory application (Van der Zwaan & Van Engelen 1994b, p. 93):

- if research is aimed at obtaining insight into certain phenomena, researchers want to explain these by developing a theory. The research approach starts with an exploration of all possibly relevant practical observations and theoretical ideas. This results in an explanatory theory using the process of induction. Finally, this theory is tested. This approach is called the fundamental research approach;
- if research,however, focuses on the solving of specific problems, the problem situation is imbedded in a relevant theory for that situation. The theory is thus applied. Based on this theory, a solution is constructed (for instance a measure, or a method), and implemented. This approach is called the applied research approach.

These approaches have different methodologies (Van der Zwaan 1990, p. 145). The fundamental approach uses the empirical cycle (Swanborn 1984, p. 124):

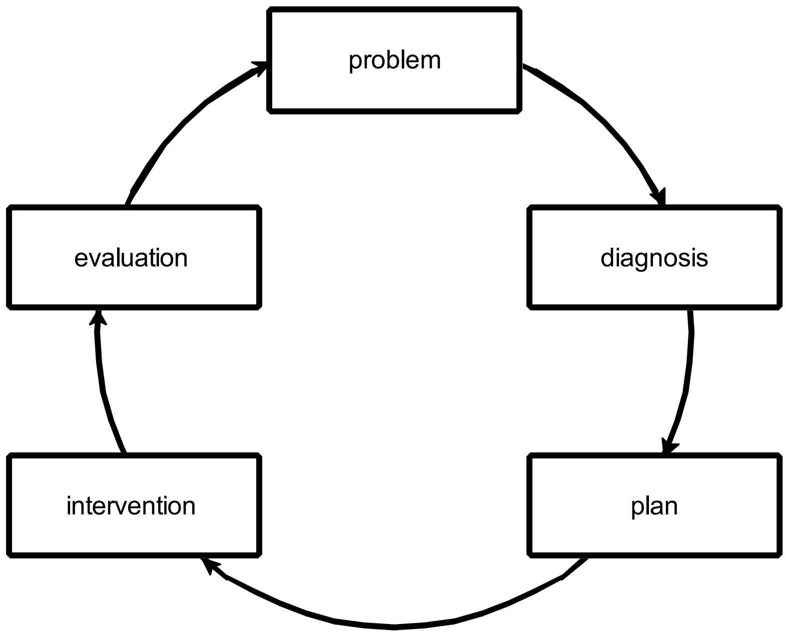
Figure 1.5 THE EMPIRICAL CYCLE



1. observation: first the issue (phenomenon) is explored in its context, for which the researcher makes use of empirical material and parts of various theories;
2. induction: after this exploration, an explanatory model is designed via the process of induction, in which a mixture of common sense, theories and data is used. After describing the model, researchers are able to refine the research goal and to state the research questions because they have developed relevant terminology for the study on this issue;
3. deduction: to verify whether or not the theoretical model is correct, hypotheses have to be aligned to the theory developed;
4. test: next, the hypotheses have to be tested in (an empirical) research. Data are gathered and analyzed, and the results become clear;
5. evaluation: the cycle finishes with the evaluation of the results. New questions arise, and form the basis for further research.

This fundamental approach wants to enlarge the basis of scientific knowledge that eventually could be used to solve concrete problems. The main goal, however, is understanding. The applied approach directly wants to contribute a solution to a specific problem. The applied approach follows the regulating cycle (Van Strien 1986, p. 19; see also Swanborn 1984, p. 127):

Figure 1.6 THE REGULATIVE CYCLE



1. problem definition: a problem has been perceived. This means that the present situation is not satisfactory in comparison with a normative measure (Swanborn 1984, p. 127; Van der Zwaan 1990, p. 148). At the beginning of the research, the problem description is still vague and precise information about the situation is missing;
2. diagnosis: more information is gathered and the problem under scrutiny is formulated within a theoretical framework (Van der Zwaan & Van Engelen 1994b, p. 86). Now researchers can characterize the problem as a deviation from the applied theory (Van der Zwaan & Van Engelen 1994a, p. 30);
3. plan: solutions are designed. These are cause-effects models that are deduced from the theoretical formulation of the problem (Swanborn 1984, p. 129). Firstly, specifications are developed: the prescriptions for the final solution. Thereafter, the solutions are designed (Van der Zwaan & Van Engelen 1994b, pp. 90-91);
4. intervention: the solution is implemented. Researchers report the effects of this implementation;
5. evaluation: the effect is evaluated in terms of the earlier problem. Based on the possible improvements, new theories can be developed. So, not only

is theory applied, it can also be a result of this research approach.

The choice between these approaches (summarized: exploration - explanation - test vs. diagnosis - construction - implementation) is mainly based on the research goal. The relevant question runs as follows: which result must be accomplished with the research: understanding or improvement?

Despite the differences between the two approaches, the following similarities should not be neglected. Firstly, there is the relevance of theory. In both approaches, theory holds a central place as a condition for the scientific claim of the research approach. In the fundamental approach, theory is the desired result of the research. Theory developed in the fundamental approach can fluently proceed to the applied research as applied theory (Van der Zwaan & Van Engelen 1994a, p. 33). In the applied approach, theory forms the framework in which the situation is formulated. Besides, theory could be a result of applied research. Concrete objects like cars and bridges are not the only objective of applied researchers. The bottom line of this approach remains, however, the direct solving of the original problem. Secondly, the 'hypothesis' and 'design' are more or less equivalent statements. Both are deduced from a theory that is explicitly tested (fundamental) or implicitly evaluated after implementing the design (applied, see also Swanborn 1984, p. 130). Finally, in the fundamental approach, design occupies an important place in the process of induction in which the theory is developed (Van der Zwaan & Van Engelen 1994a, p. 30).

1.4.3 Using the fundamental approach

The characteristics of the research goal and the current development of the theory determine the choice between the two approaches. In this chapter, it has been made clear that the goal of the research is to get insight into the strategic usage of IT. Although there are some theoretical foundations for this phenomenon (e.g. the concept of the value chain), a theory enabling understanding of the strategic usage of IT is still lacking (Sabherwal & King 1991, p. 191). We need more theory in order to gain insight into strategic IT. Therefore, the fundamental approach is very suitable. Based on a newly developed theory, we shall give some guidelines for IT use. These guidelines will, however, not be implemented in organizations and accordingly not evaluated in this study (see: suggestions for further research in the last chapter under the heading Conclusions).

1.4.4 Outline

The outline of this thesis is deduced from the fundamental research approach and follows the empirical cycle.

Chapter 1: Introduction
In this first chapter, the issue of strategic IT has been observed. Examples of strategic IT were given. The relevance of the subject was not only made clear by several theoretical researchers, it was also known in practice. IT managers considered strategic use of IT as one of their main issues at the present time. The relevance of successful use of IT was also very clear because of the high investments involved. Not only were the relevance and importance of IT outlined, but also the problems of reaching strategic advantages with IT. Although there are conceptual models on strategic IT (including SISP models), a lucid theoretical foundation is lacking. Combining these observations, the preliminary goal of the research has been presented: to gain insight into the strategic usage of IT.

The research approach is aligned to the classical empirical cycle because of the fundamental character of the research goal. The goal was described rather broadly. To refine this goal, it is necessary to develop the vocabulary (the concepts) in which the detailed goal and questions can be stated. For this, we design a theoretical model in the following chapters 2-5, in which a simplified view of the relevant issues under scrutiny is given.

Chapter 2: Uni-variate research: explaining the strategic performance with one variable
Chapters 2 to 5 deal with the development of the theoretical model for strategic use of IT. We start as simply as possible. The initial research involves whether or not the single variable of IT might explain its strategic success. This seems not to be the case. This observation is also made for several organizational variables which seem to be relevant in the field of Information Systems, viz. competitive strategy and organizational structure. Researching only one variable (uni-variate research) does not offer a sufficient explanation for strategic success.

Chapter 3: Bi-variate research: explaining the strategic performance with two variables
The third chapter continues the quest for a model that explains strategic IT.

Because one single variable could not offer enough insight into using IT strategically successfully, now IT is linked with an organizational variable, namely the competitive strategy. Researches on the impact of the IT - competitive strategy relation on the strategic performance offer promising results (bi-variate researches), but are not always consistent. The same remark can be made about the impact of the IT - organizational structure researches and the competitive strategy - organizational structure studies. Maybe more variables have to be related in one model in order to explain strategic IT.

Chapter 4: Multi-variate research: explaining the strategic performance with several variables
In chapter 4, models in the fields of Information Systems and Organization Studies are studied, where several technological and organizational variables are simultaneously taken into account (multi-variate researches). A well-known theoretical point of view is the importance of the fit between IT and the organization to bring about a successful usage of IT. It is, however, difficult for practicians to use IT in accordance with this 'fit-idea', because of the conceptual nature of the models. The concepts have to be made more concrete.

Chapter 5: Research model: relating the three variables IT, competitive strategy and organizational structure
The fifth chapter presents our theoretical model for the strategic use of IT. In this model, the concepts of the IT and the organization (from chapter 4) have been made operational (using the ideas from chapter 2) and related (based on the researches mentioned in chapter 3), so that the preliminary goal of the research (see chapter 1) can be reframed in a more detailed way: the finding of concrete fits between the IT and the organization that enhance the strategic use of IT. The exact research goal and detailed research questions are given after the final presentation of the model; the relevant vocabulary will then have been designed. The chapter finishes with the deduction of three hypotheses on the successful usage of IT. These hypotheses are the expected answers to the research questions.

Chapter 6: Method of research
The sixth chapter describes the method of research used to perform the tests. The features of the research goal and questions, the nature of the theoretical model and the features of the data demand the further gathering of the data if so desired. In the preceding chapter, the theoretical model is defined in operationalized variables to which several values can be assigned. The operational goal of the research is

to find favorable fits. Therefore, more instances of the model have to be compared with each other on their strategic position. Data from many organizations are necessary in order to compare those instances of successful IT usage. A survey is a proper research design for this purpose because these data are not yet available. In chapter 6, we shall discuss the population, sample and response of the survey. Also the (reliability and validity of the) operationalized concepts, like the competitive strategy, IT, competitive position and SISP is reviewed. The chapter finishes with the scheme of analyses used for the testing of three hypotheses.

Chapter 7: Results

Chapter 7 presents the results of the tests. Following the scheme of analyses, described in the method of research, it becomes clear as to whether the hypotheses can be confirmed or must be rejected. The research results are concerned with three main topics that are introduced in this first chapter. The first result deals with the successful exploitation of IT. It indicates that the organizational context is an important factor regarding the strategic opportunities of IT. The second result takes the lack of exploitation of IT into account. It demonstrates that organizations often not balance their usage of IT with the organizational environment. Finally the third result deals with the impact of SISP on the strategic success of IT. It shows that SISP is no guarantee for successful IT usage. The theoretical interpretation of these results and their practical implications are presented in the last chapter.

Chapter 8: Conclusions

In chapter 8, the results are evaluated. We shall describe whether or not the research goal has been reached by discussing the theoretical and practical implications of the results. One of the results is that the theory of alignment is confirmed by means of the operationalizations in this research. This result may be used in practice via implementation of some guidelines. The main suggestion for further research is faced with the difficulty of implementing these guidelines in practice. Such research should develop an applied method, in which the theory, developed and tested in this research, can be used as frame of reference.

CHAPTER 2

UNI-VARIATE RESEARCH: EXPLAINING THE STRATEGIC PERFORMANCE WITH ONE VARIABLE

2.1 INTRODUCTION

In chapters 2 to 4, the research model that serves as an interface between the preliminary research goal and the final research questions is developed. Research models make the point of view explicit on the explored issues. Clarification of this point of view is one of the demands of scientific study. This is true not only because researchers have to make their subjects researchable for themselves, but also because they have to offer others the opportunity to test or duplicate their study. The theoretical research model assumes a position at the heart of the research via a process of induction where parts of theories and empirical studies are integrated. When the model has been developed, there is enough basis to refine the research goal into questions. Finally, hypotheses can be developed to test the research ideas.

In this study, which concentrates on obtaining strategic advantage with the use of IT, the building of the research model had the next stages. Initially, an examination was carried out as to whether a simple research model with one variable, or perhaps two variables, would be sufficient to deal with the issue under scrutiny. Empirical studies described in the literature indicated that this assumption was not adequate. Therefore, more ideas had to be used to make the problem manageable. In the search for usable ideas, some interesting occurrences took place.

In the first place, two parallel, unconnected research directions were found in the field of Information Systems. On the one hand, there were studies on the relation between IT and competitive strategy, and on the other hand studies concerning IT and organizational structure were found. It was not too difficult to integrate these research areas, the more so because the relation between competitive strategy and organizational structure had been thoroughly studied in the field of Organization Studies.

In the second place, this attempt at integration attempt fitted into the mainstream research on the planning of information systems very well. Moreover, it added a new element to this field, namely the operationalization of concepts. For this operationalization and integration, we could borrow ideas from the field of Organization Studies, where relations between structure, environment, technology and so on are studied, articulated in the contingency ideas. The ideas on the relation between IT and strategy, IT and structure, planning of information systems and the ideas of contingency approach could be combined into one research model as the result of induction.

This second chapter is arranged as follows. In the discourse, the uni-variate research, which deals with the relation between IT and the strategic performance (also indicated as the competitive position) of an organization is presented. We explore whether or not one variable can determine a significant portion of the strategic performance. Next to the IT, other relevant variables in the field of Information Systems are also studied regarding their performance implications. Before the uni-variate part starts, the concept of strategic performance is introduced as a necessary element for the rest of the study.

2.2 ORGANIZATION STUDIES AND INFORMATION SYSTEMS LITERATURE ON STRATEGIC PERFORMANCE

In this research we aim to find suitable ways to exploit IT. Therefore, an indicator for successful IT usage is needed to assess this exploitation. A direct measurement of IT returns from separate information systems is known to be very difficult. Naturally we should like to specify the influence of IT precisely by comparing the extra returns delivered by the IT with the (IT) investments. This method is extremely complex, both for theoretical reasons (which part of the extra returns for the organization is caused by IT?) as well as for empirical reasons (how should the costs and returns of IT be measured?). So far there is no costs-benefits method that assesses and compares all IT related costs and returns (see the next subsection 2.3.2: The relevance of IT for strategic performance).

An indirect manner to indicate the successful exploitation of IT is to use the strategic performance as a criterion (Chan & Huff 1992, pp. 196-197; Gerstein & Reisman 1982; Niederman et al. 1991, p. 486). In this subsection, this option, as opposed to a direct measurement, will be founded. The strategic performance is in at the heart of the research topics in strategic IT research. In the first chapter, it was stated that:

- case studies illustrate the strategic differences between competitors caused by the relatively effective use of IT. Broadbent & Weill found that IT-based performance results were generally consistent with the overall financial results (Broadbent & Weill 1991, p. 304). Strategic effects of IT are recognized via the influence on financial results (such as the profit margins) but also via the changes in market share (Saunders & Jones 1992, p. 71; Strassmann 1985, p. 140);
- managers mention this strategic importance of IT;
- in information-intensive industries, IT is identified as a crucial means of production and its impact on business processes and the industry is great (Porter & Millar 1985). Parker et al. focus on opportunities for the strategic advantages of information systems (Parker et al. 1989). They state that IT provides strategic benefits, like better quality, greater flexibility or technological expertise. Also the strategic risk of not investing in the IT project receives their attention.

Therefore it is possible to use the strategic performance as an indicator for the effective exploitation of IT (Johnston & Carrico 1988, pp. 37-39). This performance could be expressed in many different indicators: market share, return on investment (ROI), sales growth (Guimares & Igbaria 1994, p. 133). This is especially true in information-intensive industries where the IT investments are high and their impact is important (Porter & Millar 1985; Sabherwal & King 1991, p. 194; see also chapter 1).

The strategic performance has two main angles: the internal and external situation of the organization (Chan & Huff 1992, p. 193). In Caves' description of the economic performance of the firm, profitability and market share measures are equally important (Caves 1980, p. 64). High market shares without earnings make new investments impossible, whereas high profits with low market shares may result in being overrun by the competitors (see also Miller & Friesen 1986a, p. 42). Both angles will have to be clear in the operationalization (see chapter 6).

Another important point is the comparability of organizations. There is a wide variation in profitability between industries (Porter 1980). But even within industries, differences are great. Profitability structures tend to differ between large and small organizations.

Definition: The strategic performance indicates the well-functioning of an organization related to comparable competitors in the same industry.

The strategic performance, which will also be referred to as the competitive position of the organization, can be stimulated by the use of IT. This indicates the importance of the exploitation of the IT-opportunities (Bakos & Treacy 1986, p. 108; Saunders & Jones 1992, p. 72). In the next section, the argument regarding the competitive position as an appropriate indicator for the effective usage of IT will be elaborated.

2.3 THE IMPACT OF DISTINCT VARIABLES ON THE STRATEGIC PERFORMANCE

2.3.1 Introduction

The quest for explaining the impact of IT on the strategic performance starts easily. We study IT as a single variable in terms of its effect on the strategic performance of organizations. If such an approach succeeds, the research model will remain rather uncomplicated and elegant. This subsection is organized as follows. To begin with, IT will be discussed regarding its effect on the organizational strategic performance (subsection 2.3.2). However, this factor alone cannot explain the variations in this performance. This observation will be backed by studying the competitive effect of two important organizational variables: competitive strategy (subsection 2.3.3) and organizational structure (subsection 2.3.4) (Miles & Snow 1978; Perrow 1986; Porter 1980). The conclusions derived from these researches form the basis for the direction of further research.

2.3.2 The relevance of IT for strategic performance

2.3.2.1 Introduction

In this subsection we investigate the influence of the IT as an individual, independent variable on the strategic performance of organizations. In chapter 1, it was stated that IT may play a significant role in an organization's competitive position. This contribution however is not self-evident. The usage of IT does not always bring the revenues expected.

This subsection has the following structure. Firstly, IT is described and defined (subsections 2.3.2.2 & 2.3.2.3). Then the effect of IT is discussed on three levels in subsection 2.3.2.4:

- the micro-level. What are the strategic benefits of IT for particular information systems in (departments of) individual organizations? This subject is studied in the field of Information Economics (Parker et al. 1989);
- the meso-level. Is there any relation between IT and strategic performance measures of organizations?
- the macro-level. What is the impact of IT for the productivity in society?

The results of this study of literature are discussed as a basis for further research on strategic IT.

2.3.2.2 Description and definition of IT

In the literature, IT is described in various ways. This variety of definitions resulted in conflicting measures for IT (Markus & Robey 1988, p. 583). Basically two kinds of definitions can be distinguished:

a. the technological definitions: in this stream, the tools for the automation of the information services are described, such as hardware and software. The following definitions are illustrative examples:

   IT is a set of the following elements (Scott Morton 1991, p. 4):
   1. hardware: ranging from large-scale mainframe computers to small-scale microcomputers;
   2. software: ranging from traditional languages like COBOL via fourth-generation equivalents to expert systems based on developments in artificial intelligence;
   3. networks: telecommunications ranging from public to private, from broad band to narrow band;
   4. workstations: ranging from those designed for engineers (using a lot of computational power for elaborate graphics) to professional workstations used by a bank's lending officers or by market analysts (models, heuristics, simple graphics and a large database);
   5. robotics: ranging from robots for the factory floor to automatic teller machines;
   6. smart chips: used in products to enhance the performance (elevators).

   IT is a comprehensive term for (Stegwee 1992, p. 15):
   - hardware, software and services,
   - relating to the processing, storage and communication of information,
   - using primarily opto-electronic means.

   In this view, other components of information systems (people, procedures, data(bases): Boersma 1989, p. 6; Bots et al. 1990, p. 25) are not included because they do not automatically refer to automation as such. For the use of IT, however, these components are indispensable.

b. the knowledge definitions: in this stream the IT is viewed as the body of knowledge and skills within the organization contributing to the information services. The definitions stated below are clear examples:

IT consists of all the technical automation tools, knowledge and methods for the organization of the information services, which are the activities, facilities and procedures by which the organization fulfills its information needs (Greveling & Kokke 1989, p. 662).

Sebus: IT is the know-how for the development, production, implementation and application of technics and tools for the registration, storage, maintenance, mutation, provision and transport of data (Sebus 1991, p. 18).

The description of IT in technological sense refers to the automation tools. People are interested in the improvement of the capabilities of hardware or in the progression in software development. These automation tools contain an implicit body of knowledge. However, in this technological angle, the raison d'etre of IT is lacking, viz. the support of the information services in and between organizations. Information services are concerned with the input, processing, storage and distribution of data for the execution, support and management of business functions (compare Theeuwes 1988, p. 13). If a definition includes the role of IT for the business functions, the gap between the technological and the knowledge angles will be closed slightly.

Definition: IT is the collection of automation tools (hardware, software, telecommunications) that are used for the support of the information services of organizations.

In this definition, the concrete presence of tools (the technological component) is combined with their function (or application) in the organization (the knowledge component) . This function of IT and its presence throughout the organization are described in the next subsection 2.3.2.3.

2.3.2.3 Elaborating on IT: dimensions and configurations

The definition is an invitation for elaboration of the function of the IT and of the distribution of IT in the organization, in order to finally measure the way IT is used in organizations. Earl specifies four different ways of using IT strategically (Earl 1991, pp. 10-13):

1. using IT for obtaining a competitive advantage by influencing the competi-

tive forces in the industry.
IT can support the information processing in the product (services) and in the distribution. Earl illustrated this by means of the Merrill Lynch Cash Management Account system that combined various financial services for its customers;
2. using IT for improving the productivity internally.
IT reduces the costs and improves the quality of the primary production process. This is illustrated by IT for CAD/CAM systems and inventory systems used by Ford Europe;
3. using IT for new ways of management and organization.
IT can renew working procedures. Working at home is used as an example (Rank Xerox);
4. using IT for developing new business activities.
IT makes possible all kinds of trade in information services for clients. Marketing bureaus become specialized in analyzing certain market data.

Weill and Broadbent distinguish strategic IT, referring to a new use of IT in industry (innovative, resembling Earl's 1. and 4.), informational IT, aimed at supporting management in a better way (comparable with 3.) and transactional IT, meant for cutting costs (see 2.) (Weill and Broadbent 1990, p. 206). Bakos and Treacy also recognize the improvement in efficiency, effectiveness, and (product) innovation as being opportunities for IT to support the competitive strategy (Bakos and Treacy 1986, pp. 112-113). They also add inter-organizational use of IT, resulting in better coordination that benefits all the participants, and the use of IT to bind the suppliers and customers.

IT adds value by fulfilling different needs for customers. These can be new needs (innovative use of IT) but also quicker deliverance, more service, and better quality (extra effectiveness). Besides, IT can also be aimed towards a change in production processes (more efficiency for instance) in the organization. The results of all this IT usage can be the same: a better competitive position via lower costs or more differentiation (Porter 1985, p. 3). Thus, three dimensions to indicate the function (realized use) of IT are:

1. IT efficiency: IT adds to lowering the costs of the primary process;
2. IT effectiveness: IT adds to the function of the product (better quality, quicker distribution, more service and so on);
3. IT innovation: IT contributes to changes in the organization so that products, services and production processes are created that are relatively new in the industry. This might adjoin major changes in this industry.

These dimensions do not automatically refer to concrete information systems. Different applications can be used for the same goal (effectiveness), and the same application can be used in different ways (Jaikumar 1986). However, the realized goal of the IT should be relevant to the (IT) management. General policy statements concern this (abstract) function of IT, so that linkages with, for instance, the competitive strategy can be made at the same level of abstraction, resulting in a clear basis for further planning and development of IT choices (comparable with Strategy Set Transformation (King 1978)).

The description of the distribution of IT in the organization depends on the information-processing role of the IT. The organizational structure has a certain capacity for processing information (Galbraith 1973). IT deals with the same issue; it enlarges the information-processing capacity. Therefore it is maintained that the distribution of IT (the IT structure) is a reflection of the organizational (decision-making) structure (Ein-Dor & Segev 1982, p. 56; Tavakolian 1989, p. 309). Ein-Dor & Segev see the IT structure as a multi-attribute variable comprising several dimensions (Ein-Dor & Segev 1982, p. 56):

4. IT centralization: the locus of responsibility for development and implementation of applications (see also Tavakolian 1989, p. 311);
5. IT concentration: deployment of hardware (from processing near the user to central - non-user located - processing);
6. IT integration: IT can be used for shared data-use.

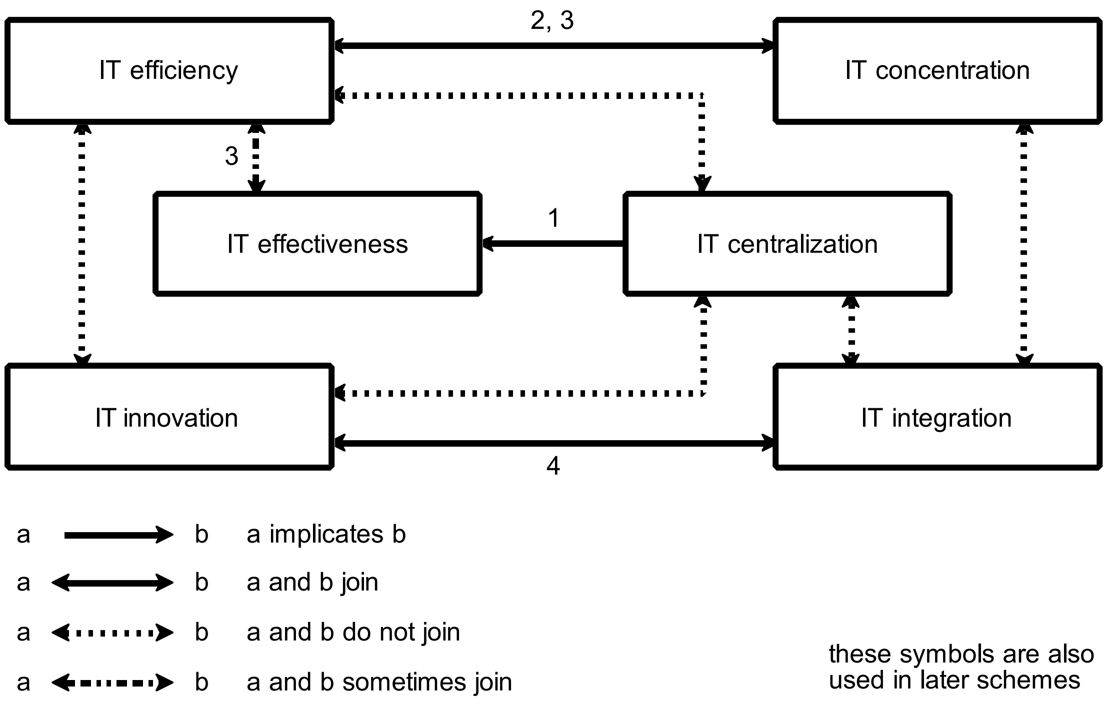
These six dimensions are the basis for a limited number of IT types or IT configurations. These configurations are also known as fits. A fit is a linkage that relates various dimensions of one variable (IT for instance) or more variables (IT and competitive strategy) in a certain way that implies a better organizational performance compared with linkages in another way. The concept of fit is further elaborated in the description of the contingency theory (see subsection 4.3.4).

Application of the configurational approach is based on the idea that the dimensions are mutually relative (Miller 1986; Mintzberg 1979, p. 473). This approach is widely used in the field of competitive strategy (Miller & Friesen 1984). In addition, they make also use of organizational types in research on organizational structure. Based on the idea of configuration, Mintzberg describes the existence of the so-called pure organizational structure types (in Weber's terms: ideal types). Real organizational structures do not match the configurations exactly, but some come really close. These are the so-called configurations (Gestalts, natural clusters) of a theoretically consistent combination of structural variables.

In the field of Information Systems, the configurational approach is less well-known. Leifer recognized its importance and categorized IT in four types: centralized, distributed, decentralized and stand-alone IT (Leifer 1988, pp. 64-65). These types are based on relations between the dimensions of IT structure, since a single dimensional approach may not be sufficient for a description (Lee & Leifer 1992, p. 30). However, in the configuration only IT distribution variables (4-6) were taken into consideration, leaving IT function variables (1-3) aside. In our study, the latter function variables will also be included.

The configuration relations between the dimensions are the following (see also Figure 2.1: Configurational scheme for IT):

Figure 2.1 CONFIGURATIONAL SCHEME FOR IT



- IT efficiency and IT concentration go together very well. Concentrated IT is especially appropriate for processing a great magnitude of data for clearly defined tasks. This performance enables the efficiency of these tasks so that benefits are created;
- IT innovation and IT integration support each other. Innovations are often

the result of teamwork. Here, mutual communication is very important. This communication is supported by integrative IT opportunities: direct, quick and no authorizations required;

- IT efficiency and IT innovation are mutually exclusive. Efficient IT is based on processing large amount of data. This requires and results in regular (formalized) business processing. Innovative IT, however, is aimed at changing that organizational situation (i.e. the coordination and performance of business processes);
- IT concentration and IT integration do not combine: the communication in concentrated IT goes via the central hub. This IT structure hinders quick mutual adjustment;
- IT centralization is only possible for the management if the opportunities of the IT are not too complex. This is true for IT effectiveness without innovative (integrative) opportunities and without efficiency capacity;
- efficient IT and effective IT may be integrated when central processing is combined with local processing. Then it is possible to offer extra competitive value by means of lower costs and by offering more quality and convenience to the organizational functioning. In this enhanced situation the integration via the IT is enlarged.

Initial values leads to (the figure between brackets refers to the configuration):

IT efficiency +:	it follows that IT concentration +, IT innovation - and: -IT effectiveness -, IT centralization 0 and IT integration - (2) -IT effectiveness +, IT centralization 0 and IT integration 0 (3)
IT centralization +:	it follows that IT effectiveness +, IT innovation -, IT efficiency -, IT integration - and IT concentration - (1)
IT innovation +:	it follows that IT integration +, IT centralization -, IT efficiency -, IT concentration - and IT effectiveness - (4)

Table 2.1 IT TYPES IN VARIABLES

	unconnected IT	concentrated IT	distributed IT	decentralized IT
efficiency	low	high	high	low
effectiveness	high	low	high	low to aver.
innovation	low	low	low	high
centralization	high	average	average	low
concentration	low	high	aver. to high	low
integration	low	low to aver.	average	high

aver. = average

The IT types are represented by the numbers that belong to the dimensions or the relations in-between. The four resulting types have internally consistent dimensions. Of course these types are only 'pure, ideal', and do not match the real IT situation perfectly. Nevertheless, the general use of IT is represented by one of them (for elaboration see appendix A.2).

2.3.2.4 Research on the strategic impact of IT

Now that we have given an elaborate description of IT, the impact of IT will be dealt with. Firstly, the theoretical research concerning the effect of separate applications at the micro-level is researched. Then we shift the attention to the meso-level because of the difficulties of determining the distinct costs and benefits of individual applications. Here too, practical research is present. The analyses and findings at the micro-level and the meso-level are supported by the impact studies on the macro-level, which are presented at the end.

Micro

At the micro-level, the estimated costs and benefits of IT (applications) within the organizations are researched (field of Information Economics: IE). This field gives guidelines for investment decisions for computing and information systems (Parker et al. 1989, p. 24). Organizations frequently have only limited resources for investments. Therefore various investment projects are competing for scarce resources. The competition is based on the expected costs and benefits of the projects. In IE, developing and implementing information systems are seen as investment projects; resources are spent on hardware and software for future benefits.

There are great risks and uncertainties which inhibit the assessment of costs and benefits compared with other kinds of investment projects, due to the possible organizational changes as a result of the usage of IT (Sebus 1991, p. 71). Accordingly, Parker et al. give a method that tries to clarify the relevant decision factors for IT investments (Sebus 1991, p. 88). The result of IE is a decision-making approach for the allocation of its scarce resources (Parker et al. 1989, p. 31). This decision-making is a complex exercise. Not only are the costs difficult to measure, but the estimation of the benefits is also complex.

Problems on estimation of IT costs: different costs are measured, namely:

1. the hardware and software costs (see for instance the IT definition of Scott Morton 1991, pp. 4-5);
2. the budget of the IT department, leaving aside other forms of automatization in the organization (Strassmann 1990);
3. all costs related to information services besides the hardware and software itself, like personnel for instance (Sebus 1991, pp. 18, 56; Weill & Broadbent 1990, p. 207).

Problems regarding the estimation of IT benefits:

1. allocation: implementation of IT does not only produce changes in the technological state of the organization, it also results in a changing of the business processes. IT enables those changes. Therefore, increased profits are not only ascribed to the IT, but also to the combined effect of IT and organizational changes (Van Irsel & Swinkels 1992, p. 627; Niederman et al. 1991, p. 486);
2. time of acquiring the benefits: often there is a time-lag between investments and returns on the investments (see also Brynjolfsson 1994, p. 55);
3. place of benefits: the advantages of IT are generated outside the organization (near the customers) due to competitive reasons (see also Hitt & Brynjolfsson 1994, pp. 272-273);
4. intangible: the profits of indispensable information are difficult to capture (see also Brynjolfsson 1994, pp. 54-55).

To tackle these problems, IE looks beyond the usual IT costs and benefits, and takes risks and opportunities into consideration. With reference to the costs, it recognizes the following classes (Parker et al. 1989, pp. 25-26; see also Delahaye & Van Reeken 1992, p. 661; Oosterhaven 1992, p. 671; Sebus 1991, pp. 85-86):

- strategic uncertainty: the assessment of the degree to which the business strategy is likely to succeed. IT projects that support a risky business strategy are also at risk themselves;
- organizational risks: the assessment of the degree to which IT projects can be supported by organizational capabilities such as organizational skills, experiences or management capabilities. If information systems require certain organizational changes, the organization must have the ability to change accordingly;
- IS infrastructure risks: the assessment of the degree to which the IS infrastructure can support the development and functioning of new information systems;
- definitional uncertainty: the assessment of the degree to which the users and/or the management are able to describe their IT specifications;
- technological uncertainty: the assessment of the degree to which the IT projects are dependent on new or untried technologies. A project may be risky if it requires the use of untried technology.

With reference to the benefits, IE focuses on the opportunities for competitive advantages of information systems. Parker et al. state that IE goes beyond traditional returns on investment decision-making methods that are usually based on concrete returns on the investment. They add non-monetary 'returns'. As a result they identify the next classes for the benefits (Parker et al. 1989, pp. 23-24):

- enhanced view of return on investment (economic impact): the commonly used ROI calculations may be used to gain insight into the costs and returns of the IT project, but with special consideration. Some IT projects have a longer life than non-IT projects and provide benefits (better quality, greater flexibility, technological expertise) that can be used for other strategic investments. The typical capital justification process does not quantify these benefits;
- strategic match: assesses the degree to which the IT project aligns to the business strategy;
- competitive advantage: assesses the degree to which the IT project establishes a competitive advantage in the market;
- management information: assessment of the IT's contribution to the management's need for information on core activities that are directly involved in the realization of the organizational strategy;
- competitive response: the evaluation of the business risk of not investing in the IT project;
- strategic IS architecture: the degree to which the IT-investment fits into the general direction of information systems planning.

The subject of the costs and benefits of individual information systems is complex, even using IE. There is no IE method that elucidates all the benefits (Delahaye & Van Reeken 1992, p. 668;Van Irsel & Swinkels 1992, p. 633). Therefore, it is difficult to study the effect of separate information systems on the organizational performance. Another important feature of information systems is their interdependency. When fixing on separate information systems, there is the danger of loss of the interdependencies. For instance, the IT infrastructure combines other information systems, but it does not yield returns itself.

Changing the level of analysis is a way to escape the difficulties caused by the focus on separate information systems. IE methods evaluate specific information systems benefits rather than the impact of IT on the organization as a whole (Burn 1989, p. 9).

Meso

In our research, we chose to look at the aggregated IT devices of the whole organization as a way to research the impact of IT. As an indicator to assess and to compare the costs of IT, the amount of IT investment is widely used. In some studies, IT investments are indicated by the budget for the IS department (Saunders & Jones 1992, p. 63; Strassmann 1990). The investments in hardware, software and telecommunications are generally included (Mahmood 1993, p. 187). These IT investments and the presence of hardware, software and telecommunications are, of course, not perfectly interchangeable. But especially in organizations within the same sector of industries, where the same sorts of IT components are used, the level of IT investment could be viewed as a handy reference. The effect of this IT has to be researched with respect to the organization as a whole. Hence the competitive position of the organizations is used, indicated with various measures.

We concentrate on the total IT of the organization, and do not focus on the different information systems, as in Information Economics. Using the combined IT and competitive position has the following advantages:

1. in the competitive position the IT advantages are recorded for the organization itself and for parties outside the organization:
   - inside: IT makes a better production possible, which decreases the costs of the organization and favors the profits.

   Hitt & Brynjolfsson indicate the difference of the concept of productivity versus the concept of profitability. The first concept is related to the function between 'inputs' and 'outputs', whereas the second concept concentrates on the returns that firms earn (Hitt & Brynjolfsson 1994, pp. 263-265). They found that IT investments relate with productivity gains, but not with the profitability (Hitt & Brynjolfsson 1994, p. 264, 272). Their explanation is that the extra benefits created, such as cheaper and more sophisticated products, are transferred to the customers (Hitt & Brynjolfsson 1994, p. 272). IT is a competitive necessity in a competitive market with a free entry; all organizations can make use of it. If all competitors use the IT well, the benefits are taken by the customers, and the profitability of those competitors will remain the same (Hitt & Brynjolfsson 1994, p. 265). However, if an organization does not use IT, or does not gain extra productivity benefits from IT, the customers will change to the competitors, and the market position will be damaged on the long run. Therefore, we shall also include the market position in the measurement of the competitive position;

   - outside: IT does not deliver direct advantages to the organization itself, but it is appreciated by customers so that the organization's market share rises;

2. studying the overall IT of the organization makes it superfluous to break down the IT into several information systems and to allocate benefits to all these components. We are interested in the overall, aggregated effect of IT, for which the relationship between the IT components must not be disjoined.

Using the competitive position of the organization as a dependent variable for the impact of IT also raises some problems:

- it is a complex construct that can be operationalized and measured in many ways;
- competitive advantages could be caused by more factors than IT. The question is therefore: which part in competitive change could be caused by the result of the usage of IT.

In chapter 6 we shall go into detail on these subjects.

Practical research in literature

Now that we have established the competitive position as a usable reference for the exploitation of IT, we list a series of meso-level researches on the general impact of IT on organizations, based on several works (Mahmood 1993, pp. 185-187; Mahmood & Mann 1993, pp. 101-102; Thurow 1990):

- one of the first IT investment researches was performed by Cron & Sobol in 1983. They studied 138 medical wholesalers in the Surgical Trade Association survey. For the IT variable, the amount of computer applications was used (comparable with the level of IT investments) ranging from the absence of computer use to heavy computer use. As dependent variables, they used four profitability figures to indicate the competitive position: profits before tax, return on assets (ROA), return on net worth and the sales growth rate. The results of the study were peculiar. Low IT investments correlated with a weak competitive position, but high IT investments did not correlate with a strong competitive position. Firms with large IT investments showed a bimodal distribution of performance indicators. This meant that they were either very strong (obtaining IT benefits) or very weak performers (high IT costs);
- in 1985, Turner did not find any relation between IT investments and organizational performance. This research used 58 mutual saving banks

as a sample;

- one year later, in 1986, Bender estimated that 15-25% of the total investment of a firm must be spent on IT for a superior firm performance. This research was also performed in the financial services industry, namely among 132 insurance companies;
- in 1988, Loveman conducted a research that failed to show a significant relation between IT investment and productivity. This time, the sample comprised a number of manufacturing firms;
- in the same year, Banker & Kaufmann could not find the strategic impact of automatic teller machines (ATM's) for banks. The market shares studied did not improve;
- also in 1988, Harris & Katz studied 40 insurance companies over a four year period and found that firm profitability related positively with IT investments. They were interested to see whether certain IT investment ratios could predict organizational performance. For the IT investment ratio's they used IT expense ratio (IT expenses to total expense) and IT costs efficiency ratio (IT expenses to premium income). A company's performance was operationalized by relating the total operating expenses to the premium income;
- in 'Business Value of Computers' , Strassmann reported that he did not find any relation between IT investments (related to total sales) and the profitability of organizations (Strassmann 1990);
- in 1990, Kühn Pedersen could not find a significant relationship between IT expenditure and the observation of competitive advantages of information systems. Also the correlation of IT intensity and competitive advantage showed no significant correlation (Kühn Pedersen 1990, p. 199);
- finally, in 1993, Mahmood presented a research in which he clustered organizations in moderate, high and extremely high IT investment clusters, determined by a combination of diverse IT investment measures. He also clustered organizations on their performance, determined by ROA, ROI, market value to book value, growth in revenues and so on. Relating the two clusters, he did not find a relation between the level of IT investment and the competitive performance (Mahmood 1993, p. 192). By means of further analysis of the various clusters, however, he could find some relations between IT investments and competitive performance (Mahmood 1993, p. 197).

We see that researches on the relation between the total IT investments and the competitive positions reveal, at best, mixed results. Research demonstrates that IT investments as such do not explain the competitive performance. IT investment is not a good predictor of competitive position. There are several explanations possible for this conclusion:

1. Usage by organizations.
   Misusage of IT causes bias. In the studies mentioned, IT investment is not checked on the usage of IT. Using IT, firms sometimes reach higher sales, better profits and bigger market shares in comparison with their competitors. These relative advantages can emerge if the customers prefer certain organizations that perform better for them.
   The organization that exploits its IT in the most useful way (the best IT exploitation) will benefit from IT by means of its competitive position, directly within the organization or indirectly outside the organization, viz. with its customers. Owing to the high costs of IT investments in particular, the need for successful exploitation is extremely clear. If IT is not used appropriately and does not really deliver benefits, the competitive position may be heavily damaged. If investments are not really high (in small organizations for example) but the IT rewards are reasonable, the competitive position will also profit from the IT. These events could cause mixed results in the empirical studies. Johnston & Carrico therefore strongly link the exploitation of the IT opportunities to this strategic position (Johnston & Carrico 1988, pp. 38, 39, 47).

2. Various operationalizations.
   Various researchers used different operationalizations for the constructs of IT investment and organizational performance. Studies are thus difficult to compare, so that general conclusions cannot be drawn regarding them. There is no clear theoretical foundation for the justification of one of the measurements in preference to the others (Mahmood & Mann 1993, p. 104).

Macro

The impact of IT on society is also not clear in macro-economic terms (Nolan & Schotgerrits 1989, p. 997; Scott Morton 1991, p. 23). Davenport & Short report that since 1973 aggregate productivity figures have not increased. Only a few firms, probably including the firms always described in the successful case studies, have realized major productivity gains (Davenport & Short 1990, p. 12). Thurow presents figures that show small annual growth productivity in 1975-1985 (+ 0.7%), while in the same period the overall investments, including IT, have grown substantially (+ 11.1%) (Thurow 1990). Compared with the years 1948-1965, the productivity growth has been decelerated (+ 3.3%: a decline of 2.6%), while the investments have been raised (+ 9.5%: a rise of 1.6%). In addition, Huppes' research confirms this observation (Huppes 1990). He notices that, since 1960, productivity in western countries has been dropping while the IT development has accelerated (see also Rienstra 1992, p. 569). De Jong refers to this observation as the IT paradox (De Jong 1994, p. 13).

Roach (1987, 1991) suggested that IT investments has done little to improve productivity. This research is based on US data from the service sector. The sector's productivity did not increase in comparison with the increase in expenditures on IT. The expenses rose 20% a year in the 1980s and reached 45% of the total capital investment, but these figures were not matched by similar productivity increments.

Brynjolfsson argues that this IT paradox (also known as the productivity paradox) might not be justified (Brynjolfsson 1994, pp. 42, 47, 50). In a recent study the relation between IT investments and productivity was supported (Hitt & Brynjolffson 1994, p. 272). This is not very odd. The IT's function for the business processes of organizations has already been made clear (efficiency, effectiveness, innovation). Advantages are created via execution, management and support of the primary processes. However, why do these advantages not emerge in the statistics on the macro-level? Scott Morton sees a number of reasons (Scott Morton 1991, p. 19, see also Brynjolffson 1994):

1. Reasons of usage.
   IT does not deliver real benefits when applied to the wrong organizational areas, where it is superimposed upon existing procedures and superficial change in business functions. In that way, the IT opportunities are not really exploited.
   Analyzing the productivity developments, Thurow finds that the decline in productivity can be especially attributed to dropping office productivity (Thurow 1990). Rockart & Scott Morton, just like Thurow, refer to the disappointing role of IT in office work (Rockart & Scott Morton 1984). They expected few changes as a result of only changing the way the paperwork would be done. In the 1970s in particular, most of the IT only speeded up

the processing of paperwork. This IT usage did not produce really comparative advantages. Hammer concludes that these disappointing results of IT were caused by mechanizing old ways of doing business, leaving the existing processes intact and using computers only to speed them up (Hammer 1990, p. 104). This observation is very appropriate for the early use of IT in offices.

Thurow also finds that the productivity of the factory (bluecollar productivity) is still growing. Organizational transformation was necessary in order to be able to use the potential of the IT for this growing factory productivity. He states that IT is only an enabler and claims that dramatic restructuring of organizations is necessary to yield increased returns for organizations. Back in 1984, Rockart & Scott Morton concluded that these necessary changes, although predicted by Leavitt and Whisler in 1958, had not yet occurred (Rockart & Scott Morton 1984, p. 85). Then, in 1984, they predicted that using IT for the 'blue collar productivity' would have a huge impact on the organization's productivity (Rockart & Scott Morton 1984, pp. 86, 91-94). Fundamental changes would then occur beyond existing business strategies, new products and markets, and cost structures of the firm (Rockart & Scott Morton 1984, p. 89). To explain these changes, they offered a conceptual model of technology impact in which all the elements of the organization's functioning (IT, strategy, organizational structure and culture, managerial processes, individuals and their roles) must be in balance (Rockart & Scott Morton 1984, p. 90). The phenomenon of organizational changes by means of IT really arrived on the scene in 1990. Then, the combination of IT and organizational redesign was thoroughly described in two articles, one by Davenport & Short (The New Industrial Engineering Information Technology and Business Process Redesign) and the other by Hammer (Reengineering Work: Don't Automate, Obliterate). If organizations used IT as an analytical and modelling tool for the redesign of organizational processes, real improvement in the organization's performance would be achieved. Well-known uses of this kind of IT in the manufacturing environment are materials management information systems, production scheduling and control and logistics. Here, IT has been used to redesign the manufacturing functions (Davenport & Short 1990, p. 11).

Davenport & Short point out that this idea on the different usage of IT has not yet penetrated office work. Therefore, productivity improvements in that area have not yet occurred;

2. Reasons of place and time.
   IT delivers benefits to the organization's business processes, but these result in financial advantages not for the organizations but for their customers, due to competitive reasons. IT is used to fulfil the growing demands of the external world, like quicker service, cheaper products, more and new features and diversity in products and services. This reason uncovers the nature of the IT benefits. The developments mentioned result in new competitive relations in and between industries (Brynjolffson 1994, p. 56; Porter & Millar 1985).
   In time those organizations will manage to survive that offer the advantages to their customers. This observation is in line with the population ecology (Astley & van de Ven 1983, p. 253). Environmental changes, caused by new technologies for instance, select groups of organizations with corresponding characteristics. For instance, IT changed and improved production processes in the financial services tremendously, in comparison with 50 years ago. Nowadays, it is possible to find out one's bank account without leaving home (Scott Morton 1991, p. 19). Neglecting such IT opportunities ultimately result in bankruptcy (Saunders & Jones 1992, p. 71). This survival is not considered as a real advantage and is not seen in macro-economic data.

3. Reasons of measurement.
   Benefits are not financially visible (Brynjolffson 1994, pp. 54-55). IT is used to fulfil the growing demands of the external world, like:
   - certainty: managers can confirm their decisions with information from MIS or DSS;
   - quality: in addition to the customer's quality of life, the quality of office work in the office has also been improved by the use of IT (Nolan & Schotgerrits 1990, p. 997).

   These non-economic benefits improve the societal functioning but are difficult to record.

2.3.2.5 Conclusion

Research on all three levels made it clear that for the exploitation of IT, the role of the organization with respect to the usage of IT has to be studied as well. The fit between IT and the organization must be studied (Van Irsel & Swinkels 1992, p. 634). Accordingly, organizational variables have to be analyzed too. The next two sections devote attention to the relation of two of the main organizational variables with the strategic performance: competitive strategy and organizational structure (Dunphy & Stace 1988, pp. 321-322; Miles & Snow 1978, p. 8).

2.3.3 The relevance of competitive strategy for strategic performance

2.3.3.1 Introduction

This subsection deals with the importance of competitive strategy for strategic performance. Although the relationship between strategy and performance is very complex, strategic research often includes prescriptive implications for the performance (Chan & Huff 1992, p. 196). Porter, for instance, states the necessity of prescribing a competitive strategy for the creation of competitive advantage (Porter 1985, p. 1). This importance is not only known in the organizational literature. Also in studies on information systems, competitive strategy has a special role. This strategy is often seen as a starting point for the successful (strategic) planning of information systems. This is very obvious in King's method of Strategy Set Transformation (King 1978).

This subsection first defines the concept of competitive strategy based on a discussion of strategic views. Then the influence of strategy for the competitive position is investigated.

2.3.3.2 Description and definition of competitive strategy

In the literature, there are many definitions available for the concept of strategy. In these descriptions, strategic decisions have a profound impact because of the large amount of resources involved (Pennings 1985, p. 6). In addition, the relation with the environment is important for organizational success (Chaffee 1985, p. 89; Wilkes 1991, p. 50). Chaffee recognizes three different ways of describing the relation between the organization and the environment, viz. the linear approach, the adaptive approach and the interpretative approach as depicted in Figure 2.2 (Chaffee 1985, p. 93; see also Volberda 1992).

In the linear approach, the 'objective' environment is analyzed. This approach uses a chronological distinction between strategy formulation and implementation. Botter uses this distinction to describe the process of strategic management (Botter 1988, p. 87). Strategy formulation takes place during the strategic planning (Anthony 1965). Then goals are formulated, and the strengths, weaknesses, opportunities and threats (SWOT) of the organization are analyzed. The results are, for instance, long-term ideas on the mission of the organization, choices concerning the products to be made, markets to be served, and the positioning in relation to rivals. This strategy formulation is followed by elaboration of action plans and a further execution and evaluation in the process of strategy implementation. Haselhoff calls this strategic view the 'synoptical' approach: how does a organization want to position itself in its environment? This question is followed by: how should the organization be organized? (Haselhoff 1977, pp. 5, 20, 21; 1987, p. 7). It is clear that this view follows the sequence of formulation first and implementation afterwards (Haselhoff 1977, p. 15).

However, to formulate and reach goals is no unequivocal task. Firstly, there is the plurality of goals (Veen: in Hulshof 1985, pp. 4-6):

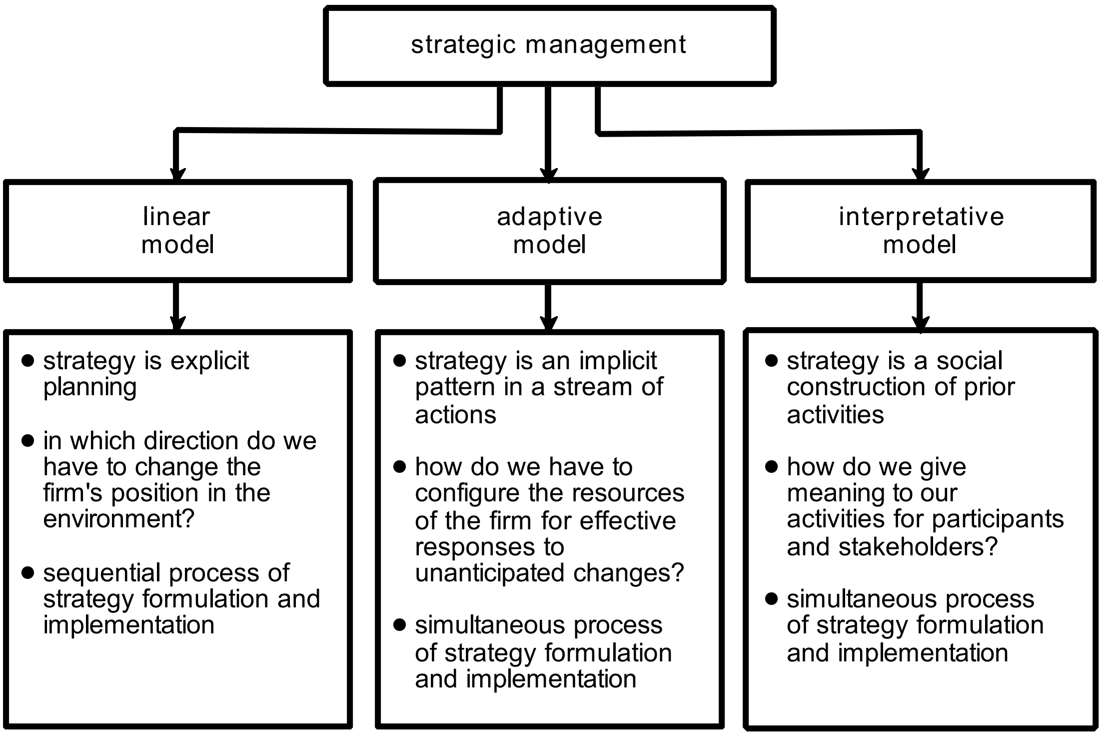
- which products;
- what markets;
- how to balance between short-term profits and long-term market shares and survival;
- what is the significance of providing a certain amount of employment;
- how important is organizational growth.

Secondly, the goals are not often made operational. Therefore, it is not clear which organizational activities are needed. There could be conflicting 'operational' goals on these activities at a low level in the organization (Perrow 1986, p. 133).

The adaptive approach is a response to this ignorance of the complexity of the strategic problem in the linear approach. The adaptive approach is based on a simultaneous monitoring of the environmental and organizational changes. It is aimed at finding a match between environmental opportunities and organizational capabilities and resources for exploiting the (strategic) opportunities (Chaffee 1985, p. 91). Miles and Snow argue that the process of organizational adaption is governed by strategic choices of top managers (Miles & Snow 1978). They describe an adaptive cycle of choices in the product-market domain (strategic point of view), choices in the technologies for production and distribution and choices in the structure and processes (structural point of view). The adaptive model differs with the linear model on the following issues:

- there is a simultaneous formulation and implementation (not linear). The role of strategic planning is smaller;
- the adaptive model is guided to align the means of the organization to the opportunities of the environment. The emphasis on clear-cut goals is smaller;
- incremental changes also receive attention. Strategy does not always refer to big changes.

Figure 2.2 THREE STRATEGIC APPROACHES



In both views, the organization and environment are seen as objectively existing entities. The third view takes an opposing position. The interpretative approach is based on a socially constructed reality (Chaffee 1985, p. 93). Different stakeholders have different perceptions on the organization and environment. The reality is 'defined' by means of social interchange. The interpretative strategist deals with the environment via symbolic interaction and communication (Chaffee 1985, p. 94). Organizational goals are part of this created 'reality'. Weick maintains that goals are not formulated as a basis for further organizational functioning, but are the result of the image of completed organizational activities (Weick 1979, p. 8).

Pennings also divides ideas on strategy into three streams, viz. the explicit view, the implicit view and the rationalized view (Pennings 1985, pp. 2-3). In the explicit view, the intents for subsequent actions take a central place. In this view, which is equivalent to the linear approach, strategy consists of a plan containing a mission statement, organizational objectives and action plans on the allocation of resources. Plans are often reformulated during the next planning period. The content of strategies (of private firms), in particular, is studied in this view (under the name 'business policy' or 'strategic management': Pennings 1985, p. 9). Studies on the content of strategy are concerned with the influence of aspects of strategies for reaching competitive advantages, like the cost and/or marketing aspects in Porter's generic strategies (Porter 1980). These studies do not address the (strategic decision) processes behind the specification of generic strategies (Markus & Robey 1988, pp. 590-591; Pennings 1985, p. 31; for content and process approach, see further subsection 2.3.4.2: Description and definition of organizational structure).

In the explicit view, emphasis is laid on the prescriptive (competitive) intentions of the strategy, and not on the realization of them (Chan & Huff 1992, p. 192). This view is criticized for its simplistic, mechanistic view of the organization, which results in unjustified prescriptive statements (Pennings 1985, p. 7, 24). This brings us to the next view.

The implicit view is focused on the pattern of choices describing the (realized) behavior of the organization (Pennings 1985, p. 10). Intentions are not always realized as planned, owing to unpredictably emerging phenomena. Mintzberg & Waters researched the process of strategy. They formulated strategy as a pattern in a stream of decisions, and studied the relationship between the plans and intentions on the one hand and what organizations really did on the other (Mintzberg & Waters 1985, p. 257). However, because of the intentional nature of 'decisions', they changed to studying strategy as a pattern in a stream of actions, reflecting the finally followed conducted behavior of the realized strategy (Mintzberg & Waters 1985, p. 258). This implicit view of strategy resembles the adaptive approach in its modest role of strategic planning.

Finally, the rationalized view considers strategy as a social construction that gives meaning to prior activities. Strategic related activities like planning, budgeting and meetings are seen as myths, ceremonies and rituals. This view clearly corresponds to the interpretative view.

To describe the strategic concept of our research, it is important to take a position on these different approaches. In the linear, explicit approach, the link between strategy and performance is considered to be important (Pennings 1985, pp. 9, 11). In our research this link is also seen as being relevant. Therefore, this first perspective offers a handy start to define strategy. But, as ascertained before, the intentional view neglects some realities. Therefore, it is convenient to use the 'realized' connotation of the implicit view as well. To describe strategy, the ideas of content and realization will be combined (see also White 1986, p. 225).

Porter's typology of generic strategies is generally used as a start for describing the content of competitive strategies, which aim to create competitive advantages for separate business units (Porter 1985, p. 43). Porter (1980, p. 35) detects three approaches:

- overall cost leadership: low costs, relative to competitors, yields an above-average return in the industry;
- differentiation: creating something that is perceived industry-wide as being unique, is also a viable strategy for above-average returns;
- focus: when an organization is able to select and serve a particular target (buyer, group, segment of the product line or geographic market), the focus strategy results in differentiation or cost advantages.

Based on the perception of the industry and the characteristics of the organization itself (available resources, production processes), the management should choose one of the approaches. If management does not develop a strategy in one of those directions, the firm gets stuck in the middle, which is a guarantee for low profitability (Porter 1980, pp. 41-42). These competitive strategies exist on the level of the separate organization or business unit. On the level of divisionalized organizations, there is also corporate strategy. This strategy is aimed at the management of more than one business unit. We shall not deal with these corporate strategies.

Definition: realized competitive strategy is the way in which the organization positions itself to reach an above-average competitive position in its industry via its business processes of the value chain.

2.3.3.3 Elaborating on competitive strategy: dimensions and configurations

Porter states two forms of competitive advantage: lower costs and differentiation (Porter 1985, p. 3). These forms determine the content of the competitive strategy that can be characterized by the emphasis on various dimensions. In focusing on these dimensions, the organization directs the execution, management and support of business functions of the value chain (Porter 1985, p. 33). The firm realizes advantages by performing these functions more cheaply or better than its competitors (Porter 1985, p. 34).

Diverse dimensions of the content of strategy can be identified. The following four dimensions are often mentioned (Miller 1988, pp. 284-285; Romme et al. 1990, p. 47):

1. innovation: indicates how an organization differs from the competitors by the use of new products, services and technologies;
2. focus: states in what way the organization is aimed at the particular needs of certain customers;
3. marketing differentiation: indicates the organization's efforts, like service, advertising and quality image that add to the function of its product or service to distinguish the organization from others;
4. low costs: makes clear that the organization is distinguished by the lowest costs in the creation of products and services.

Using these dimensions, we are able to create a limited number of strategic types following the configurational approach (see also subsection 2.3.2.3). Porter, for instance, distinguished only three strategic types, which were supposed to be internally consistent, having integrated and supportive strategic elements which result in strategic 'Gestalts' or types (Dess & Davis 1984, p. 468). Miller & Friesen see types as quantum states in which the components of diverse dimensions are mutually supportive (Miller & Friesen 1984, p. 1). The mutual complementability of variables results in effectively functioning types of organizations. Successful firms have the tendency to cluster their components in this internally consistent way (Miller & Friesen 1984, p. 26). This internal consistency between variables can be seen in only a limited number of different (effective) combinations (Miller & Friesen 1984, p. 2; comparable with the idea of creating IT types). The types have a predictive value: the presence of a certain attribute determines the type, which further suggests the occurrence of other attributes (Miller & Friesen 1984, p. 12).

To identify these strategic types, Miller uses rules of thumb (Miller 1986, p. 240):

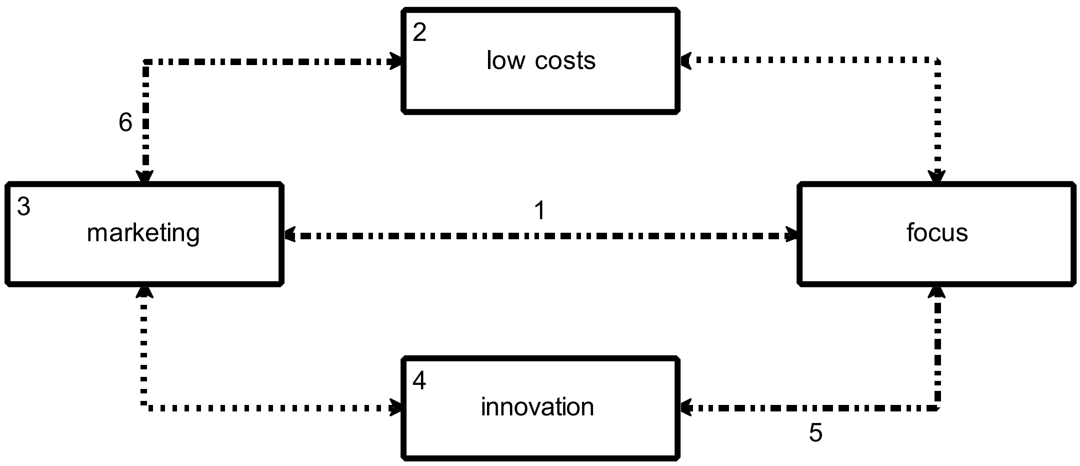
1. successful firms often use a cost approach or a differentiation (innovation) approach. Asset parsimony is useful for (flexible) differentiators, but not

appropriate for cost leaders;

2. particular strategies need a certain level of focus: cost leaders operate on broad markets, innovative differentiators are in between and some market differentiators are forced to focus because of their lack of assets.

Using these rules, the internal consistency between the strategic variables is based on the following rules (see also Figure 2.3: Configurational scheme for strategy).

Figure 2.3 CONFIGURATIONAL SCHEME FOR STRATEGY



Organizations will generally compete via:

- the low costs of their production process. This is affordable in a stable, wide, unfocused market:
  - innovation at a certain level is necessary to develop efficient production processes;
  - marketing differentiation is possible as long as it does not hinder the efficient production process;
  - it excludes focus: various segments are needed for the utilization of the capacity;
- or differentiating otherwise, without any emphasis on low costs, via:
  - marketing that is adds supplementary features (quality, service) to the (function of the) product. This marketing hampers innovation, and has a reasonable to well developed focus;
  - innovation that adds new opportunities to the products or services. This innovation hampers marketing: the organization wants to spend its

resources on state-of-the-art products. This is important to its customers. Besides, there is a reasonable to well-developed focus, especially if the market segments offer enough potential for the production of the organization.

Initial values lead to (the figure between brackets refers to the configuration):

Low costs +: it follows that focus -, innovation 0 and:

- marketing - (2)
- marketing + (6)

Innovation +: it follows that low costs -, marketing - and:

- focus 0 (4)
- focus + (5)

Focus +: it follows that low costs - and:

- marketing + so innovation - (1)
- innovation + so marketing - (5)

Marketing +: it follows that:

- low costs + so focus - and innovation 0 (6)
- low costs - so innovation - and focus + (1)
- low costs 0, focus 0 and innovation 0 (3)

Table 2.2a STRATEGIC TYPES IN VARIABLES

	niche marketer	cost leader	marketers	innovators
innovation	low	average	average	high
focus	high	low	average	average
marketing differ.	aver. to high	low	high	low to aver.
low costs	low	high	average	low

aver. = average
differ. = differentiation

The following strategic types emerge (Miller 1986; 1988). We created more types than Porter (1980). Dess & Davis made empirically clear that organizations can have more than one dominant strategic dimension: low costs and differentiation for instance (Dess & Davis 1984, p. 484). An explanation is that the efficiency of the production process is not always hindered by differentiation efforts. Both elements of advertising and manufacturing efficiency are favorable to success and not conflicting (Miller & Friesen 1986a, pp. 37, 39). For a further elaboration, see appendix A.3: Competitive strategic types.

The strategic types described above are more or less 'standard' configurations (Miller 1986). There are also two mixed types combining dimensions in a slightly different way.

Table 2.2b STRATEGIC TYPES IN VARIABLES

	niche innovators	low cost marketers
innovation	high	average
focus	high	low
marketing differ.	low to aver.	high
low costs	low	high

aver. = average
differ. = differentiation

2.3.3.4 Research on the strategic impact of competitive strategy

This subsection is devoted to the relation between strategy and performance. For the empirical foundation of this relation, three well-known researches are presented (Dess & Davis 1984; Hambrick 1983; Miller & Friesen 1986a, 1986b).

Hambrick

Hambrick split two samples of organizations (disciplined capital goods makers, aggressive makers of complex capital goods), both into two groups (Hambrick 1983, p. 695): high profit organizations (pretax ROI > 25%) and low profit organizations (pretax ROI < 15%). His research approach tested, among other things, the following propositions:

- the primary (competitive) strategies pursued by high-performers would resemble Porter's three strategic types;
- the primary strategies of the low performers would differ from those of the high performers. Porter referred to these strategies as 'stuck in the middle'. Miles & Snow named them reactors (see Miles & Snow 1978, p. 81).

The data analyses yielded 6 successful strategies and 4 unsuccessful strategies. The successful strategies were treated first.

In the first sample (disciplined capital goods makers) the following successful strategies emerged:

1. cost leadership type: this cluster of organizations contained very efficient firms, eschewing changes and serving a narrow domain. These

organizations were price leaders and belonged to an environment of low product dynamism;
2. asset-conscious followers: these organizations used their capacity fully, but held down their capital investments. This strategy did not refer clearly to one of Porter's strategies. They did not have differential advantages or the lowest costs, but in this stable industry, this strategy was realistic for stable market shares;
3. high-quality gendarme: organizations using this differentiation strategy competed through quality rather than through price. They chose for higher margins and competed on image and service.

The second sample (aggressive makers of complex capital goods) displayed the following successful strategies:
4. broad-based differentiation: this differentiation strategy had proprietary technology and quality fit for their customers. In addition, they held down their capital intensity (comparable with 3: high-quality gendarme);
5. prospectors (see also Miles & Snow 1978, pp. 65-67): these innovator-differentiators defined the state-of-the art in their industry, reacting to new market needs by creating new products. They were careful with their assets;
6. asset-conscious focusers: these organizations had elements of the focus strategy. They dedicated themselves to narrow segments and served them in a variety of ways, controlling their assets and innovations.

The four other strategies (inefficient, passive, under-competitive and asset-heavy) did not resemble the successful ones. Besides, they all were not well adjusted to their environment.

Comments

The successful strategies resemble Porter's strategies, but are not totally equivalent. Numbers 2 and 6, for instance, cannot be placed in Porter's scheme. Number 6 has both focus and low costs elements. But in spite of these deviations, the results do not reject the strategy-performance relationship. The study also supports the role of the organization itself. Not only the industry determines the strategy, but also the characteristics of the organization (resources, emphasis on the business functions of the value chain, managerial choices) should not be neglected. This phenomenon of different strategies in the same environment addresses the notion of (intended) strategic choice (Dess & Davis 1984, p. 469). Even similar organizations may choose to act differently.

Dess & Davis

Dess & Davis examined the success of different strategies in one industry. They classified organizations on the basis of their resemblance to Porter's 1980 generic strategies (Dess & Davis 1984, pp. 467-469).

Prior to allocating the 22 organizations of the Paints and Allied Product Industry to Porter's three strategic types, a factor analysis was conducted. This analysis extracted three factors from 21 strategic elements (competitive methods): differentiation, low costs and focus. This structure clearly referred to the existence of internally consistent strategic elements. Subsequently a cluster analysis was conducted. The authors started with a three cluster solution, to facilitate the emergence of the three Porter based strategies. The results were as follows:

The organizations clearly followed characteristic strategies:

- cluster 1 contained the differentiation strategy. It had the highest score on the differentiation strategy and was, in fact, the only cluster with a positive score on this factor;
- cluster 2 had negative scores on all factors. This did not mean that the organizations in this cluster lacked high scores on certain strategic elements, but indicated that they lacked an internal consistency between the elements. This cluster is typified as 'stuck in the middle';
- cluster 3 showed the highest score on the focus factor.

A cluster for low costs organizations did not emerge.

The relation between the strategy and the performance indicators was less convincing. The three groups did not differ significantly on ROA. Only the mean values of 'stuck in the middle' and focus showed significant differences, with a higher mean for the focus cluster.

Thus, the organizations did not differ enough on the low costs factor in the three-cluster solution. Therefore, the authors also tried a four-cluster solution to find a low costs cluster. This produced a different allocation of organizations:

- cluster 1 was the low costs cluster, but also had a high value for differentiation and ranked first on the focus;
- cluster 2 was seen as 'stuck in the middle';
- cluster 3 contained the focus strategies;
- cluster 4 consisted of the differentiators.

This four-cluster approach resulted in a solution that was more in line with Porter's framework (Dess & Davis 1984, p. 481). Also the implications for the performance were better: the ROA differed between the groups (but 'stuck in the middle' did not produce the lowest score). The highest score on ROA was obtained by for the low-costs organizations. But, as Dess & Davis made clear, this group had two dominant strategic elements: low costs and focus.

Comments
The results partly support the strategy - performance relationship. The performance implications are weak. Besides, two different cluster solutions are produced because the first solution did not result in a clear strategy-performance relation.

Miller & Friesen
The last research presented on this issue is that by Miller & Friesen, subtitled 'testing Porter (1980)'. Their study had two purposes (Miller & Friesen 1986a):

- deriving an empirical taxonomy of competitive strategies and comparing this taxonomy with Porter's 1980 strategies;
- studying the performance implications of the strategic types.

Porter's strategies are meant to be mutually exclusive (advantages via the lowest costs or via differentiation). Miller & Friesen stated that the studies of Hambrick and Dess & Davis basically support this distinction between differentiation and low costs strategic competencies (Miller & Friesen 1986a, pp. 37, 39). They claimed that differentiation and low costs go together in successful strategies. This violates the idea of Porter's pure types of low costs or differentiation (with or without focus).

To test this claim, they took a sample from the consumer durable firms industry. They expected a possible combination of differentiation and low costs to be supportive of a successful strategy in this industry. Both elements of advertising and manufacturing efficiency are favorable to success and do not conflict.

They found 5 kinds of groups of organizations via cluster analyses:

1. differentiation: organizations with the highest scores on differentiation variables (product quality, image, marketing efforts) who were also cost leaders (high capacity utilization, low relative direct costs of production). These organizations had a low focus;
2. low costs: these organizations showed extremely low costs, but they also differed a little via advertising and promoting, and sometimes via new product introductions. Still they were not differentiators. In general, they had little differentiation and low quality products;

3. focus: the firms in this cluster had very little differentiation and lower than average costs (full utilization of equipment). They were extremely focused, selling their small assortment of products to only a few types of customers;
4. focus without further competencies: these focus organizations had weaknesses in differentiation and did not follow a low costs emphasis;
5. no competence: these organizations did not show consistent relations between the elements at all (see also Dess & Davis 1986).

These five clusters were related to Porter's types. Singularity is a main characteristic for these types. Comparing the empirical results and the Porter-based theoretical expectations, it will be clear that the results conflict with the theory (Miller & Friesen 1986a, pp. 48-51):

- differentiators are supported by low costs;
- cost leaders do have a selective differentiation;
- organizations following a focus support this focus with low costs (consistent with Porter's typology).

Thus, the strategic types were not singular. A second question is: what is their relation to strategic advantages? A second article answered this question (Miller & Friesen 1986b). They used growth in market share and ROI as performance indicators. Firms in clusters 1-3 were expected to perform better than organizations in the last two clusters. The first clusters did not differ significantly from each other on the performance measures, just like the last two clusters. But there were significant differences between the first three and the last two clusters, especially on the ROI. This result was explained via synergy among the elements of the strategy: successful configurations are composed of mutually supporting elements.

Comments
We must be careful in drawing causal conclusions. Good performance may support a fit between the elements (more resources available), and internally consistent variables can support performance.

2.3.3.5 Conclusion

The three studies indicated the relevance of strategic types. The relation between strategy and performance was also slightly supported. However, there are discrepancies between the findings of various researches:

- pure types do not always emerge;
- the empirical support of the effect of strategy on performance is not evident.

This observation can be explained by the different measures and analyses so that the relationship 'an sich' is not rejected. Chan & Huff believe that within a single industry, performance differences can be explained by the strategies followed (Chan & Huff 1992, p. 196). On the other hand, Ginsberg & Venkatraman assert that other (contingency) variables, like technology and organizational structure, affect the relationship between strategy and performance (Ginsberg & Venkatraman 1985). In a later work, describing the contingency view, Venkatraman maintains that strategy alone cannot be universally superior (Venkatraman 1989a, p. 424). Miller very clearly shares this opinion and states that strategy as such cannot sufficiently contribute to a firm's performance (Miller 1988, p. 281). The relation of competitive strategy with the organizational structure has implications for the organizations performance (see subsection 3.4). Structure has attracted the attention several times in this subsection. Therefore, this variable will be dealt with regard to its impact on organizational performance as well.

2.3.4 The relevance of organizational structure for strategic performance

2.3.4.1 Introduction

In the preceding subsection the relevance of the structure for the functioning of organizations was already mentioned. Researchers spent much effort studying the relationship between structure and performance (Mintzberg 1979, p. 217; Pugh et al. 1983, p. 14). Perrow stated that the formal structure, although heavily violated, was the most important key to the (effective) functioning of the organization (Perrow 1986, p. 260). This subsection first researches the concept of structure, based on a discussion of different views of organizations. Then the influence of the structure on the performance is discussed.

2.3.4.2 Description and definition of organizational structure

Labor activities are conducted by the members of the organization to implement the business functions of the value chain. The organizational structure deals with the way this labor is divided into tasks and the coordination needed between these tasks (Mintzberg 1979, p. 2). This internal allocation of tasks adjoins aspects of relations between people, like their communication and the authority and rules for decision-making (Caves 1980, p. 64; Fredericson 1986, p. 282).

De Leeuw highlights the relevance of knowing the 'real' organizational situation. In his opinion, the relations between all kinds of organizational features (activities, resources, people) are not described by the formal structure alone (De Leeuw 1986). Informal elements (authority, patterns of communication) are equally important. Viewing the organization from different perspectives is also clearly seen in the work of Morgan. He states that our insights into organizations are based on, and determined by certain different ways of thinking and seeing. He refers to these 'ways' as metaphors (Morgan 1989, p. 12). For example, organizations can be seen as if they were machines. A machine performs different functions to transform inputs into outputs. For this, it has well-defined goals. The criterion of efficient transforming is often important. Looking at organizations in this way, the attention is aimed at specifying goals and connecting the business functions for an efficient functioning of the organization. The human factor is then neglected because it does not play a role in the functioning of machines. This machine view on organizations should not be considered as right or wrong, but as incomplete. Using metaphors (if not explicitly, then implicitly) results in one-sided insights. The challenge is to connect those different insights to understand organizational life (Morgan 1989, p. 13).

Morgan recognizes 8 different metaphors, namely organizations as machines, organisms, brains, cultures, political systems, psychic prisons, flux and transformation and instruments of domination. The highlights of these metaphors are summarized by Gazendam. Based on similar features of the different metaphors, he makes three groups of metaphors (Gazendam 1993, pp. 156, 157):

- the machine metaphor;
  In this group (of one metaphor), organizations are seen as machines with attention to interlocking parts. Related parts also play a role in the organization as a whole (Gazendam 1993, pp. 157-158; Morgan 1986, p. 13). In office factories and mass production factories, the machine-like way of operating is clearly visible. But in fast food restaurants too, every action is planned, even in the area of personal interaction. The work is standardized, with a lot of repetitive activities (Morgan 1986, p. 20). This metaphor

shows the classical rational vision on decision-making in organizations. The organization is seen as a unit with profit-maximization as its leading goal. To attain this profit, the entrepreneur (representing the organization as a whole) is able to know the available decision alternatives, organize these alternatives and choose the most appropriate one in order to realize maximum profits (Boersma 1989, p. 21);

- the organism group of metaphors, containing the metaphors referring to organisms and flux and transformation.
  In this group, authors view organizations as organisms that are related to their environment (Gazendam 1993, p. 163). An important element in this view is the development (passive adaption or proactive influencing) of organizations to fit into features of the environment. This alignment to the environment is seen as being important for effective functioning;
- the mind group of metaphors contains the remaining metaphors: in this view the functioning of the human brain is the standard for the organizational functioning.
  This group refers to the information-processing and decision-making processes in organizations with the brain metaphor (Morgan 1989, pp. 80-81), and also to socially constructed reality that is discussed in the light of the metaphors, referring to cultures and the psychic prison (Gazendam 1993, p. 173).

Using the mind metaphors, reactions can be given on the classical rationalistic (decision-making) view in the machine view. These reactions are based on the works of Simon (bounded rationality), March and Cyert (conflict solving) and Olson (garbage can). Gazendam describes the basic argument against the rational approach as follows (Gazendam 1993, pp. 174-175):

1. an organization is a collection of people with a decision-making capacity that exceeds the capacity of one single individual. The decision-making capacity is distributed among these people;
2. however, each separate individual person 'suffers' from bounded rationality. There are limitations in the intelligence, design and choice stages of decision-making, in every phase of the decision-making process (Boersma 1989, pp. 23-24):
   - in the intelligence phase, the image of the problem is created. Perrow states that the definition of the situation is based on experience and on more or less coincidentally present stimuli (Perrow 1986, p. 122). Further, as a consequence of insufficient information about the reality, the

problem definition is subjective;

- in the design phase, alternatives for solving the problem have to be created. Also in this phase there are limitations. Perrow gives some examples (Perrow 1986, p. 121):
- people lack complete knowledge of the consequences of their actions;
- people lack complete knowledge of alternative courses.
  Solutions that were used before are proposed. The searching process ends if a sufficient alternative is found (satisfycing);
- in the choice phase, the limitations constrain the choice for the best appropriate alternative. Even if individuals have developed more alternatives to solve the problem, they lack the mechanism to accurately rank these alternatives from most to least desirable (Perrow 1986, p. 121). If there is no sufficient alternative, the constraints in the intelligence stage are adjusted (probably relaxed) or the expected choice is adjusted. The organization controls these standards for the decision-making process and hence limits the individual (Perrow 1986, p. 122).

Boersma concludes that 'bounded' does not only refer to the result of the decision (the final choice), as if this result is somehow disappointing. 'Bounded' refers to each of the three phases of the decision-making process. In each of these phases there are processes of information-gathering and problem-solving. Due to the limitations that are caused by the lack of structure in the decision-making process (there is no complete and clear decision model) and the lack of information, these processes are 'bounded';

3. as a result of these limitations on a individual level, the organizational decision-making can also be seen as rationally bounded (Gazendam 1993, pp. 174-175).

Another aspect that contributes to this complex and bounded rational decision-making in the organization is the presence of conflicts. This aspect is related to the presence of various operational goals in organizations (Perrow 1986, p. 133). The operational goals indicate the specific operations that must be undertaken. These operational goals can clash, and therefore cause conflicts. Improving one operational goal may take place at the expense of another, although both are based on the abstract goal of 'profitability-maximizing' of the organization. This observation denies the simplicity of the single profitability goal, which automatically directs the efforts of the organizational members, and on which the classical rational organizational view is based. Cyert & March generate some mechanisms to stabilize the goal-setting process to solve conflict situations (Boersma 1989, pp. 26-27; Perrow 1986, pp. 135-136).

The garbage can model of March & Olson further elaborates on the complex and unpredictable process of organizational decision-making (Boersma 1989, p. 28):

- human behavior is not always goal-directed and consistent;
- goals are determined afterwards, based on the choices already made;
- intuition, tradition, trust and impulsive acts are important elements in decision-making.

Elements of the three groups of metaphors will be combined to define the concept of organizational structure in this study. The criterion is our interest in the relation between structure and performance. On the one hand, organizations have the intention to reach goals like higher productivity. To reach these, they use rational analyses (mechanical view). The organizational structure is seen as an instrument for the best pursuit of the goals of the organization (Caves 1980, p. 64). On the other hand, the intentions are not always realized as planned, due to diverse reasons as seen via the mind metaphors. The organization is bounded in its decision-making. The organizational structure is not the result of deliberate decision-making, but merely reflects the (human) decision-making processes (Perrow 1986, p. 124). The relationships between people, the communication channels available and the authority structure in the organization have developed in time.

Combining these organizational views leads to the so-called intentional rationalistic view (Pennings 1984, p. 340). In this view many authors focus on the content of the structure: the organizational dimensions and the configurations or types hidden in the structure. Others however emphasize the focus on the (decision-making) processes behind the organizational structure.

Content researches are concerned with explaining outcomes, while process theories focus on the development of situations (Markus & Robey 1988, p. 589). In content research, the constructs are seen as variables that can take a range of values. Then the variance of the dependent variables can be predicted because the independent variables are seen as sufficient and necessary conditions (Markus & Robey 1988, p. 591; Pennings 1984, p. 346). The content research is, for instance, interested in the relation between structure and performance (Pennings 1984, pp. 340, 345). Many studies suggest that an appropriate structure is vital to (and predicts) the efficiency of an organization (Pugh 1983, p. 14). Lawrence & Lorsch found that in uncertain and unstable environments, high performers had both greater differentiation and integration than low performers (Morgan 1989, p. 54; Pugh 1983, pp. 44-47). In the subsection on Organization Studies theory (subsection 4.3), this research will be treated in more detail. Correlational evidence, the result of content research, mostly ignores the organizational and managerial processes. Therefore, less is known about these processes behind of the resulting variables, and causal relations are assumed (Miles & Snow 1978, p. 259).

In process theory, the constructs are not seen as variables, but more as discrete or discontinuous phenomena that might be called 'changes of state'. These phenomena are studied in detail. The results cannot be predicted because the organizational situation is too complex. Researchers, therefore, study some necessary conditions to grasp their effect on the real organizational developments. They are interested in understanding the process, and not merely in one dependent variable like 'performance'. The garbage can decision model is viewed as a process theory where decisions result from coincidental collisions of participants, choice opportunities, solutions and decisions (Markus & Robey 1988, p. 590; Pennings 1984, p. 347).

In this study, where we are interested in the performance implications of, for instance, organizational structure, the content approach is the feasible one. Opting for the content approach implies that the organizational processes as such are not studied (see also Romme et al. 1990, pp. 47-48). Focusing on the (formal) intentions alone ignores the naturally-developed situation (De Leeuw 1986, pp. 18-20). Therefore, the 'realized' structure will be studied. This structure is characterized by a variety of dimensions like centralization or formalization, and types, like simple structure or machine bureaucracy (Fredericson 1986, p. 282; Mintzberg 1979). Miller & Friesen link the concept of types to effective functioning of organizations based on the configuration of elements (Miller & Friesen 1984; see also Mintzberg 1979, p. 219).

Based on the described realized content view, Mintzberg's definition of organizational structure can be used (Mintzberg 1979, p. 2):

Definition: The organizational structure is the division of organizational activities into tasks and the coordination between them.

2.3.4.3 Elaborating on organizational structure: dimensions and configurations

Structure can be characterized by a variety of dimensions (Fredericson 1986, p. 282). The Aston group is famous because they tried to generate a universal instrument to measure structural variables (Schrama 1991, p. 107). In the light of this attempt, Inkson et al. developed an abbreviated instrument to measure two of the major structural variables in a replication study (Inkson et al. 1970, pp. 318-320):

- structuring of activities: refers to the degree of formal regulation of the intended activities of the employees. This dimension embraces:
  - specialization (when at least one person performs only one function);
  - formalization (the presence of role-defining documents like written operating instructions, policies or a manual of procedures;
- concentration of authority: describes the level at which the formal authority rests (centralization).

In later literature, other variables are also mentioned:

- Miller & Dröge: centralization, formalization, specialization and integration (liaison devices) (Miller & Dröge 1983);
- Fredericson: centralization, formalization and complexity (the presence of many interrelated parts) (Fredericson 1986).

Mintzberg suggests a total of nine relevant variables (design parameters), divided over four groups (Mintzberg 1979, pp. 66-67; elaborated in appendix A.4: Organizational structure types):

Table 2.3 NINE RELEVANT VARIABLES SUGGESTED BY MINTZBERG

positioning variables	grouping variables	lateral linkages	decision making variables
• (job) specialization • formalization • training and indoctrination	• unit grouping • unit size	• planning and control systems • liaison devices	• vertical centralization • horizontal centralization

Both formal and informal aspects are treated via these variables. The positioning and grouping variables build a formal organizational structure, while the other variables encourage informal contacts (Mintzberg 1979, p. 66). So the real, factual situation can be described using these variables (De Leeuw 1986, p. 19).

Based on the idea of configuration, Mintzberg describes the existence of the so-called pure organizational structure types (in Weber's terms: ideal type). Real organizational structures do not match the configurations exactly, but some come really close (see also the subsections about IT (2.3.2) and about strategy (2.3.3)). These are the so-called configurations ('Gestalts', natural clusters) of a theoretically consistent combination of structural variables. These structural designs are clearly distinctive (Miller & Friesen 1986, p. 70). Organizations are driven towards such configurations to search for harmony in structure (Mintzberg 1979, p. 473). This results in effective organizations. Successful organizations have a logical configuration of the organizational structure variables (Mintzberg 1979, pp. 219, 220). This configuration is based on the work of Khandwallah. There were no significant relations between single structural variables and performance. The internal consistency between structural variables, however, related positively to organizational performance (Khandwallah 1977).

This configuration view determines the concept of change. For a successful change, organizations should leap from one state to another. Small (piecemeal) changes result in the loss of the internal consistent structure (Miller & Friesen 1984, pp. 2-3). This view supports March & Simons's stable picture of organizations (Perrow 1986, p. 124). However, it contradicts the incremental change view of Lindblom. He found that organizational changes were based on incremental changes because in organizations there is resistance to greater changes (Boersma 1989, pp. 29-31, 37). The acceptance of the alternatives for the diverse stakeholders is an important reason for these small changes from the (known and accepted) status quo. Dunphy and Stace compared the two ways of organizational change: transformation and incrementalism (Dunphy & Stace 1988). They stated that transformation is needed when the organization is extremely 'out of fit'. To survive, the organization must then be changed discontinuously. The incremental view is appropriate when smaller adjustments are needed and when there is enough time to realize these changes. If the stakeholders in the organization are cooperative enough, then collaborative means of change can be used, otherwise the changes must be forced (Dunphy & Stace 1988, pp. 321, 323, 325, 331).

Having described the structural variables, we must now choose variables to reach the configurations. Due to the supportive, supplementing and predictive character of the variables, not all of them are needed to describe the types. The specific coordinating mechanism that determines the structural types is used as a basis to choose from them.

Coordination between tasks can be effected in five different ways (Mintzberg in Miller & Friesen 1984, p. 70):

1. direct supervision: one person gives direct orders to others;
2. standardization of work processes: the work required to be executed by the organization's members in order to realize the business functions is specified, for instance via formal methods;
3. standardization of outputs: the required outputs are defined by the top, so that others know their aims;
4. standardization of skills: persons are trained in a predetermined way so that their complex and non-routine work automatically fits in with the activities of others;
5. mutual adjustment: the (informal) communication between members performing complex expert activities is sufficient to realize the primary business functions. Asking the hierarchy for permission for activities is unnecessary and hampers the realization.

Standardization of output is the coordinating mechanism for divisionalized organizations. These organizations are no object of research. This study concentrates on independent undivisionalized organizations or business units (see: subsection 2.3.3 about competitive strategy).

This leaves only four coordinating mechanisms to be treated by structural variables. Working with the next variables, we are able to build the configurations. Each coordinating mechanism is linked to an obvious variable. The internal consistency between these variables must be sufficient to configure the types:

1. direct supervision refers to a central leader who prescribes behavior and goals to other organizational members: (vertical) centralization is characteristic for these organizations (but also present in formalized organizations). Vertical centralization concerns the vertical division of decision-making power, up or down diverse (management) levels (Mintzberg 1979, p. 185);
2. standardization of work processes requires a predetermined description for the behavior needed. Formalization is an appropriate instrument to reach this. Formalization is aimed at regulating the individual behavior using formal prescriptions for jobs and the work flow or general rules for all kinds of situations (Mintzberg 1979, pp. 81-82);
3. standardization of skills is usually attained via training outside the organization and indoctrination inside the organization;
4. mutual adjustment adjoins to the existence of integrative liaison devices (integration). There are four forms to be distinguished: persons on liaison positions, tasks forces, integrating managers and the matrix structure.

The internal consistency between the structural variables is based on the following rules (see also Figure 2.4: Configurational scheme for structure). The tasks of the business functions are coordinated via:

- bureaucratic organization, resulting in standardization to regulate activities in front (appropriate if the environment is stable). For this regulation, the management can choose between:
  - formalization, appropriate if tasks are not too complex (simple environment):
    - . this results in centralization: taking away decision-making power from the workers;
    - . it excludes integration as unnecessary communication in a stable situation;
    - . it excludes training as unnecessary eduction in a simple situation;
  - training and indoctrination, necessary for many complex tasks (complex environment):
    - . this results in decentralization: the decision-making power is transferred to the workers. They have the skills, developed during the training, to take the decisions;
    - . it excludes formalization since many complex tasks cannot be controlled from a distance via regulation;

- it excludes integration since the experts are able to perform their tasks independently;
- organic organization (appropriate in dynamic environments). Organizations cannot react quickly enough to environmental changes if the organization is standardized. A choice has to be made between:
- centralization. The entrepreneur decides, which is appropriate if tasks are not too complex (simple environment):
  - excludes formalization because this is ineffective in dynamic situations;
  - excludes integration because there is no mutual adjustment necessary in simple situations;
  - excludes training because the tasks are rather simple;
- integration. The unpredictable, diverse and unknown nature of the tasks requires cooperation with other experts (and staff) so that lateral communication is the basis for coordination. Mutual adjustment is necessary if there are too many complex tasks to be treated via direct supervision (dynamic environment);
  - requires training for the education of the experts who are working in constellations;
  - excludes formalization that cannot cover the whole area of necessary decisions;
  - leads to decentralization. The executives have to trust the knowledge and the decision-making capacity of the workers, although some centralization still remains for the integration of the diverse working areas (decentralization).

Initial values lead to (the figure between brackets refers to the configuration):

Formalization +:	it follows that centralization +, training - and integration - (2)
Training +:	it follows that formalization - and: ● integration - and centralization - (3) ● integration + and centralization 0 (4)
Centralization +:	it follows that integration -, training - and: ● formalization + (2) ● formalization - (1)
Integration +:	it follows that training +, formalization - and centralization 0 (4)

As a result of these relations, Mintzberg defines five ideal types of which the structural variables seem to relate logically (Mintzberg 1979, pp. 301-303; see also: Miller 986, pp. 241-246). We use four of them, which are stated below, the fifth (the divisionalized structure) is not taken into account in our research, because the research, by using competitive strategies, concentrates on business units or organizations that consist of a single business unit.

Figure 2.4 CONFIGURATIONAL SCHEME FOR STRUCTURE

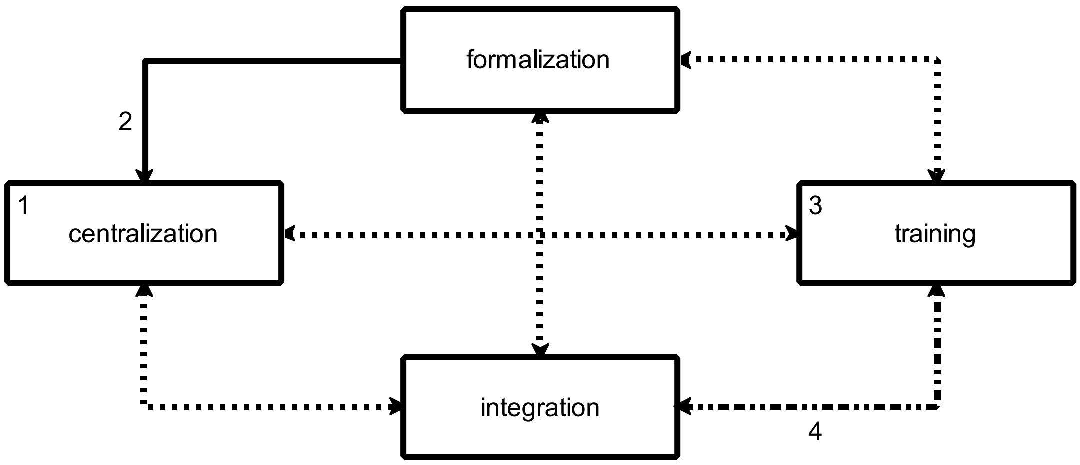


Table 2.4 STRUCTURAL TYPES IN VARIABLES

	simple structure	machine bureaucracy	professional bureaucracy	adhocracy
formalization	low	high	low	low
centralization	high	high	low	average
integration	low	low	low to aver.	high
training & indoctr.	low	low	high	high *

aver. = average
indoctr. = indoctrination

* indoctrination low, mutual contact results in socialization

A major shortcoming of these types is the lack of empirical foundation (Miller & Friesen 1984, p. 178). Therefore, they tested the predictiveness of the typology. Firms were divided according to centralization, formalization, size and several other characteristics. This resulted in the following classification (an analysis of variance indicated that the groups really differed when classified by (other) structural variables):

- simple firms (simple structure);
- planning firms (machine bureaucracy);

- organic firms (adhocracy).

The question was whether or not other structural variables would relate as predicted, given this classification. The findings supported the typology satisfactorily. Another study, however, concluded that Mintzberg's typology could not be used as a basis for quantitative research. Several variables of the framework could not be tested in that study (Schreuder et al. 1989).

2.3.4.4 Research on the strategic impact of organizational structure

Knowing the empirical limitations mentioned above, the relation between structure and performance is questioned. For several decades, the relation between the meso-level structure and performance has been an object of study.

Weber

At the start of this century, Weber stated the rational-legal bureaucratic organization as the most efficient form of organization possible (Perrow 1986, p. 3; Pugh et al. 1983, pp. 16-17). Weber distinguished three pure types of authority systems, in which the subordinates see the issuing of directives by the managers as legitimate:

- charismatic: based on the personal qualities of the leader;
- traditional: based on customs inherited from the past;
- rational-legal bureaucratic: based on rational principles. The means were logically related to the achievement of goals (like a well-designed machine with a certain function to perform) and backed by legal sanctions existing in a legal framework. Some elements of this bureaucracy are listed below (Perrow 1986, p. 3; Pugh et al. 1983, p. 18):
  - equal treatment of all employees;
  - reliance on expertise, skills so that the best knowledge was available;
  - depersonalized: the roles and positions were relevant, not the personal goals of the employees;
  - specific standards and record-keeping of work and output;
  - rules and regulations binding the managers and employees to serve the interests of the organization.

These three types were ideal forms to be used for analyzing organizations, although real organizations may show a combination of these types and do not exactly fit within a single configuration (Pugh et al. 1983, p. 15; see also Mintzberg 1979, p.

304).

Perrow gives reasons why the bureaucratic ideal form was never realized:

1. it tried to realize the impossible: eliminating all unwanted (i.e. not in the interest of the organization) influence of behavior of organizational members;
2. rapid changes in organizational tasks hampered this form. Bureaucracies were set up to deal with stable routine tasks, the basis for organizational efficiency. Stable tasks were needed for stable division of labor, prescribing the acquisition of expertise and formal planning and coordination. With rapid changes, the changing form of the organization hampered efficiency (Perrow 1986, p. 4);
3. the environment was seen as given and not problematic, which was, in reality, seldom the case (Perrow 1986, p. 156).

Taylor

In 1911, Taylor, too, insisted on a scientifically determined best organizational form. In organizations, there must be maximal specialization. (Mintzberg 1979, p. 73; Pugh et al. 1983, p. 136). Organizations should be programmed (Mintzberg 1979, p. 10). The basis for this programming was work-time studies to discover the most efficient methods of performing the job and controlling the workers. This would benefit fewer workers so that the organization would be in a better position to pay higher wages to these workers (Pugh et al. 1983, p. 134). Although Taylor meant to realize maximal prosperity for the organization and the workers, his ideas led to controversy because the system was considered to be inhuman (Pugh et al. 1983, pp. 133, 136, 137). Perrow points out the effects. It transferred skills and expertise from workers to the engineers (time study specialists). Because the work was de-skilled, the wages were apt to be reduced (Perrow 1986, p. 57).

Fayol

A third classical author after Weber and Taylor was Fayol. He was especially interested in general management principles. In 1916, Fayol saw all organizational activities divided into the following six groups (Gazendam 1993, p. 200; Pugh et al. 1983, pp. 63-64):

- technical activities (like production);
- commercial activities (like selling);
- financial activities (like searching for optimal capital usage);
- security activities (like protection of property);

- accounting activities (like stock-taking and the making of balance sheets);
- managerial activities (like planning and organizing).

Fayol's contribution was his definition of management, consisting of five elements:
- forecasting: look to the future and make a plan of action;
- organizing: build up the material and human structure (authorities and accountabilities);
- commanding: maintain activity among personnel (put the plan in motion);
- coordinating: binding other activities and efforts (timing and sequence of activities);
- controlling: seeing that everything occurs in conformity with rules and commands (monitor and correct).

The great value of Fayol's definition becomes evident when we look at a definition of McKenzie 50 years later: planning, organizing, establishing functions and controlling (Botter 1988, p. 47).

To perform the management activities in the best way, Fayol prescribed 14 management principles (Pugh et al. 1983, p. 66). As an example, three principles are reproduced to clarify Fayol's notion of organizing in one best way:
- division of work: according to Fayol, specialization allows the individual to be more productive;
- unity of command: each person should have only one boss;
- unity of direction: activities with the same objective should be directed by one manager and one plan. Fayol cannot accept organic or matrix-formed organizations (Gazendam 1993, p. 207).

Miller

Miller claimed that structure alone cannot explain good performance (Miller 1988, p. 282). This claim was supported by the result of an empirical study. The dependent variables, relative profitability, growth in net income, and ROI, did not correlate with the structural variables such as: use of technocrats (indicative for specialization), liaison devices (representing integration) and formal controls (representing formalization).

Khandwallah

Khandwallah directed the attention to the relations between the structural variables. In his empirical research, significant relations between single structural variables and performance were not found. The internal consistency between structural variables, however, related positively to organizational performance (Khandwallah 1977).

2.3.4.5 Conclusion

Structure as such, seen as an important organizational variable, does not accurately predict the effective functioning of the organization. The three classical authors (Weber, Taylor, Fayol) did not consider the possibility that the different structures could be effective in different environmental situations (see subsection 4.3 on Organization Studies theory). Later, in the 1960's, authors, such as Burns & Stalker and Lawrence & Lorsch combined features of the environment and the organizational structure. Their researches are presented in chapter 4 because they relate several variables to explain the organizational performance (no uni-variate researches).

Khandwallah found some evidence for the relation between structural configurations and performance, but Miller rejected the idea of such a relation, and used the argument that more variables have to be studied simultaneously to understand strategic performance.

2.3.5 Conclusion on uni-variate research

In the previous sections, it has become clear that the level of competitive advantage can hardly be attributed to the separate factors consisting of IT, competitive strategy or organizational structure. Two further research options are possible to explain the competitive position (see below). Both options start from the content research approach, meaning that the content of organizational aspects (IT, strategy, structure, strategic performance) is under scrutiny, and not the process of the organizational behavior (see subsections 2.3.3 or 2.3.4 on the strategic relevance of strategy or structure). Following the content approach, performance variables of many organizations (an advantage of content research compared with the process approach) are correlated with organizational and technological variables:

- on the one hand, new organizational and technological variables can be studied with regard to their strategic opportunities (option 1). The main disadvantage of the first option is one of a theoretical nature. Competitive strategy, organizational structure and IT are at the theoretical center of the Information Systems and Organizational Studies literature. If these important variables do not show clear empirical relations with competitive measures, which other separate variables could be successful?

- on the other hand the combined strategic effect of several variables can be studied (option 2).

The second option is discussed further in the next chapter.

CHAPTER 3

BI-VARIATE RESEARCH: EXPLAINING THE STRATEGIC PERFORMANCE WITH TWO VARIABLES

3.1 INTRODUCTION

In the previous chapter, we observed that the competitive impact of IT was not only dependent on the IT itself. We proposed two options for the further study of the strategic opportunities for organizations, viz. to do research on the strategic impact of new particular organizational or technological variables and to do research on the combination of several organizational and technological variables.

In the previous chapter, it was stated that the first option lacked a promising theoretical basis for further research on the issue of strategic IT. The second option offers a new theoretical point of view. Organizations can be viewed from more than one angle. Obviously, the competitive effects are not explained from only one of those angles. Therefore, it is tempting to combine two of those angles to gain more insight (see also Morgan 1989, p. 13). Per definition, all three variables mentioned above are related to the business functions, so that relations can be expected.

We shall first research the bi-variate relation between IT and competitive strategy on the competitive position, and subsequently the relation between IT and organizational structure and the competitive implications (option 2). The impact of the relation between the competitive strategy and the organizational structure is examined to make the study complete.

3.2. IT AND COMPETITIVE STRATEGY

3.2.1 Introduction

This section deals with the relation between IT and strategy, and its effect on the performance of the organization. We start with an elaborate description of the relation between strategy and IT as used in this research. This relation is based on the congruence between the various dimensions of the two variables. Subsequently, several empirical studies on this issue are presented. Although there are differences between the operationalizations of the variables, similar features that serve as a basis for further research can be recognized.

3.2.2 Relating IT and competitive strategy: connecting dimensions and configurations

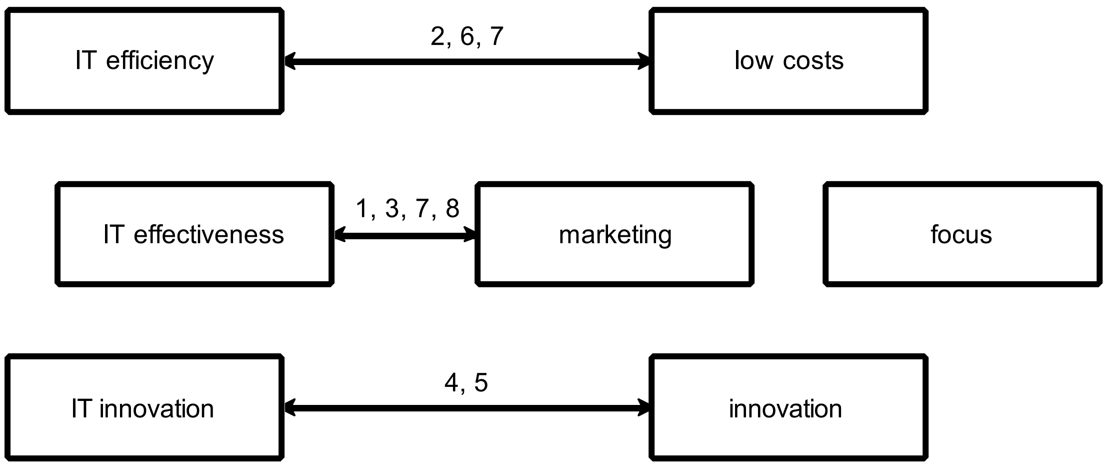
In general, the IS research that deals with strategic IT concentrates on the business strategy level (Chan & Huff 1992, p. 193). Parker et al. state that IT investments must result in improved business performance. For the successful exploitation of IT, one of the main questions is: for which goal has the IT been installed in the organization. To answer this, the IT must be evaluated regarding its possible contribution to the business goals (Parker et al. 1989, p. 19). At present times, there is a broad stream of theoretical research on information systems and their relation to company strategy. And in practice, aligning strategy and IT is a continuing challenge for (IT) management (Broadbent & Weill 1991, p. 293).

This topic of the fit between business strategy and the general goals for IT implicates that a good policy on the use of IT is not possible without a clear business strategy (Holland & Lockett 1992, pp. 135, 141). This linkage has an impact on company performance (Chan & Huff 1992, p. 191), whether it is reactive alignment or proactive impact. The better the fit (congruence) between strategy and IT, the better the expected company performance.

In the various alignment models, this IT - strategy fit is rather conceptual (Chan & Huff 1992, p. 195). Variables are often not translated into measurable indicators. A good example is to be seen in a study concerning 20 UK retailers. Holland & Lockett describe business and IT strategies without operationalizing these constructs (Holland & Lockett 1992, pp. 136-137). The consequence of this conceptual approach is that the assessment of 'fit' is not possible. Therefore, the question remains: what is the nature of the fit between strategy and IT? The answer to this question can be used to assess the effect of fit. Which fits are profitable for the organizations, and which fits are undesirable? To answer this kind of question, strategy and IT must be formally assessed to uncover the links (congruences) between IT and strategy (Chan & Huff 1992, p. 193). Bi-variate researches provide guidelines for the operationalization for the variables. These researches are presented in the next subsection.

The relations between IT and strategy are based on the earlier defined dimensions (see subsections 2.3.2.2 about IT and 2.3.3.2 about strategy). Congruence is explained via rules, which are aligned with certain scores. The scores are determined as follows. Generally two points are awarded if two high logical values are aligned (for instance a high IT effiency and a high low costs). One point is awarded if two low values are present. Finally there are some penalty rules that deny the relation between certain dimensions and therefore certain types.
The application of the rules leads to a final score for the combination of certain IT types and strategic types. The combination between two types is accepted if that combination has at least two points.

Figure 3.1 CONGRUENCE SCHEME FOR IT AND STRATEGY



The congruence rules that relate IT and competitive strategy are:

Two points if:

- low costs + is aligned with IT efficiency +;
- marketing + is aligned with IT effectiveness +;
- innovation + is aligned with IT innovation +.

One point if:

- low costs - is aligned with IT efficiency -;
- marketing - is aligned with IT effectiveness -;
- innovation - is aligned with IT innovation -.

Penalty rules:

- low costs - can not relate with IT efficiency + (too expensive);
- low costs + can not relate with IT efficiency - (not enough capacity);
- marketing- can not relate with IT effectiveness + (too expensive).

Table 3.1a SCORING THE COMBINATIONS BETWEEN IT TYPES AND STRATEGIC TYPES

strategy \ IT			unconnected			concentrated			distributed			decentralized		
			effi	effec	in	effi	effec	in	effi	effec	in	effi	effec	in
			-	+	-	+	-	-	+	+	-	-	-	+
niche marketer	low costs	-	1			x			x			1		
	marketing differentiation	+		2						2				
	focus	+												
	innovation	-			1			1			1			
	total		4			0			0			1		
cost leader	low costs	+	x			2			2			x		
	marketing differentiation	-		x			1			x			1	
	focus	-												
	innovation	0												
	total		0			3			0			0		
marketer	low costs	0												
	marketing differentiation	+		2						2				
	focus	0												
	innovation	0												
	total		2			0			2			0		
innovator	low costs	-	1			x			x			1		
	marketing differentiation	-		x			1			x			1	
	focus	0												
	innovation	+												2
	total		0			0			0			4		

Table 3.1b SCORING THE COMBINATIONS BETWEEN IT TYPES AND STRATEGIC TYPES

strategy \ IT		unconnected			concentrated			distributed			decentralized		
		effi -	effec +	in -	effi +	effec -	in -	effi +	effec +	in -	effi -	effec -	in +
niche innovator	low costs - marketing differentiation - focus + innovation +	1	x		x	1		x	x		1	1	2
	total	0			0			0			4		
low costs marketer	low costs + marketing differentiation + focus - innovation 0	x	2		2			2	2		x		
	total	0			2			4			0		

effi = IT efficiency
effec = IT effectiveness
in = IT innovation

The application of the rules is shown in the Tables 3.1a and 3.1b. Relating the IT with the three strategic dimensions, combined with the configurational linkages (see subsections 2.3.2.3 and 2.3.3.3), results in the following eight possible types where the IT and strategic dimensions are supportive.

1. Niche marketers with unconnected IT.
Niche marketers do not compete via the lowest costs and neither need to process large amounts of data, nor use concentrated or distributed IT for efficiency. They compete via anticipating the needs of their specific niches (focus) and need to be supportive in their marketing (differentiation), administration and simple production processes. This support can be offered effectively by unconnected IT. It would be dangerous (and not necessary) to invest in highly innovative decentralized IT. The resources would be concentrated on specific applications so that the organization would be forced to limit its delivery to one segment only.

2. Cost leaders with concentrated IT.
The main concern of these organizations is to operate at the lowest costs. The strategic necessity to efficiently process data for controlling production processes and the administrative support fits the regulated information processing of concentrated IT perfectly. These organizations have a low focus and deliver to more market segments. Large investments in IT preclude operating at only one segment: the market capacity would be too small for returns on this investment.

3. Marketers with distributed IT.
Extra emphasis on the products and their delivery is crucial. All kinds of complex differentiation opportunities, like extra services and quality, determine the position of these organizations in the industry. This differentiation demands elaborate tasks for which standard applications of unconnected IT are not always feasible. Effective special applications are appropriate. These larger organizations (compared with niche marketers: they do not focus heavily) can also use efficient information processing capacity for administrative purposes. Expensive distributed IT aligns with these needs, and can be afforded.

4. Innovators with decentralized IT.
Innovative opportunities offered by IT are compatible with the behavior of innovators. These opportunities effectively support the workers in these organizations. In no sense do they restrict their innovating efforts. The expensive IT requires a low-focused organization to produce sufficient returns. Efficiency aspects do not

play the most important role regarding the production processes. Customers are willing to pay the price for innovation.

The four types mentioned above are the standard combinations. It would be a simplification to create a hypothesis based on only these combinations. There is enough slack in organizations to realize other combinations.

5. Niche innovators with decentralized IT.
Comparable with the last combination, but differing in the dimension of focus. Obviously these organizations focus on certain market segments with enough potential to pay back the IT investments of the decentralized IT.

6. Low costs marketers with concentrated IT.
These organizations are low costs producers with the possibility to improve the appearance and supply of their products without hindering the smooth execution of the production processes. The main function of the IT is to support the efficiency. Therefore, concentrated IT is appropriate.

7. Low costs marketers with distributed IT.
As 6., but with the difference that the distributed IT supports the differentiation dimensions of the marketer and the efficiency dimensions of the cost leader.

8. Marketers with unconnected IT.
Not all marketers realize complex differentiation. Some concentrate on simple added value in the features of their products and services, and are comparable with niche marketers, operating several market segments at the same time (no focus). Efficiency is not an important competitive consideration. Therefore, effective unconnected IT with its opportunities to support standard functions is appropriate.

It is useful to note that the way the organization wants to differentiate and the use of IT are both linked to the efficient, effective and/or innovative performance of the value chain functions. Besides, various strategies and IT functions can be appropriately linked to each other; the management has choices to make on this issue.

3.2.3 Research on the strategic impact of IT and competitive strategy

Although bi-variate researches provide guidelines for the operationalization of the variables, the different properties of the constructs IT, strategy and competitive advantages of organizations are a main source of ambiguity. This leads to incomparabilities. However, the similarities between the researches are still striking. In all the researches:

- IT is involved with the goals/usage of the automation of the information services;
- the business strategy handles the intended or realized organizational goals;
- the competitive position deals with the relative performance of the organization in comparison with other organizations.

Simon & Grover

Simon & Grover conducted a research in which the linkages of IT with strategic objectives took an important place (Simon & Grover 1993, p. 29). The study investigated the function of certain applications in facilitating the strategic plan of (international) organizations.

For the operationalization of strategy, they used the following strategic dimensions (Miller 1987b):

- complex innovation: the degree to which the firm introduces major new products or services;
- marketing differentiation: the creation of customer loyalty by uniquely meeting a particular need;
- breadth: the scope of the market that the business serves;
- conservative cost control: the extent to which the business achieves a cost leadership position.

IT was not operationalized. Examples were given of applications linked to the various strategic dimensions:

- complex innovation requires information-gathering and the evaluation of systems. These systems improve management decision-making from conceptual design to new marketing concepts with the improved quality of information. IT can play an additional role via CAD/CAM applications;
- using marketing differentiation, customer service and marketing become prime ingredients for the firm's competitive mix. IT can support this by means of inventory management and routing systems and systems offering marketing intelligence;
- as the scope of the business widens, the level of uncertainty will increase. IT can assist management in decreasing newly created uncertainty by

means of detailed sales and product records in database management systems;
- for cost control, it is necessary for the management to closely monitor the organization's operations via information systems and to control costs using inventory and accounting systems. Besides, systems are that standardized operating procedures and formalize policies are needed.

Comments
The difference between this approach and the approach in our study, lies in the linking of concrete application and organizational goals, instead of considering the use of IT at a strategic level. Besides, Simon & Grover see the strategic value of IT particularly in its role as coordinating mechanism of value chain activities (Simon & Grover 1993, p. 30).

Due to the lack of IT operationalization, the link remains rather coincidental. Anecdotal evidence is used to illustrate the linkages between some applications and strategic dimensions. We could imagine applications linked to other dimensions. Nevertheless, the authors claim that, by using this 'fit' concept, IT applications can be most beneficial (Simon & Grover 1993, p. 40). These benefits need to be operationalized. So far, the framework serves as a guide to explore possibilities between strategies and IT.

Ramaswami et al.
In this next study on the impact of IT and strategy, the construct of strategy was also operationalized following the fundamental strategic approach of Porter (Ramaswami et al. 1992, p. 153). They perceived four dimensions:
- service differentiation: emphasizes customer service, service quality and image of the organization;
- marketing differentiation: emphasizes advertising, personal selling and other marketing techniques;
- product differentiation: emphasizes product development and modification;
- cost focus: emphasizes costs efficiencies and competitive pricing.

As in the research of Simon & Grover, the marketing dimension was split into service differentiation and marketing differentiation, and the breadth (focus) dimension was ignored.

They distinguished various information needs concerning the operationalization of IT. Firms need internal and external information for strategy formulation and implementation. Internal information is, for instance, provided by internal accounting systems delivering data on sales, inventories, costs and so on. External data are provided by marketing intelligence systems, which offer information on customers, competitors, suppliers etcetera, and marketing research systems that support the solving of specific problems (Simon & Grover 1993, p. 152). Both environmental scanning and market research demand complex information processing for which strategic information systems can be used. According to the authors, strategic information systems describe the activities in the collecting, processing and analyzing stages through which this external information needs to pass in order to make strategic marketing decisions. This decision-making process is not directly aimed at getting competitive advantages.

The objective of the study was the assessment of the need for strategic information when using one of the competitive strategies. For instance, a firm using a differentiation strategy may need more strategic information than a firm using a costs strategy. The need for this kind of strategic information (system) governs the IT the organization should use. Knowing the strategy, IT can play a facilitating role for the provision of strategic information. When it is not really necessary, the high costs associated with the labor and the financial resources needed for such IT can damage the competitive position. A firm that meets its strategic information needs and therefore uses the appropriate IT may be in a better position to arrive at a competitive advantage. The fit between strategy and IT is believed to be relevant for the performance of the firm.

The results of their empirical research indicated that organizations using a marketing or service differentiation tend to emphasize the need for strategic information systems (Simon & Grover 1993, p. 157). The other two strategic dimensions did not show any relationship with strategic information systems.

Comments

The research described follows Rackoff et al. in their perception of strategic IT. The focus on IT is that of its usage in the support of the strategic management process. For this they concentrate on external marketing information (Rackoff et al. 1985).

As pointed out before, in our research strategic IT is viewed as being the IT that enhances competitive advantages. The literature shows that strategic effects are not only reached by information systems for supporting strategic management, but also (or even more) by information systems for internal operations efficiency (Galliers 1993; Wilkes 1991, p. 57). For the costs strategy in particular, this 'internal' IT is of essential strategic value. Due to this reason, their operationalization of IT, which focuses on the emphasis of external marketing information (systems), is one-sided.

Another comment on this research concerns the lack of measurement of strategic advantage or (comparative) business performance. The link of the fit with firm performance, which is viewed as relevant for the competitive position of the firm, is not explicitly addressed in their research design. In a footnote however, they report the positive association of strategic information systems with market coverage and penetration. Thus, using a marketing differentiation strategy needs strategic information systems, resulting in a higher market share.

Kühn Pedersen

In a study covering 27 organizations, Kühn Pedersen found 44 examples of information systems that generated competitive advantages. The effect of the fit between IT and strategy is treated in his research (Kühn Pedersen 1990).

As in the researches previous mentioned, he also used the scheme of Porter to identify the business strategies (Porter 1980):

- overall cost leadership;
- differentiation;
- focus.

IT was operationalized in the Information System Strategies (IS strategies). The basis for the classification was the distinction between cost-effectiveness (doing things right: the effective use of resources) and goal-effectiveness (doing the right things: the effective achievement of the business objectives). This distinction was combined with the differentiation between the use of IT for the primary processes and the usage of IT as an output in the realized products and/or services. This combination delivered the following classification (Kühn Pedersen 1990, pp. 196-197):

- administrative support (costs/processes): IT for distributed data and word processing systems;
- information management (costs/products): IT for efficient management of the data resources themselves;
- management support (goals/processes): IT like decision-support systems, expert systems and communication systems (electronic mail, EDI);
- markets and products support (goals/products): IT in electronic payment systems and home banking systems, but also information IT for the reproduction of business statistics, calculations and market data.

The mix of strategy and IT was researched on its impact on the competitive effects of information systems in order to explore the concept of fit (in the research referred to as strategy conformance). The conformance was hypothesized as follows:

- overall cost leadership - administrative support/information management;
- differentiation - management support;
- focus - markets and product support.

In order to measure the strategic advantages of information systems, he separated intended strategic advantages and emerged strategic advantages. The author referred to the information systems as realized strategic information systems if the IS-strategy was formulated according to the business strategy, if strategic conformance (reactive fit) was reached and if the IT delivered the expected advantages. If, however, the advantages were the result of coincidence (Galliers 1993), and the business strategy was adjusted to the IT effects (proactive fit), then the information systems were called emergent strategic information systems (Kühn Pedersen 1990, pp. 195, 201).

The result of the research was that in 6 of the 27 organizations (1/5), realized strategic information systems were present. These information systems produced 15 of the 44 cases of competitive advantage (1/3). The fit was obviously advantageous to competitive advantage. The 29 other cases may result in emergent strategic information systems if these organizations change their business strategy.

Comments

The following conclusions can be drawn:

- the absence of a fit between strategy and IT happens four times more often than the presence of a fit. If there is an absence of fit, then there are only twice as many competitive advantages in comparison with the fit situation. Thus, having a fit is relatively twice as rewarding than lacking a fit;
- 2/3 (29 out of 44) of the competitive effects are not planned and are not based on the business strategy. Up until now, business strategies have not been successfully used as guidelines to reach competitive advantages using IT. Kühn Pedersen gives as a possible reason the formal and abstract nature of business and IT strategies, which prevents the successful usage of the fit concept (Kühn Pedersen 1990, p. 201).

Broadbent & Weill

A comparable research, a case study treating four Australian banks, was conducted by Broadbent & Weill. They carried out their research in the banking industry because this information-intensive area of financial services was relatively mature in the use of IT (Broadbent & Weill 1991, p. 304). The competitive importance of the fit between business and information strategies was also very clear in this work. Their assumption was that the presence of (more) information-based comparative advantages suggested that there had been a (higher) level of fit (Broadbent & Weill 1991, pp. 294, 296, 297).

Firstly, they identified the level of IT based competitive advantage. Managers were asked to rate their firms' information-based advantages. There was one bank where all the executives stated that they had an above-average position in relation to their competitors. By asking the other banks about the position of the competitors, the good position of this bank was confirmed. The questionnaire continued with questions to diverse managers on areas where the firm had gained some advantage over competitors utilizing IT. This resulted in an average number of information-based comparative advantages. The responses were consistent with the earlier questionnaire. These information-based ratings were also consistent with financial performance indicators. For these reasons, the best bank was assumed to have the best alignment between strategy and IT.

Comparing the banks, some results were:

- compared with the other banks, the successful bank was more focused on its business strategy formation process and used less extensive documentation;
- the successful bank had the highest level of consensus and consistency in its strategic orientation;
- the successful bank had the longest experience in attempting to link business strategies and information systems.

The major factor in a good fit was a flexible and issue-oriented strategy formation process, with concurrent processes taking place at different organizational levels.

Comments

The virtue of their approach is the start of the operationalization and measurement of the strategy and IT issues. The nature of linkage between strategy and IT, however, stays hidden.

Van Engelen

Operationalization of strategy and IT services was present in the research of Van Engelen, which focused on the relation between the (marketing) strategy and the information systems of product/market combinations and their performance (Van Engelen 1989, p. 3).

This study used systems theory to create a model in which strategy and information systems characteristics were related. Based on the phases of the sales market and the central organization, 7 (marketing sales) strategies were distinguished (Van Engelen 1989, pp. 76-79):

- development strategy
- me too strategy
- niche strategy
- early innovator strategy
- cost-efficiency strategy
- differentiation strategy
- harvesting strategy

These strategies required different (information) relations, viz. formality, bottom-up/top-down, centralization, frequency, degree of automation, importance of content, speed of reaction, usability and private/public relations. These relations exist between various parties, described in the information systems dimension matrix (Van Engelen 1989, p. 102).

The relation between strategy and information systems (characteristics) was studied as follows. Firstly, 300 organizations answered questions that determined their (marketing sales) strategies. For each of the strategies a correlation matrix was created between the information systems dimension matrix and the performance measure. Although diverse measures were considered, the following measure was finally used: the realized profits as a percentage of the intended profits (Van Engelen 1989, p. 120).

In each strategic type significant correlations were found between the measure of success measure and information systems characteristics. The conclusion was: there is a measurable relation between the compatibility of information systems and strategy on the one hand and the performance of the product/market combination on the other (Van Engelen 1989, p. 129).

Comments

The competitive effect of a fit between strategy and information services was supported, although the competitive measure is not equivalent to other measures. Besides, this study was not conducted at a business level but at a product/market level.

3.2.4 Conclusion

Looking at the fit between strategy and IT (or IT related constructs), the following features become apparent:

- the (bi-variate) fit influences the competitive position (comparative performance) of the organization. In all the researches there were attempts (some more detailed than others) to asses the three variables, and to determine the effect of fit on the competitive situation;
- the adjustment between strategy and IT is based on their relevance for the business functions. Strategies concern the linkage of the value chain functions with the organization's position in the industry, while IT is the automation of the information services used for the execution, support and management of these business functions;
- the fit between IT and strategy is the result of mutual influences from strategy to IT (reactive alignment) and vice versa (proactive impact);
- the (IT) management of organizations tries to steer this process of adjustment;
- there is no single best fit between strategy and IT. Strategies can even have appropriate linkages with more than one IT instance (value), and IT instances can relate with more than one strategy.

Relating strategy and IT is obviously common in strategic is research, but the competitive results are not consistent, partly due to different measurements. In an adjoining area of IS-research, the relation between an organizational variable and IT has also been studied. The following subsection deals with that research.

3.3 IT AND ORGANIZATIONAL STRUCTURE

3.3.1 Introduction

This section discusses the linkage between IT and the organizational structure, and its effect on the performance. It starts by defining the relation between structure and IT. Subsequently, several empirical studies on this issue will be presented. Although there are differences between the operationalizations of the variables, some similar features can be observed , which are also comparable with the characteristics of the IT - strategy relationship.

3.3.2 Relating IT and organizational structure: connecting dimensions and configurations

Not only has the IT - strategy linkage received much attention in the field of Information Systems research since the 1970s, the role of the organizational structure has also been viewed as being important. The interest in the relation between IT and organizational structure started in 1958 with the predictions of Leavitt & Whisler. The impact of the IT would result in centralization and in the shrinking importance of middle management (Karake 1992, p. 259).

In the 1970s, many researches were conducted on this IT - centralization relation (see for instance Markus & Robey 1988, pp. 585-586; Schrama 1993, p. 604). Next to the relation between IT and centralization, the relations between IT and other structural dimensions, such as formalization, were also studied (see for instance Carter 1984). The fit concept maintains that the adjustment between IT and the organizational variables is necessary for the organization because it prevents organizational friction (Tavakolian 1989, p. 309). Successful IT functions in organizations which display a fit between IT and structure (Ein-Dor & Segev 1982, p. 66).

The rationale for the relation between IT and structure is based on the major changes that IT causes in the execution of organizational tasks and processes (Karake 1992, p. 259; Keon et al. 1992, p. 25). By definition, the organizational structure deals with these organizational tasks and the coordination between them (Mintzberg 1979, p. 2; Schrama 1993, pp. 604-605). Not only can the execution of the processes change due to IT, the coordination between them may also change, causing an organizational restructuration (Davenport & Short 1990, p. 12). Benjamin & Scott Morton state that IT enables restructuration at several levels: task level, business process level and the organizational level (Benjamin & Scott Morton 1988, p. 94; see also Davis & Olson 1985, p. 354). These IT enabled changes are seen as the key to achieve competitive advantage (see also Hammer 1990). Obviously, there is a tight relation between organizational structure and IT, and this relation is important for the effectiveness of the organization (Schrama 1993, p. 605).

Proponents of the fit concept state that IT reflects the organizational (decision-making) structure (Tavakolian 1989, p. 309). This notion deals with the information processing function of IT and the information-processing function of structure. Galbraith approaches the IT - structure relation from this angle: the (lack of) information-processing capacity of an organization (Galbraith 1973). Coordination in organizations is possible by means of regulation. Rules cannot regulate all the necessary coordination. There will be always be exceptions in the organization of the processes. These exceptions are dealt with by the hierarchy, for instance by supervisors who make ad hoc decisions. Under stable circumstances, the information- processing capacity is sufficient to coordinate organizational tasks. If the organizational situation is becoming less stable, perhaps because of environmental changes in the industry, the number of exceptions will rise, so that the hierarchy is apt to become overloaded. The information-processing capacity of the organization in this turbulent situation is no longer sufficient, so that uncertainty concerning the tasks rises.

Galbraith offers two basic solutions aimed at reducing this uncertainty (see also Davis & Olson 1985, pp. 341-342):

- reducing the need for information-processing:
  - via decentralization, self-organizing subsystems can be formed. These systems do not need overall organizational regulation because of the decision authority given;
  - via the relaxation of demands (lower profit levels to attain, higher budgets to use), the turbulent situation does not make so many demands on the organization. Some problems will be avoided through the creation of slack for the organizational departments. The same tasks can use more time or resources so that the amount of information needed will decrease (Pennings 1989, p. 15);
- increasing the capacity for information-processing:
  - via the use of computers, the communication and consequently the coordinating possibilities are enlarged. The top-down planning and bottom-up control in the organization will be enhanced, so that the information capacity rises to an acceptable level again. IT may enable top managers to obtain information quickly, reduce their ignorance and support the making of decisions (Huber 1990, pp. 250-251);
  - the use of horizontal communication opportunities for decision-making, the information-processing capacity of the organization also rises.

In fact, Galbraith mixes three elements:

- structural changes;

- information processing changes;
- performance changes.

By relating these three elements, the organization can be balanced. IT and structure are both concerned with the communication in the organization for the coordination of tasks. The fit between them affects the organization's performance. Working in the field of Information Systems, this relationship must be considered (Van den Berg 1988, p. 49).

We use the previously defined descriptions to relate IT and structure (see chapter 1). The types and variables will be linked via their congruence. The congruence rules for IT and organizational structure are:

Two points if:

- formalization + is aligned with IT concentration + (IT has central processing capabilities for standardized data processing. This is appropriate for formalized organizations where standardization is arranged via regulations);
- integration + is aligned with IT integration + (IT lacks a central processing unit: all data processing and control is local, and the IT is connected via integrative devices. This IT enables mutual adjustment which is necessary for the complex and unpredictable work in an adhocracy);
- centralization + is aligned with IT centralization + (for simple tasks, the IT does not require all kinds of specialized applications and connected hardware. This IT fits simple organizations).

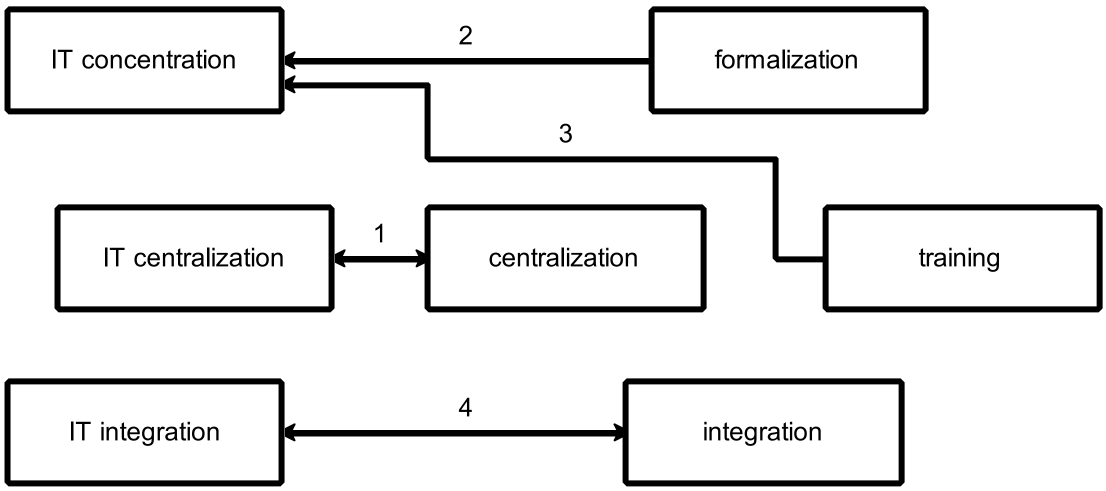
One point if:

- training + is aligned with IT concentration + (collective databases, administrative support for professionals);
- formalization - is aligned with IT concentration -;
- integration - is aligned with IT integration 0 (the lack of integration in the organization is backed by a little integration via the IT. More IT integration would require too many resources).

Penalty rules:

- formalization + can not relate with IT concentration - (not enough capacity).

Figure 3.2 CONGRUENCE SCHEME FOR IT AND STRUCTURE



Combining this congruence with the configurational rules (see subsections 2.3.2.3 and 2.3.4.3), the following four standard types, relating IT types and organizational structure types, are produced, along with one mixed type (see Table 3.2).

1. Simple structure with unconnected IT.
In these organizations, the CEO has the decision-making authority. This means that he/she is also involved in the final IT decision-making (centralization). This is possible because of the simple nature of the unconnected IT, consisting mostly of simple effective standard applications with local information processing (concentration). This IT is not needed for lateral communication (integration). The decision-making authority is regulated centrally, using face-to-face contacts and telephone facilities for communication.

2. Machine bureaucracy with concentrated IT.
These formalized organizations are favored by efficient operations. Concentrated IT performs routine and regulated information-processing. Therefore, it needs formalization, but it also reinforces and strengthens the formalized way of doing things (Bots et al. 1990, p. 126). IT is primarily aimed at efficient information-processing via concentrated data-processing at one place. It does not support the effectiveness

Table 3.2 SCORING THE COMBINATIONS BETWEEN IT TYPES AND STRUCTURAL TYPES

structure \ IT			unconnected			concentrated			distributed			decentralized		
			conc -	cent +	int -	conc +	cent 0	int -	conc +	cent 0	int 0	conc -	cent -	int +
simple structure	formalization	-	1									1		
	centralization	+		2										
	integration	-									1			
	training & indoctrination	-												
	total		3			0			1			1		
machine bureaucracy	formalization	+	x			2			2			x		
	centralization	+		2										
	integration	-									1			
	training & indoctrination	-												
	total		0			2			3			0		
professional bureacracy	formalization	-	1						1			1		
	centralization	-												
	integration	-									1			
	training & indoctrination	+				1								
	total		1			1			2			1		
adhocracy	formalization	-	1									1		
	centralization	0												
	integration	+												2
	training & indoctrination	+				1			1					
	total		1			1			1			3		

conc = IT concentration cent = IT centralization int = IT integration of tasks in other ways, in order to realize better service or quality. Integration by means of the use of concentrated IT is also not appropriate; all communication flows via the central processor. Several parties are involved in decision making on IT: the general management, the IT management (as part of the technocracy), IT vendors and the users. The IT centralization is, therefore, not totally implemented.

3. Professional bureaucracy with distributed IT.
In organizations where the workers perform stable but difficult tasks, IT should offer convenience to those involved with operations and decision-making (effectiveness). The choices on IT are to be made by all the relevant parties (general management, IT management, users). This results in average IT centralization. The operators work mainly independently, therefore the IT does not need to offer lateral communicative opportunities (integration). Another consequence of working independenty is the possibility of local data processing and control (concentration). Finally, in these organizations there are also major supportive administrative tasks that are supported by the efficient data processing of the central processor.

4. Adhocracy with decentralized IT.
The striking feature of adhocracies and professional bureaucracies is their coordination via lateral and vertical communication. The integrative opportunities of IT support this communication (especially needed when a team is not working at one location) and can even result in more personalized contacts and a hierarchy based on competence (adhocracy elements). The complexity of the tasks is a feature which is also found in professional bureaucracies. This requires effective support. A difference, however, is the unpredictability of the tasks. This has two consequences. Firstly, the users should possess decision-making authority because they are able to assess the relevant requirements for the IT (centralization). Secondly, the IT will support innovative goals. The data-processing and control facilities are situated locally near the users (concentration).

One non-standard configuration can be distinguished.

5. Machine bureaucracy with distributed IT.
Machine bureaucracies can use distributed IT as long as distributed IT offers efficiency opportunities. The advantages of this more effective IT lie in the differentiation opportunities for organizations.

It has been observed that the coordination of the organizational tasks in order to perform the business functions is the basis for the linkage between the IT types and the organizational structure (Galbraith 1973). The question can be posed as to whether the IT should reflect the decision making structure or complement the coordinating needs. Besides, management has choices to make on the adjustment between structure and IT. These are related entities that influence each other (Markus & Robey 1988).

3.3.3 Research on the strategic impact of IT and organizational structure

Research on the relation between IT and structure has a strong conceptual basis. The basis will first be discussed according to the views of three authors. Subsequently, empirical researches conducted by four authors will be presented.

Leifer
The concept of fit has been worked out by Leifer. He states that the importance of fit between IT and organizational design in order to achieve successful IT usage is underestimated (Leifer 1988, p. 63). One reason for the mixed evidence is the different definitions of the variables, just like in the strategy - IT relationship (see also Keon et al. 1992, p. 25; Lee & Leifer 1992, pp. 28-29; Markus & Robey 1988, pp. 585-586; Schrama 1993, p. 604). Leifer proposes operationalizations of the constructs to find natural matches. Our measures are equivalent to the measures in his research.

Comments
The existence and effect of these matches were not empirically tested. Another unsolved issue is the direction of influence (IT ↔ structure). Leifer suggested that organizational change is needed to realize the fit between IT and structure. These changes should not be the result of autonomous organizational development, but a consequence of managerial decision-making (Leifer 1988, p. 71). In a later article, Leifer (in cooperation with Lee) stated that the relationship between IT and organizational structure is reciprocal (Lee & Leifer 1992).

Markus & Robey
IT influences the organizational dimensions and, at the same time, the organization affects IT (Lee & Leifer 1992, p. 28). This observation recurs in the study of

Markus & Robey. They connected this issue with the contradicting results of IT impact on organizations. They see the usage of different approaches in the various studies as the fundamental reason for this disorder. These approaches deal with, amongst others, the causal issue of IT and organizational change. They distinguish three approaches (Markus & Robey 1988, pp. 585-589):

- the technological imperative: IT is seen as force from outside the organization that creates certain organizational changes (situational control). It is argued that this is caused by the influence of contingencies (organizational size, the stable or turbulent nature of the environment). Leavitt & Whisler's predictions comply with this perspective. This deterministic approach has, however, not delivered consistent findings on the IT - centralization relation since the 1970s;
- the organizational imperative: organizational change and the presence of IT are caused by choices of organizational members, especially designers of information systems (intended rational). Organizational needs determine information needs, the basis for the IT. IT is the dependent variable, dependent on the organizational situation. Galbraith is a well-known proponent of this opinion (Galbraith 1973). The empirical support for this imperative is limited also;
- emergent perspective: the organizational consequences of IT are the unpredictable results of complex social interactions (emergent). This approach does not explain change via exogenous IT or actors' intentions, but explains change via the dynamic interplay among actors, contingencies and IT. Identical (information) technologies lead to different organizational outcomes in different settings (see for instance: Jaikumar 1986). Meier & Sprague, for instance, conceptualize the match between information systems and organizational design (Meier & Sprague 1991, p. 368). In this framework there is no inherent causal determinism (from IT to structure, or vice versa). The match between IT and structure can be viewed as a two-way dependency, and is seen to contribute to the company's performance. In this emergent perspective, management should facilitate the cooperation between IT and business management in dealing with general management problems.

Comments

The management of organizations can play an influencing role by:

- selecting the IT with particular features. The direction of change is from IT to the organization;

- determining information needs and implementation strategies. The direction of change is from the organizational situation to IT;
- supporting user participation in analysis, design and implementation of IT. The complex interplay leads to unpredictable changes. There is a mutual direction of change between IT and the organization.

Schrama

Schrama emphasized the definition of IT as an important argument for the mixed results (Schrama 1993, p. 604), and combined this with the question of causality. He described the centralization-decentralization debate. The earliest researches found that the use of computers resulted in more centralized organizations. Later, other researches detected the opposite tendency, towards decentralization. Gradually a neutrality thesis developed: not the IT itself, but the usage of IT determined the organizational changes. This view reflects the nature of the technological imperative (technological determinism). It is still seen as an exogenous instrument that causes organizational change. He proposed a definition that focuses on the knowledge and skills for the support of information services. Using this idea of IT, it became evident that the organizational structure (being the tasks, accountabilities and authorities belonging to positions within the organization and the mutual relations between these positions) and IT are both equal aspects of the organization. There is no reason to suggest a one-way relation between IT and structure. The fit between structure and IT, which is the result of a mutual adjustment, was seen as necessary for an effectively-functioning organization (Schrama 1993, p. 605).

Comments

This argument explains the importance of fit and the reciprocal relationship between IT and structure. The basis of his reasoning is viewing both these constructs as parts ('aspects') of the organization. As a consequence of this conceptual debate, the 'fit' is assessed as important for organizational performance. The remaining question is: what is the nature of the fit between structure and IT? To answer this kind of question, structure and IT must be formally assessed.

In the field of the IT - structure relationship, there are some empirical studies that deal with this question. Despite the different measurements, the similarities between the researches are:

- IT is involved in the execution of, and coordination between, processes via the distribution of information;

- the structure handles the coordination of tasks in the organization;
- the fit between IT and structure is important for successful implementation and usage of IT, and hence for the effective functioning of the organization itself.

Ein-Dor & Segev

Ein-Dor & Segev conducted a well-known empirical study on this issue. They started with the question for successful IT. They found several organizational variables relating to IT success in a literature study. The IT structure was seen as a reflection of the managerial processes in the organization (Ein-Dor & Segev 1982, p. 56). This view suggested an direction of influence from organization to IT (organizational approach).

They operationalized IT and structure to investigate the importance of the relation between IT and structure. For the organizational structure, the level of managerial decision making (centralization level) was chosen, ranging from 'important decisions are made at the top level' to 'strategic decision-making goes down to the lowest level'.

The IT structure was seen as a composition of variables, including:

- centralization of development and implementation efforts concerning IT;
- integration of (for instance) data referring to diverse organizational areas in one database;
- deployment of hardware: ranging from large centralized processing computers (mainframes) to minis and micros;
- the place of the IT manager in the hierarchy.

The main hypothesis was as follows: the IT structure is associated with the organizational structure. The research was conducted amongst successful IT users. Therefore, if the hypothesis could be confirmed, this would mean that a relation between IT structure and organizational structure for successful IT users did exist. The concept of fit is, therefore, appropriate for this research (Ein-Dor & Segev 1982, p. 66).

The hypothesis could be broken down into four concrete sub-hypotheses:

a. there is a positive relation between organizational centralization and IT centralization;
b. there is a positive relation between organizational centralization and IT integration;

c. there is a positive relation between organizational centralization and centralized hardware;
d. there is a positive relation between organizational centralization and the rank of the IT manager.

The sub-hypotheses a, c and d were confirmed. For b, a negative correlation was found.

Comments
Studying the results of this research, a comparison was made with the work of Olson (Olson 1978). In 1978, she found no pattern of relationship between organizational characteristics and information services at all. Later however, with Chervany (Olson & Chervany 1981), some relations were reported, but none between the centralization of organizational structure and hardware. These findings are inconsistent compared with the research of Ein-Dor & Segev; in their view due to different operationalizations (Ein-Dor & Segev 1982, p. 65).

The cause-to-effect direction between IT and structure is also discussed. Ein-Dor & Segev saw the IT as a reflection of managerial processes (thus, finally, the organizational structure), contrary to the idea of Leavitt & Whisler (IT affects organizational structure). They conclude that organizations should be aware of the conjunction between the two constructs, leaving the question of direction unanswered.

Keon et al.
In 1992, Keon et al. performed a study on the same IT - structure relation. However, the performance of the organization received hardly any attention. Only once did they refer to the successful enhancement of organizational objectives by the usage of IT in combination with a structural dimension.

The structure of the organization was assessed by measuring (Keon et al. 1992, pp. 24, 27):

- specialization: the degree to which specialists in various functional areas are present in the unit;
- centralization: the degree to which decisions of various types are made by individuals;
- formalization: the degree to which job descriptions, written policies, organization charts and workflow schedules are used by the employees.

The IT variables included the hardware potential (microcomputers, word processors and terminals) and the sophistication of the IT, ranging from simple data storage and retrieval to forecasting and decision support.

The following results were found:

- a positive relation between both IT measures and specialization;
- a negative relation between sophisticated IT and centralization;
- a positive relation between sophisticated IT and formalization.

Comments

The relations between IT and structure are clear, but the performance implications of the fits are not elaborated.

Schrama

Schrama assigned more consideration to the performance element mentioned above, although he did not measure the organizational performance. He related the organizational (de)centralization with the level of IT (de)centralization (Schrama 1993, pp. 605, 607):

- centralization: distribution of tasks, accountabilities and authorities between the centralized and decentralized level;
- IT (de)centralization: the level of decentralized collecting, mutating and using data.

Both measures showed a clear distribution. Centralized and decentralized forms were present. The relation was measured twice, in 1988 and in 1992. There was a strong relationship between IT and structure on both occasions (Schrama 1993, p. 607).

Comments

This result confirms the opinion regarding the need for consistency between IT and organization in organizations in order to produce effective functioning. Organizations have slack in choosing a certain level of centralization, in structure as well as in IT. To improve their effective functioning, they adjust these variables.

Tavakolian

Tavakolian researched the relation between competitive strategy and IT structure (Tavakolian 1989). He based his strategic distinction on the typology of Miles & Snow. This typology also implicates a structural taxonomy. Therefore, his research could be viewed as relating organizational centralization with IT centralization.

For the competitive strategy, Miles & Snow distinguished:

- the defender (Miles & Snow 1978, pp. 47-48): following a conservative competitive strategy without much product innovation:
  - centralized decision-making and autocratic management style;
  - structuring activities around business functions (functional organizational form);
  - efficiency driven;
- the prospector (Miles & Snow 1978, pp. 65-67): following an aggressive competitive strategy attempting to pioneer in product/market developments:
  - decentralized decision-making and participating management;
  - structuring its activities around product/market divisions (product form);
  - effectiveness/profit driven;
- the analyzer (Miles & Snow 1978, p. 78-80): following a moderate competitive strategy that makes fewer innovations than prospectors and is less committed to stability than the defenders:
  - balanced decision-making structure;
  - matrix form;
  - driven to the combination of efficiency and effectiveness;
- the reactor (Miles & Snow 1978, p. 93): not following a discrete competitive strategy. Decisions are made at random. This type is excluded from the sample.

The IT activities (development and maintenance, systems operations, systems administration) can be structured with different degrees of centralization: the higher the degree of centralization, the lower the users' responsibilities (Tavakolian 1989, p. 311). So, the linkage investigated relates IT centralization and organizational centralization tendencies.

The following research hypotheses were constructed:

a. a defender (centralized) is more IT centralized than a prospector (decentralized);
b. a defender (centralized) is more IT centralized than an analyzer (balanced);
c. an analyzer (balanced) is more IT centralized than a prospector (decen-

tralized).

These hypotheses were confirmed by the results.

Comments

For the appropriateness of a successful implementation of IT, management should recognize the fit between IT and organization (Tavakolian 1989, pp. 309, 314). This successful IT usage neither operationalized nor measured.

3.3.4 Conclusion

Looking at the IT - organizational structure fit, the features below become clear:

- this (bi-variate) fit is seen as important for successful IT usage and thus for effectively functioning organizations;
- the adjustment between structure and IT is based on their relevance to the business functions and information-processing capacity;
- the realization of the fit is researched from different angles: IT determines structure, structure influences the value of IT, or there is a process of mutual adjustment;
- regardless of these approaches, the (IT) management is in the middle of this process due to the coordination of business functions;
- organizations have slack so that they can choose for certain structures and IT (Ein-Dor & Segev 1982; Schrama 1991). There is no single best fit.

The existence of the relation between IT and structure is obvious, but the measures, and therefore the relations, are not always defined equally. This hampers comparison. Besides, the precise effect on the competitive position is not clearly empirically investigated.

3.4 COMPETITIVE STRATEGY AND ORGANIZATIONAL STRUCTURE

3.4.1 Introduction

In the preceding sections, we made clear that IT must logically fit with the competitive strategy and the organizational structure to enable effective usage. Therefore, it is challenging to explore the relation between the competitive strategy and the organizational structure as well.

The structure of this section is as follows. Firstly, a theoretical basis is developed on the linkage between strategy and structure. Then various empirical studies on this issue are discussed. Although there are differences between the operationalizations of the variables, some similar features are found, especially in comparison with the characteristics of the IT - strategy and IT - structure relationships.

3.4.2 Relating competitive strategy and organizational structure: connecting dimensions and configurations

The strategic ideas of Porter pay much attention to the realization of the business functions (Porter 1985). Generic strategies are determined by means of a thorough study of the industry and the value chain business functions. Porter devotes less attention to the coordination of the tasks that perform these business functions. This coordination determines the organizational structure (Mintzberg 1979, p. 2). Different strategies need different administrative requirements and therefore different decision-making organizational structures (White 1986, p. 218).

Researchers other than Porter pay more attention to the relation of the competitive strategy with the organizational structure. Caves (1980), for instance, gives a broad review of studies on the relation between strategy and structure. In this review, the study of Chandler (structure follows strategy) occupies a prominent place. He uses the paradigm of (market) structure → conduct → performance. The environmental forces determine the choice for the appropriate strategy (Caves 1980, p. 74). The strategy prescribes the conduct of the firm. The company's performance benefits if the strategy is well-tuned to the (market) structure (based on the work of Rumelt: Caves 1980, p. 77). Caves concludes that:

- correct strategic choices, based on (market) opportunities, improve economic performance;
- organizational structure should be correct, given the strategy chosen.

It is important to note that, in the view stated above, the strategy prescribes the structure. According to Pennings, this vision is based on a mechanistic perspective of the organization, as if it were an instrument (Pennings 1985). Scholars in the field of organizational behavior consider this mechanistic view as unrealistic, and state that the organizational context is not only the result of strategic choices, it is also a factor that causes strategic choices. Bower views the structure as the context within which decisions are made so that the structure motivates or impedes strategic activities (Fredericson 1986, p. 281). It is clear that the organizational structure is more or less the solid reflection of decision-making processes that influence strategic decision-making, according to the work of Simon, March and Cyert (Boersma 1989, p. 37; Miles & Snow 1978, p. 8; Perrow 1986, p. 124). Hall & Saias hypothesize that the structure may (partly) predetermine strategy because (Hall & Saias 1980, pp. 151, 153):

- the structure influences the process of strategic planning;
- structural features may act like filters for information-processing and condition the perception of (strategic) matters;
- structure determines organizational behavior, and therefore strategic problem-solving, via the structure of communication (channels) and power.

Fredericson demonstrates the influence of three structural dimensions on the strategic decision-making (Fredericson 1986, pp. 282, 285-290). Some hypothetic examples are given below:

- centralization leads to delaying the start of the strategic decision-making process. In addition it increases the possibility that strategic decision-making will be a proactive, opportunity-seeking process;
- formalization increases the likelihood of a reactive strategic process. The comprehensiveness of strategic decision-making will also be enlarged by a higher formalization.

These arguments indicate the role of structure in developing a particular way of strategic decision-making.

Concluding:

- on the one hand, studies suggest that structure follows strategy (Chandler 1962; Donaldson 1986, 1987);
- on the other hand, there are studies that demonstrate the opposite (Fredericson 1986; Hall & Saias 1980).

Just like Miles and Snow, Miller (1986) chooses for a third perspective, where "ties unite strategy and structure; that given a particular strategy there are only a limited number of suitable structures and vice versa" (Miles and Snow 1978, p. 8; Miller, 1986, p. 234; see also Hall & Saias 1980, p. 161). The structure influences the flow of information and human interaction, thereby channelling human interaction and collaboration, specifying coordination and allocating power and responsibilities in the organization. These elements do, of course, influence the determining of strategy. There is also a reverse direction of influence. The nature of strategic decision-making needs and motivates certain structural devices. For example, elaborate analysis and formal planning need expert staff and specialists. These demands can lead to more specialization and technocration. In the terms applied by Miles & Snow, there is complementary adaptation of strategy and structure, and properly aligned, this will enhance organizational performance (Miller 1987a, pp. 7-8; 1987b, p. 70; 1988, pp. 281, 283, 286).

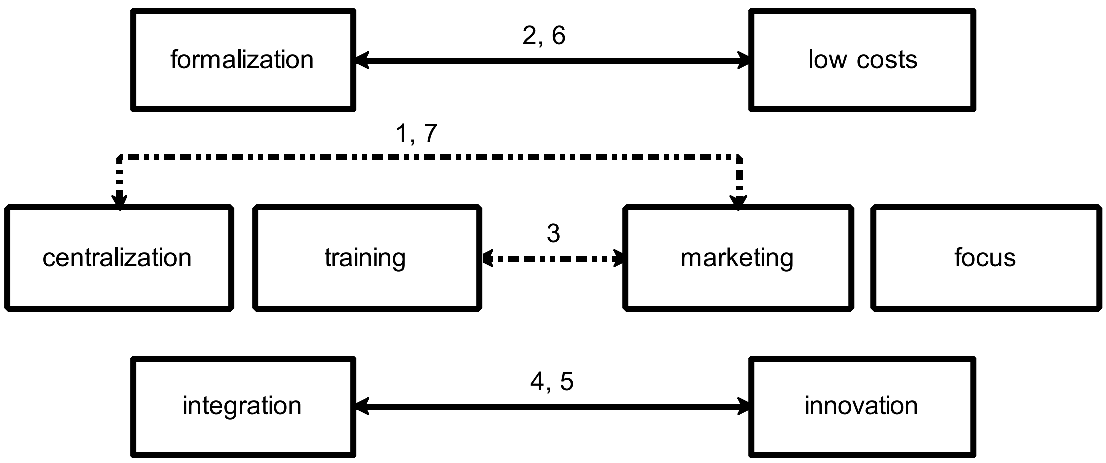
To describe the mutual relation between strategy and structure, we use the earlier-defined measurements. In the subsections dealing with strategy and structure (2.3.3.2 and 2.3.4.2), the dimensions and types for the future measurement of the variables have already been defined. These types and variables will be linked, based on congruence rules.

The congruence rules for competitive strategy and organizational structure are (see also Figure 3.3: Congruence scheme for strategy and structure):

Two points if:

- low costs + is aligned with formalization + (low costs requires a continuous production process for efficiency. This requires regularity, and regulated work is favored by formalization that results in standardized behavior);
- innovation + is aligned with integration + (the complex and unpredictable innovation requires independent, skilled workers operating together);
- marketing + without low costs + is aligned with:
  - centralization + and formalization - (marketing differentiation can also mean that value is offered via more simple operations. Non-formalized control is feasible to direct these operations);
- marketing + with focus 0 is aligned with:
  - training + and integration - (marketing can require very stable but complex tasks (quality work) so that skilled (training) independent tasks are needed).

Figure 3.3 CONGRUENCE SCHEME FOR STRATEGY AND STRUCTURE



Based on the strategic and structural types (see subsections 2.3.3.3 and 2.3.4.3), seven configurations can be created in which the strategic and structural variables are related as follows (the Tables 3.3a and 3.3b; see also Miller 1986, pp. 241-248; Romme et al. 1990, pp. 52-55):

1. Niche marketers with simple structure.
In these organizations, one person (the entrepreneur) can oversee the total situation. This is possible because of the focus on a certain market segment where the organization tries to differentiate. The executive can directly supervise the workers who perform simple tasks to realize the primary process (no innovative capacity). Training or mutual adjustment are not necessary for the coordination; all the decision-making power is centralized. Also formalization is not needed for coordination: standardization would hinder the required flexibility in the competitive market.

2. Cost leaders with machine bureaucracy.
Low costs producers need efficient production processes to compete well. The standardization needed for this requirement is prompted by a regular, stable primary process without interruptions. Via formalization the required tasks are prescribed, resulting in centralization. The large, regular and rather specialized output is sold to a stable and large market. The predictable tasks should not be renewed too often (innovations result in interruptions). These not-too-complex tasks are standardized, and therefore do not require much mutual coordination or

specific training (comparable with defenders: Miles & Snow 1978, pp. 47-48).

Table 3.3a SCORING THE COMBINATIONS BETWEEN STRATEGIC TYPES AND STRUCTURAL TYPES

strategy \ structure			simple structure				machine bureauc.				professional bureauc.				adhocracy			
			frm	cen	int	tr	frm	cen	int	tr	frm	cen	int	tr	frm	cen	int	tr
			-	+	-	-	+	+	-	-	-	-	-	+	-	0	+	+
niche marketer	low costs	-																
	marketing differentiation	+		2														
	focus	+																
	innovation	-																
	total		2				0				0				0			
cost leader	low costs	+					2											
	marketing differentiation	-																
	focus	-																
	innovation	0																
	total		0				2				0				0			
marketer	low costs	0																
	marketing differentiation	+		2										2				
	focus	0																
	innovation	0																
	total		2				0				2				0			
innovator	low costs	-																
	marketing differentiation	-																
	focus	0																
	innovation	+															2	
	total		0				0				0				2			

Table 3.3b SCORING THE COMBINATIONS BETWEEN STRATEGIC TYPES AND STRUCTURAL TYPES

strategy \ structure		simple structure				machine bureauc.				professional bureauc.				adhocracy			
		frm -	cen +	int -	tr -	frm +	cen +	int -	tr -	frm -	cen -	int -	tr +	frm -	cen 0	int +	tr +
niche innovator	low costs - marketing differentiation - focus + innovation +															2	
	total	0				0				0				2			
low costs marketer	low costs + marketing differentiation + focus - innovation 0					2											
	total	0				2				0				0			

bureauc. = bureaucracy

frm = formalization
cen = centralization
int = integration
tr = training & indoctrination

3. Marketers with professional bureaucracy.
Stable primary processes can also consist of complex tasks. Training is then an appropriate means of coordination, because the complexity is learned and the process is still standardized. This dependence on the skills of the workers results in decentralization. These skills are especially needed when the quality of the performance of the tasks is crucial: differentiation is the important factor. Innovative new activities that require much mutual coordination are undesirable. The organization delivers specific services and products to specific customers: the lowest costs are not the most important competitive aim. This does not automatically mean that they focus on one group only; this would result in vulnerability.

4. Innovators with adhocracy.
Some organizations compete by means of a constant renewal of products and services; they want to deliver the quality reflecting the state-of-the-art. An issue like low costs efficiency, and differentiation aspects such as advertisements or extra services, are of no interest to their customers. This innovative motivation results in unpredictable processes and products which are mostly highly complex; standardization is not possible (thereby eliminating formalization and training-coordinating mechanisms). Management cannot control the content of this work alone; it decentralizes the decision-making power to the teams of experts. The mutual adjustments between, and within, these teams coordinate the tasks of the primary process. The focus of these organizations is not tight; one market segment does not always have enough innovative absorption potential (comparable prospectors: Miles & Snow 1978, pp. 65-67).

Three mixed forms are also suggested.

5. Niche innovators with adhocracy.
The only difference with the 'innovators with adhocracy' is the absorption potential of a certain market segment. If this potential is large enough, then the focus of the organization should be high.

6. Low costs marketers with machine bureaucracy.
The difference with the cost leader / machine bureaucracy is that the efforts towards differentiation do not hinder the efficiency of the production process.

7. Marketers with simple structure.

Niche marketers can grow out of their only niche by delivering to more market segments (focus). They still differentiate by adding value to the products (quality, convenience of use, better service), not only for specific customers but also with the aim of reaching more types of customers. Maybe they are even capable of developing a limited amount of innovations if this does not tax the simple structure.

The execution of the business functions of the primary process is an important aspect behind the linkage between the variables. Besides, the variables are mutually supportive and develop in time; it is impossible to indicate causality (Miller 1988, p. 286).

3.4.3 Research on the strategic impact of competitive strategy and organizational structure

In this subsection, a conceptual study conducted by Miller is presented, followed by several empirical works.

Miller

Miller suggests a research direction to really relate strategy and structure. He proposes to look at strategy and structure from a multidimensional angle (Miller 1986, p. 234). Venkatraman backs this idea, saying that studying strategy from a one-dimensional point of view unjustly simplifies the construct of strategy (Venkatraman 1989b). As strategic dimensions Miller recognizes the Porter-based dimensions of (Miller 1986, pp. 238-239):

- differentiation (innovation and/or marketing): aims to create a product that is perceived as uniquely attractive;
- focus: gives special attention to a specific type of customer;
- cost leadership: strives to produce goods cheaper than the competitors do;
- asset parsimony: emphasizes the low amount of assets per unit output.

These dimensions refer to the content approach of strategy, meaning the intentions and the outcome of the strategy, and not the strategic decision-making process (see for instance Fredericson 1986). As a proponent of the configuration approach, Miller suggests the use of creating strategic types of supporting elements from these dimensions, based on the rules of thumb (see subsection 2.3.3.3 and appendix A.3 about strategic types) (Miller 1986, p. 236):

1. niche marketers: high focus - high differentiation - high asset parsimony - low cost leadership;
2. innovators: low focus - high (innovation-) differentiation - high asset parsimony - low cost leadership;
3. marketers: low focus - high (marketing) differentiation - high asset parsimony - low cost leadership;
4. cost leaders: low focus - low differentiation - low asset parsimony - high cost leadership;
5. conglomerates: low focus.

Miller admits the weakly-described character of the coherence of the strategic elements. Nevertheless, he crosses them with the structural types of Mintzberg, and reaches 8 strategy - structure fits. Romme et al. gave some empirical basis for the strategic - structural types based on a variance (content) approach (Mohr 1982). They found the following fits (Romme et al. 1990, pp. 52-58):

- niche marketers and simple structure;
- cost leaders and machine bureaucracy;
- (innovative) differentiation and adhocracy.

These fits should be more effective than others because of the balance between the strategic and structural elements (Miller 1986, p. 248). The relations between all these elements are broadly described, making clear that there is no one-way direction between strategy and structure; the message is that they should be mutually balanced each other. To achieve this, the management has to makes choices. Although there are many constraints on managerial choices, like the present organizational structure, the current product-market combinations, and the demands of the industry, the management is not forced to respond to the strategic, or structural, imperative.

In the remainder of this subsection, empirical studies on the topic of strategy - structure subject are discussed.

Egelhoff

Studies that back the importance of the strategy - structure relation started with Egelhoff. He operationalized and measured strategy and structure to study the effect of fit. He based his research on the information-processing model (Galbraith 1973). Different elements of strategy require different information-processing in the organization. Structure is the organizational variable that offers a certain information-processing capacity. There is a good strategy - structure fit if the information-processing requirements demanded by the strategy are satisfied by the information-processing capacity of the structure (Egelhoff 1982, p. 436). Based on this information-processing approach, strategy and structure were both operationalized and linked (Egelhoff 1982, p. 437).

The study was specifically aimed at multinational firms. The information-processing relation between the parent firm and the foreign subsidiaries was the central issue. Based on this relation, the structure was operationalized. This resulted in (Egelhoff 1982, pp. 438-441):

- worldwide functional divisions;
- international divisions;
- geographical regions;
- worldwide product divisions.

This characterization of structure was very different from commonly-used structural features like formalization or centralization. This was due to the multinational focus of this study.

The strategy was measured via eight elements of international strategies conducted by firms:

- product diversity;
- product modification differences;
- product change;
- size of foreign operations;
- size of foreign manufacturing;
- number of foreign subsidiaries;
- extent of ownership;
- extent of acquisitions.

Product diversity refers to the commonly-used dimension of differentiation. Product modifications and product changes resemble the dimension of innovation. The other elements are strongly related to the global aspect of multinational companies.

The author hypothesized diverse fit relationships for successful organizations (there is no comparison with unsuccessful organizations). Most of these relationships were supported (Egelhoff 1982, p. 449). He recognized that 20 good fits for organizations were possible.

Comments

Although this research supports the relevance of fit, some comments can be made.

Firstly, the research was aimed at MNCs, and was not indicative of common strategy and structure measurements. Secondly, although information-processing was linked to managerial decision-making, the role of management in reaching a fit was not highlighted. Thirdly, Egelhoff assumed a deterministic one-way direction. The strategy was a constraint for the appropriate structure. Finally, the success of organizations was not measured. He selected a sample of so-called "successful organizations".

Ettlie et al.

The relation between strategy and structure is also studied in the field of innovation. Ettlie et al. hypothesized two kinds of innovations: a radical innovation especially aimed at process innovation, and a more incremental process adoption. One of these innovations would emerge as being dependent on the fit between strategy and structure (Ettlie et al. 1984, pp. 682, 684).

Structure was operationalized, partly based on the Aston studies (see Inkson et al. 1970). Three dimensions were examined:

- complexity;
- formalization;
- centralization.

The concentration of technical specialists was added to these dimensions of structure.

Strategy was typified as follows:

- technology policy: a preemptive, long-term strategy for technological innovation;
- market-dominated growth strategy;
- diversification.

Success was not measured. The dependent variable was the nature of the innovation.

The results showed that the technological strategy and technical concentration predict radical innovation. The effect of the fits between the other strategies and structures is less clear. Notwithstanding, the author claimed that incremental innovation appears to be dependent on market-oriented strategies and traditional arrangements (Ettlie et al. 1984, pp. 693-694).

Comments

Although this research originates from another field of study, the concept of fit was still recognized. The conceptual model very clearly stated the deterministic one-way direction of strategy to structure. Technological policies led to concentration of technical specialists; growth strategies and strategies of diversification were implemented via traditional complex, formalized and decentralized structural arrangements (Ettlie et al. 1984, pp. 684, 685).

White

In 1986, another strategy - structure research did measure all three relevant variables, namely strategy, structure and performance (White 1986). White noted that there were few researches on the fit between business strategy and internal organization. Therefore, his aim was to show how differences in performance associate with differences in generic strategies combined with organizational differences (White 1986, pp. 217-218).

The idea at the basis of his study was that the structure is relevant for the successful implementation of strategy. Therefore the strategy guides the structural choices. Although Porter recognized the need of supporting organizational arrangements, the possible choices were not explored in the literature (see also Porter 1980, p. 35). The reason for this deterministic approach lies in the strategic demands for the business functions like internal operations, distribution, R&D and so on (White 1986, pp. 221, 222, 224). For their successful execution, management has to coordinate these functions. This coordination entails a certain amount of uncertainty. The greater the uncertainty experienced using a certain strategy, the greater the certainty the structure has to provide. The role of the managerial choices is unclear, probably because of the deterministic approach used. This means that the choices should be clear when using a certain strategy.

Strategy was measured according to Porter's ideas. In the past, there had been a lack of non-situation-specific strategies at the level of business units. Through the development of generic strategies, linkages could be made between the goals and the coordination of business units. White limited his strategic operationalization to the basic distinction between low costs and differentiation strategies. Because he wanted to link equivalent constructs, he measured outcomes (and not intentions), viz. the current organizational structure and the realized competitive strategy. He combined costs and differentiation outcomes into 4 types (White 1986, p. 226):

- pure costs;
- pure differentiation;
- both costs and differentiation;

- neither costs nor differentiation.

Strangely enough, the organizational structure did not deal with the usual internal organization of the business units, but with the broader organizational context. Three organizational requirements were chosen to cope with the strategic demands (White 1986, pp. 222-224):

- autonomy: organizations deal with uncertainty by means of decentralization, resulting in autonomous units;
- frequent reviews: reporting to the hierarchy is necessary, but can demand too much information processing capacity, ultimately causing more uncertainty;
- coordination: the differentiation and integration of business functions can differ dramatically, varying from direct functional line responsibility via shared responsibility to no line responsibility at all.

The performance was measured using sales growth and ROI figures, taking 4-year averages (White 1986, p. 227).

Overall, the results confirmed the positive effect on performance of the associations between strategy and structure (White 1986, pp. 228-229):

- low autonomy (more control for corporate office in business decisions) corresponds to higher ROI only with low costs strategy;
- shared responsibilities fit with low costs strategy (effect on ROI) or with differentiation strategies (effect on sales growth).

Comments

The concept of fit is supported, although the measures for the organizational structure deviate from the usual measures.

Miller

In a follow-up to his previous study (1986), Miller conducted an empirical research for which structural dimensions were linked to features of strategy-making in 1987. For organizational structure, the following frequently-used dimensions were measured (Miller 1987a, p. 8):

- formalization;
- centralization;
- complexity;
- integration.

These dimensions express the content of the structure. However, this content of structure was linked to the process characteristics of the strategy (compare for instance Fredericson 1986). The way the organization deals with the strategy was studied, and not the content of the strategy itself. This was evident in the following dimensions (Miller 1987a, pp. 9-10):

- rationality: how carefully and systematically do scanning and analysis take place?;
- interaction: how much bargaining and consensus-building is involved with decision-making?;
- assertiveness: what is the level of risk-taking and action (rather than reaction) with respect to the environment?

Miller developed two kinds of hypotheses. The first kind dealt with the relations between the dimensions of strategy and structure (Miller 1987a, pp. 11-13):

- integration is positively associated with rational, interactive and assertive strategy-making;
- formalization is positively associated with rational and interactive strategy-making and negatively associated with assertiveness;
- centralization is negatively associated with rationality and interaction, but positively associated with assertiveness;
- complexity is positively associated with rationality and negatively associated with assertiveness.

It is clear that different characteristics of structure prosper form the same features of strategy. There is no tight 1:1 relationship.

The second group of hypotheses linked the fit to performance implications. The most relevant one was (Miller 1987a, pp. 13-14):

- the predicted association of structure with rationality and interaction will be stronger in successful firms than in unsuccessful firms.

Overall, there was substantial support for many of the hypotheses. The findings showed significant associations between structure and strategy-making. In general, the relationships were the highest among good performers (Miller 1987a, pp. 26-27).

Comments

The concept of fit was supported again, although it was the process of strategy that was studied, and not the content.

Miller

In the same year (1987), Miller produced a second study in which strategy and structure were again correlated (Miller 1987b). The aim of the study was to relate strategic dimensions to those of structure. There were, however, a few deviations from his earlier studies (Miller 1986; 1987a).

In the first place the contents of strategy (thus not its process characteristics as in 1987a) were used (Miller 1987b, pp. 55, 56). The strategic dimensions were:

- (complex) innovation;
- marketing differentiation;
- breath (reversed focus);
- conservative control (low costs).

Secondly, these strategic dimensions were linked to rather uncommon structural dimensions:

- uncertainty reduction: the structural mechanism to deal with the unpredictability of the organization for more informed and orderly administration (for instance: scanning and analyzing the environment, developing a hierarchy and implementing formal procedures);
- differentiation;
- integration.

The structural content variables, like formalization and centralization, which were previously proposed and used as a basis for structural configurations (see Miller 1986; 1987a) were ignored. Besides, performance was not measured in this study.

Comments

The deviations make it hard to compare the studies. The main result of this 1987b study was the finding of strong correlations between strategic and structural dimensions. This conclusion supports the notion of fit, although not related to the performance of organizations.

Miller

In 1988, strategic and structural content variables, comparable with the variables in our research, were linked. Realized strategies influence actual organizational tasks, and therefore the focus is also on the emergent (actual) structure, rather than on the intentional, formal structure (Miller 1988, p. 293). The linkage between strategy and structure was also investigated with respect to its effect on performance. Miller recognized that previous organizational research had neglected strategy because it had been viewed as a necessary response to the environment, as in the structure-conduct-performance paradigm. Subsequently, Child had elucidated the possibility and importance of strategic choice (Child 1972). Accordingly, this strategy was considered to be a relevant fit variable in Miller's research. The message for the management is that it can and should pay attention to creating good fits between strategy and structure (Miller 1988, p. 302). The shape of these fits is, again, an object of Miller's study.

Four strategic dimensions were distinguished:

- innovation;
- marketing differentiation;
- cost leadership;
- strategic breadth (inverted focus).

These dimensions were associated with the following structural features, namely the use of:

- liaison devices (integration);
- delegation (inverted centralization);
- technocrats (indicative for specialization);
- formal controls (indicative for formalization).

Performance was measured via averages of ROI, growth in net income and a subjective assessment of the chief executive officer (CEO) of the profitability of the firm compared with its competitors. On the basis of these figures, the sample was divided into successful and unsuccessful organizations.

The following hypotheses were developed:

1. innovation has a positive association with liaison devices, technocrats and delegation.
   Result: mostly confirmed (delegation does not relate to any strategy);
2. marketing has no association with liaison devices, technocrats and delegation.
   Result: mostly confirmed (except for a low-order correlation between marketing and liaison devices);
3. cost leadership has a negative association with liaison devices, technocrats and delegation, and a positive association with formal controls.
   Result: partly confirmed (the relation is as expected, but only the links with liaison devices and formal controls are significantly);

4. strategic breadth has a positive association with all four structural dimensions.
   Result: not confirmed (the relations are as expected, but only liaison devices relate significant);
5. the three positive associations (1, 3 and 4) will be stronger for high performers than for low performers.

Result: Only a few of the relations between strategy and structure were more significant in the successful than in the unsuccessful organizations.

Comments

The conclusion of this subsection is that several strategy - structure fits exist. However, their effect on the performance is not consistent.

3.4.4 Conclusion

Looking at the fit between strategy and structure, the features listed below become clear:

- this (bi-variate) fit is important for successful organizations, although the precise effect on the dependent variables is not always investigated empirically in the same way;
- the adjustment between strategy and structure is based on their relevance to the business functions;
- the realization of the fit was earlier researched from different causality angles, but now there is agreement on the mutual adjustment of strategy and structure;
- regardless of these approaches, the management is at the middle of these processes because of the coordination of business functions;
- organizations have slack enabling to choose for certain strategies and structures and IT. There is no single best fit.

3.5 CONCLUSION ON BI-VARIATE RESEARCH

Bi-variate studies offer promising competitive results in comparison with the univariate research, but they have two drawbacks:

- the results of the researches are not clearly matching;
- the competitive results are not very strong, in contrast to the results from the well-known case studies.

An important reason for these drawbacks, besides the standard operationalization issues, could be the neglect of the third central variable (viz. organizational structure is missing in research relating IT and competitive strategy). Despite these drawbacks, the insights obtained from the bi-variate studies are a basis for further use of the variables in this research, because of the congruences between them and other similar characteristics.

CHAPTER 3

BI-VARIATE RESEARCH: EXPLAINING THE STRATEGIC PERFORMANCE WITH TWO VARIABLES

3.1 INTRODUCTION

In the previous chapter, we observed that the competitive impact of IT was not only dependent on the IT itself. We proposed two options for the further study of the strategic opportunities for organizations, viz. to do research on the strategic impact of new particular organizational or technological variables and to do research on the combination of several organizational and technological variables.

In the previous chapter, it was stated that the first option lacked a promising theoretical basis for further research on the issue of strategic IT. The second option offers a new theoretical point of view. Organizations can be viewed from more than one angle. Obviously, the competitive effects are not explained from only one of those angles. Therefore, it is tempting to combine two of those angles to gain more insight (see also Morgan 1989, p. 13). Per definition, all three variables mentioned above are related to the business functions, so that relations can be expected.

We shall first research the bi-variate relation between IT and competitive strategy on the competitive position, and subsequently the relation between IT and organizational structure and the competitive implications (option 2). The impact of the relation between the competitive strategy and the organizational structure is examined to make the study complete.

3.2. IT AND COMPETITIVE STRATEGY

3.2.1 Introduction

This section deals with the relation between IT and strategy, and its effect on the performance of the organization. We start with an elaborate description of the relation between strategy and IT as used in this research. This relation is based on the congruence between the various dimensions of the two variables. Subsequently, several empirical studies on this issue are presented. Although there are differences between the operationalizations of the variables, similar features that serve as a basis for further research can be recognized.

3.2.2 Relating IT and competitive strategy: connecting dimensions and configurations

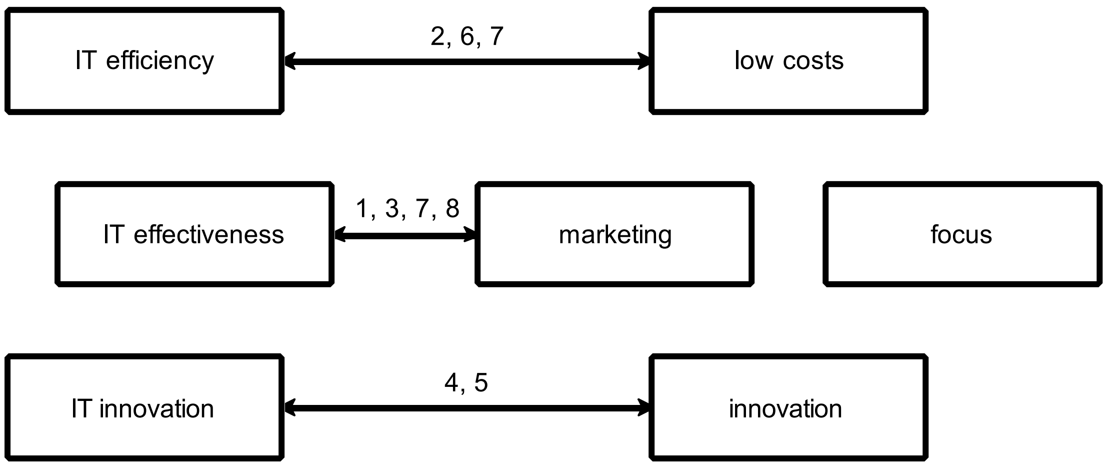
In general, the IS research that deals with strategic IT concentrates on the business strategy level (Chan & Huff 1992, p. 193). Parker et al. state that IT investments must result in improved business performance. For the successful exploitation of IT, one of the main questions is: for which goal has the IT been installed in the organization. To answer this, the IT must be evaluated regarding its possible contribution to the business goals (Parker et al. 1989, p. 19). At present times, there is a broad stream of theoretical research on information systems and their relation to company strategy. And in practice, aligning strategy and IT is a continuing challenge for (IT) management (Broadbent & Weill 1991, p. 293).

This topic of the fit between business strategy and the general goals for IT implicates that a good policy on the use of IT is not possible without a clear business strategy (Holland & Lockett 1992, pp. 135, 141). This linkage has an impact on company performance (Chan & Huff 1992, p. 191), whether it is reactive alignment or proactive impact. The better the fit (congruence) between strategy and IT, the better the expected company performance.

In the various alignment models, this IT - strategy fit is rather conceptual (Chan & Huff 1992, p. 195). Variables are often not translated into measurable indicators. A good example is to be seen in a study concerning 20 UK retailers. Holland & Lockett describe business and IT strategies without operationalizing these constructs (Holland & Lockett 1992, pp. 136-137). The consequence of this conceptual approach is that the assessment of 'fit' is not possible. Therefore, the question remains: what is the nature of the fit between strategy and IT? The answer to this question can be used to assess the effect of fit. Which fits are profitable for the organizations, and which fits are undesirable? To answer this kind of question, strategy and IT must be formally assessed to uncover the links (congruences) between IT and strategy (Chan & Huff 1992, p. 193). Bi-variate researches provide guidelines for the operationalization for the variables. These researches are presented in the next subsection.

The relations between IT and strategy are based on the earlier defined dimensions (see subsections 2.3.2.2 about IT and 2.3.3.2 about strategy). Congruence is explained via rules, which are aligned with certain scores. The scores are determined as follows. Generally two points are awarded if two high logical values are aligned (for instance a high IT effiency and a high low costs). One point is awarded if two low values are present. Finally there are some penalty rules that deny the relation between certain dimensions and therefore certain types.
The application of the rules leads to a final score for the combination of certain IT types and strategic types. The combination between two types is accepted if that combination has at least two points.

Figure 3.1 CONGRUENCE SCHEME FOR IT AND STRATEGY



The congruence rules that relate IT and competitive strategy are:

Two points if:

- low costs + is aligned with IT efficiency +;
- marketing + is aligned with IT effectiveness +;
- innovation + is aligned with IT innovation +.

One point if:

- low costs - is aligned with IT efficiency -;
- marketing - is aligned with IT effectiveness -;
- innovation - is aligned with IT innovation -.

Penalty rules:

- low costs - can not relate with IT efficiency + (too expensive);
- low costs + can not relate with IT efficiency - (not enough capacity);
- marketing- can not relate with IT effectiveness + (too expensive).

Table 3.1a SCORING THE COMBINATIONS BETWEEN IT TYPES AND STRATEGIC TYPES

strategy \ IT			unconnected			concentrated			distributed			decentralized		
			effi	effec	in	effi	effec	in	effi	effec	in	effi	effec	in
			-	+	-	+	-	-	+	+	-	-	-	+
niche marketer	low costs	-	1			x			x			1		
	marketing differentiation	+		2						2				
	focus	+												
	innovation	-			1			1			1			
	total		4			0			0			1		
cost leader	low costs	+	x			2			2			x		
	marketing differentiation	-		x			1			x			1	
	focus	-												
	innovation	0												
	total		0			3			0			0		
marketer	low costs	0												
	marketing differentiation	+		2						2				
	focus	0												
	innovation	0												
	total		2			0			2			0		
innovator	low costs	-	1			x			x			1		
	marketing differentiation	-		x			1			x			1	
	focus	0												
	innovation	+												2
	total		0			0			0			4		

Table 3.1b SCORING THE COMBINATIONS BETWEEN IT TYPES AND STRATEGIC TYPES

strategy \ IT			unconnected			concentrated			distributed			decentralized		
			effi -	effec +	in -	effi +	effec -	in -	effi +	effec +	in -	effi -	effec -	in +
niche innovator	low costs	-	1			x	1		x			1		
	marketing differentiation	-		x						x			1	
	focus	+												
	innovation	+												2
	total		0			0			0			4		
low costs marketer	low costs	+	x			2			2			x		
	marketing differentiation	+		2						2				
	focus	-												
	innovation	0												
	total		0			2			4			0		

effi = IT efficiency
effec = IT effectiveness
in = IT innovation

The application of the rules is shown in the Tables 3.1a and 3.1b. Relating the IT with the three strategic dimensions, combined with the configurational linkages (see subsections 2.3.2.3 and 2.3.3.3), results in the following eight possible types where the IT and strategic dimensions are supportive.

1. Niche marketers with unconnected IT.
Niche marketers do not compete via the lowest costs and neither need to process large amounts of data, nor use concentrated or distributed IT for efficiency. They compete via anticipating the needs of their specific niches (focus) and need to be supportive in their marketing (differentiation), administration and simple production processes. This support can be offered effectively by unconnected IT. It would be dangerous (and not necessary) to invest in highly innovative decentralized IT. The resources would be concentrated on specific applications so that the organization would be forced to limit its delivery to one segment only.

2. Cost leaders with concentrated IT.
The main concern of these organizations is to operate at the lowest costs. The strategic necessity to efficiently process data for controlling production processes and the administrative support fits the regulated information processing of concentrated IT perfectly. These organizations have a low focus and deliver to more market segments. Large investments in IT preclude operating at only one segment: the market capacity would be too small for returns on this investment.

3. Marketers with distributed IT.
Extra emphasis on the products and their delivery is crucial. All kinds of complex differentiation opportunities, like extra services and quality, determine the position of these organizations in the industry. This differentiation demands elaborate tasks for which standard applications of unconnected IT are not always feasible. Effective special applications are appropriate. These larger organizations (compared with niche marketers: they do not focus heavily) can also use efficient information processing capacity for administrative purposes. Expensive distributed IT aligns with these needs, and can be afforded.

4. Innovators with decentralized IT.
Innovative opportunities offered by IT are compatible with the behavior of innovators. These opportunities effectively support the workers in these organizations. In no sense do they restrict their innovating efforts. The expensive IT requires a low-focused organization to produce sufficient returns. Efficiency aspects do not

play the most important role regarding the production processes. Customers are willing to pay the price for innovation.

The four types mentioned above are the standard combinations. It would be a simplification to create a hypothesis based on only these combinations. There is enough slack in organizations to realize other combinations.

5. Niche innovators with decentralized IT.
Comparable with the last combination, but differing in the dimension of focus. Obviously these organizations focus on certain market segments with enough potential to pay back the IT investments of the decentralized IT.

6. Low costs marketers with concentrated IT.
These organizations are low costs producers with the possibility to improve the appearance and supply of their products without hindering the smooth execution of the production processes. The main function of the IT is to support the efficiency. Therefore, concentrated IT is appropriate.

7. Low costs marketers with distributed IT.
As 6., but with the difference that the distributed IT supports the differentiation dimensions of the marketer and the efficiency dimensions of the cost leader.

8. Marketers with unconnected IT.
Not all marketers realize complex differentiation. Some concentrate on simple added value in the features of their products and services, and are comparable with niche marketers, operating several market segments at the same time (no focus). Efficiency is not an important competitive consideration. Therefore, effective unconnected IT with its opportunities to support standard functions is appropriate.

It is useful to note that the way the organization wants to differentiate and the use of IT are both linked to the efficient, effective and/or innovative performance of the value chain functions. Besides, various strategies and IT functions can be appropriately linked to each other; the management has choices to make on this issue.

3.2.3 Research on the strategic impact of IT and competitive strategy

Although bi-variate researches provide guidelines for the operationalization of the variables, the different properties of the constructs IT, strategy and competitive advantages of organizations are a main source of ambiguity. This leads to incomparabilities. However, the similarities between the researches are still striking. In all the researches:

- IT is involved with the goals/usage of the automation of the information services;
- the business strategy handles the intended or realized organizational goals;
- the competitive position deals with the relative performance of the organization in comparison with other organizations.

Simon & Grover

Simon & Grover conducted a research in which the linkages of IT with strategic objectives took an important place (Simon & Grover 1993, p. 29). The study investigated the function of certain applications in facilitating the strategic plan of (international) organizations.

For the operationalization of strategy, they used the following strategic dimensions (Miller 1987b):

- complex innovation: the degree to which the firm introduces major new products or services;
- marketing differentiation: the creation of customer loyalty by uniquely meeting a particular need;
- breadth: the scope of the market that the business serves;
- conservative cost control: the extent to which the business achieves a cost leadership position.

IT was not operationalized. Examples were given of applications linked to the various strategic dimensions:

- complex innovation requires information-gathering and the evaluation of systems. These systems improve management decision-making from conceptual design to new marketing concepts with the improved quality of information. IT can play an additional role via CAD/CAM applications;
- using marketing differentiation, customer service and marketing become prime ingredients for the firm's competitive mix. IT can support this by means of inventory management and routing systems and systems offering marketing intelligence;
- as the scope of the business widens, the level of uncertainty will increase. IT can assist management in decreasing newly created uncertainty by

means of detailed sales and product records in database management systems;
- for cost control, it is necessary for the management to closely monitor the organization's operations via information systems and to control costs using inventory and accounting systems. Besides, systems are that standardized operating procedures and formalize policies are needed.

Comments
The difference between this approach and the approach in our study, lies in the linking of concrete application and organizational goals, instead of considering the use of IT at a strategic level. Besides, Simon & Grover see the strategic value of IT particularly in its role as coordinating mechanism of value chain activities (Simon & Grover 1993, p. 30).

Due to the lack of IT operationalization, the link remains rather coincidental. Anecdotal evidence is used to illustrate the linkages between some applications and strategic dimensions. We could imagine applications linked to other dimensions. Nevertheless, the authors claim that, by using this 'fit' concept, IT applications can be most beneficial (Simon & Grover 1993, p. 40). These benefits need to be operationalized. So far, the framework serves as a guide to explore possibilities between strategies and IT.

Ramaswami et al.
In this next study on the impact of IT and strategy, the construct of strategy was also operationalized following the fundamental strategic approach of Porter (Ramaswami et al. 1992, p. 153). They perceived four dimensions:
- service differentiation: emphasizes customer service, service quality and image of the organization;
- marketing differentiation: emphasizes advertising, personal selling and other marketing techniques;
- product differentiation: emphasizes product development and modification;
- cost focus: emphasizes costs efficiencies and competitive pricing.

As in the research of Simon & Grover, the marketing dimension was split into service differentiation and marketing differentiation, and the breadth (focus) dimension was ignored.

They distinguished various information needs concerning the operationalization of IT. Firms need internal and external information for strategy formulation and implementation. Internal information is, for instance, provided by internal accounting systems delivering data on sales, inventories, costs and so on. External data are provided by marketing intelligence systems, which offer information on customers, competitors, suppliers etcetera, and marketing research systems that support the solving of specific problems (Simon & Grover 1993, p. 152). Both environmental scanning and market research demand complex information processing for which strategic information systems can be used. According to the authors, strategic information systems describe the activities in the collecting, processing and analyzing stages through which this external information needs to pass in order to make strategic marketing decisions. This decision-making process is not directly aimed at getting competitive advantages.

The objective of the study was the assessment of the need for strategic information when using one of the competitive strategies. For instance, a firm using a differentiation strategy may need more strategic information than a firm using a costs strategy. The need for this kind of strategic information (system) governs the IT the organization should use. Knowing the strategy, IT can play a facilitating role for the provision of strategic information. When it is not really necessary, the high costs associated with the labor and the financial resources needed for such IT can damage the competitive position. A firm that meets its strategic information needs and therefore uses the appropriate IT may be in a better position to arrive at a competitive advantage. The fit between strategy and IT is believed to be relevant for the performance of the firm.

The results of their empirical research indicated that organizations using a marketing or service differentiation tend to emphasize the need for strategic information systems (Simon & Grover 1993, p. 157). The other two strategic dimensions did not show any relationship with strategic information systems.

Comments

The research described follows Rackoff et al. in their perception of strategic IT. The focus on IT is that of its usage in the support of the strategic management process. For this they concentrate on external marketing information (Rackoff et al. 1985).

As pointed out before, in our research strategic IT is viewed as being the IT that enhances competitive advantages. The literature shows that strategic effects are not only reached by information systems for supporting strategic management, but also (or even more) by information systems for internal operations efficiency (Galliers 1993; Wilkes 1991, p. 57). For the costs strategy in particular, this 'internal' IT is of essential strategic value. Due to this reason, their operationalization of IT, which focuses on the emphasis of external marketing information (systems), is one-sided.

Another comment on this research concerns the lack of measurement of strategic advantage or (comparative) business performance. The link of the fit with firm performance, which is viewed as relevant for the competitive position of the firm, is not explicitly addressed in their research design. In a footnote however, they report the positive association of strategic information systems with market coverage and penetration. Thus, using a marketing differentiation strategy needs strategic information systems, resulting in a higher market share.

Kühn Pedersen

In a study covering 27 organizations, Kühn Pedersen found 44 examples of information systems that generated competitive advantages. The effect of the fit between IT and strategy is treated in his research (Kühn Pedersen 1990).

As in the researches previous mentioned, he also used the scheme of Porter to identify the business strategies (Porter 1980):

- overall cost leadership;
- differentiation;
- focus.

IT was operationalized in the Information System Strategies (IS strategies). The basis for the classification was the distinction between cost-effectiveness (doing things right: the effective use of resources) and goal-effectiveness (doing the right things: the effective achievement of the business objectives). This distinction was combined with the differentiation between the use of IT for the primary processes and the usage of IT as an output in the realized products and/or services. This combination delivered the following classification (Kühn Pedersen 1990, pp. 196-197):

- administrative support (costs/processes): IT for distributed data and word processing systems;
- information management (costs/products): IT for efficient management of the data resources themselves;
- management support (goals/processes): IT like decision-support systems, expert systems and communication systems (electronic mail, EDI);
- markets and products support (goals/products): IT in electronic payment systems and home banking systems, but also information IT for the reproduction of business statistics, calculations and market data.

The mix of strategy and IT was researched on its impact on the competitive effects of information systems in order to explore the concept of fit (in the research referred to as strategy conformance). The conformance was hypothesized as follows:

- overall cost leadership - administrative support/information management;
- differentiation - management support;
- focus - markets and product support.

In order to measure the strategic advantages of information systems, he separated intended strategic advantages and emerged strategic advantages. The author referred to the information systems as realized strategic information systems if the IS-strategy was formulated according to the business strategy, if strategic conformance (reactive fit) was reached and if the IT delivered the expected advantages. If, however, the advantages were the result of coincidence (Galliers 1993), and the business strategy was adjusted to the IT effects (proactive fit), then the information systems were called emergent strategic information systems (Kühn Pedersen 1990, pp. 195, 201).

The result of the research was that in 6 of the 27 organizations (1/5), realized strategic information systems were present. These information systems produced 15 of the 44 cases of competitive advantage (1/3). The fit was obviously advantageous to competitive advantage. The 29 other cases may result in emergent strategic information systems if these organizations change their business strategy.

Comments

The following conclusions can be drawn:

- the absence of a fit between strategy and IT happens four times more often than the presence of a fit. If there is an absence of fit, then there are only twice as many competitive advantages in comparison with the fit situation. Thus, having a fit is relatively twice as rewarding than lacking a fit;
- 2/3 (29 out of 44) of the competitive effects are not planned and are not based on the business strategy. Up until now, business strategies have not been successfully used as guidelines to reach competitive advantages using IT. Kühn Pedersen gives as a possible reason the formal and abstract nature of business and IT strategies, which prevents the successful usage of the fit concept (Kühn Pedersen 1990, p. 201).

Broadbent & Weill

A comparable research, a case study treating four Australian banks, was conducted by Broadbent & Weill. They carried out their research in the banking industry because this information-intensive area of financial services was relatively mature in the use of IT (Broadbent & Weill 1991, p. 304). The competitive importance of the fit between business and information strategies was also very clear in this work. Their assumption was that the presence of (more) information-based comparative advantages suggested that there had been a (higher) level of fit (Broadbent & Weill 1991, pp. 294, 296, 297).

Firstly, they identified the level of IT based competitive advantage. Managers were asked to rate their firms' information-based advantages. There was one bank where all the executives stated that they had an above-average position in relation to their competitors. By asking the other banks about the position of the competitors, the good position of this bank was confirmed. The questionnaire continued with questions to diverse managers on areas where the firm had gained some advantage over competitors utilizing IT. This resulted in an average number of information-based comparative advantages. The responses were consistent with the earlier questionnaire. These information-based ratings were also consistent with financial performance indicators. For these reasons, the best bank was assumed to have the best alignment between strategy and IT.

Comparing the banks, some results were:

- compared with the other banks, the successful bank was more focused on its business strategy formation process and used less extensive documentation;
- the successful bank had the highest level of consensus and consistency in its strategic orientation;
- the successful bank had the longest experience in attempting to link business strategies and information systems.

The major factor in a good fit was a flexible and issue-oriented strategy formation process, with concurrent processes taking place at different organizational levels.

Comments

The virtue of their approach is the start of the operationalization and measurement of the strategy and IT issues. The nature of linkage between strategy and IT, however, stays hidden.

Van Engelen

Operationalization of strategy and IT services was present in the research of Van Engelen, which focused on the relation between the (marketing) strategy and the information systems of product/market combinations and their performance (Van Engelen 1989, p. 3).

This study used systems theory to create a model in which strategy and information systems characteristics were related. Based on the phases of the sales market and the central organization, 7 (marketing sales) strategies were distinguished (Van Engelen 1989, pp. 76-79):

- development strategy
- me too strategy
- niche strategy
- early innovator strategy
- cost-efficiency strategy
- differentiation strategy
- harvesting strategy

These strategies required different (information) relations, viz. formality, bottom-up/top-down, centralization, frequency, degree of automation, importance of content, speed of reaction, usability and private/public relations. These relations exist between various parties, described in the information systems dimension matrix (Van Engelen 1989, p. 102).

The relation between strategy and information systems (characteristics) was studied as follows. Firstly, 300 organizations answered questions that determined their (marketing sales) strategies. For each of the strategies a correlation matrix was created between the information systems dimension matrix and the performance measure. Although diverse measures were considered, the following measure was finally used: the realized profits as a percentage of the intended profits (Van Engelen 1989, p. 120).

In each strategic type significant correlations were found between the measure of success measure and information systems characteristics. The conclusion was: there is a measurable relation between the compatibility of information systems and strategy on the one hand and the performance of the product/market combination on the other (Van Engelen 1989, p. 129).

Comments

The competitive effect of a fit between strategy and information services was supported, although the competitive measure is not equivalent to other measures. Besides, this study was not conducted at a business level but at a product/market level.

3.2.4 Conclusion

Looking at the fit between strategy and IT (or IT related constructs), the following features become apparent:

- the (bi-variate) fit influences the competitive position (comparative performance) of the organization. In all the researches there were attempts (some more detailed than others) to asses the three variables, and to determine the effect of fit on the competitive situation;
- the adjustment between strategy and IT is based on their relevance for the business functions. Strategies concern the linkage of the value chain functions with the organization's position in the industry, while IT is the automation of the information services used for the execution, support and management of these business functions;
- the fit between IT and strategy is the result of mutual influences from strategy to IT (reactive alignment) and vice versa (proactive impact);
- the (IT) management of organizations tries to steer this process of adjustment;
- there is no single best fit between strategy and IT. Strategies can even have appropriate linkages with more than one IT instance (value), and IT instances can relate with more than one strategy.

Relating strategy and IT is obviously common in strategic is research, but the competitive results are not consistent, partly due to different measurements. In an adjoining area of IS-research, the relation between an organizational variable and IT has also been studied. The following subsection deals with that research.

3.3 IT AND ORGANIZATIONAL STRUCTURE

3.3.1 Introduction

This section discusses the linkage between IT and the organizational structure, and its effect on the performance. It starts by defining the relation between structure and IT. Subsequently, several empirical studies on this issue will be presented. Although there are differences between the operationalizations of the variables, some similar features can be observed , which are also comparable with the characteristics of the IT - strategy relationship.

3.3.2 Relating IT and organizational structure: connecting dimensions and configurations

Not only has the IT - strategy linkage received much attention in the field of Information Systems research since the 1970s, the role of the organizational structure has also been viewed as being important. The interest in the relation between IT and organizational structure started in 1958 with the predictions of Leavitt & Whisler. The impact of the IT would result in centralization and in the shrinking importance of middle management (Karake 1992, p. 259).

In the 1970s, many researches were conducted on this IT - centralization relation (see for instance Markus & Robey 1988, pp. 585-586; Schrama 1993, p. 604). Next to the relation between IT and centralization, the relations between IT and other structural dimensions, such as formalization, were also studied (see for instance Carter 1984). The fit concept maintains that the adjustment between IT and the organizational variables is necessary for the organization because it prevents organizational friction (Tavakolian 1989, p. 309). Successful IT functions in organizations which display a fit between IT and structure (Ein-Dor & Segev 1982, p. 66).

The rationale for the relation between IT and structure is based on the major changes that IT causes in the execution of organizational tasks and processes (Karake 1992, p. 259; Keon et al. 1992, p. 25). By definition, the organizational structure deals with these organizational tasks and the coordination between them (Mintzberg 1979, p. 2; Schrama 1993, pp. 604-605). Not only can the execution of the processes change due to IT, the coordination between them may also change, causing an organizational restructuration (Davenport & Short 1990, p. 12). Benjamin & Scott Morton state that IT enables restructuration at several levels: task level, business process level and the organizational level (Benjamin & Scott Morton 1988, p. 94; see also Davis & Olson 1985, p. 354). These IT enabled changes are seen as the key to achieve competitive advantage (see also Hammer 1990). Obviously, there is a tight relation between organizational structure and IT, and this relation is important for the effectiveness of the organization (Schrama 1993, p. 605).

Proponents of the fit concept state that IT reflects the organizational (decision-making) structure (Tavakolian 1989, p. 309). This notion deals with the information processing function of IT and the information-processing function of structure. Galbraith approaches the IT - structure relation from this angle: the (lack of) information-processing capacity of an organization (Galbraith 1973). Coordination in organizations is possible by means of regulation. Rules cannot regulate all the necessary coordination. There will be always be exceptions in the organization of the processes. These exceptions are dealt with by the hierarchy, for instance by supervisors who make ad hoc decisions. Under stable circumstances, the information- processing capacity is sufficient to coordinate organizational tasks. If the organizational situation is becoming less stable, perhaps because of environmental changes in the industry, the number of exceptions will rise, so that the hierarchy is apt to become overloaded. The information-processing capacity of the organization in this turbulent situation is no longer sufficient, so that uncertainty concerning the tasks rises.

Galbraith offers two basic solutions aimed at reducing this uncertainty (see also Davis & Olson 1985, pp. 341-342):

- reducing the need for information-processing:
  - via decentralization, self-organizing subsystems can be formed. These systems do not need overall organizational regulation because of the decision authority given;
  - via the relaxation of demands (lower profit levels to attain, higher budgets to use), the turbulent situation does not make so many demands on the organization. Some problems will be avoided through the creation of slack for the organizational departments. The same tasks can use more time or resources so that the amount of information needed will decrease (Pennings 1989, p. 15);
- increasing the capacity for information-processing:
  - via the use of computers, the communication and consequently the coordinating possibilities are enlarged. The top-down planning and bottom-up control in the organization will be enhanced, so that the information capacity rises to an acceptable level again. IT may enable top managers to obtain information quickly, reduce their ignorance and support the making of decisions (Huber 1990, pp. 250-251);
  - the use of horizontal communication opportunities for decision-making, the information-processing capacity of the organization also rises.

In fact, Galbraith mixes three elements:

- structural changes;

- information processing changes;
- performance changes.

By relating these three elements, the organization can be balanced. IT and structure are both concerned with the communication in the organization for the coordination of tasks. The fit between them affects the organization's performance. Working in the field of Information Systems, this relationship must be considered (Van den Berg 1988, p. 49).

We use the previously defined descriptions to relate IT and structure (see chapter 1). The types and variables will be linked via their congruence. The congruence rules for IT and organizational structure are:

Two points if:

- formalization + is aligned with IT concentration + (IT has central processing capabilities for standardized data processing. This is appropriate for formalized organizations where standardization is arranged via regulations);
- integration + is aligned with IT integration + (IT lacks a central processing unit: all data processing and control is local, and the IT is connected via integrative devices. This IT enables mutual adjustment which is necessary for the complex and unpredictable work in an adhocracy);
- centralization + is aligned with IT centralization + (for simple tasks, the IT does not require all kinds of specialized applications and connected hardware. This IT fits simple organizations).

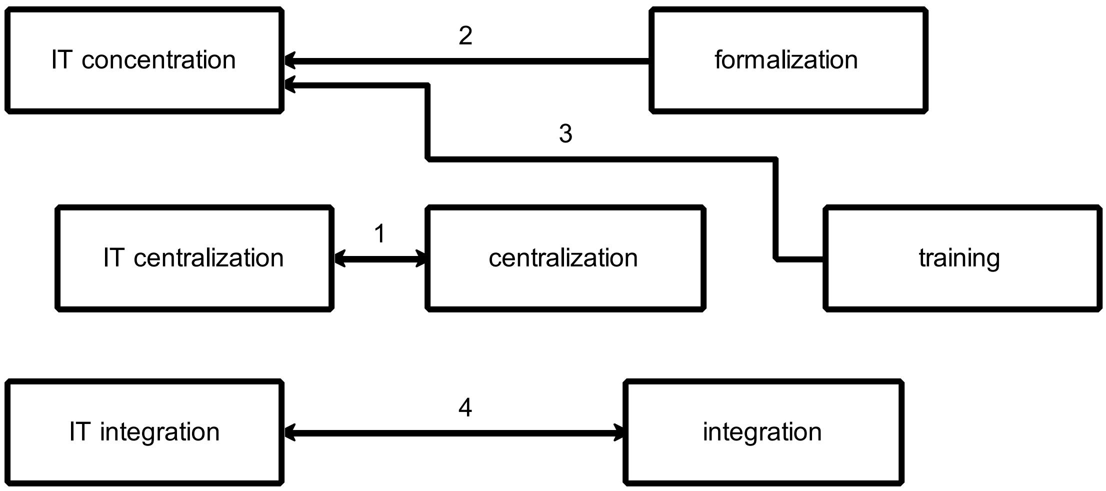
One point if:

- training + is aligned with IT concentration + (collective databases, administrative support for professionals);
- formalization - is aligned with IT concentration -;
- integration - is aligned with IT integration 0 (the lack of integration in the organization is backed by a little integration via the IT. More IT integration would require too many resources).

Penalty rules:

- formalization + can not relate with IT concentration - (not enough capacity).

Figure 3.2 CONGRUENCE SCHEME FOR IT AND STRUCTURE



Combining this congruence with the configurational rules (see subsections 2.3.2.3 and 2.3.4.3), the following four standard types, relating IT types and organizational structure types, are produced, along with one mixed type (see Table 3.2).

1. Simple structure with unconnected IT.
In these organizations, the CEO has the decision-making authority. This means that he/she is also involved in the final IT decision-making (centralization). This is possible because of the simple nature of the unconnected IT, consisting mostly of simple effective standard applications with local information processing (concentration). This IT is not needed for lateral communication (integration). The decision-making authority is regulated centrally, using face-to-face contacts and telephone facilities for communication.

2. Machine bureaucracy with concentrated IT.
These formalized organizations are favored by efficient operations. Concentrated IT performs routine and regulated information-processing. Therefore, it needs formalization, but it also reinforces and strengthens the formalized way of doing things (Bots et al. 1990, p. 126). IT is primarily aimed at efficient information-processing via concentrated data-processing at one place. It does not support the effectiveness

Table 3.2 SCORING THE COMBINATIONS BETWEEN IT TYPES AND STRUCTURAL TYPES

structure \ IT		unconnected			concentrated			distributed			decentralized		
		conc -	cent +	int -	conc +	cent 0	int -	conc +	cent 0	int 0	conc -	cent -	int +
simple structure	formalization -	1									1		
	centralization +		2										
	integration -									1			
	training & indoctrination -												
	total	3			0			1			1		
machine bureaucracy	formalization +	x			2			2			x		
	centralization +		2										
	integration -									1			
	training & indoctrination -												
	total	0			2			3			0		
professional bureacracy	formalization -	1						1			1		
	centralization -												
	integration -									1			
	training & indoctrination +				1								
	total	1			1			2			1		
adhocracy	formalization -	1									1		
	centralization 0												
	integration +												2
	training & indoctrination +				1			1					
	total	1			1			1			3		

conc = IT concentration   cent = IT centralization   int = IT integration of tasks in other ways, in order to realize better service or quality. Integration by means of the use of concentrated IT is also not appropriate; all communication flows via the central processor. Several parties are involved in decision making on IT: the general management, the IT management (as part of the technocracy), IT vendors and the users. The IT centralization is, therefore, not totally implemented.

3. Professional bureaucracy with distributed IT.
In organizations where the workers perform stable but difficult tasks, IT should offer convenience to those involved with operations and decision-making (effectiveness). The choices on IT are to be made by all the relevant parties (general management, IT management, users). This results in average IT centralization. The operators work mainly independently, therefore the IT does not need to offer lateral communicative opportunities (integration). Another consequence of working independenty is the possibility of local data processing and control (concentration). Finally, in these organizations there are also major supportive administrative tasks that are supported by the efficient data processing of the central processor.

4. Adhocracy with decentralized IT.
The striking feature of adhocracies and professional bureaucracies is their coordination via lateral and vertical communication. The integrative opportunities of IT support this communication (especially needed when a team is not working at one location) and can even result in more personalized contacts and a hierarchy based on competence (adhocracy elements). The complexity of the tasks is a feature which is also found in professional bureaucracies. This requires effective support. A difference, however, is the unpredictability of the tasks. This has two consequences. Firstly, the users should possess decision-making authority because they are able to assess the relevant requirements for the IT (centralization). Secondly, the IT will support innovative goals. The data-processing and control facilities are situated locally near the users (concentration).

One non-standard configuration can be distinguished.

5. Machine bureaucracy with distributed IT.
Machine bureaucracies can use distributed IT as long as distributed IT offers efficiency opportunities. The advantages of this more effective IT lie in the differentiation opportunities for organizations.

It has been observed that the coordination of the organizational tasks in order to perform the business functions is the basis for the linkage between the IT types and the organizational structure (Galbraith 1973). The question can be posed as to whether the IT should reflect the decision making structure or complement the coordinating needs. Besides, management has choices to make on the adjustment between structure and IT. These are related entities that influence each other (Markus & Robey 1988).

3.3.3 Research on the strategic impact of IT and organizational structure

Research on the relation between IT and structure has a strong conceptual basis. The basis will first be discussed according to the views of three authors. Subsequently, empirical researches conducted by four authors will be presented.

Leifer

The concept of fit has been worked out by Leifer. He states that the importance of fit between IT and organizational design in order to achieve successful IT usage is underestimated (Leifer 1988, p. 63). One reason for the mixed evidence is the different definitions of the variables, just like in the strategy - IT relationship (see also Keon et al. 1992, p. 25; Lee & Leifer 1992, pp. 28-29; Markus & Robey 1988, pp. 585-586; Schrama 1993, p. 604). Leifer proposes operationalizations of the constructs to find natural matches. Our measures are equivalent to the measures in his research.

Comments

The existence and effect of these matches were not empirically tested. Another unsolved issue is the direction of influence (IT ↔ structure). Leifer suggested that organizational change is needed to realize the fit between IT and structure. These changes should not be the result of autonomous organizational development, but a consequence of managerial decision-making (Leifer 1988, p. 71). In a later article, Leifer (in cooperation with Lee) stated that the relationship between IT and organizational structure is reciprocal (Lee & Leifer 1992).

Markus & Robey

IT influences the organizational dimensions and, at the same time, the organization affects IT (Lee & Leifer 1992, p. 28). This observation recurs in the study of

Markus & Robey. They connected this issue with the contradicting results of IT impact on organizations. They see the usage of different approaches in the various studies as the fundamental reason for this disorder. These approaches deal with, amongst others, the causal issue of IT and organizational change. They distinguish three approaches (Markus & Robey 1988, pp. 585-589):

- the technological imperative: IT is seen as force from outside the organization that creates certain organizational changes (situational control). It is argued that this is caused by the influence of contingencies (organizational size, the stable or turbulent nature of the environment). Leavitt & Whisler's predictions comply with this perspective. This deterministic approach has, however, not delivered consistent findings on the IT - centralization relation since the 1970s;
- the organizational imperative: organizational change and the presence of IT are caused by choices of organizational members, especially designers of information systems (intended rational). Organizational needs determine information needs, the basis for the IT. IT is the dependent variable, dependent on the organizational situation. Galbraith is a well-known proponent of this opinion (Galbraith 1973). The empirical support for this imperative is limited also;
- emergent perspective: the organizational consequences of IT are the unpredictable results of complex social interactions (emergent). This approach does not explain change via exogenous IT or actors' intentions, but explains change via the dynamic interplay among actors, contingencies and IT. Identical (information) technologies lead to different organizational outcomes in different settings (see for instance: Jaikumar 1986). Meier & Sprague, for instance, conceptualize the match between information systems and organizational design (Meier & Sprague 1991, p. 368). In this framework there is no inherent causal determinism (from IT to structure, or vice versa). The match between IT and structure can be viewed as a two-way dependency, and is seen to contribute to the company's performance. In this emergent perspective, management should facilitate the cooperation between IT and business management in dealing with general management problems.

Comments

The management of organizations can play an influencing role by:

- selecting the IT with particular features. The direction of change is from IT to the organization;

- determining information needs and implementation strategies. The direction of change is from the organizational situation to IT;
- supporting user participation in analysis, design and implementation of IT. The complex interplay leads to unpredictable changes. There is a mutual direction of change between IT and the organization.

Schrama

Schrama emphasized the definition of IT as an important argument for the mixed results (Schrama 1993, p. 604), and combined this with the question of causality. He described the centralization-decentralization debate. The earliest researches found that the use of computers resulted in more centralized organizations. Later, other researches detected the opposite tendency, towards decentralization. Gradually a neutrality thesis developed: not the IT itself, but the usage of IT determined the organizational changes. This view reflects the nature of the technological imperative (technological determinism). It is still seen as an exogenous instrument that causes organizational change. He proposed a definition that focuses on the knowledge and skills for the support of information services. Using this idea of IT, it became evident that the organizational structure (being the tasks, accountabilities and authorities belonging to positions within the organization and the mutual relations between these positions) and IT are both equal aspects of the organization. There is no reason to suggest a one-way relation between IT and structure. The fit between structure and IT, which is the result of a mutual adjustment, was seen as necessary for an effectively-functioning organization (Schrama 1993, p. 605).

Comments

This argument explains the importance of fit and the reciprocal relationship between IT and structure. The basis of his reasoning is viewing both these constructs as parts ('aspects') of the organization. As a consequence of this conceptual debate, the 'fit' is assessed as important for organizational performance. The remaining question is: what is the nature of the fit between structure and IT? To answer this kind of question, structure and IT must be formally assessed.

In the field of the IT - structure relationship, there are some empirical studies that deal with this question. Despite the different measurements, the similarities between the researches are:

- IT is involved in the execution of, and coordination between, processes via the distribution of information;

- the structure handles the coordination of tasks in the organization;
- the fit between IT and structure is important for successful implementation and usage of IT, and hence for the effective functioning of the organization itself.

Ein-Dor & Segev

Ein-Dor & Segev conducted a well-known empirical study on this issue. They started with the question for successful IT. They found several organizational variables relating to IT success in a literature study. The IT structure was seen as a reflection of the managerial processes in the organization (Ein-Dor & Segev 1982, p. 56). This view suggested an direction of influence from organization to IT (organizational approach).

They operationalized IT and structure to investigate the importance of the relation between IT and structure. For the organizational structure, the level of managerial decision making (centralization level) was chosen, ranging from 'important decisions are made at the top level' to 'strategic decision-making goes down to the lowest level'.

The IT structure was seen as a composition of variables, including:

- centralization of development and implementation efforts concerning IT;
- integration of (for instance) data referring to diverse organizational areas in one database;
- deployment of hardware: ranging from large centralized processing computers (mainframes) to minis and micros;
- the place of the IT manager in the hierarchy.

The main hypothesis was as follows: the IT structure is associated with the organizational structure. The research was conducted amongst successful IT users. Therefore, if the hypothesis could be confirmed, this would mean that a relation between IT structure and organizational structure for successful IT users did exist. The concept of fit is, therefore, appropriate for this research (Ein-Dor & Segev 1982, p. 66).

The hypothesis could be broken down into four concrete sub-hypotheses:

a. there is a positive relation between organizational centralization and IT centralization;
b. there is a positive relation between organizational centralization and IT integration;

c. there is a positive relation between organizational centralization and centralized hardware;
d. there is a positive relation between organizational centralization and the rank of the IT manager.

The sub-hypotheses a, c and d were confirmed. For b, a negative correlation was found.

Comments
Studying the results of this research, a comparison was made with the work of Olson (Olson 1978). In 1978, she found no pattern of relationship between organizational characteristics and information services at all. Later however, with Chervany (Olson & Chervany 1981), some relations were reported, but none between the centralization of organizational structure and hardware. These findings are inconsistent compared with the research of Ein-Dor & Segev; in their view due to different operationalizations (Ein-Dor & Segev 1982, p. 65).

The cause-to-effect direction between IT and structure is also discussed. Ein-Dor & Segev saw the IT as a reflection of managerial processes (thus, finally, the organizational structure), contrary to the idea of Leavitt & Whisler (IT affects organizational structure). They conclude that organizations should be aware of the conjunction between the two constructs, leaving the question of direction unanswered.

Keon et al.
In 1992, Keon et al. performed a study on the same IT - structure relation. However, the performance of the organization received hardly any attention. Only once did they refer to the successful enhancement of organizational objectives by the usage of IT in combination with a structural dimension.

The structure of the organization was assessed by measuring (Keon et al. 1992, pp. 24, 27):

- specialization: the degree to which specialists in various functional areas are present in the unit;
- centralization: the degree to which decisions of various types are made by individuals;
- formalization: the degree to which job descriptions, written policies, organization charts and workflow schedules are used by the employees.

The IT variables included the hardware potential (microcomputers, word processors and terminals) and the sophistication of the IT, ranging from simple data storage and retrieval to forecasting and decision support.

The following results were found:

- a positive relation between both IT measures and specialization;
- a negative relation between sophisticated IT and centralization;
- a positive relation between sophisticated IT and formalization.

Comments
The relations between IT and structure are clear, but the performance implications of the fits are not elaborated.

Schrama
Schrama assigned more consideration to the performance element mentioned above, although he did not measure the organizational performance. He related the organizational (de)centralization with the level of IT (de)centralization (Schrama 1993, pp. 605, 607):

- centralization: distribution of tasks, accountabilities and authorities between the centralized and decentralized level;
- IT (de)centralization: the level of decentralized collecting, mutating and using data.

Both measures showed a clear distribution. Centralized and decentralized forms were present. The relation was measured twice, in 1988 and in 1992. There was a strong relationship between IT and structure on both occasions (Schrama 1993, p. 607).

Comments
This result confirms the opinion regarding the need for consistency between IT and organization in organizations in order to produce effective functioning. Organizations have slack in choosing a certain level of centralization, in structure as well as in IT. To improve their effective functioning, they adjust these variables.

Tavakolian
Tavakolian researched the relation between competitive strategy and IT structure (Tavakolian 1989). He based his strategic distinction on the typology of Miles & Snow. This typology also implicates a structural taxonomy. Therefore, his research

could be viewed as relating organizational centralization with IT centralization.

For the competitive strategy, Miles & Snow distinguished:

- the defender (Miles & Snow 1978, pp. 47-48): following a conservative competitive strategy without much product innovation:
  - centralized decision-making and autocratic management style;
  - structuring activities around business functions (functional organizational form);
  - efficiency driven;
- the prospector (Miles & Snow 1978, pp. 65-67): following an aggressive competitive strategy attempting to pioneer in product/market developments:
  - decentralized decision-making and participating management;
  - structuring its activities around product/market divisions (product form);
  - effectiveness/profit driven;
- the analyzer (Miles & Snow 1978, p. 78-80): following a moderate competitive strategy that makes fewer innovations than prospectors and is less committed to stability than the defenders:
  - balanced decision-making structure;
  - matrix form;
  - driven to the combination of efficiency and effectiveness;
- the reactor (Miles & Snow 1978, p. 93): not following a discrete competitive strategy. Decisions are made at random. This type is excluded from the sample.

The IT activities (development and maintenance, systems operations, systems administration) can be structured with different degrees of centralization: the higher the degree of centralization, the lower the users' responsibilities (Tavakolian 1989, p. 311). So, the linkage investigated relates IT centralization and organizational centralization tendencies.

The following research hypotheses were constructed:

a. a defender (centralized) is more IT centralized than a prospector (decentralized);
b. a defender (centralized) is more IT centralized than an analyzer (balanced);
c. an analyzer (balanced) is more IT centralized than a prospector (decen-

tralized).
These hypotheses were confirmed by the results.

Comments
For the appropriateness of a successful implementation of IT, management should recognize the fit between IT and organization (Tavakolian 1989, pp. 309, 314). This successful IT usage neither operationalized nor measured.

3.3.4 Conclusion

Looking at the IT - organizational structure fit, the features below become clear:

- this (bi-variate) fit is seen as important for successful IT usage and thus for effectively functioning organizations;
- the adjustment between structure and IT is based on their relevance to the business functions and information-processing capacity;
- the realization of the fit is researched from different angles: IT determines structure, structure influences the value of IT, or there is a process of mutual adjustment;
- regardless of these approaches, the (IT) management is in the middle of this process due to the coordination of business functions;
- organizations have slack so that they can choose for certain structures and IT (Ein-Dor & Segev 1982; Schrama 1991). There is no single best fit.

The existence of the relation between IT and structure is obvious, but the measures, and therefore the relations, are not always defined equally. This hampers comparison. Besides, the precise effect on the competitive position is not clearly empirically investigated.

3.4 COMPETITIVE STRATEGY AND ORGANIZATIONAL STRUCTURE

3.4.1 Introduction

In the preceding sections, we made clear that IT must logically fit with the competitive strategy and the organizational structure to enable effective usage. Therefore, it is challenging to explore the relation between the competitive strategy and the organizational structure as well.

The structure of this section is as follows. Firstly, a theoretical basis is developed on the linkage between strategy and structure. Then various empirical studies on this issue are discussed. Although there are differences between the operationalizations of the variables, some similar features are found, especially in comparison with the characteristics of the IT - strategy and IT - structure relationships.

3.4.2 Relating competitive strategy and organizational structure: connecting dimensions and configurations

The strategic ideas of Porter pay much attention to the realization of the business functions (Porter 1985). Generic strategies are determined by means of a thorough study of the industry and the value chain business functions. Porter devotes less attention to the coordination of the tasks that perform these business functions. This coordination determines the organizational structure (Mintzberg 1979, p. 2). Different strategies need different administrative requirements and therefore different decision-making organizational structures (White 1986, p. 218).

Researchers other than Porter pay more attention to the relation of the competitive strategy with the organizational structure. Caves (1980), for instance, gives a broad review of studies on the relation between strategy and structure. In this review, the study of Chandler (structure follows strategy) occupies a prominent place. He uses the paradigm of (market) structure → conduct → performance. The environmental forces determine the choice for the appropriate strategy (Caves 1980, p. 74). The strategy prescribes the conduct of the firm. The company's performance benefits if the strategy is well-tuned to the (market) structure (based on the work of Rumelt: Caves 1980, p. 77). Caves concludes that:

- correct strategic choices, based on (market) opportunities, improve economic performance;
- organizational structure should be correct, given the strategy chosen.

It is important to note that, in the view stated above, the strategy prescribes the structure. According to Pennings, this vision is based on a mechanistic perspective of the organization, as if it were an instrument (Pennings 1985). Scholars in the field of organizational behavior consider this mechanistic view as unrealistic, and state that the organizational context is not only the result of strategic choices, it is also a factor that causes strategic choices. Bower views the structure as the context within which decisions are made so that the structure motivates or impedes strategic activities (Fredericson 1986, p. 281). It is clear that the organizational structure is more or less the solid reflection of decision-making processes that influence strategic decision-making, according to the work of Simon, March and Cyert (Boersma 1989, p. 37; Miles & Snow 1978, p. 8; Perrow 1986, p. 124). Hall & Saias hypothesize that the structure may (partly) predetermine strategy because (Hall & Saias 1980, pp. 151, 153):

- the structure influences the process of strategic planning;
- structural features may act like filters for information-processing and condition the perception of (strategic) matters;
- structure determines organizational behavior, and therefore strategic problem-solving, via the structure of communication (channels) and power.

Fredericson demonstrates the influence of three structural dimensions on the strategic decision-making (Fredericson 1986, pp. 282, 285-290). Some hypothetic examples are given below:

- centralization leads to delaying the start of the strategic decision-making process. In addition it increases the possibility that strategic decision-making will be a proactive, opportunity-seeking process;
- formalization increases the likelihood of a reactive strategic process. The comprehensiveness of strategic decision-making will also be enlarged by a higher formalization.

These arguments indicate the role of structure in developing a particular way of strategic decision-making.

Concluding:

- on the one hand, studies suggest that structure follows strategy (Chandler 1962; Donaldson 1986, 1987);
- on the other hand, there are studies that demonstrate the opposite (Fredericson 1986; Hall & Saias 1980).

Just like Miles and Snow, Miller (1986) chooses for a third perspective, where "ties unite strategy and structure; that given a particular strategy there are only a limited number of suitable structures and vice versa" (Miles and Snow 1978, p. 8; Miller, 1986, p. 234; see also Hall & Saias 1980, p. 161). The structure influences the flow of information and human interaction, thereby channelling human interaction and collaboration, specifying coordination and allocating power and responsibilities in the organization. These elements do, of course, influence the determining of strategy. There is also a reverse direction of influence. The nature of strategic decision-making needs and motivates certain structural devices. For example, elaborate analysis and formal planning need expert staff and specialists. These demands can lead to more specialization and technocration. In the terms applied by Miles & Snow, there is complementary adaptation of strategy and structure, and properly aligned, this will enhance organizational performance (Miller 1987a, pp. 7-8; 1987b, p. 70; 1988, pp. 281, 283, 286).

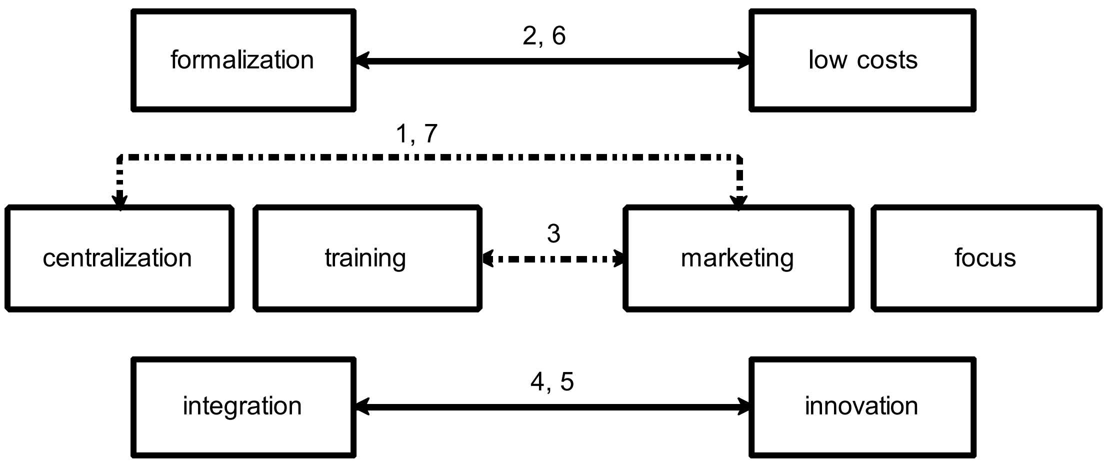
To describe the mutual relation between strategy and structure, we use the earlier-defined measurements. In the subsections dealing with strategy and structure (2.3.3.2 and 2.3.4.2), the dimensions and types for the future measurement of the variables have already been defined. These types and variables will be linked, based on congruence rules.

The congruence rules for competitive strategy and organizational structure are (see also Figure 3.3: Congruence scheme for strategy and structure):

Two points if:

- low costs + is aligned with formalization + (low costs requires a continuous production process for efficiency. This requires regularity, and regulated work is favored by formalization that results in standardized behavior);
- innovation + is aligned with integration + (the complex and unpredictable innovation requires independent, skilled workers operating together);
- marketing + without low costs + is aligned with:
  - centralization + and formalization - (marketing differentiation can also mean that value is offered via more simple operations. Non-formalized control is feasible to direct these operations);
- marketing + with focus 0 is aligned with:
  - training + and integration - (marketing can require very stable but complex tasks (quality work) so that skilled (training) independent tasks are needed).

Figure 3.3 CONGRUENCE SCHEME FOR STRATEGY AND STRUCTURE



Based on the strategic and structural types (see subsections 2.3.3.3 and 2.3.4.3), seven configurations can be created in which the strategic and structural variables are related as follows (the Tables 3.3a and 3.3b; see also Miller 1986, pp. 241-248; Romme et al. 1990, pp. 52-55):

1. Niche marketers with simple structure.
In these organizations, one person (the entrepreneur) can oversee the total situation. This is possible because of the focus on a certain market segment where the organization tries to differentiate. The executive can directly supervise the workers who perform simple tasks to realize the primary process (no innovative capacity). Training or mutual adjustment are not necessary for the coordination; all the decision-making power is centralized. Also formalization is not needed for coordination: standardization would hinder the required flexibility in the competitive market.

2. Cost leaders with machine bureaucracy.
Low costs producers need efficient production processes to compete well. The standardization needed for this requirement is prompted by a regular, stable primary process without interruptions. Via formalization the required tasks are prescribed, resulting in centralization. The large, regular and rather specialized output is sold to a stable and large market. The predictable tasks should not be renewed too often (innovations result in interruptions). These not-too-complex tasks are standardized, and therefore do not require much mutual coordination or

specific training (comparable with defenders: Miles & Snow 1978, pp. 47-48).

Table 3.3a SCORING THE COMBINATIONS BETWEEN STRATEGIC TYPES AND STRUCTURAL TYPES

strategy \ structure			simple structure				machine bureauc.				professional bureauc.				adhocracy			
			frm	cen	int	tr	frm	cen	int	tr	frm	cen	int	tr	frm	cen	int	tr
			-	+	-	-	+	+	-	-	-	-	-	+	-	0	+	+
niche marketer	low costs	-																
	marketing differentiation	+		2														
	focus	+																
	innovation	-																
	total		2				0				0				0			
cost leader	low costs	+					2											
	marketing differentiation	-																
	focus	-																
	innovation	0																
	total		0				2				0				0			
marketer	low costs	0																
	marketing differentiation	+		2										2				
	focus	0																
	innovation	0																
	total		2				0				2				0			
innovator	low costs	-																
	marketing differentiation	-																
	focus	0																
	innovation	+															2	
	total		0				0				0				2			

Table 3.3b SCORING THE COMBINATIONS BETWEEN STRATEGIC TYPES AND STRUCTURAL TYPES

strategy \ structure			simple structure				machine bureauc.				professional bureauc.				adhocracy			
			frm	cen	int	tr	frm	cen	int	tr	frm	cen	int	tr	frm	cen	int	tr
			-	+	-	-	+	+	-	-	-	-	-	+	-	0	+	+
niche innovator	low costs	-																
	marketing differentiation	-																
	focus	+																
	innovation	+															2	
	total		0				0				0				2			
low costs marketer	low costs	+					2											
	marketing differentiation	+																
	focus	-																
	innovation	0																
	total		0				2				0				0			

bureauc. = bureaucracy

frm = formalization
cen = centralization
int = integration
tr = training & indoctrination

3. Marketers with professional bureaucracy.
Stable primary processes can also consist of complex tasks. Training is then an appropriate means of coordination, because the complexity is learned and the process is still standardized. This dependence on the skills of the workers results in decentralization. These skills are especially needed when the quality of the performance of the tasks is crucial: differentiation is the important factor. Innovative new activities that require much mutual coordination are undesirable. The organization delivers specific services and products to specific customers: the lowest costs are not the most important competitive aim. This does not automatically mean that they focus on one group only; this would result in vulnerability.

4. Innovators with adhocracy.
Some organizations compete by means of a constant renewal of products and services; they want to deliver the quality reflecting the state-of-the-art. An issue like low costs efficiency, and differentiation aspects such as advertisements or extra services, are of no interest to their customers. This innovative motivation results in unpredictable processes and products which are mostly highly complex; standardization is not possible (thereby eliminating formalization and training-coordinating mechanisms). Management cannot control the content of this work alone; it decentralizes the decision-making power to the teams of experts. The mutual adjustments between, and within, these teams coordinate the tasks of the primary process. The focus of these organizations is not tight; one market segment does not always have enough innovative absorption potential (comparable prospectors: Miles & Snow 1978, pp. 65-67).

Three mixed forms are also suggested.

5. Niche innovators with adhocracy.
The only difference with the 'innovators with adhocracy' is the absorption potential of a certain market segment. If this potential is large enough, then the focus of the organization should be high.

6. Low costs marketers with machine bureaucracy.
The difference with the cost leader / machine bureaucracy is that the efforts towards differentiation do not hinder the efficiency of the production process.

7. Marketers with simple structure.

Niche marketers can grow out of their only niche by delivering to more market segments (focus). They still differentiate by adding value to the products (quality, convenience of use, better service), not only for specific customers but also with the aim of reaching more types of customers. Maybe they are even capable of developing a limited amount of innovations if this does not tax the simple structure.

The execution of the business functions of the primary process is an important aspect behind the linkage between the variables. Besides, the variables are mutually supportive and develop in time; it is impossible to indicate causality (Miller 1988, p. 286).

3.4.3 Research on the strategic impact of competitive strategy and organizational structure

In this subsection, a conceptual study conducted by Miller is presented, followed by several empirical works.

Miller

Miller suggests a research direction to really relate strategy and structure. He proposes to look at strategy and structure from a multidimensional angle (Miller 1986, p. 234). Venkatraman backs this idea, saying that studying strategy from a one-dimensional point of view unjustly simplifies the construct of strategy (Venkatraman 1989b). As strategic dimensions Miller recognizes the Porter-based dimensions of (Miller 1986, pp. 238-239):

- differentiation (innovation and/or marketing): aims to create a product that is perceived as uniquely attractive;
- focus: gives special attention to a specific type of customer;
- cost leadership: strives to produce goods cheaper than the competitors do;
- asset parsimony: emphasizes the low amount of assets per unit output.

These dimensions refer to the content approach of strategy, meaning the intentions and the outcome of the strategy, and not the strategic decision-making process (see for instance Fredericson 1986). As a proponent of the configuration approach, Miller suggests the use of creating strategic types of supporting elements from these dimensions, based on the rules of thumb (see subsection 2.3.3.3 and appendix A.3 about strategic types) (Miller 1986, p. 236):

1. niche marketers: high focus - high differentiation - high asset parsimony - low cost leadership;
2. innovators: low focus - high (innovation-) differentiation - high asset parsimony - low cost leadership;
3. marketers: low focus - high (marketing) differentiation - high asset parsimony - low cost leadership;
4. cost leaders: low focus - low differentiation - low asset parsimony - high cost leadership;
5. conglomerates: low focus.

Miller admits the weakly-described character of the coherence of the strategic elements. Nevertheless, he crosses them with the structural types of Mintzberg, and reaches 8 strategy - structure fits. Romme et al. gave some empirical basis for the strategic - structural types based on a variance (content) approach (Mohr 1982). They found the following fits (Romme et al. 1990, pp. 52-58):

- niche marketers and simple structure;
- cost leaders and machine bureaucracy;
- (innovative) differentiation and adhocracy.

These fits should be more effective than others because of the balance between the strategic and structural elements (Miller 1986, p. 248). The relations between all these elements are broadly described, making clear that there is no one-way direction between strategy and structure; the message is that they should be mutually balanced each other. To achieve this, the management has to makes choices. Although there are many constraints on managerial choices, like the present organizational structure, the current product-market combinations, and the demands of the industry, the management is not forced to respond to the strategic, or structural, imperative.

In the remainder of this subsection, empirical studies on the topic of strategy - structure subject are discussed.

Egelhoff

Studies that back the importance of the strategy - structure relation started with Egelhoff. He operationalized and measured strategy and structure to study the effect of fit. He based his research on the information-processing model (Galbraith 1973). Different elements of strategy require different information-processing in the organization. Structure is the organizational variable that offers a certain information-processing capacity. There is a good strategy - structure fit if the information-processing requirements demanded by the strategy are satisfied by the information-processing capacity of the structure (Egelhoff 1982, p. 436). Based on this information-processing approach, strategy and structure were both operationalized and linked (Egelhoff 1982, p. 437).

The study was specifically aimed at multinational firms. The information-processing relation between the parent firm and the foreign subsidiaries was the central issue. Based on this relation, the structure was operationalized. This resulted in (Egelhoff 1982, pp. 438-441):

- worldwide functional divisions;
- international divisions;
- geographical regions;
- worldwide product divisions.

This characterization of structure was very different from commonly-used structural features like formalization or centralization. This was due to the multinational focus of this study.

The strategy was measured via eight elements of international strategies conducted by firms:

- product diversity;
- product modification differences;
- product change;
- size of foreign operations;
- size of foreign manufacturing;
- number of foreign subsidiaries;
- extent of ownership;
- extent of acquisitions.

Product diversity refers to the commonly-used dimension of differentiation. Product modifications and product changes resemble the dimension of innovation. The other elements are strongly related to the global aspect of multinational companies.

The author hypothesized diverse fit relationships for successful organizations (there is no comparison with unsuccessful organizations). Most of these relationships were supported (Egelhoff 1982, p. 449). He recognized that 20 good fits for organizations were possible.

Comments

Although this research supports the relevance of fit, some comments can be made.

Firstly, the research was aimed at MNCs, and was not indicative of common strategy and structure measurements. Secondly, although information-processing was linked to managerial decision-making, the role of management in reaching a fit was not highlighted. Thirdly, Egelhoff assumed a deterministic one-way direction. The strategy was a constraint for the appropriate structure. Finally, the success of organizations was not measured. He selected a sample of so-called "successful organizations".

Ettlie et al.

The relation between strategy and structure is also studied in the field of innovation. Ettlie et al. hypothesized two kinds of innovations: a radical innovation especially aimed at process innovation, and a more incremental process adoption. One of these innovations would emerge as being dependent on the fit between strategy and structure (Ettlie et al. 1984, pp. 682, 684).

Structure was operationalized, partly based on the Aston studies (see Inkson et al. 1970). Three dimensions were examined:

- complexity;
- formalization;
- centralization.

The concentration of technical specialists was added to these dimensions of structure.

Strategy was typified as follows:

- technology policy: a preemptive, long-term strategy for technological innovation;
- market-dominated growth strategy;
- diversification.

Success was not measured. The dependent variable was the nature of the innovation.

The results showed that the technological strategy and technical concentration predict radical innovation. The effect of the fits between the other strategies and structures is less clear. Notwithstanding, the author claimed that incremental innovation appears to be dependent on market-oriented strategies and traditional arrangements (Ettlie et al. 1984, pp. 693-694).

Comments

Although this research originates from another field of study, the concept of fit was still recognized. The conceptual model very clearly stated the deterministic one-way direction of strategy to structure. Technological policies led to concentration of technical specialists; growth strategies and strategies of diversification were implemented via traditional complex, formalized and decentralized structural arrangements (Ettlie et al. 1984, pp. 684, 685).

White

In 1986, another strategy - structure research did measure all three relevant variables, namely strategy, structure and performance (White 1986). White noted that there were few researches on the fit between business strategy and internal organization. Therefore, his aim was to show how differences in performance associate with differences in generic strategies combined with organizational differences (White 1986, pp. 217-218).

The idea at the basis of his study was that the structure is relevant for the successful implementation of strategy. Therefore the strategy guides the structural choices. Although Porter recognized the need of supporting organizational arrangements, the possible choices were not explored in the literature (see also Porter 1980, p. 35). The reason for this deterministic approach lies in the strategic demands for the business functions like internal operations, distribution, R&D and so on (White 1986, pp. 221, 222, 224). For their successful execution, management has to coordinate these functions. This coordination entails a certain amount of uncertainty. The greater the uncertainty experienced using a certain strategy, the greater the certainty the structure has to provide. The role of the managerial choices is unclear, probably because of the deterministic approach used. This means that the choices should be clear when using a certain strategy.

Strategy was measured according to Porter's ideas. In the past, there had been a lack of non-situation-specific strategies at the level of business units. Through the development of generic strategies, linkages could be made between the goals and the coordination of business units. White limited his strategic operationalization to the basic distinction between low costs and differentiation strategies. Because he wanted to link equivalent constructs, he measured outcomes (and not intentions), viz. the current organizational structure and the realized competitive strategy. He combined costs and differentiation outcomes into 4 types (White 1986, p. 226):

- pure costs;
- pure differentiation;
- both costs and differentiation;

- neither costs nor differentiation.

Strangely enough, the organizational structure did not deal with the usual internal organization of the business units, but with the broader organizational context. Three organizational requirements were chosen to cope with the strategic demands (White 1986, pp. 222-224):

- autonomy: organizations deal with uncertainty by means of decentralization, resulting in autonomous units;
- frequent reviews: reporting to the hierarchy is necessary, but can demand too much information processing capacity, ultimately causing more uncertainty;
- coordination: the differentiation and integration of business functions can differ dramatically, varying from direct functional line responsibility via shared responsibility to no line responsibility at all.

The performance was measured using sales growth and ROI figures, taking 4-year averages (White 1986, p. 227).

Overall, the results confirmed the positive effect on performance of the associations between strategy and structure (White 1986, pp. 228-229):

- low autonomy (more control for corporate office in business decisions) corresponds to higher ROI only with low costs strategy;
- shared responsibilities fit with low costs strategy (effect on ROI) or with differentiation strategies (effect on sales growth).

Comments

The concept of fit is supported, although the measures for the organizational structure deviate from the usual measures.

Miller

In a follow-up to his previous study (1986), Miller conducted an empirical research for which structural dimensions were linked to features of strategy-making in 1987. For organizational structure, the following frequently-used dimensions were measured (Miller 1987a, p. 8):

- formalization;
- centralization;
- complexity;
- integration.

These dimensions express the content of the structure. However, this content of structure was linked to the process characteristics of the strategy (compare for instance Fredericson 1986). The way the organization deals with the strategy was studied, and not the content of the strategy itself. This was evident in the following dimensions (Miller 1987a, pp. 9-10):

- rationality: how carefully and systematically do scanning and analysis take place?;
- interaction: how much bargaining and consensus-building is involved with decision-making?;
- assertiveness: what is the level of risk-taking and action (rather than reaction) with respect to the environment?

Miller developed two kinds of hypotheses. The first kind dealt with the relations between the dimensions of strategy and structure (Miller 1987a, pp. 11-13):

- integration is positively associated with rational, interactive and assertive strategy-making;
- formalization is positively associated with rational and interactive strategy-making and negatively associated with assertiveness;
- centralization is negatively associated with rationality and interaction, but positively associated with assertiveness;
- complexity is positively associated with rationality and negatively associated with assertiveness.

It is clear that different characteristics of structure prosper form the same features of strategy. There is no tight 1:1 relationship.

The second group of hypotheses linked the fit to performance implications. The most relevant one was (Miller 1987a, pp. 13-14):

- the predicted association of structure with rationality and interaction will be stronger in successful firms than in unsuccessful firms.

Overall, there was substantial support for many of the hypotheses. The findings showed significant associations between structure and strategy-making. In general, the relationships were the highest among good performers (Miller 1987a, pp. 26-27).

Comments

The concept of fit was supported again, although it was the process of strategy that was studied, and not the content.

Miller

In the same year (1987), Miller produced a second study in which strategy and structure were again correlated (Miller 1987b). The aim of the study was to relate strategic dimensions to those of structure. There were, however, a few deviations from his earlier studies (Miller 1986; 1987a).

In the first place the contents of strategy (thus not its process characteristics as in 1987a) were used (Miller 1987b, pp. 55, 56). The strategic dimensions were:

- (complex) innovation;
- marketing differentiation;
- breath (reversed focus);
- conservative control (low costs).

Secondly, these strategic dimensions were linked to rather uncommon structural dimensions:

- uncertainty reduction: the structural mechanism to deal with the unpredictability of the organization for more informed and orderly administration (for instance: scanning and analyzing the environment, developing a hierarchy and implementing formal procedures);
- differentiation;
- integration.

The structural content variables, like formalization and centralization, which were previously proposed and used as a basis for structural configurations (see Miller 1986; 1987a) were ignored. Besides, performance was not measured in this study.

Comments

The deviations make it hard to compare the studies. The main result of this 1987b study was the finding of strong correlations between strategic and structural dimensions. This conclusion supports the notion of fit, although not related to the performance of organizations.

Miller

In 1988, strategic and structural content variables, comparable with the variables in our research, were linked. Realized strategies influence actual organizational tasks, and therefore the focus is also on the emergent (actual) structure, rather than on the intentional, formal structure (Miller 1988, p. 293). The linkage between strategy and structure was also investigated with respect to its effect on performance. Miller recognized that previous organizational research had neglected strategy because it had been viewed as a necessary response to the environment, as in the structure-conduct-performance paradigm. Subsequently, Child had elucidated the possibility and importance of strategic choice (Child 1972). Accordingly, this strategy was considered to be a relevant fit variable in Miller's research. The message for the management is that it can and should pay attention to creating good fits between strategy and structure (Miller 1988, p. 302). The shape of these fits is, again, an object of Miller's study.

Four strategic dimensions were distinguished:

- innovation;
- marketing differentiation;
- cost leadership;
- strategic breadth (inverted focus).

These dimensions were associated with the following structural features, namely the use of:

- liaison devices (integration);
- delegation (inverted centralization);
- technocrats (indicative for specialization);
- formal controls (indicative for formalization).

Performance was measured via averages of ROI, growth in net income and a subjective assessment of the chief executive officer (CEO) of the profitability of the firm compared with its competitors. On the basis of these figures, the sample was divided into successful and unsuccessful organizations.

The following hypotheses were developed:

1. innovation has a positive association with liaison devices, technocrats and delegation.
   Result: mostly confirmed (delegation does not relate to any strategy);
2. marketing has no association with liaison devices, technocrats and delegation.
   Result: mostly confirmed (except for a low-order correlation between marketing and liaison devices);
3. cost leadership has a negative association with liaison devices, technocrats and delegation, and a positive association with formal controls.
   Result: partly confirmed (the relation is as expected, but only the links with liaison devices and formal controls are significantly);

4. strategic breadth has a positive association with all four structural dimensions.
   Result: not confirmed (the relations are as expected, but only liaison devices relate significant);
5. the three positive associations (1, 3 and 4) will be stronger for high performers than for low performers.

Result: Only a few of the relations between strategy and structure were more significant in the successful than in the unsuccessful organizations.

Comments

The conclusion of this subsection is that several strategy - structure fits exist. However, their effect on the performance is not consistent.

3.4.4 Conclusion

Looking at the fit between strategy and structure, the features listed below become clear:

- this (bi-variate) fit is important for successful organizations, although the precise effect on the dependent variables is not always investigated empirically in the same way;
- the adjustment between strategy and structure is based on their relevance to the business functions;
- the realization of the fit was earlier researched from different causality angles, but now there is agreement on the mutual adjustment of strategy and structure;
- regardless of these approaches, the management is at the middle of these processes because of the coordination of business functions;
- organizations have slack enabling to choose for certain strategies and structures and IT. There is no single best fit.

3.5 CONCLUSION ON BI-VARIATE RESEARCH

Bi-variate studies offer promising competitive results in comparison with the univariate research, but they have two drawbacks:

- the results of the researches are not clearly matching;
- the competitive results are not very strong, in contrast to the results from the well-known case studies.

An important reason for these drawbacks, besides the standard operationalization issues, could be the neglect of the third central variable (viz. organizational structure is missing in research relating IT and competitive strategy). Despite these drawbacks, the insights obtained from the bi-variate studies are a basis for further use of the variables in this research, because of the congruences between them and other similar characteristics.

CHAPTER 4

MULTI-VARIATE RESEARCH: EXPLAINING THE STRATEGIC PERFORMANCE WITH SEVERAL VARIABLES

4.1 INTRODUCTION

In the previous chapter we have seen that bi-variate researches offer new insights into the relation between IT and the competitive position. They do not, however, lead to a consistent explanation. A possible and promising research option is the combination of the three angles (IT, strategy and structure) in one research. This is:

- possible, because the three variables do fit: bi-variate relations exist between the variables (congruence), and they share the same features;
- promising, because research that relates several variables at the same time in order to explaining competitive performance occurs in both the Information Systems literature and the Organization Studies literature.

The bi-variate studies have already been presented. Therefore, in this chapter, those conceptual theories are discussed, which state that more variables have to be studied simultaneously in order to explain organizational performance (multi-variate studies):

- in the field of Information Systems, the adjustment of IT and organizational variables has been a significant condition for the successful usage of IT. In the field of Strategic Information Systems Planning (SISP), successful IT usage is supposed to be dependent on the way the technology is used in the organization, and not on the technology itself (see also Galliers 1993, p. 287). Neglecting this fit between a number of variables causes a one-sided insight into the effect of IT on the strategic performance of organizations;
- In the field of Organization Studies, the contingency theory (CT) states that the effectiveness of an organization depends on the level of congruity or the goodness of fit between separate variables like structure and the environment of organizations (Pennings 1989, p. 4.1-8).

This chapter has the following structure. The next section handles the SISP concepts in the field of Information Systems. Subsequently section 4.3 deals with equivalent ideas regarding the field of Organization Studies, namely the contingency ideas. The final section presents a conclusion.

4.2. INFORMATION SYSTEMS THEORY LINKING DIVERSE VARIABLES: SISP ALIGNMENT MODELS

4.2.1 Introduction

In the field of Information Systems, the importance of a fit between organizational and technological constructs is manifest. The successful exploitation of IT, indicated by the competitive position, depends on the fit (also known as alignment) between IT and strategy, structure and so on (Boersma 1989, p. 165; Chan & Huff 1992, p. 196; Scott Morton 1991, p. 61). Via the fit between IT and organizational variables, the usage of IT by the organization is studied, and not merely its presence in the organization.

The organization of this section is as follows. Firstly, we explain the concept of SISP and give a definition. Then we discuss the alignment as it is imbedded in the area of strategic information systems planning (SISP). SISP and alignment are closely related to another (Hartog & Herbert 1986, p. 356). Subsequently, developments of SISP models (including the alignment issue) are discussed, resulting in models where several organizational and technological variables are involved. We use this conclusion as a basis for the theoretical research model.

4.2.2 Description and definition of SISP

SISP is concerned with the general direction (the strategy) of information services and finally results in a plan for the development of applications. Adjusting IT and organization has been a significant issue since the development of methods for planning information systems in organizations. According to Davis & Olson, alignment is a central problem in the field of information systems planning (Davis & Olson 1985, p. 443).

SISP has been the subject of differing terminology in recent years. Some of them are mentioned below, partly based on enumerations by Stegwee and Fitzgerald (Fitzgerald 1993, p. 336; Stegwee 1992, p. 5):

- MIS Planning (Bowman et al. 1983);
- SPIS: strategic planning for information systems (King 1988);
- Information Planning (Theeuwes, 1988);
- Information Strategy (Simons & Verheijen 1991).
- SISP: strategic information systems planning (Earl 1993);

This enumeration is not exhaustive. In this research, we shall use with the term SISP.

Following Fitzgeralds's line of reasoning, we state that SISP can have two different meanings (Fitzgerald 1993, pp. 336-337; see also Lederer & Sethi 1988, p. 446; Pruijm 1990, p. 103):

- the strategic (long-term) planning of information systems. Lederer & Sethi for instance use the following description: SISP is the process of deciding on the objectives for organizational computing and identifying potential computer applications which the organization should implement (Lederer & Sethi 1988, p. 445);
- the planning of strategic information systems that will give organizations a competitive advantage. Rackoff et al. view SISP as the planning for information systems used to support or shape the organization's competitive strategy, its plan for gaining and/or maintaining advantage (Rackoff et al. 1985, p. 285).

The first angle describes the general planning of IT, not specifically aimed at competitive advantage. The idea of gaining competitive advantage via IT is suggested by the second angle.

On the one hand, we are interested in this research on strategic IT, and not generally in the planning of information systems as such. In the literature, the fact that strategic IT is seldom planned has been recognized (Ciborra 1991, pp. 283, 287; Galliers 1993, p. 286). It merely evolves. Therefore, the second angle seems the most appropriate one. On the other hand, organizations with developed business planning and more IS department participation in the overall planning process have fewer problems realizing SISP (Lederer & Sethi 1988, p. 455). SISP can pay off (see also Baets 1992, p. 205).

In a definition of SISP, we should clarify that IT can have strategic impact on the organization and include this fact in the planning of information systems.

Fitzgerald combines these elements and he reaches the following definition based on the description of Lederer & Sethi (Fitzgerald 1993, p. 337; Lederer & Sethi 1988).

Definition: SISP is the process of identifying a portfolio of computer-based applications that will assist an organization in executing its business plans and consequently realizing its business goals and/or the process of searching for applications with a high impact and the ability to create an advantage over competitors.

An example of the planning activities and the content of an SISP plan is given (Flynn and Goleniewska 1994, pp. 294-295):

1. consider organizational goals and IT aims;
2. assess the current set of information systems;
3. identify information needs of business processes;
4. evaluate the external competitive environment;
5. assess the technological terms;
6. agree system priorities concerning old and new systems under development;
7. provide individual project planning so that each project has clearly identified factors such as a timetable, a budget and personnel;
8. involve users in the planning process;
9. gain top management support and commitment.

These activities result in the following output:

1. organizational goals and objectives;
2. information architecture;
3. application portfolio;
4. portfolio priorities;
5. IT management strategy (organizing the IT function);
6. IT strategy (technological infrastructure);
7. individual project plans.

4.2.3 The concept of alignment in the models of SISP

Alignment of IT goals with business goals has always been a central issue in SISP.

SISP resulted from a 25-year history of describing, using and evaluating the planning of information systems. In 1977, McLean & Soden gave an overview of the literature in their book 'Strategic planning for MIS'. According to them, the relevant literature started with "the foundation-setting work" of Kriebel. In his 1968 paper 'The strategic dimension of computer systems planning', Kriebel stated that for a company computer strategy the corporate objectives must first be clarified. Subsequently, the computer planning objectives must be based on the corporate goals. The company computer strategy ends with an action plan for information system development (McLean & Soden 1977, pp. 14-15). The necessary element to link corporate objectives with the action plan is the information architecture. This is extensively dealt with in the work of the IBM company, which introduced business systems planning (BSP) based on their own method for the planning of information systems in 1975. This architecture is the blueprint for future data support of business with information systems (IBM 1981, pp. 14, 68). It consists of modules that will be developed as information systems. Using BSP, organizations bridge the gap between business goals and the action plan for information system development.

Having described this history, McLean & Soden linked the three parts in their Management Information System (MIS) strategic planning framework. This framework consists of the following phases (McLean & Soden 1977, pp. 23-27):

1. strategic MIS planning: the process of deciding on IT objectives, which deals with the fit with the overall organizational objectives (McLean & Soden 1977, pp. 23, 27). In addition to this fit, guidelines are given to carry out the strategic MIS plan;
2. long-range MIS planning: deciding on future MIS architecture to meet future information needs of the organization;
3. medium-range MIS planning: determining the present MIS architecture and the portfolio of prioritized information system projects;
4. short-range MIS planning: planning of the individual projects.

In this framework, the MIS architecture is dispersed over two phases (2 and 3). The application portfolio is also present in phase 3.

Bowman et al. modeled SISP and separated information architecture and applications portfolios more clearly (Davis & Olson 1985, pp. 455-468):

1. strategic planning stage (of MIS planning): the (information systems) objectives are derived from the organizational plan. A proper technique is strategic set transformation (SST). We shall elaborate on that later. This phase is comparable with strategic MIS planning from McLean & Soden

(Theeuwes 1988, p. 26);

2. organizational information requirements analysis: organizational goals are obtained by performing the business functions (major organizational activities: Davis & Olson 1985, p. 460). To support the striving for organizational goals with information systems, it is necessary to know what information is required for the realization of business functions. The linkage of these classified information requirements with business functions produces the information architecture (IBM 1981, p. 68). The information systems can be identified and developed from the information architecture (IBM 1981, p. 9);
3. resource allocation: the information architecture produces a need for information systems. Because of the availability of resources impose a constraint, the development of information systems is put into a sequence: which applications will be developed and when (Davis & Olson 1985, p. 463). This prioritization is the result of the resource allocation. After this third phase, the development of the individual information systems is started.

This division of SISP into three parts has become the 'communis opinio'. In the Netherlands, writers like Theeuwes (1986) and Boersma (1989) also use this division in their description of SISP (see also Stegwee 1992, pp. 48-50). Using this separation, we reach the following SISP division:

1. general direction (strategy) of IT usage: the goals for IT usage are based on the general direction for the information services in the organization as a whole, and which should be linked to organizational goals (Theeuwes 1988, pp. 26, 52);
2. information architecture: the general direction is a guideline for this phase, the creation of the information architecture, the kernel of the information plan (Boersma 1989, p. 166). Coupling the business functions and data classes derived from the information requirements produces the information architecture. The information architecture characterizes the (future information) systems with regard to the data they create/use and with regard to the future business processes they support (IBM 1981, p. 70). The architecture is a graphically represented blueprint (matrix) into which information systems development should fit (IBM 1981, p. 68). With the information architecture, relevant areas for information system development are identified (Niederman et al. 1991); it points out the desired (information systems) situation for the information services in the

organization (Theeuwes 1988, p. 26);

3. a prioritized portfolio of information systems: the way to reach the desired situation described in the information architecture is indicated in this last phase (Boersma 1989, p. 166; Theeuwes 1988, pp. 83, 126). A project plan (or in BSP terms: action plan) is a prioritization schedule for developing the various information systems. The order is based on various criteria (IBM 1981, p. 77). Using this schedule, the scarce resources of the organization are allocated (Theeuwes 1988, p. 114).

The alignment question is primarily relevant in the first phase of identifying the general direction of IT usage. Therefore, this stage gets more attention in this thesis than the stages on information architecture and portfolio issues.

One of the major issues in the discussion on alignment is the distinction between reactive and proactive adjustment of IT goals and the organization's goals (Lederer & Sethi 1988, p. 446):

- reactive adjustment refers to the top-down alignment of IT in the organization (Galliers 1993, p. 285). In this view, IT is an instrument to realize the organizational strategy and to seek competitive advantage with it (Flynn & Goleniewska 1993, p. 292). The SISP is principally driven by business priorities (Greveling & Kokke 1989, p. 669);
- proactive adjustment stands for changing those organizational goals by using the opportunities of the IT for competitive advantage. IT is a means to define the organizational strategy (Greveling & Kokke 1989, p. 669). The SISP is also driven by the IT opportunities; based on the potential of IT, SISP is formulated and it then influences the business strategy again (Venkatraman 1991, p. 155). Thus, this 'impact' planning starts with technological opportunities and changes the organizational strategy (Parker et al. 1989, p. 4). From the proactive point of view, there must be a certain degree of unpredictability. The success cases explained that competitive advantage with IT occurred by introducing the IT without ex ante recognizing the strategic opportunities. Some competitive advantages of IT have been realized without it being a product of ex ante SISP (Kühn Pedersen 1990, p. 195). The strategic advantage more or less evolved, often after the IT was introduced as non-strategic IT, but being transactional for instance (Galliers 1993, p. 287). IT opportunities are often tried without first being approved in the context of (business) strategy formulation (Ciborra 1991, p. 287). Strategic advantages evolve from IT opportunities that lie outside the framework of the existing business strate-

gy. The realized advantages reflect proactive SISP if they later become a part of changed business strategy (Kühn Pedersen 1990, p. 195). This innovative and implemented IT changes organizational goals ex post (see also Earl 1991, p. 120). If SISP approves this kind of IT introduction, then SISP can affect business strategy through the potential of IT (Venkatraman 1991, p. 155).

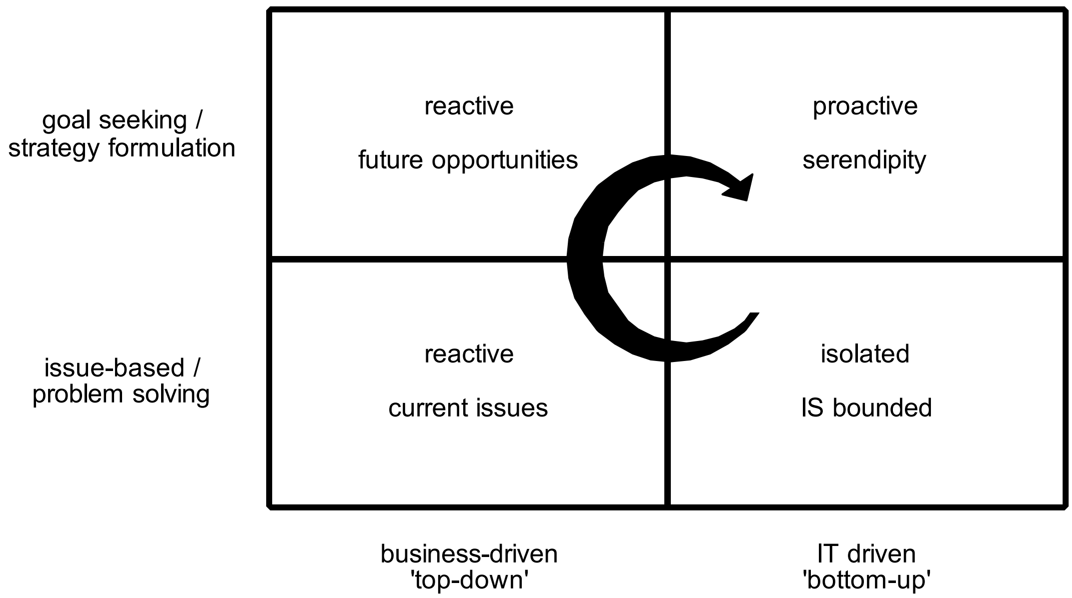
The border between reactive and proactive is slightly blurred (see for instance the characterization of the diverse methods by Lederer & Sethi 1988, p. 449). Using the reactive angle, the opportunities of IT are also studied. However, the reactive aspect means that the business goals are the basis for the use of the IT opportunities. The IT opportunities then lie within the existing framework of business strategy (see also Figure 4.5: The contradiction between reactive SISP and proactive SISP).

4.2.4 Developments in the field of SISP

Now that we have explained the relevance and position of alignment in the area of SISP, the development of alignment in the literature will be presented. For this, we can use the shifting focus on SISP as pointed out by Galliers. He distinguishes two dimensions to describe the transition, as depicted in Figure 4.1 (Galliers 1992, 1993).

1. solving current situation versus directed towards future;
2. IT driven versus business driven.

Figure 4.1 DEVELOPMENTS IN SISP



The various phases of planning information systems will be described below (Galliers 1993, p. 285).

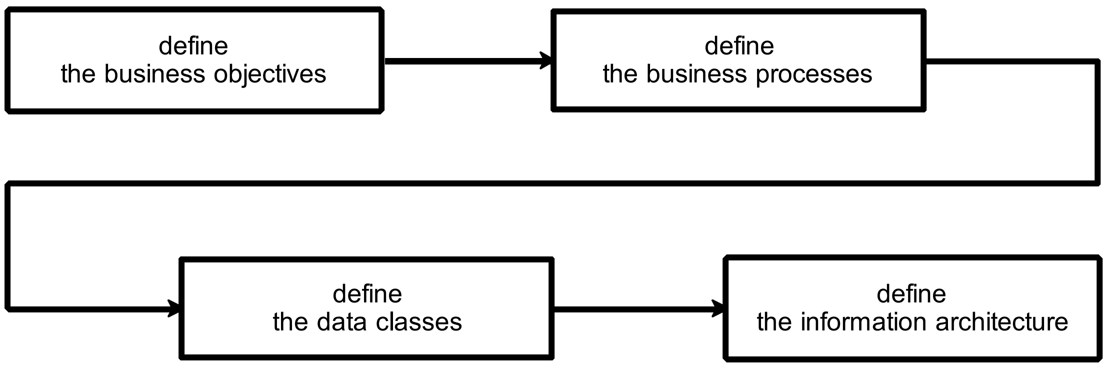
I. Isolated
The information-planning task started with the identification of potential computer applications and paid attention to the improvement of computer efficiency. This planning was realized by computer departments isolated from the rest of the organization (see also Stegwee 1992, pp. 8-9). The intention was to examine technological matters without having to take all kinds of business requirements into consideration. Alignment of information systems with organizational goals was not really considered during the planning. The technology offered opportunities to solve 'available' problems (Galliers 1992, p. 98; 1993, p. 285).

Conclusion
There was no deliberate fit between organization and IT.

II. Reactive: current issues
After several years of experience, the management of organizations felt the need to plan the use of computers for solving existing business problems. This is obvious in one of the earlier examples of SISP methods: BSP. The major goal of BSP is to provide an integral information systems plan which, united with the

business plan, will support the goals of the business (IBM 1981, pp. 3,5). BSP consists of a number of basic concepts to realize this (see Figure 4.2). One of these is the concept of the top-down IT planning with bottom-up implementation (IBM 1981, pp. 8-9). This means that the long-range goals for IT are first established. They are the basis for the organization of all the information services of the company. Based on this organization and, aligned with the goals of the top management, information systems are built from the bottom up in modular blocks. This top-down planning will be described below.

Figure 4.2 BSP BUILDING BLOCKS



1. BSP starts with the clarification of the business goals of the organization. According to Earl, this definition of the business goals is one of the rewards of top-down SISP (Earl 1991, p. 104). Firstly, the business goals of the organization should be apparent in the business plan. If this plan is not available, these goals can be stated as a part of BSP. Although the deduction of IT goals from business goals is described as being important (IBM 1981, pp. 5, 30), the procedure to realize this actual alignment question is not formally present in BSP (see the flow of BSP study: IBM 1981, p. 13). The actual alignment is reflected in the final information architecture (IBM 1981, p. 9). BSP arranges this transformation via the building of information systems according to the architecture by means of the following steps.
2. Business processes are identified, with the aim of realizing the business goals; the business processes are the decisions and activities by which the organization manages the resources of the business to reach its goals (IBM 1981, p. 31). They should be analyzed to find the key to the success of the

business (IBM 1981, p. 14).

3. These business processes form the basis for the elicitation of information requirements (IBM 1981, p. 31). To support the business functions, the requirements are logically formed as data in data classes (IBM 1981, p. 41).
4. The business functions and data classes are related in an information architecture. As stated before, this blueprint for future information services of the business (IBM 1981, pp. 14, 68) is presented in the form of a matrix. This architecture consists of modules that will be developed into information systems (IBM 1981, p. 12).

BSP finishes with an action plan for the development and establishment of priorities in order to develop information systems geared to realizing (a part of) the information architecture. Based on the recommendations of the action plan, the bottom-up implementation follows and is no part of BSP itself.

The features of this BSP are:

1. focus on the current situation: although business goals and information needs are directed to the future, the trait of this method is to deal with existing problems instead of looking towards their future situation (Pruijm 1990, p. 69; Theeuwes 1988, p. 107). In theory, business goals are important (IBM 1981, p. 9). In practice, they do not get enough attention. Defining business goals is eliminated as a major activity and has acquired the role of a 'general business fact' under "preparing for the study" (IBM 1981, pp. 13, 22). Obviously it gets a lower priority than, for instance, defining business processes and data classes;
2. neglecting environment: Wiseman states that the environment is excluded from BSP so that all kinds of IT opportunities are not thoroughly studied (Pruijm 1990, p. 69). This observation could have the same background as the treatment of business goals. This must be a result of the usage of BSP, because the business environment is officially a major business fact (IBM 1981, p. 22);
3. reactive: the organizational situation determines the future usage of IT via the business processes and information architecture. BSP is very clearly used as a reactive method. There is no room for potential IT opportunities outside the organizational situation: first the organization, then the IT.

Conclusion

Reactive: the current business processes determine the choices on the use of the

IT.

III. Reactive: future business opportunities
Comments on BSP resulted in ideas that took the future goals of the organization more explicitly into consideration, so that organizations searched for new IT opportunities and did not use SISP solely for the solution of their current problems (Bushoff & Oosterhaven 1987, p. 231; Galliers 1992, p. 99).

This alignment of IT with future business goals receives more attention in Information Systems Planning (ISP). ISP is the first part of the information-engineering methodology (IEM), a complete method for the development of information systems (Bushoff and Oosterhaven 1987, p. 228). IEM starts with the strategic plan, produces the information architecture based on the information needs that are derived from the business processes (Bushoff & Oosterhaven 1987, p. 233), and finishes with the realization of the concrete information systems (Bushoff & Oosterhaven 1987, pp. 228-229).

The primary goal of ISP is relating organizational strategy, SISP and IT opportunities (Bushoff & Oosterhaven 1987, p. 229). Therefore, it pays more explicit attention (in comparison with BSP) to analyzing the organizational strategy and the transition from the organizational strategy to the information architecture via the information requirements (Bushoff & Oosterhaven 1987, pp. 230-234).

An explicit organizational strategy is often not available (NNC 1992). The lack of a business plan troubles SISP (Lederer & Sethi 1988, p. 449). If there is no formal strategy, organizational goals should first be established. ISP does not have an own way of defining these goals. Rockart's critical success factor (CSF) model is viewed as helpful for this (strategic) planning process (Pruijm 1990, p. 70; Rockart 1979, p. 88; Theeuwes 1988, p. 71). The approach is primarily meant to help management uncover their information needs (Rockart 1979, p. 84). In intensive interview sessions, the so-called success factors are defined. These are the limited numbers of areas relevant for competitive performance that underlie and support the organizational goals. Another source of CSFs are the environmental and internal organizational considerations (Rockart 1979, pp. 86-87). Based on the CSFs, the information requirements are elicited. They form the basis for proper information systems development (Rockart 1979, p. 92). Because of the thorough discussions on organizational strategy and the aim at the future (Rockart 1979, p. 89), the CSF approach is useful for ISP, so that higher management, in particular, can cope with it easily (Theeuwes 1988, p. 71).

The features of ISP:

1. focus on future situation (Theeuwes 1988, p. 72): in ISP, there is a distinct activity called 'analysis of organizational strategy'. At this stage, interviews with top management about the mission of the company, the organizational goals, and the possible problems are discussed (Bushoff & Oosterhaven 1987, p. 231). In that stage the CSF approach can also be used. Discussions on these topics lead to ideas on future information services. The border between BSP and ISP is, theoretically, not very concrete. In BSP too, there are interviews with top management on business objectives. And in BSP the CSF approach can also be used. In BSP however, the emphasis on (future) business objectives is smaller. The (existing) business processes and data classes are really at the center of attention. The use of BSP is more geared to the existing situation;
2. attention to environmental issues: not only do future aspects come into the attention while analyzing the organizational strategy, the environment (the industry) is also thoroughly studied (Theeuwes 1988, p. 72). This is stimulated by the use of the CSF approach where environmental factors are a source of success factors;
3. reactive: for ISP, the border between proactive and the reactive is vague. ISP, in combination with CSF approach, has opportunities for impact (Lederer & Mendelow, 1988, p. 449). IT could bring strategic advantages into the organization. The potential opportunities of IT with respect to the future functioning of the organization are considered (Bushoff & Oosterhaven 1987, p. 231). This aspect of impact, however, is not sufficient to call ISP proactive. IT could change the organizational goals, but first the formal strategy should be altered as a basis for further IT development (Bushoff & Oosterhaven 1987, p. 231). The basis for the IT goals is still the alignment with the business goals (Bushoff & Oosterhaven 1987, p. 230; Theeuwes 1988, p. 66). This top-down realization takes a long time in a general method, so that changes make the final plan irrelevant (Lederer & Mendelow 1988a, p. 75). The innovative, opportunistic, unexpected, laissez-faire feature of proactive behavior is not a part of ISP. So finally, ISP as a general method has the danger of overlooking possible strategic opportunities (Pruijm 1990, p. 71).

Conclusion

Reactive: the goals for the use of IT are aligned from the organizational goals.

IV. Proactive
Supporting the business goals via IT and exploiting IT for competitive advantage are targets for SISP (Earl 1993, p. 1; Lederer & Sethi 1988, p. 446). All methods described so far have started with the present and future images of the organization and have aligned their information needs. Based on these needs, they have prescribed IT to satisfy them. Various researches found disappointing results of SISP: the prescribed plans were not actually implemented so that the SISP had no function for strategic IT (Earl 1993, p. 15; Lederer & Sethi 1988, pp. 453, 455; see also Flynn & Goleniewska 1993, p. 292). Although influencing the competitive position was formally included (in ISP, even in BSP, see IBM 1981, p. 5), the case studies made clear that strategic IT was not usually prescribed ex ante as being strategic. The advantages evolved, after which the business strategy was adjusted. The basis for the impact was the effect of IT on the value chain and industry.

Theories on this strategic IT are mostly descriptive; they subsequently describe why and how the strategic gains were accomplished (see chapter 1). The value of these theories can be questioned; the same cases are used repeatedly as empirical validation for different ideas (Pruijm 1990, p. 261). Formal methods to reach competitive advantage with IT are hardly generated. There are some guidelines described by Porter & Millar in 1985, but these are very broad and do not make statements on decidisions about business processes, architectures and applications.

The Customer Resource Life Cycle may be the model nearest to a (SISP) method: a model that claims to support the finding of strategic IT applications (Ives & Learmoth 1984, pp. 1193, 1197). They concentrate on the single relationship between the organization and the customer. The support of information resources develops via a life cycle, just like the products of an organization. The organizations can help (and bind) their customers with the use of IT in all the 13 phases of this life cycle. The authors claim that organizations can discover strategic IT by the use of this method. Their is no empirical research linked to this statement. Other comments refer to the lack of an architecture as a basis for all applications and the lack of other kinds of applications besides the customer-aimed applications, such as applications directed towards the organization's supplier or IT for important internal use. These applications can also result in competitive advantages.

Features of impact models:

1. focus on organizational strategies and environment: in the various descriptive impact models (see chapter 1), organizational strategies have a domin-

ant role (see for instance Parsons 1983; Porter & Millar 1986; Rackoff et al. 1985). Here the strategies do not form the autonomous starting point of the theories (as in BSP, ISP) but are an integral part of the organization's business activities via the analysis of the value chain and analysis of the industry;
2. proactive: the impact models are mostly based on case studies where IT offered the organization a competitive edge. Often starting as a non-strategic information system, IT produced a competitive effect that was - later explained by a combination of business functions, industry, and resulting strategic choices of the organization. IT was the trigger offering possibilities that could be used perfectly in that organizational situation (see for instance McFarlan's strategic grid (Cash et al. 1988), and the strategic opportunities framework (Benjamin et al. 1984)).

Conclusion
Proactive: the usage of IT leads to changes in the organization which , in turn, lead to adjusting organizational goals.

@@@ Table 4.1: Success of SISP

Table 4.1 SUCCESS OF SISP

reference	satisfaction	realization
Lederer & Sethi 1988, pp. 452-455	32% satisfied - 53% dissatisfied carrying out SISP satisfaction with: • SISP process: 3.68 (neutral = 3) • SISP output 3.38 • carrying out final SISP: 2.53	• 24% initiated after 56% of time elapsed • 38% of realized applications not in SISP conclusion: no good execution of SISP (see also Runge 1985: 80% SISP ignored)
Mantz 1991, p. 851		• 62% needed follow-up studies (SISP does not mean: better control over information services)
Galliers 1992, pp. 100-101		• Galliers 1987: 71% (partly) successful • Wilson 1989: 73% (reasonable) successful
Earl 1993, pp. 3, 15	• 69% worthwhile - 31% better not doing it • 3.73 success score (neutral = 3)	• 14% of strategic applications derived from SISP
Flynn & Goleniewska 1993, pp. 301, 307	• process: 27% • output: 56%	• strategic applications from SISP: 2 (neutral = 3)

4.2.5 Research on the strategic impact of SISP

When analyzing the success of SISP, particularly the second and the third stage are relevant. The fourth stage has a more descriptive nature. Several researchers found problems in realizing the plans and gaining strategic impact with IT when applying SISP. These results are listed Table 4.1.

Reported problems are (see also Lederer & Mendelow 1987; 1988a; 1988b; 1993; Lederer & Sethi 1993):

1. lack of knowledge about the organizational objectives:
   business objectives should be the basis for SISP (Galliers 1992, p. 101). Often there is a lack of a formal strategic plan (Lederer & Mendelow 1987, p. 392, Vitale et al. 1986). If there is a plan, IT executives are sometimes not familiar with it and the organizational goals (Lederer & Mendelow 1987, p. 392; 1988a, p. 74);
2. an absence of commitment at top management level:
   basic for SISP are the business goals, which fall within the scope of top management. Besides, SISP is very expensive and has far-stretching consequences for the organization (strategic impact, all kinds of business functions are involved). For successful SISP, it is necessary to have the support of the top management (Galliers 1992, p. 101). Convincing the top management of the strategic advantages of IT is still a problem because of the lack of awareness by top management of the strategic value of IT (Lederer & Mendelow 1988b, p. 529). Strategists are often uninformed about IT (Vitale et al. 1986, p. 268) and lack IT understanding (Lederer & Mendelow 1987, p. 392). This hampers commitment (Lederer & Sethi 1992, p. 33);
3. a failure to realize the fit between organizational goals and IT goals:
   relating organizational and IT objectives is, without doubt, one of the main issues in the field of SISP. Therefore, it is remarkable that this linkage is still rather implicitly described. A possible reason could be the separation between the participants and the processes of creating the business goals on the one hand and the IT goals on the other (Galliers 1992, p. 105). Lederer & Sethi found that organizations whose IT department participated to a lesser extent in business planning had more problems than organizations with greater IT departmental participation (Lederer & Sethi 1988, p. 455).
   Using a method developed by King in 1978, the organizational set of

strategic goals can be transformed into a set of information systems goals (Theeuwes 1988). This method is called Strategy Set Transformation (SST). The method is often used reactively, starting with the organizational goals and ending with the IT goals. According to Theeuwes, this method concentrates on internal and current organizational issues, and does not take the future organization, as influenced by the IT development into consideration (Theeuwes 1988, p. 72). The interaction between the IT and the organization is not considered. The random nature of the organizational and the IT objectives is another disadvantage.

The overall consequence of these potential problems is that SISP rarely yields competitive advantage. There are two possible reactions:

1. the first reaction is approving the concept of SISP. SISP as such is a valid concept, but the elaboration is impeded by implementation problems like the need for further studies (Mantz et al. 1991, p. 851), a long and expensive planning cycle (Lederer & Sethi 1992, p. 33) and comprehensive documentation (Van Dissel & Park 1989, p. 751). These problems can eventually be solved;
2. the other reaction is disapproving the SISP concept as a means of reaching strategic advantage with IT.

In the first view, the latent usage of SISP is accepted. If it can have the desired positive results for the organization, it will be worthwhile to solve the problems mentioned with respect to SISP. There are some arguments in favor of this line of reasoning. Organizations which are used to strategic planning experience fewer problems with SISP than organizations without planning experience. The same is true for organizations with IT management participating in strategic planning (Lederer & Sethi 1988, p. 455). Thus under these circumstances, SISP will produce better results.

The other reaction, however, refers to the idea that SISP has a conceptual error so that the advantages mentioned are a matter of coincidence (Galliers 1993, p. 286). The use of SISP and the use of better controlled information services do not go together (Mantz et al. 1991, p. 851). It even seems to be the case that, where there is no SISP, information services are better organized. The information policy paradox illuminates this phenomenon of SISP (see also subsection 1.2.5):

- organizations which want to implement SISP (because their information services are poorly organized) are not capable of implementing (successful) SISP;

- organizations which are capable of implementing (successful) SISP (because their management is well-organized) do not require to do so.

If organizations are not functioning well due to organizational problems, their information services are probably not properly organized either. A potential consequence might be islands of automation. Especially in those situations, there is a demand for a better organization of the information services. SISP will be tried in order to achieve better organization. However, if the management wants to tackle that problem solely by improving the information services using SISP, it neglects the general managerial problem. The situation requires a further development of SISP, by integrating SISP with the management of the organization. There are some signs of this in the literature. Johnston & Carrico find successful IT usage occurring in organizations where the management did not only concentrate on the planning of IT as such, but especially on the management of their organization and their position in the industry. This results in changed products, services, organizational structure and processes, and finally in a changed competitive position in the industry (Johnston & Carrico 1988, p. 41). Galliers also favors SISP where internal change management issues are combined with external forces. This leads to changes in business strategy, organizational structure, information services, skills and staff (see also Galliers 1992).

In the literature on business process reengineering (BPR), this idea is further elaborated. There are two major themes for BPR (Davenport & Short 1992, p. 11) as a basis for the management of the organization:

- IT opportunities: capabilities offered by hardware and software (a technological IT definition);
- business process redesign: the analysis and design of processes in and between organizations.

The combination of these two themes can result in organizational transformation in which IT opportunities are exploited (see also Nolan & Schotgerrits 1989). The planning of information systems as such is not the central issue, but the management and functioning of the company, for which IT offers important opportunities.

We made it clear that IT as such should not be the central issue, but the management and functioning of the company. SISP as a general management instrument, starting from the angle of information services, is in its infancy (Mantz et al. 1991, p. 855). Mantz et al. see a further growing role of management concepts of organizational processes as being necessary for successful SISP (Mantz et al. 1991, p. 850).

Looking back at the two possible reactions, approving or disapproving the SISP concept, our conclusion is that solving problems, such as reducing the scope of the planning cycle, is necessary to escape the paradox. However, SISP can only be successful if it is enriched with more managerial areas for solving issues on information services, as a way to deal with organizational management questions. SISP should develop a management instrument that cuts across the whole organization, through all the value chain functions; it should be integrated with imported management issues (like strategic and structural questions), and it should be backed by top management.

4.2.6 SISP as a conceptual framework for research on strategic IT

The conclusion stated above, on the conditions for successful SISP, is worked out by Earl. This development of SISP does not stop at the proactive stage. It has been recognized that elements from several stages are useful. In that way, 'multiple' SISP methods develop (Earl 1991, pp. 98-103; Galliers 1992, p. 100; Stegwee et al. 1993). These methods claim that, for SISP, reactive and proactive planning must be accomplished. In Earl's multiple method there are three views for SISP that, when integrated, combine the reactive and proactive mode of SISP:

- top-down: based on the objectives of the organization, the need for specific information systems is aligned using an analytical approach. Results are the clarification of organizational goals and the prioritization of the development of IT (Earl 1991, p. 103);
- bottom-up: the existing information systems and the planned development of future information systems are evaluated on their technical quality and value for the company. Based on this analysis, the organization finds out where IT is important for the competitive functioning, and where improvement is necessary (Earl 1991, pp. 105-108);
- inside-out: the top-down and bottom-up approaches give the necessary insights into the current IT situation (strengths, flaws) and the future goals for IT as a basis for further IT developments. However, this is not sufficient to explore the strategic opportunities of the IT (Earl 1991, p. 109). Therefore, the IT opportunities that lie outside the business goals are neglected. In this third aspect, new, innovative IT opportunities are studied which could be useful for the organization and could impact the organizational goals.

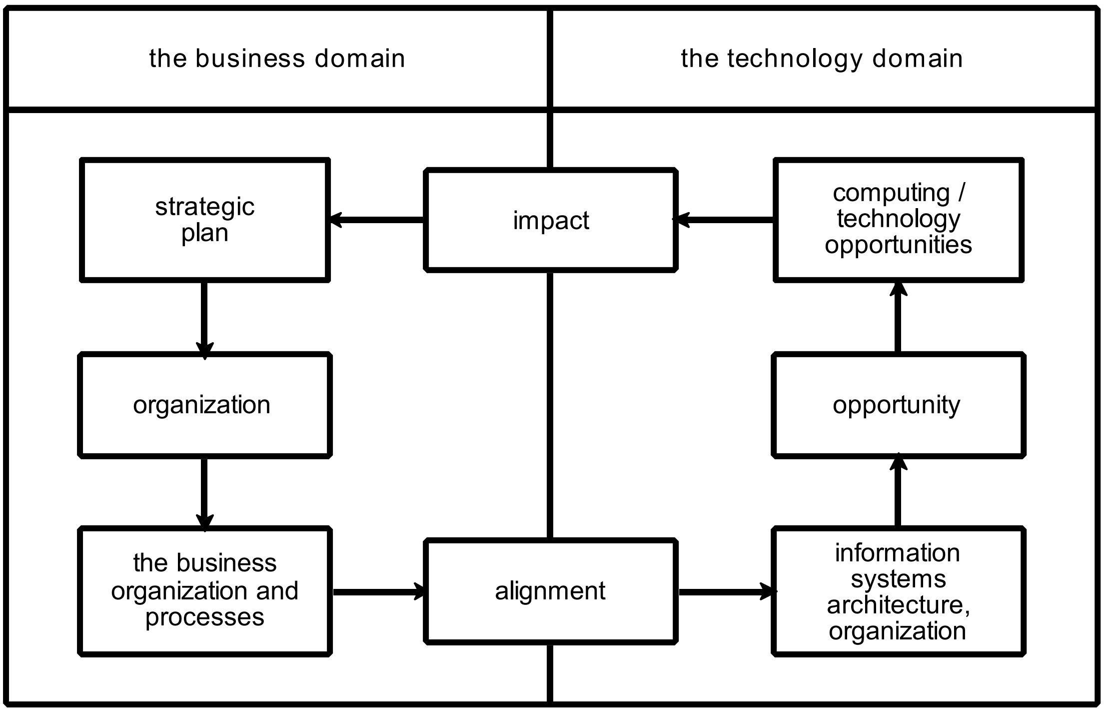
These reactive and proactive elements are also combined in the Enterprise-wide Information Management (EwIM) planning process from Benson & Parker (Parker et al. 1989), This model consists of 4 elements (see Figure 4.3):

- the organizational strategy;
- the business processes and structure;
- the information architecture and systems;
- the IT opportunities.

Planning activities for SISP are accomplished by repeatedly combining two adjoining elements. The resulting four planning activities should be performed circularly, counterclockwise.

The reactive element is represented by the organization's alignment. This begins with the business plan, and continues by defining a proper organizational form (business processes and structure). Subsequently, the alignment planning connects the information strategy plan with the organizational form to satisfy the information needs of the organization. The information systems architecture is the result. Thus, the role of IT is determined in order to accomplish the strategic plan (top-down).

Figure 4.3 EwIM PLANNING PROCESS

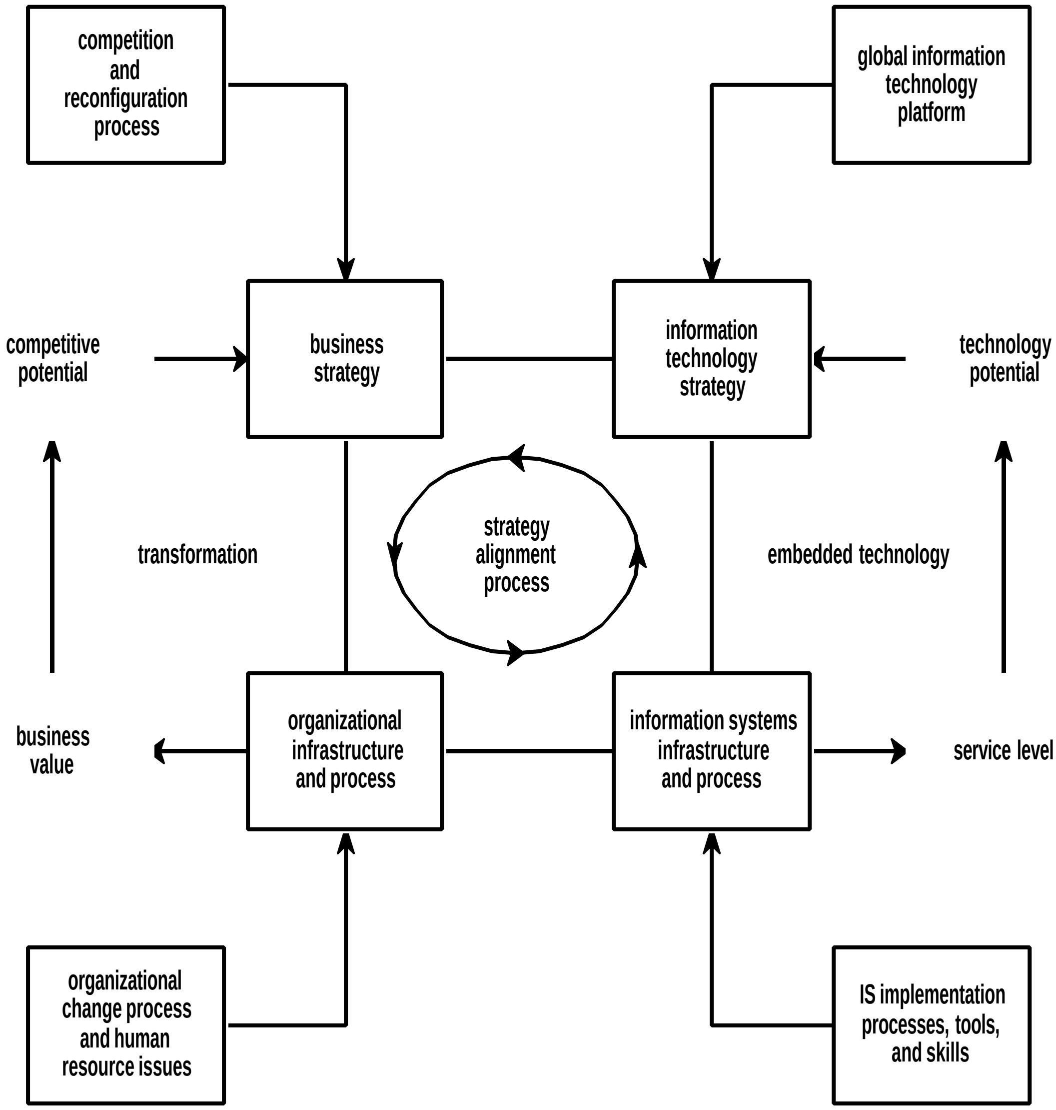


The proactive aspect is also present. By studying the existing IT in the opportunity planning phase (bottom-up) and new technology opportunities in the impact planning phase (inside-out), the business plan is changed. Concluding: alignment and impact are both important characterizations of the model. The model attunes organizational goals and IT goals; in addition the organizational structure is a relevant element. A disadvantage of this model is the unclear position of the SISP. It seems to be present everywhere in the cycle. Therefore, the impact of SISP on business goals remains vague.

In McDonald's expanded strategic alignment process (see Figure 4.4), based on work of Henderson & Venkatraman, the SISP has a more clearly-defined position. The four EwIM elements are also present in this model, but instead of IT opportunities the fourth element is SISP, or IT strategy (McDonald 1991, p. 162). He identifies four stages, containing three elements (Scot Morton 1991, pp. 310-322).

figure 4.4 expanded strategic alignment process

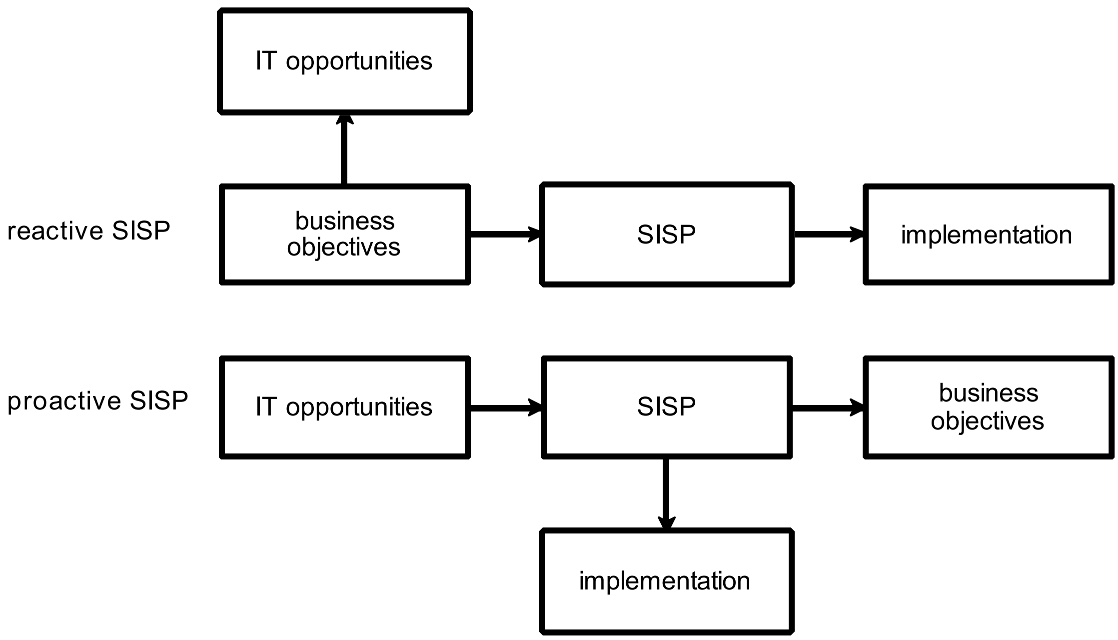
Figure 4.4 EXPANDED STRATEGIC ALIGNMENT PROCESS



stage 1: IT strategy → business strategy → organizational structure (impact);
stage 2: business strategy → organizational structure → architecture and systems (alignment);
stage 3: organizational structure → architecture and systems → IT strategy (alignment);
stage 4: architecture and systems → IT strategy → business strategy (impact).

In the stages of this strategic alignment model (SAM), the repeated and systematic adjustment of two of the three elements is assessed. The stages are all covered twice in approximately two weeks. The fit must then be sufficiently established. Subsequently, the final IT opportunities and organizational strategies are balanced. The reactive side is clear: business activities finally determine IT development. The proactive side is also visible: business objectives can be changed according to the IT opportunities.

Figure 4.5 THE CONTRADICTION BETWEEN REACTIVE SISP AND PROACTIVE SISP

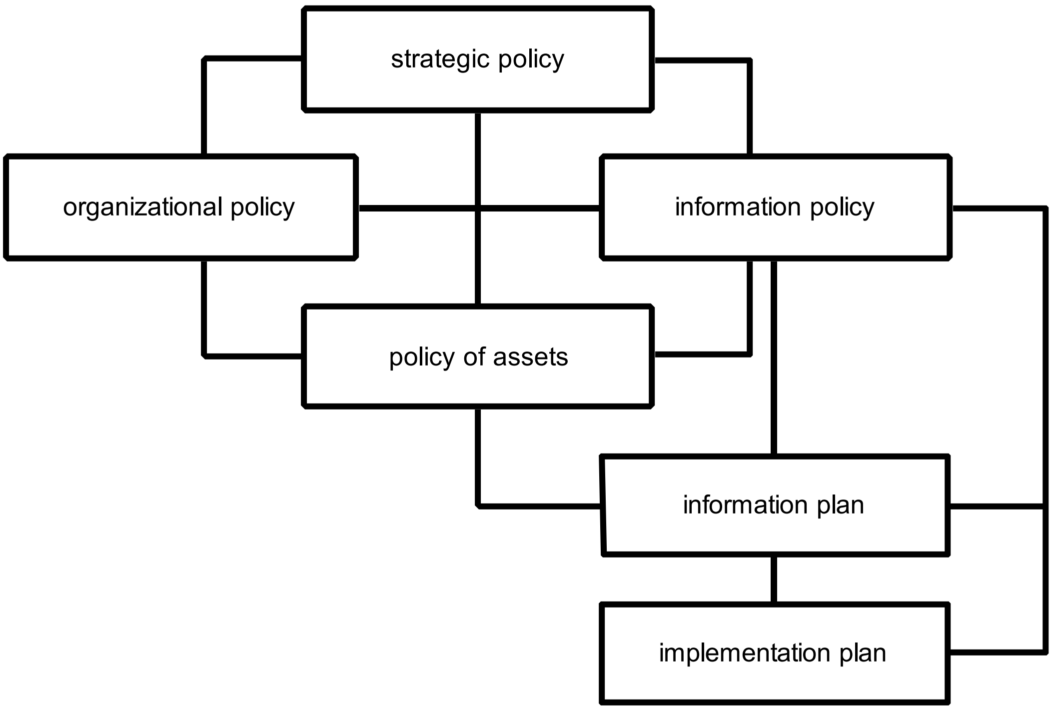


Both models, however, suggest that new IT opportunities should always be in line with the (new) business strategy, and should be approved by top management before the implementation because of the counterclockwise direction of the cycles. Therefore, the innovative, unpredictable side of proactive behavior is slightly neglected; in real proactive impact, the emphasis is on exploring IT opportunities without thinking too much about the formal business strategy. Later, the (formal) strategy is also adjusted.

Baets maintains that these concepts are still conventional, starting from corporate strategy and aligning SISP with it (Baets 1992, p. 206). The innovative aspect of competitive advantage with IT (in Earl's terminology: inside-out) must be rewarded. Ciborra, too, claims that SISP for competitive advantages must be started as an innovative process (Ciborra 1991, p. 287). SISP must have an autonomous impetus to implement IS (Ciborra 1991, p. 287). The business strategy is influenced parallel to that (Baets 1992, p. 207). Then the proactive side of SISP is also used.

This idea is also used by Boersma. He starts by saying that in the current view SISP is aligned with the organizational strategy. Following that, he states that, in reality, SISP is not always originated by the organizational strategy. Technological, innovative developments, such as the explosive growth of PCs, can trigger SISP, and SISP again influences the business strategy. In his opinion, SISP and the organizational strategy are mutually influence one another (Boersma 1989, pp. 166-168).

Figure 4.6 BeMI MODEL



Another issue is the relevance of organizational issues other than organizational strategy which influence SISP and which are influenced by SISP. He mentions two issues:

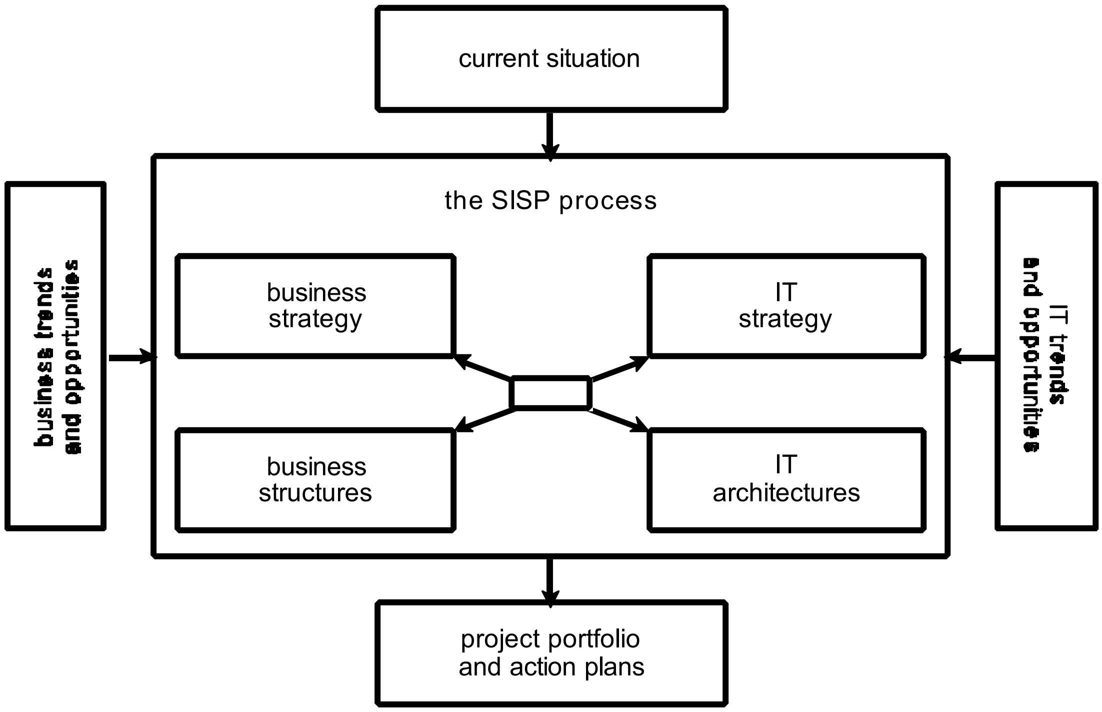
- the policy concerning the organizational structure (see also SAM, EwIM);
- the policy on the financial assets of the organizations.

The resulting BeMI model, i.e. a business administration method for information policy (in Dutch: "Bedrijfskundige methode voor informatiebeleid"), consists of the four policies that influence each other and that are the basis for future architecture (referred to as "information planning") and information system development. The policies are the result of decision processes that interact between these subjects. Therefore, it is not a circular model but an opportunistic model, the behavior of which is dependent on accidental input.

In the SISP model of Stegwee & Van Waes, previously-mentioned elements are combined (Stegwee & Van Waes 1990, pp. 93-94):

- top-down and inside-out;
- reciprocal influence.

Figure 4.7 (S)ISP AS A MANAGERIAL DECISION-MAKING INSTRUMENT



In their model (see Figure 4.7), SISP is a key component of the managerial process in the organization. Via the integration of SISP in the annual business planning cycles, the planning and implementation should be constantly performed, so that an optimal advantage from IT applications can be expected.

Looking back on the history of SISP, we see the development of a mature management instrument for the planning of IT. In the early years, SISP was solely aimed at the planning of IT, with reactive alignment to the strategy. Nowadays, this instrument is aimed at relating the information services with strategic and structural aspects, not only in a reactive but also in a proactive way (see for instance the framework of Rockart & Scott Morton 1984). These aspects are related via the business processes of the firms, and decisions are made by the management, resulting in a situation balanced between the technology and the organization.

4.2.7 Conclusion

Discussing various SISP models, it becomes clear that next to organizational goals and IT, other organizational issues are also relevant. Scott Morton states that the management processes will have to deal with IT, strategy, structure and people (Scott Morton 1991, p. 21). All these elements are part of the business environment, and any change in one of them will affect the others. Simon & Grover also recognize the need for managers to examine business strategy, organizations structure and environmental issues to reach a fit between these items (Simon & Grover 1993, p. 40). And in the 'NNC and VSB research 1992' the business strategy, the structure of business processes, and the IT are used as part of the research model (NNC 1992, p. 10). We can not only conclude that alignment is aimed at adjusting strategy and IT goals, but also that, at the same time, structure, culture, environment, people and so on should be balanced in the SISP to attain a successful planning of IT (Cash et al. 1988, p. 3; Davis & Olson 1985, p. 458). The proactive and reactive alignment rejects the one-way relationship between the variables, and supports the concept of the mutually reciprocal relation. The proactive and/or reactive alignment offers the management the opportunity to realize a suitable balance between the variables, dependent on the business situation (processes) and the management's point of view.

In the SISP models, the adjustment variables stay rather vague because the elements of the various models are not operationalized. This problem can be solved by borrowing insights from the field of Organization Studies, where the concept of fit is also under scrutiny.

4.3 ORGANIZATION STUDIES THEORY LINKING DIVERSE VARIABLES: CONTINGENCY THEORIES

4.3.1 Introduction

In this section, we elaborate on organizational theories that deal with relations between variables like technology, structure and environment. These relations have been studied for several decades. Ideas have been generated on the measurement of the concept of fit. These ideas are useful in our research, where the fit between IT and organizational variables is studied.
This section is has the following structure. Firstly, the general concept of the contingency theory (CT), a major theory in the field of Organizational Studies, is elucidated. Subsequently, developments in the CT, including the adjustment between variables, are discussed. Then the different measurements of fit are presented, followed by a conclusion on their usability.

4.3.2 Description of the contingency theory

The CT is not really a theory, but an approach, dealing with the relation between the organizations and their environments or, to be precise, their contextual variables (Ahaus & Kastelein 1985, p. 397). The CT started as a concept claiming that the structure must fit its context in order to be effective (Drazin & Van de Ven 1985, p. 515). For instance, the organizational structure is contingent on the environment: the environment is a contingency variable.

The research of Burns & Stalker in 1961 was one of the first examples of the CT (Lammers 1986, p. 22). They measured organizations within the British electronic industry on a scale ranging from mechanistic (bureaucratic standardization: precisely- defined tasks, coordination via clear hierarchy and control, regulations, vertical communication and regulations, rigid, centralized) to organic (continual adjustment of tasks, no rigorous definitions of functions and responsibilities, coordination via mutual adjustment using vertical and horizontal communication, flexible, decentralized). Before the second world war, when the environment was rather stable, mechanic organizations could flourish. After the war, the conditions changed: the market became more complicated and unpredictable. In this changing and dynamic environment, organic organizations become more appropriate

(Morgan 1989, pp. 50-51; Pennings 1989, p. 4.1-10; Pugh et al. 1983, pp. 52-53).

Lawrence & Lorsch brought the CT really into the center of attention in 1967 (Lawrence & Lorsch 1967, pp. 8-13; Mintzberg 1979; Morgan 1989, p. 54). In order to cope with their environment, organizations develop units. There should be departments for design, for attending to technological developments, for production, for focusing on resources like machines and materials. These units may differentiate in their goals, time orientation, interpersonal style and the formality of their structure. For instance, the level of horizontal specialization may vary between the units. To realize a good state of collaboration (the units have to work together of course), there are individual persons (managers), cross-functional teams or the organizational hierarchy. These are integrating mechanisms. The researchers found that in more uncertain environments, such as the plastics industry, the need to differentiate was greater in order to be effective. High performers in this industry were more differentiated and more integrated, compared with low performers. In more certain environments, like the container industry, there was less need for differentiation. Concluding, they stated that there is no single best structural form for all situations, and that appropriateness in the light of the contingencies is the key to well-functioning (Pugh et al. 1983, p. 48).

In the literature, contingency (context) variables other than environmental variables, have also been recognized. An example is the classical research of Woodward in 1965, who stated that technology is a contingency for the organizational structure. In a study in a region in England in the 1950s, she found that organizational structure and technical systems of production correlated in the following ways:

- mass production needs formal organizations with a complex administrative hierarchy of specialist staff and control departments;
- process technology fits with management through committees instead of with instructions down the line;
- unit technology requires a less extensive administrative control in a looser structure.

These relations were strong for the successful firms; the organizational effectiveness resulted from a match between the context and the structure (Mintzberg 1979, pp. 11, 217; Pugh et al. 1983, p. 27).

Strategy was also studied as a determining variable for organizational structure. Chandler's research is known from the famous statement "structure follows strategy" (Chandler 1962, p. 14). Strategy is viewed as defining long-term goals and adopting a course of action (Chandler 1962, p. 13). Structure is seen as the design of the administration of the organization (Chandler 1962, p. 14).

Strategies require refashioned structures to operate efficiently (Chandler 1962, p. 15). Du Pont's strategy of diversification (fabricating many different products) led to a multi-divisional decentralized structure (Chandler 1962, pp. 88, 104). The strategy is viewed as a (controllable) contingency variable for the structure. Although this strategic view uses a linear approach, Miles & Snow claim that even in Chandler's work there is no simple causal relationship between strategy and structure (Miles & Snow 1978, p. 7). Organizations spent years to develop an appropriate structure.

All the researches mentioned describe one-way alignment. The context (contingent) variables determine the organizational features. These contingency ideas have been a reaction to generally valid organizational principles (Weber, Taylor, Fayol) that favored fixed organizational structures (Pennings 1989, p. 4.1-3). Schrama states that, in the 1960s, the CT killed off the idea of universal laws for management (Schrama 1991, p. 27; see also Miles & Snow 1978, pp. 250-251; Pennings 1989, p. 4.1-3). The previously mentioned studies of Burns & Stalker, Lawrence & Lorsch and Woodward made clear that there was no single best way to organize that applied in all situations (contexts). Depending on the contingent situation, the structure (and the management) of the organization should be determined.

Figure 4.8 CLASSIFICATION OF ORGANIZATION STUDIES THEORIES

	deterministic orientation	voluntaristic orientation
macro level of research	natural selection view	collective action view
micro level of research	systems-structural view	strategic choice view

4.3.3 Discussions of, and developments in, the contingency theory

There are some important points of criticism on the theory (Ahaus & Kastelein 1985, pp. 399-400). These criticisms have their roots in other organizational theories, as classified by Astley & Van de Ven. They describe four views on organization and management, as depicted in Figure 4.8 (Astley & Van de Ven 1983, pp. 248-251):

- systems-structural view: the theories in this view, on the analysis level of individual organizations, share a common deterministic orientation. Organizational behavior is determined by constraints. The manager's role is a reactive one, responding to changing environments by rearranging the internal organizational structure to achieve effectiveness. The authors place the CT in this view;
- strategic choice view: there is a choice available in the design of the organizational structure. These theories are present at the level of organizations too. Internal political considerations are relevant here. Obviously there is slack in organizations which enables them to select between alternatives: not all the choices concern the survival of the organization. Another point is the opportunity to manipulate the environment. This view is well-known, having been expressed by Child (strategic choice) and Pfeffer & Salancik (influencing the environment);
- natural selection view: this macro-view on organizations focuses on structural and demographic characteristics of populations of organizations. The available resources are present in so-called niches and are relatively intractable for individual organizations. The view is deterministic: there

is no room for choices outside these niches. Organizations do not have the ability to adapt their structure according to the requirements of the particular niche: inertia. Population ecology ideas belong to this group;

- collective action view: also at the macro-level, these theories emphasize collective survival via collaboration between organizations by means of constructing a regulated and controlled social environment as an interface with the natural environment. Inter-organizational networks exist, in which there is room for the participants to bargain, negotiate and so on.

The CT is criticized from the adjacent points of view, namely from the angle of the strategic choice and from the angle of natural selection.

The debate between CT and strategic point of view focuses on 'the strong deterministic bias that largely ignores the important variable of managerial choice' (Miles & Snow 1978, p. 259; Morgan 1989, p. 74). According to Schreyogg, the CT states that (Schreyogg 1980):

- there is only one best structure related to a specific context without a choice among alternative structures;
- the environment is considered as a given circumstance and the organization is not able to influence or control its environment;
- the organization has to achieve a certain externally determined level of economic performance to survive.

According to these remarks, management has no choice, other than to follow the external constraints for organizational survival. This CT approach proposed by Schreyogg is contrary to Child's ideas of strategic choice for the management of organizations:

- organizational decision-makers have more autonomy than suggested in the deterministic approach. There may be a variety of structures possible in the (given) environment. Not all the management choices are relevant to organizational survival;
- organizations can select niches and can change their environment (Aldrich & Pfeffer 1976, p. 90; Child 1972, p. 97). Firms try to influence governments to realize restrictions for the entry of new organizations into their markets and to stabilize market prices (Aldrich & Pfeffer 1976, p. 91). Although organizations have these opportunities, influencing their position in the environment is difficult. Entry barriers, for instance, limit organizational choice (Aldrich & Pfeffer 1976, p. 94). Influencing the state government is only possible for the big enterprises (Aldrich & Pfeffer

1976, p. 94). However, on a local scale, smaller organizations can also put pressure on their environment, such as the city councils for instance.

- organizations do not operate at the limits of their efficiency. Furthermore, economic performance is only one of the multiple points of reference for management. Besides, organizational structure might influence the performance levels, but the strength of the linkage between structural arrangements and performance variation is questionable. Therefore, managerial decision-making is not only determined by structural features (Aldrich & Pfeffer 1976, p. 90; Astley & Van de Ven 1983, p. 253; Child 1972, pp. 98-100). However, especially under heavy competition, economic performance is the bottom line, and every element that supports the performance is relevant.

Ending the criticism from the strategic choice angle, it is clear that there is room (slack) to maneuver between structural forms in organizations. Not all the structural decisions seem relevant to survival. Internal political conditions therefore become relevant to organizational decisions (Child 1972, p. 101).

The second point of criticism comes from a different perspective, namely the population-ecological theories (Pennings 1985). Where the CT gives the management the opportunity for internal changes, the population theory states that the environment only selects those populations of organizations that are congruent with the environment. This congruence makes the organizations successful (Aldrich & Pfeffer 1976, p. 81). Population ecology attacks CT, for its notion on ability of management to make structural changes in organizations. Population ecology states that survival is determined by the environment, and not by decisions of the management. Organizations are inert, and under changing conditions they are hardly (if not) able to change to a new organizational form (Pennings 1989, p. 4.1-6; see also Astley & Van de Ven 1983, p. 253). Only in situations with severe problems are there enough incentives for radical organizational redesign. In a later version of the population theory, redesign became possible but it was seen as the start of a new organization (Pennings 1989, p. 4.1-27). Therefore, we can state that management, even under this theory, can make decisions with fit as an important criterion.

The question raised by these criticisms is whether the CT should be abandoned or perhaps could be adjusted. The argument of the population ecology (it would not be possible to adjust the organization to a changing environment) has faded because of the change opportunities that are integrated within the adjusted theory. The arguments of the strategic choice can be integrated in the CT as well.

Donaldson defended the CT by admitting the presence of strategic choice and recognizing that more than one structure was appropriate under the same contingencies (Ahaus & Kastelein 1985, p. 400). Child attempted to combine strategic choice and CT by admitting that the goodness of fit may have performance implications (Astley & Van de Ven 1983, p. 253). Although Child attacked determinism and stated that organizations reach fits thanks to internal processes, the difference between strategic choice and CT is not that great (Pennings 1989, pp. 4.1.-23, 24). The reason for this deterministic bias is probably that the descriptive studies at meso-level obtained a normative value at micro-level. The fact that most organizations behave in a certain way does not mean per se that there are no other possibilities to maneuver. Volberda describes the adjustments of the CT as relaxing some of the unrealistic assumptions of the static CT (Volberda 1992, p. 55). Miles & Snow developed the neo-contingent perspective, combining the CT with the managerial role (see also dynamic CT: Volberda 1992, p. 57):

1. the managerial choice is the link between the organization and the environment (Miles & Snow 1976, pp. 260, 263). Managerial choices shape the structure (Miles & Snow 1976, p. 7);
2. the management has the ability to create, learn and manage the environment. It not only responds, but acts to create and/or enact its environment (Miles & Snow 1976, p. 5);
3. the CT encompasses the many ways to respond to environmental conditions.

The CT is not always confirmed by empirical results (Ahaus & Kastelein 1985, p. 401; Drazin & Van de Ven 1985, p. 514; Pennings 1989, pp. 4.1-18, 19). Mintzberg indicates that, although there is a lot of empirical support for the contingency theory, synthesis is still lacking (Mintzberg 1979, pp. 11-12). The reason for this is found in the lack of conceptual foundation of the concept of fit. Drazin & Van de Ven indicate that this fit, the basis for the CT, is central to the development of theory, collection of data and statistical analyses (Drazin & Van de Ven 1985, p. 515). This fit lacks a precise definition (Drazin & Van de Ven 1985, p. 514; Schoonhoven 1981: lack of clarity; Venkatraman 1989, p. 423). Therefore, a comparison between empirical results is hindered.

4.3.4 The concept of fit elaborated in the contingency theory

Basically the ideas on fit (and thus the CT) can be divided into two schools (Drazin & Van de Ven 1985, p. 519; Mintzberg 1979, p. 219).

1. A fit is a configuration of various variables clustering together (configuration hypothesis: see for instance the structural configurations in subsection 2.3.4.3)

In this first stream, the variables of, for instance, the organizational structure are related with each other (Miller 1986, pp. 235-237; Mintzberg 1979, pp. 299-304). In addition, elements of strategy and environment often join to form a small group of certain types (see also Drazin & Van de Ven 1985, p. 521; Venkatraman 1989, p. 432). There are no dependent or independent variables; every variable depends on the others. Configurations consists of mutually supportive elements. The presence of certain elements can lead to a prediction of the remaining ones. This view is called a systems view (Drazin & Van de Ven 1985, p. 519; Mintzberg 1979, p. 303). Drazin & Van de Ven found support for the systems view. It was shown that a fit between organizational variables was a significant predictor of performance (Drazin & Van de Ven 1985, pp. 534-535). This relation is first seen in the previously described work of Khandwallah in 1977.

2. A fit describes the presence of a relation between single contextual variables and structural variables (congruence hypothesis: see for instance the relations between strategy and structure in subsection 3.4.2).

The second stream deals with relating single variables of the context and the organization. The literature recognizes:

- studying the fit without examining performance implications:
  Drazin & Van de Ven state that the early CT researches the congruence between environment variables like complexity, and organizational variables like centralization, without examining the consequences for the performance (Drazin & Van de Ven 1985, p. 516). They refer to it as the selection approach, based on the terminology of population ecologists (see also Venkatraman's match approach). Nevertheless, the necessity of fit for the organization's performance becomes relevant in this way. In the selection approach, organizations survive because they fit into the environment

via a process of variation, selection and retention (Aldrich & Pfeffer 1976). This survival is an implicit indicator of good performance;

- explicitly relating the fit and the organizational performance: interaction effects between contextual and organizational variables explain the performance (see also Pennings 1989, p. 4.1-22; Schoonhoven 1981, p. 351). In this form, there is no assumption of causality between the contingency and the organizational variables; the adjustment between those variables has no clear direction (Pennings 1989, p. 4.1-21; Venkatraman 1989, p. 425) Therefore, Venkatraman's fit as mediation is not appropriate for use in this situation because the organizational variable is seen as an intervening mechanism between the contingency variable and the performance. Indeed, this approach suggests a clear order in influencing variables, as if the contingencies affect the organization, and not vice versa.

In the moderator (interaction) approach, the adjustment between several variables correlates with a higher performance. This effect is known as synergy. This joint effect is seen via interaction tests: the combination between variables leads to higher results than expected only on the basis of the single variables (Venkatraman 1989a, p. 425). Maxwell & Delaney gave the following example: only when people use diet and therapy does medicine produce a lower blood pressure (Maxwell & Delaney 1990). Another example is the effect of the fit between sun, rain and soil nutritients on the returns from crop fields (Drazin & Van de Ven 1985, p. 517). Venkatraman recognized the approach of fit as moderation as being appropriate in this situation. The fit between predictor and moderator determines the performance. Hypotheses for this kind of research state that the performance outcome is jointly determined by the interaction between predictor and moderator variables (Venkatraman 1989a, p. 426). Two kinds of analysis are suggested:

- this kind of hypotheses can be tested while using a regression analysis with interaction terms;
- analyses of variance (ANOVA) are suggested to test interaction effects (Venkatraman 1989a, p. 432). According to Drazin & Van de Ven, the use of ANOVA is the most common way (Drazin & Van de Ven 1985, p. 530). The advantage of ANOVA is the automatically generated interaction terms. This is especially handy for higher-order interactions. The advantage of regression analyses is its higher level of measurement.

> The variables in an ANOVA are measured at nominal level, and in a regression analysis at least at interval level. Therefore, the ANOVAs are weaker. However, when interaction effects are found, interaction is really present.

The empirical support for the interaction approach is mixed (Drazin & Van de Ven 1985, pp. 517, 518, 532). In some studies, the interaction effects are clear, but this is not always the case. Drazin & Van de Ven could not support the interaction approach in their research. Jauch et al. also found no significant interactions (Venkatraman 1989a, p. 428). Does this mean that the interaction approach is not valid for testing the effect of fit? Not automatically, because:

- there is the question of precise operationalization: have the theoretical variables been properly measured?
- there is the problem of multi-collinearity: the predictive and moderate variables correlate too much with each other to draw conclusions on their interaction (Drazin & Van de Ven 1985, p. 519; Venkatraman 1989a, pp. 426-427);
- there is the lack of a theoretical basis for the interaction hypotheses (Venkatraman 1989, p. 428). By using a reductionistic technique, single variables of organizations and environment are analyzed, without taking the internal consistency between variables of a single construct as a theoretical point of departure (Drazin & Van de Ven 1985, p. 519; Venkatraman 1989, p. 432). This third problem can be solved by combining the configurational and congruence approaches (see for instance the extended configuration hypothesis: effective structuring requires a consistency among the design parameters and contingency factors: Mintzberg 1979, p. 220).

  Research should start with recognizing 'Gestalts' for the variables selected. These configurations are theoretically based (see for instance: Leifer 1988; Miller 1986; Mintzberg 1979). Based on those configurations, concrete hypotheses are designed, relating the appropriate contextual variables and organizational variables. Starting with configurations, the most reasonable fits are logically aligned and researched. If the interaction tests were to detect fits, then these findings would be of a great practical value. The interaction approach can be used as a support for the systems approach (Drazin & Van de Ven 1985, p. 523).

4.3.5 Conclusion

Looking at the CT in the field of Organization Studies, the following features become clear:

1. the contingencies and the organizational variables have to be in balance for a good performance of the firm;
2. the relations between the variables are based on aspects of organizational functioning;
3. the CT used to state that contextual factors affected organizational factors. The distinction between contingency variables and organizational variables has become less relevant because there is no clear causal direction. The relationship between contingencies and organizational factors is reciprocal (Ciborra 1991, p. 285; Hall & Saias 1980, p. 261; Miles & Snow 1978, p. 8; Miller 1988, p. 281). Organizations also influence their environment, and structure also determines strategy;
4. it is the task of the management of the organization to find situations of balance (fit). The management has the possibility to make strategic choices concerning the contingencies and the organizational factors. Child states that there is slack for choices, and that therefore internal processes are relevant (Child 1972);
5. there is no single best way of organizing, sometimes not even under the same contingencies. Within the current contingencies, there are more situations in balance. There is also slack available in the organization in order to maneuver around a situation of balance (fit).

The CT makes clear that a number of variables have to be studied on their mutual relationships in order to understand organizational functioning, and offers methods to study this claim.

4.4 CONCLUSION ON MULTI-VARIATE RESEARCH

Comparing the CT and SISP, the following similarities appear:

- the fit between a number of variables is important for the organizational performance;
- theories on the CT and SISP developed from one-way mechanism to mutually-influencing mechanisms;

- managerial choices on business processes are seen as enablers for the final values of the variables;
- there is no one single fit, not even under the same contingencies. There is slack in the organizations to choose between different situations, thus political considerations are important as well.

Both schools of thought introduce the relationship between several variables at the same moment. The CT, however, operationalized the fit concept that resides implicitly in the SISP ideas. The fit mechanism as proposed in the Organizational Studies literature, can be used to test the SISP fit empirically. Via the SISP fit, the three variables are integrated into one research design. The next chapter is devoted to that integration.

CHAPTER 5

RESEARCH MODEL: RELATING THE THREE VARIABLES IT, COMPETITIVE STRATEGY AND ORGANIZATIONAL STRUCTURE

5.1 INTRODUCTION

The multi-variate theories discussed in chapter 4 are rather abstract in their nature, and their practical relevance can be relativized. However, they form a useful starting point for the development of a testable model that integrates organizational variables and IT.

At this point, we are able to present the research model for explaining competitive advantage by the use of IT. Firstly, the level of research is determined. This choice determines the domain about which conclusions can be drawn, and forms a constraint for the kind of variables to be used. A brief recollection of the relevant arguments, which have been discussed in the previous chapters, starts the development of the research model. Integrating the bi-variate studies with the multi-variate ideas, a research model emerges in which the three variables IT, strategy and structure can be studied at the same time. This main part of the final model, consisting of related operationalized variables, is then presented. Following that, research is carried out into whether or not empirical studies of this model have been made. Using the model, the research questions can be stated and the accompanying hypotheses, based on the final research model, are formulated.

5.2 LEVEL OF ANALYSIS: THE MESO-LEVEL OF ORGANIZATIONAL RESEARCH

Researches in the field of Organization Studies and Information Systems require a clear choice of the level of analysis (Markus & Robey 1988, p. 594; Pennings 1989, p. 4.1-21; Pfeffer 1982, p. 13). Two levels of analysis are usually distinguished, the macro-level and the micro-level (Markus & Robey 1988, p. 593):

- research at the macro-level makes statements about societies (on economic

growth issues for example) or populations of organizations (like the rise and fall of certain industries). The studies at this level make use of aggregate data on organizations or households without paying further specific attention to these institutions, which are seen as atomic objects, or black boxes;
- research at the micro-level aims at understanding phenomena of groups of people (such as decision processes), and studies features of individuals (their skills or experience for instance).

The meso-level is in-between, indicating research that is aimed at understanding general features of organizations (their structure, their performance) via the use of data of features of individual organizations (their level of centralization, the performance).

Research on all of these levels is legitimate, but a choice still has to be made between them. Considering the attention for the strategic consequences of the usage of IT for individual organizations, the meso-level is appropriate (see Chan & Huff 1992, p. 193). Therefore:
- the focus is aimed at the organizational IT, and not at the separate information systems (see 2.3.2.2 and 2.3.2.3);
- the individual organizations are units of analysis (see also Leifer 1988, p. 67; Pennings 1984, p. 345).

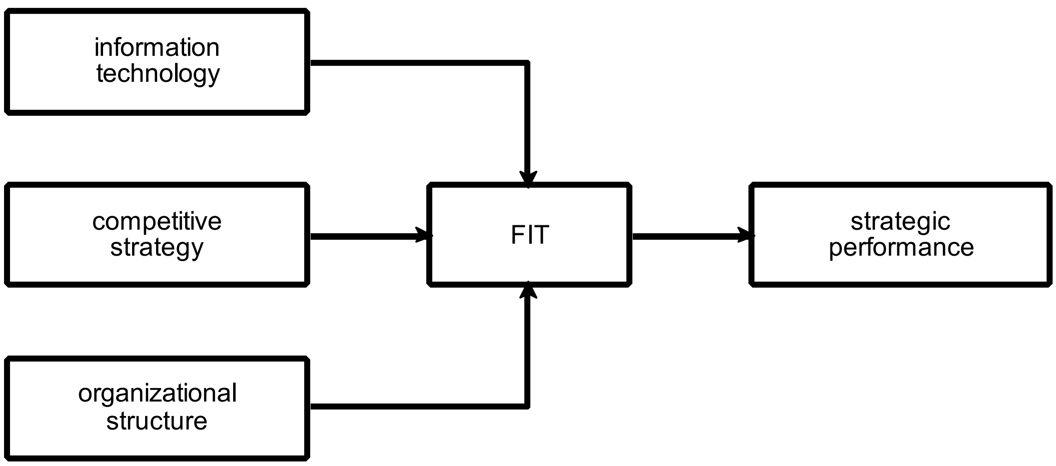
5.3 RECOLLECTION OF THE ARGUMENT

The goal of this research is to get more insight into the competitive usage of IT. First we studied the IT as the only relevant variable for strategic success (univariate research). However, IT as a separate factor did not offer much explanation. The same observation was made for other theoretically important variables in the organizational literature, competitive strategy and organizational structure. Obviously one variable cannot explain much variance in the competitive position (content research).

Hence we decided to study the organization from more than one angle, and we researched the effect of IT in relation with competitive strategy or organizational structure (bi-variate research). An important aspect of these variables was their relation with IT via the business processes of organizations. We concluded that these variables related very well (congruence reasons), but that the overall results were still shallow and also inconsistent. These drawbacks are partly caused by different measures, but could also be influenced because by the neglect of a third variable.

Therefore, we asked the logical question whether it was relevant to relate the three variables in one research design (see Figure 5.1). The theoretical answer seems confirmative because in the SISP models, several variables are related simultaneously for organizational success as well. Relating the three variables IT, competitive strategy and organizational structure, is a test of the conceptual SISP models, especially because we aimed our attention at the realized organizational situation and not only at the intended policies.

Figure 5.1 PRELIMINARY THEORETICAL RESEARCH MODEL: THE STRATEGIC PERFORMANCE IS DEPENDENT ON THE FIT BETWEEN IT, COMPETITIVE STRATEGY AND ORGANIZATIONAL STRUCTURE



Two matters would be solved if this type of test proved to be successful:

- the SISP claim (several variables have to be studied at the same time for insight into the successful use of IT) would be empirically confirmed. So far, the fit is still conceptual in the (SISP) literature. That means that the variables used are not operationalized. Therefore (comparative) surveys on the effect of the models, in which more than two variables are linked, have not yet been performed. We need a test of a multi-variate model to test the relevance of the fit of the different variables for the exploitation of the competitive opportunities of IT;
- inconsistencies in bi-variate researches would be partly explained by the

moderating role of the third variable.

We see that the SISP researches and bi-variate researches would both profit from research relating the three variables. This is possible for two reasons:

- the measurements allow a logical linkage between the three variables;
- the relations between the variables share the same (SISP) characteristics:
  - the adjustment between organizational and technological variables affects the performance of the organization. The fit causes a synergetic effect;
  - management must have intentions for the future direction of strategy, structure and IT, taking into account the present relation between them;
  - the business functions of the organization play an important role in the managerial decision-making: the goals, coordination and support of business functions should be in line. In this research the business functions themselves will not be measured; they are seen as an abstractly intervening concept between the variables measured (see for instance Egelhoff 1982, p. 436);
  - the variables mutually influence each other;
  - there is slack in organizations for more configurations, even under the same contingencies. That means that not all the choices are important for survival, and that there is no single best fit.

The question remains as to whether the effect of a fourth, fifth (and so on) variable should not be studied as well. Our answer is negative. The claim of our research, based on the concept of the SISP models, is that for clear insights into organizational issues, several organizational and technological variables and their interrelations should be studied simultaneously with regard to their effects. This claim puts into perspective the uni-variate and bi-variate approaches in their explanation of strategic performance. Such research can be performed successfully with three variables, and repetitions by adding more variables are not necessary to support this claim further. The relevant question is which variables to choose. In theory, to reach total insight, all variables should be considered. In practice, it is impossible to take all the possible organizational variables into consideration. Therefore, a theoretical model of research variables is developed, based on a theoretical exercise that makes it plausible that the relations between the variables used have a significant influence on the dependent variable, i.e. the competitive position. In our research, the plausibility lies in:

- the congruence logic between IT, strategy and structure as expressed in the bi-variate researches, and the fact that the variables are conceptually related in the SISP models

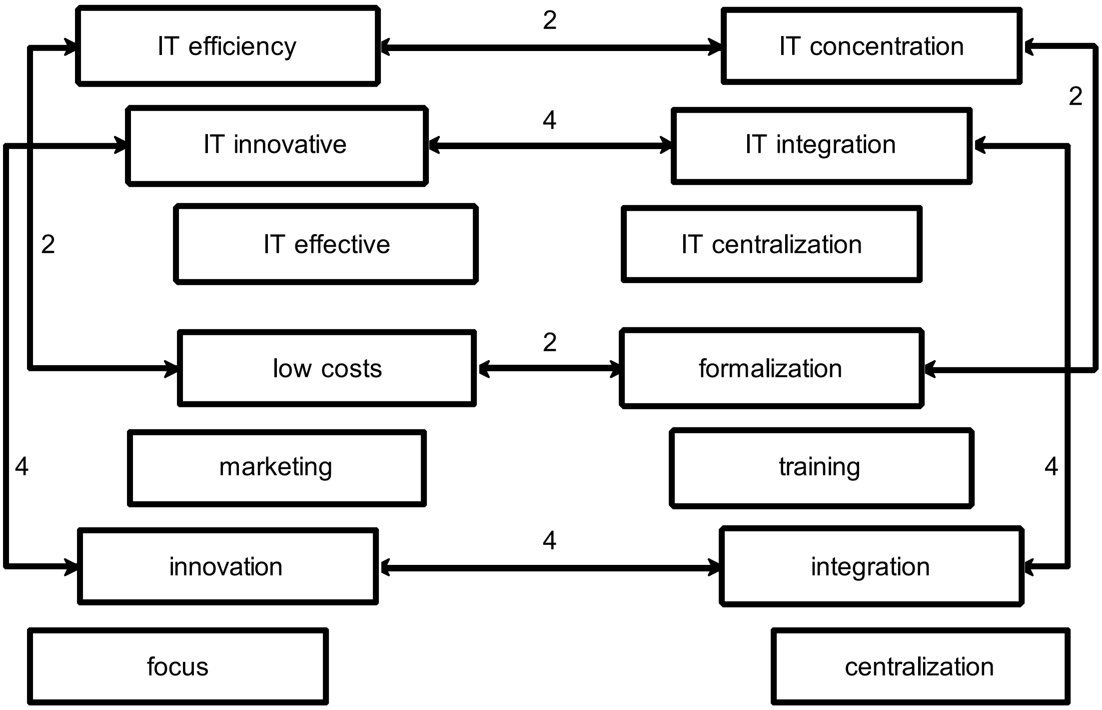
- the similar conditions of the bi-variate studies and the SISP models.

5.4 RELATING IT, COMPETITIVE STRATEGY AND ORGANIZATIONAL STRUCTURE: CONNECTING DIMENSIONS AND CONFIGURATIONS

Using our approach, an extensive organizational context is taken into account in researching the strategic opportunities of IT. The three variables can be linked into one model. This model can define (fitting) states between the three variables. The hypothesis is that organizations in fitting states function better than organizations without a fit. This should be reflected in the significantly higher performance: the indicator for strategic IT usage. If this hypothesis is confirmed, then it is proven that relating a number of variables is necessary to gain insight into the strategic utilization of IT.

The heart of the final research model is based on relations between IT, strategy and structure. We shall not go into detail about the interrelations between the dimensions. This is comprehensively treated in the configuration parts of chapter 2 (section 2.3) and congruence parts of chapter 3 (subsections 3.2.2, 3.3.2 and 3.4.2). Instead, a scheme (Figure 5.2) is presented, in which two standard types (the following types 2 and 4) are visualized.

Figure 5.2 FINAL CONFIGURATION AND CONGRUENCE SCHEME FOR IT, STRATEGY AND STRUCTURE



All the configurational and congruence constructions result in only eight possible IT - strategy - structure types in which there is consistency between the variables. We shall give short descriptions of the eight types.

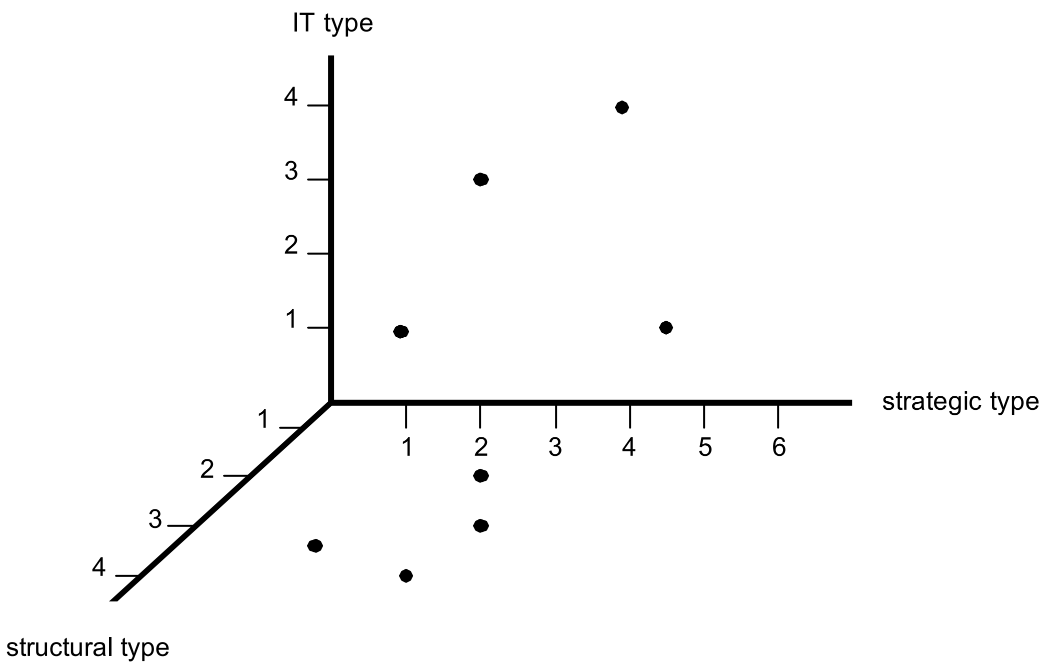
1. Niche marketers with simple structure with unconnected IT: e.g. starting entrepreneurs.
   In these small organizations, the centralization is remarkably high. The CEO decides on all the important actions, and he aims at effectiveness. Marketing differentiation in one segment enables this centralization. Unconnected IT plays a general role for the support of the standard operations and their management.
2. Cost leaders with machine bureaucracy with concentrated IT: e.g. producers of bulk goods, social security offices.
   These organizations compete via the lowest costs and use a highly formal and regular production process. Concentrated IT with central processing supports the efficiency of the production process and the supportive administration.
3. Marketers with professional bureaucracy with distributed IT: e.g. specialized accountancy offices, university hospitals.
   Adding value to standard products can demand high quality and

complexity. For these organizations, training (and thus decentralization) is demanded. The organizations can be large, so that besides IT effectiveness (with local processing) also IT efficiency (with central processing) is appropriate.

4. Innovators with adhocracy with decentralized IT: e.g. innovative advertizing agencies, architectural firms.
   Competing via offering the state-of-the-art products requires an innovative mentality aimed at continually developing new processes, products and services. Hence cooperation between highly skilled operators is a necessity. The integrative and innovative potential values of IT can be used perfectly in these organizations.
5. Marketers with simple structure with unconnected IT: e.g. larger entrepreneurs.
   Growing niche marketers can deliver to more market segments (lower focus). As long as the complexity stays controllable for one person, direct supervision is the coordinating mechanism. The IT is still not needed for efficiency reasons.
6. Low costs marketers with machine bureaucracy with concentrated IT: e.g. larger formalized organizations.
   If the efficiency of the production process is not disturbed, differentiation can be a supportive means of competing for large low costs organizations. Concentrated IT is suitable for these organizations; differentiation is less important than efficiency.
7. Low costs marketers with machine bureaucracy with distributed IT: e.g. larger formalized organizations.
   IT that offers more capabilities can also be used by 'low costs marketers with machine bureaucracies'. In that situation, more value is already given to professional task performance, still without giving up the efficiency advantages.
8. Niche innovators with adhocracy with decentralized IT: e.g. specialized research and consultancy firms.
   When enough innovative absorption potential is present in certain market segments, innovators can allow themselves to compete at (only) one of those segments: focus.

The combinations of these types are determined by the configurational and congruence constraints. These are represented in Figure 5.3.

Figure 5.3 RELATING IT TYPES, STRATEGIC TYPES AND STRUCTURAL TYPES



The relation between IT, strategy and structure, directed by SISP, is hypothesized as being important to the competitive position. This hypothesis is rooted in the idea that IT must be related with several organizational variables in order to get insight into its exploitation. This idea is operationalized and tested via measurement, and therefore variables had to be chosen. If it can be demonstrated empirically that interaction between these three variables significantly influences the competitive position, two things will be indicated:

- conceptual models containing variables like IT, strategy, structure and so on are useful. Practitioners are given assistance in using those models via the operationalization in this study;
- the influence of IT related with strategy or structure, is distorted by the third variable that functions as a moderator. This causes inconsistency between the bi-variate researches (Maxwell & Delaney 1990, p. 327).

5.5 RESEARCH ON THE STRATEGIC IMPACT OF IT, COMPETITIVE STRATEGY AND ORGANIZATIONAL STRUCTURE

Some preliminary attempts have been realized to combine the three variables. As early as 1980, Buchanan & Linowes stated that information systems should match a company's strategy and structure (Buchanan & Linowes 1980, p. 145). They recognized that the key to the design for organizations was not only the match between strategy and structure, but also the more complex match involving strategy, structure and administrative systems, embodied in the IT. The IT assists the management in controlling (performing) and coordinating the organization's value chain activities. They also saw the impact role of IT. It not only supported organizational structure, it was also an enabler in making it more elaborate.

Also in the study of Broadbent & Weill, three aspects of the organizational structure were important in linking business and information strategies (Broadbent & Weill 1991, p. 300):

- the organizational structure that complemented strategy;
- decision-making processes appropriate to strategic orientation;
- accountabilities appropriate to strategic orientation.

Comments

Both studies did not mutually relate the fit and the strategic performance by comparing many organizations in a survey. The empirical body of knowledge concerning this relation is very small. With this research, we want to supplement this knowledge.

5.6 ULTIMATE RESEARCH GOAL AND RESEARCH QUESTIONS

Now that we have developed the theoretical model, it is possible to further specify the preliminary research goal and to state the research questions required.

In chapter 1, it became clear that the expensive IT offered strategic opportunities, but that these opportunities were difficult to realize. Another observation was that the existence of SISP offered no guarantee for realizing competitive advantages with IT. Therefore the preliminary research goal was stated as follows: to gain insight into the strategic usage of IT.

In this chapter, the usage of IT (and not the level of IT investments) in the organization is viewed as crucial for exploring the strategic effect of IT on the organization. Considering the relevance of fit in organizational and information systems research, the usage is described by the fit between IT and organizational variables. So far, this fit has not been made explicit. This raises questions like:

- how can the fit between IT and organizational variables be measured?
- how does a fit relate to the competitive position of the organization?

The relations between only two variables like strategy - IT and structure - IT were studied in the literature, but the results were not consistent. It seemed only logical to relate the three variables within one study.

Also in this chapter, the role of the managerial decision-making is viewed as necessary for finding an IT - organization fit. Not only is a consistent policy needed on this matter, but the IT management needs the commitment of the top and line management to support IT development, implementation and IT usage in the organization.

Research goal

Via these two angles (IT - organization fit, managerial guidance and commitment) the preliminary research goal can be detailed in the final goal. The mismatch between organization and IT hampers realizing the strategic opportunities. This may result in a decreasing commitment from the management, which would trouble further IT investments and IT usage. Finding a good match is a complex problem. This research wants to deal with that problem by concretizing relevant organizational variables and IT.

Therefore, the research goal is stated as:

> the finding of concrete fits between IT, strategy and structure as targets for the management of organizations to use IT strategically. Via these targets, the use of SISP can be concretized.

Research questions

To reach the research goal, it is necessary to discover fits between IT, strategy and structure that are really successful. This notion leads to the first research question.

1. Do fits between IT, competitive strategy and organizational structure have a positive effect on the realization of the strategic opportunities of IT?

Furthermore, it is important to know if organizations generally find themselves in situations in which these fits occur. This would mean that the opportunities of IT are generally used well.

2. Are organizations relatively often situated in those balanced fit situations?

If this is not the case, then organizations need insight into strategic IT usage. SISP can be a useful instrument to search for the right usage of IT.

3. Does the existence of mature SISP have a positive effect on the presence of organizations in those balanced fit situations?

If the answer is negative, then SISP should be abandoned as a useful instrument or should be improved with new conceptual and/or practical insights. For this third question, the research model is slightly extended to research the origin of the fits between the variables (see Figure 5.4: Final theoretical research model).

5.7 ULTIMATE RESEARCH MODEL AND HYPOTHESES

The hypotheses give the expected answers to the research questions based on the theoretical model (Verschuren 1988, p. 126). Together they form the research model under scrutiny.

Hypothesis 1. Fits between IT, competitive strategy and organizational structure have a positive effect on the realization of the strategic opportunities of IT.

The model gives eight appropriate states backed by arguments from the CT, SISP and the bi-variate researches. It is expected that organizations in one of these states of fit have a significantly higher strategic performance than organizations in other states. By using the 8 states, Hypothesis 1 can be split up into 8 partial hypotheses.

1.1 Niche marketers with simple structure with unconnected IT have a high strategic performance.
1.2 Cost leaders with machine bureaucracy with concentrated IT have a high strategic performance.
1.3 Marketers with professional bureaucracy with distributed IT have a high strategic performance.
1.4 Innovators with adhocracy with decentralized IT have a high strategic

performance.

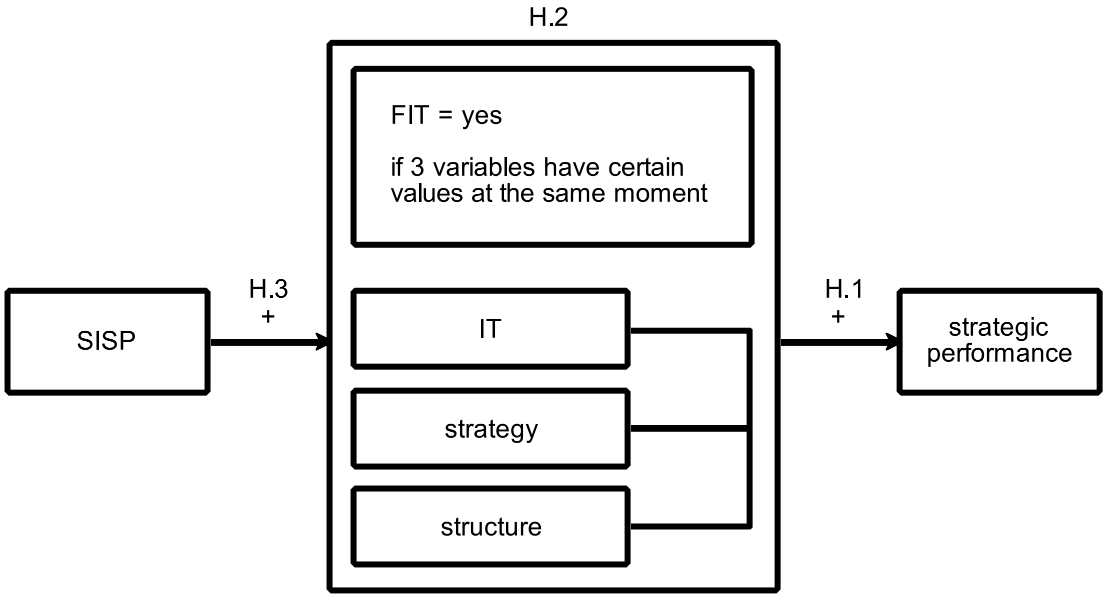
1.5 Marketers with simple structure with unconnected IT have a high strategic performance.
1.6 Low costs marketers with machine bureaucracy with concentrated IT have a high strategic performance.
1.7 Low costs marketers with machine bureaucracy with distributed IT have a high strategic performance.
1.8 Niche innovators with adhocracy with decentralized IT have a high strategic performance.

Hypothesis 2. Organizations are not relatively often situated in those balanced fit situations.

In the first chapter, it was outlined that the exploitation of IT was generally disappointing. This means that organizations probably do not exploit their strategic IT opportunities. It can be expected , based on dispersion of the values of the organizations' variables IT, competitive strategy and organizational structure that organizations will not be present significantly more in the eight fits of the model than in the surrounding states.

Hypothesis 3. The existence of mature SISP has a positive effect on the presence of organizations in those balanced fit situations.

Figure 5.4 FINAL THEORETICAL RESEARCH MODEL



The current perspective of SISP is that of a managerial instrument that not only considers the (automation of the) information services but also the role of the organizational aspects. Will this approach be more successful than the traditional ones? Earl found some preliminarily positive results for this model which he calls the Organizational Approach. Organizational members of various departments work together in interdisciplinary teams and develop a shared opinion on feasible information systems. The approach does not exactly prescribe a method, but lets the SISP evolve during the implementation. The process is incremental, but planning still happens (Earl 1993, p 11). In this approach, IT and the organizational aspects are seen as being mutually influencing, related via the business functions of the value chain and directed by SISP as a managerial decision-making instrument. Therefore, it is expected that this SISP will be successful. This means, for each of the eight favorable states, that organizations using SISP will be significantly more often situated in these fits than in the surrounding states.

To test the hypotheses we shall first (further) operationalize the different variables. Then the differences in competitive positions of organizations can be compared with the differences in the various fits. In the next chapter, we shall describe this operationalization and the analyses needed.

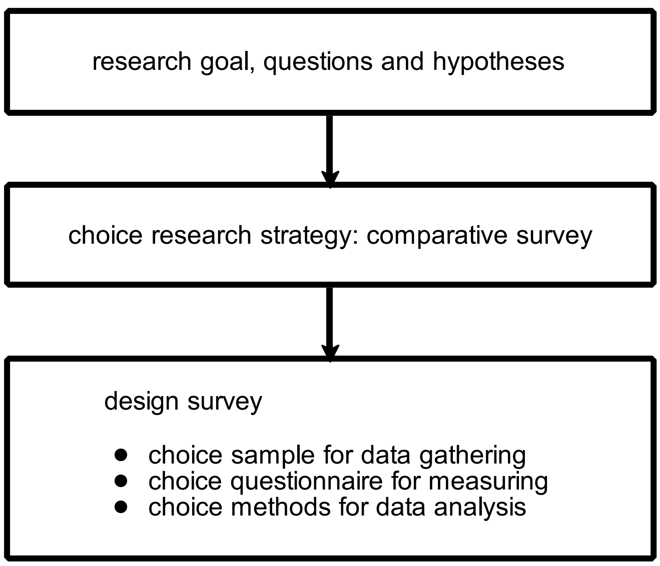
CHAPTER 6

METHOD OF RESEARCH

6.1 INTRODUCTION

This sixth chapter deals with the method of research that conducted to reach the research goal by answering the research questions, as stated in section 5.6. In this way the hypotheses are tested (section 5.7). The method of research is a plan that relates the research questions with concrete research activities like the gathering and analyzing of data (Van der Zwaan 1990, p. 21).

Figure 6.1 RESEARCH DESIGN



This chapter begins, in section 6.2, with the selection of an appropriate research strategy. Having established the comparative survey as a feasible strategy, the chapter further discusses the design of the survey. The following section 6.3 handles issues like population, sample and response of the survey (Swanborn 1984, p. 271). In this context, a questionnaire is used as a research instrument (section 6.4). This questionnaire contains the operationalized concepts based on the definitions of the concepts. Also the reliability and validity of the questionnaire are discussed in section 6.4. The chapter concludes with the scheme of analyses necessary for the testing of hypotheses, as depicted in section 6.5.

6.2 RESEARCH STRATEGY

6.2.1 Introduction

The research strategy is the basic approach for the data-gathering necessary to answer the research questions and to test the hypotheses. Data from several organizations were necessary to test the hypotheses concerning the various fits of IT, competitive strategy and organizational structure. A primary data collection was needed because these data were not yet available. Experiments, surveys, case-studies and simulation are well-known research strategies that could be used for the gathering of these primary data.

We describe these strategies as a basis for the choice between them, and start by explaining the experiment. The experiment depicts the basic structure of reasoning in causal theory testing-research, which is also needed in the light of our research questions (Swanborn 1984, p. 276; Van der Zwaan 1990, p. 55). Subsequently characteristics of other research strategies that are in line with experimental research, like case studies and surveys, are also presented. These other strategies are discussed because straight experimental research proved to be impossible. It was, however, not our aim to give a comprehensive picture of all the research methods possible, but to explore several approaches before choosing an appropriate one. Therefore, we continue with criteria for a choice between the research strategies, and finish with the research strategy selected.

6.2.2 The experimental approach: the line of reasoning in theory-testing research

Researchers are interested in finding explanations for phenomena. For these explanations, causal relations have to be hypothesized and tested. A causal relation refers to the situation where change in an independent 'treatment' variable 'causes' variation in another dependent 'outcome' variable. In 1979, Cook & Campbell wrote an influential book about the subject of studying causal relations in experimental and especially in quasi-experimental research. We follow their argument, backed by the works of several other authors, because of its relevance for our research where we apply ideas from quasi-experimental research. We start by presenting the features and conditions of straight experimental research, and explain why this research strategy is not possible. Then we state possible quasi-experimental designs that can also be used for the theory-testing research. One of these designs forms the basis for the later choice of an appropriate research strategy.

To study the causal relation between independent and dependent variables, one needs to compare variation in them to find a relation (Cook & Campbell 1979, p. 4). The presence of a (statistical) relation between these research variables is necessary but not sufficient for causality. Another important issue is that explanations other than those offered by the theory have to be ruled out. The impact of other variables can result in spurious relations between the research variables (Swanborn 1984, p. 329). This influence of those other variables should be controlled (eliminated) via the design of the research (Cook & Campbell 1979, p. 5; Swanborn 1984, p. 287).

The conditions for causality are the following (Swanborn 1984, pp. 84-86, 324-326):

1. there must be a statistical relation between the research variables;
2. the change in the independent variable (the treatment) must precede the change in the dependent variable (the outcome);
3. the relation between the research variables must not occur due to common causes.

The experiment is known as the classical strategy, which offers the opportunities to rule out the threats to valid conclusions (Cook & Campbell 1979, p. 8; Swanborn 1984, p. 273; Van der Zwaan 1990, pp. 54-55). It starts with the development of a well-formulated theory. This holds a clear set of propositions and conditions within which the propositions are believed to be true (Yin 1989, p. 47). The design of the experiment starts with the choice of research objects based on these conditions. This is followed by a test to confirm or reject the theory. To eliminate the influence of other variables, experiments offer control by means of the following three mechanisms.

1. Pretest and posttest measurements.

   Deliberate manipulation (the treatment) of an independent variable offers insight into the effect of this variable on other (dependent) variables (Cook & Campbell 1979, pp. 3-4; Swanborn 1984, p. 288). This manipulation is normally active and artificial. However, not every variable can be manipulated artificially (e.g. age). By means of an (experimental) evaluation, the influence of independent variables can be assessed as well (Van der Zwaan 1990, p. 105).

2. Comparing experimental and control groups.
   The dependent variables can always change in time due to reasons other than the treatment alone. This autonomous change, and therefore the influence of the independent variable, becomes clearer via the design of control groups next to the experimental groups (Swanborn 1984, pp. 273, 285, 287; Van der Zwaan 1990, p. 54). The design of experimental and control groups can also be applied in surveys and cases (Yin 1989, pp. 53-54; Van der Zwaan 1990, pp. 84, 87).
3. Random assignment.
   The first two mechanisms give insight into the impact of the treatment. They do not eliminate all the influence of other variables. Variables other than the anticipated and controlled ones could account for changes in the outcomes as well. For a fair comparison between the experimental and the control groups, random assignment must be used (Cook & Campbell 1979, p. 5; Swanborn 1984, p. 287). This results in a ceteris paribus situation, meaning that the values of all variables other than the researched ones are equal on the average. This random assignment can be supported by matching certain variables (Swanborn 1984, p. 290). The internal validity is protected by means of these control mechanisms (see subsection 6.4.3: Validity and reliability). This means that the change in the dependent variable can really be attributed to the change in the independent variable (Van der Zwaan 1990, p. 57).

The design of experiments is based on these three conditions. However, it happens sometimes that the situation obstructs this experimental design. Suppose one wants to study the effect of measures in organizations (Swanborn 1984, p. 301). Researchers could be involved after the effectuation of these measures has taken place. Then, only the possibility for evaluation remains, because active manipulation is no longer possible. A further problem would be the lack of information on the situation prior to the effectuation of the measures. But even if there were pretest information, and experimental groups and control groups to compare the effect of the measures were be available, the assignment of the research object to the groups would still not be random because the measures were effectuated before the assignment took place.

The questions mentioned, regarding the relation between measures and their results, can be studied using quasi-experimental designs (Cook & Campbell 1979, p. 95). In our research, it was not possible to manipulate the variables consisting of IT, competitive strategy and organizational structure; therefore, we needed an adjusted design. In order to justify a choice between the quasi-experimental designs, we briefly discuss four of them. The first three quasi-experimental designs (sometimes referred to as pre-experimental designs) often do not offer sufficient control for causal hypotheses because they fail to rule out alternative interpretations (Baarda & De Goede 1990, p. 78). They offer less control compared with the 'real' experimental situation. Only the experimental design rules out all the threats to internal validity (Cook & Campbell 1979, p. 96).

X = experiment
O = observation

1. One-group Posttest-Only Design (Cook & Campbell 1979, p. 96; Swanborn 1984, p. 281)

   X O

   - manipulation of independent variable without pretest (e.g. a policy measure);
   - no control group;
   - no random assignment.

2. Posttest-Only Design with Nonequivalent groups (Cook & Campbell 1979, p. 98; Swanborn 1984, p. 282)

   X O (experimental group)

   O (control group)

   - manipulation of independent variable without pretest;
   - experimental group (organizations with a policy measure) and a control group (organizations where no policy measures are taken);
   - no random assignment: the experimental and control groups already

exist so that they are non-equivalent on other variables.

3. One-group Pretest Posttest Design (Cook & Campbell, p. 99; Swanborn, p. 285)

   O X O

   - manipulation of independent variable with pretest;
   - no control group nor random assignment.

The fourth quasi-experimental design is frequently used in social science research and combines 2. and 3. (Cook & Campbell 1979, p. 103; Swanborn 1984, p. 285). It rules out more threats to internal validity than the first three and only differs from experimental designs by the lack of random assignment (Swanborn 1984, p. 297; Nijdam & Van Buren 1980, p. 625).

4. Untreated Control Group design with Pretest and Posttest (Cook & Campbell 1979, p. 104; Swanborn 1984, p. 285).

   O X O

   O   O

   - manipulation of independent variable with pretest;
   - experimental group and control groups;
   - no random assignment: the experimental and control groups already exist.

6.2.3 Other research strategies: case studies, surveys and simulation

Now that we have introduced causal reasoning via the experimental approach, the other research strategies can also be discussed. Case studies are often used for exploratory research, aimed at developing a theory. But cases can also be used in an experimental way to test theories. Firstly, the theory has to be developed. Then cases are selected, based on the conditions under which the theory is believed to be true. If the results of the case follow the predictions of the theory, these results are said to be generalized to the theory under the restricting theoretical conditions mentioned (Yin 1989, pp. 21, 38, 44). This is called analytic generalization. Case studies as a research strategy for testing theories have a quasi-experimental design. Therefore, the disadvantage is that other explanations cannot be ruled out, because of the lack of controlling additional variables.

Surveys may also have quasi-experimental design features (Van der Zwaan 1990, pp. 84, 106-107, 125-128). Surveys, just like case studies often used for exploration, offer opportunities for theory-testing (Swanborn 1984, pp. 274, 323). Their main deviation from the process of experiment is the passive character of the 'treatment' because they survey non-experimental data (Van der Zwaan 1990, p. 105).

Simulation is another method of research (Bosman 1977, pp. 169, 175). This method also offers the opportunity for theory development and testing. It starts with the formulation of possible explanations of research problems (Boersma et al. 1995, pp. 42, 45). The core of simulation research is the making of the model that specifies the variables and their relations. This model should be representative for the 'real-life' system. Relevant variables have to be chosen, represented and estimated for a correct structure of the model (Boersma et al. 1995, pp. 150-151). Empirical data are mostly preferred in the development of this type of a model but stochastically generated data are also usable (Frowein 1990, pp. 109-110). After the model has been developed and translated into a computer program, experts tests and experiments could be used to validate or test the model. If the model is found to be valid, it can be used for explaining and forecasting the behavior of the 'real-life' system (Boersma et al. 1995, p. 42).

Simulation is a rather deviant method of research compared with the methods already mentioned. When simulating, the researcher independently manipulates an artificial model of the reality (Van der Zwaan 1990, p. 89). This method does not fit into the line of experiments, quasi-experiments, surveys and case studies, where the researcher always relates the (artificial) model and the (empirical) data.

6.2.4 Criteria for selecting between the different research strategies

Now that the characteristics of various research strategies have been stated, the criteria for the choice between them are discussed. Then it can be explained which strategy had to be used in a particular case. Two criteria are distinguished for choosing a research strategy.

The first criterion is the nature of the research questions and the state of the theory development on the object of study (Swanborn 1984, pp. 133, 272; Yin 1989, pp. 17-18; Van der Zwaan 1990, p. 42). These questions can be aimed at:

- exploration and theory development;
  if there is little theory available on phenomena, researchers start to gather data. This material is analyzed, based on vague assumptions, to find a structure in the data. This is the first step towards theory development (Swanborn 1984, p. 133). In this explorative research, all kinds of factors and the relations between them are researched (Van der Zwaan 1990, p. 43). The following research strategies are feasible for this gathering of data:
  - cases (explorative): many variables, fewer research objects;
  - surveys: average number of variables, many research objects;
  - simulation: average number of variables, fewer research objects;
- explanation and theory testing;
  if there is a theory available on the phenomenon under study, hypotheses are deduced. These hypotheses are tested to check the validity of the theory. The following research strategies are appropriate for the testing of the theory (Van der Zwaan 1990, pp. 43-44):
  - experiments: fewer variables, average number of research objects;
  - cases (explanative): fewer variables, fewer research objects;
  - surveys: average number of variables, many research objects (comparative: Swanborn 1984, pp. 274, 323; Van der Zwaan 1990, p. 84);
  - simulation: average number of variables, fewer research objects.

In research, the borders between exploration and explanation are fuzzy. In practice, there are no perfectly finished theories to explain problems. Often exploration has to take place, followed by a testing approach. Yet there is a fundamental difference. In the case of exploration, theoretical statements may be founded on data which are more or less coincidental, dependent on the situation researched. In the case of explanation, there is already a theory available which is the result of earlier patterns in the data. If these are confirmed again, the role of coincidence is smaller.

The second criterion is formed by the required data (Swanborn 1984, p. 273; Yin 1989, pp. 19-20). In experiments, one needs to manipulate the independent variables. Sometimes this manipulation is not possible (age, nationality, established policy measures). Then a survey, case or simulation is possible instead (Swanborn 1984, p. 323). The ability to control other variables, however, is smaller than in the experimental situation.

6.2.5 The selection of the survey as an appropriate research strategy

The two criteria mentioned above in subsection 6.2.4 were applied as follows:

1. The research questions have a mixed explorative and testing character. In advance there was (SISP) theory available about the fit between different variables. This theory was rather conceptual, meaning that the various variables were not operationalized. Based on parts of empirical uni-variate and bi-variate research, we defined a theoretical model in which variables could be assigned several values (see sections 5.4 and 5.7). Firstly, the various instances of the model had to be become tangible. For this, data from several organizations were necessary. Next, the different fits had to be compared in order to test whether the fits were as favorable as predicted.
2. The required data cannot be manipulated. If our research could distinguish fit situations from non-fit situations, the management of organizations would be interested in influencing the state of the organizational affairs to get into a fit situation. However, during the time of our research, organizations could not be manipulated into fit situations. Therefore, it was decided to perform an evaluative study to investigate the hypothesized effect.

Case studies, experiments, surveys and simulations all offer possibilities for the combination of explorative and testing research.

The conceptual theories did not offer enough material to specify a usable model for simulation. The availability of the proper empirical (or stochastic) data is a crucial condition to develop the model for simulation. At the start of this research, we lacked the data to choose and operationalize the relevant variables, so that we were not able to specify a detailed simulation model. At the end of this research we had more insight into choosing and estimating the right variables for the strategic usage of IT. Further research may be in a better starting position to develop a model for simulation.

Experiments were not possible because of the problem of manipulation and random assignment, and cases could only offer one match a case.
A survey appeared to be a proper research design, because it would offer the oppor-

tunity to collect data from many organizations, resulting in a broad overview of matches, and also in the ability to test the theory by comparing the effect of fit and non-fit groups.

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   fit    O
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   fit    O
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    . .

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 no fit   O
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 no fit   O
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This survey design is normally not sufficient, because alternative causes cannot be ruled out (Cook & Campbell 1979, pp. 95-96). However, via elaboration, the possible effect of other variables can be controlled expost. Although the design is not optimal, it does support the theories under scrutiny (Swanborn 1984, p. 326; Yin 1989, p. 47). The design of the comparative, evaluative survey resembles the Posttest-Only Design with Nonequivalent groups (Van der Zwaan 1990, p. 128):

1. there is no treatment, but an ex post evaluation;
2. there are quasi-experimental and control groups, namely the organizations which have and have not taken certain measures;
3. there is no random assignment.

The survey was a proper method to explore and to test the relations between IT, strategy and structure, and their impact on the competitive position. The next sub-section is devoted to the design of the survey.

6.3 SAMPLE

6.3.1 Population: organizations in information-intensive industries

Empirical research objects were necessary to test the theory. In this study, these objects were the organizations of particular industries. There were several criteria for the selection of these organizations.

The first criterion was related with the IT usage of organizations. Sabherwal & King observed that the information-intensity of industries was positively related with the size of competitive advantage caused by IT applications (Sabherwal & King 1991, pp. 198, 201). Firms in information-intensive industries are able to gain a higher competitive advantage with IT because there is a substantial understanding of the information resources (Sabherwal & King 1991, pp. 201-203). Insurance, publishing and transport industries are ranked by them as being information-intensive industries. IT, however, plays a different role in these industries (Cash et al. 1988, p. 22). Porter & Millar detect two situations (Porter & Millar 1985):

- the information-intensity of the product is high, for instance in the publishing industry;
- the information-intensity of the value chain is high, for instance in the insurance and transport industries.

Another criterion for the selection of organizations was the functioning of the organization in a market environment. In that situation, a competitive strategy and strategic performance measures could be distinguished.

The last criterion was the variation needed in the independent variables. Various combinations of IT, competitive strategy and organizational structure would have to be compared. Therefore, there had to be enough different combinations in order to assess their impact. This criterion required having a sufficient amount of organizations in the sample with the different values of IT, competitive strategy and organizational structure. By researching in several classes of size in various industries, this variation was stimulated. In the following subsections we elaborate on this issue (see 6.3.2: Sampling; 6.4.3: Validity and reliability).

With these criteria in mind, there were still several possibilities to choose from, such as finance, insurance, publishing, transport and retailers. Because of the abundance of the data sets, the choice was made in favor of independently functioning insurers, transporters and publishing companies. Information about these organizations could be found in different sources. These sources were analyzed to find the appropriate population description. The sources were the following:

a. KvK: the Chamber of Commerce (in Dutch: Kamer van Koophandel). The KvK administration lists organizations in the trade register. It:
   - displays the total population and the individual names of the organizations of all Dutch industries classified by means of their SBI coding, i.e. the standard company classification (in Dutch: standaard bedrijfsindeling);
   - supply data of organizations based on the organization's primary activity. The organizations referred to are not branch stores but independently functioning organizations;
   - classifies the organizations by means of their size according to the number of employees.

   The KvK forms a comparative source for transporters, insurers and publishers.
b. CBS: the Central Bureau of Statistics (in Dutch: Centraal Bureau voor de Statistiek). In the Netherlands, the CBS provides national statistical information on many issues including data on companies. It counts organizations (organizational units) that are also classified by means of their major activity via the SBI coding. The CBS does not, however, provide information on individual organizations, but its output is useful to supplement the KvK data;
c. Institutions for professional registration. These institutions use different ways of registration.
d. Branch organizations of the industries. Organizations are voluntary members of these organizations. They do not necessarily offer a complete view of the industry.

Using data from these sources, we shall discuss the three chosen industries.

1. Insurers

Insurance companies are divided into life insurers (SBI 8211), which insure financial risks concerning human life/death, and non-life insurers (SBI 8221), which insure financial risks concerning other financial risk situations like burglary and fire damage (CBS financial data non-life insurers 1990, p. 13). Based on the law called supervision insurance, WTV (in Dutch: wet toezicht verzekeringsbedrijf) insurers have to report to the Insurance Chamber (in Dutch: Verzekeringskamer). The non-life group offers a much larger potential for respondents, and consequently probably more variation in the independent variables. In the rest of this study, the non-life insurers are referred to as 'insurers'.

Analyzing the sources, it became evident to us that the KvK (1992/1993), CBS (1991), Verzekeringskamer (1991) and the branch organization of insurers (in Dutch: Verbond van verzekeraars) (1991), recognize a similar amount of functioning units of (non-life) insurers.

2. Transporters

Different kinds of transport organizations are known. The largest registered class is formed by the road transport branch (SBI 7239). Their main activity is delivering goods to customers (third parties). This requires a law demanding a goods and road transport license, the WGW (in Dutch: Wet goederen- en wegvervoer). This road transport group is the source of the transport population in this research.

The KvK (1992/1993) and CBS (production of statistics on road transport organizations 1990, p. 6) have similar numbers of organizations. They only list transport organizations that have road transport as their primary activity. The national and international road transport organization, NIWO 1992/1993 (in Dutch: Stichting nationale en internationale wegvervoer organisatie), uses WGW registration as its source. This may include own-transport organizations EVOs (in Dutch: eigen-vervoersorganisaties), which deliver goods for third parties as well. Finally, Transport and Logistics Netherlands, T & L (in Dutch: Transport & Logistiek Nederland), the branch organization, also uses the CBS and NIWO as the sources of their data (T & L 1992, p. 1).

3. Publishers

Publishing, as an industry (SBI 27.2), is divided into 5 subcategories (KvK 1992/1993).

- Daily newspapers: 2721
- Magazines: 2722
- Books: 2723
- Music books: 2724
- Other: 2729

Organizations are classified as publishers if the actual printing of editions other than their own publications does not exceed 50% of their total output (CBS production statistics industry publishing 1986, p. 5). The music book publishers were excluded from the research population because this category deals with a small and unstable market.

The KvK (1992/1993) and CBS (production of statistics on industrial publishing 1990) had a similar quantity of registered organizations with a size of 20 employees and more. This was extrapolated to organizations with a size of 5 employees and more. The ISBN registration could not be used because it included organizations with publishing as a secondary activity. There were different branch organizations: the Dutch daily paper press NDP 1993 (in Dutch: Nederlandse dagbladpers), the national organization of magazine publishers NOTU 1993 (in Dutch: nationale organisatie van tijdschrift uitgevers) and the Royal Dutch publishing association KNUB (in Dutch: koninklijke nederlandse uitgevers bond). They do not categorize their members according to size and also include organizations with publishing as their secondary activity.

Conclusion:
The KvK 1992/1993 data could be used as a source for independently functioning organizations (see also CBS financial data on non-life insurers 1990, p. 13). The other sources were used for supplementary information on these organizations, if necessary, and to control the validity of the KvK source. The next division according to size within all three industries was made:

- 5-9 employees: representing small-sized organizations;
- 10-99 employees: representing middle-sized organizations;
- 100 +: representing large-sized organizations.

Table 6.1 POPULATION

number of employees	transport	insurance	publishing	total
5-9	984	53	167	1204 (35%)
10-99	1721	86	231	2038 (60%)
100 +	69	47	39	155 (5%)
total	2774 (82%)	186 (5%)	437 (13%)	3397 (100%)

The result of combining the size and industry delivered the following population for our research (see Table 6.1)

6.3.2 Sampling

Samples are used to gain insight into frequencies of, and relations between, variables (Swanborn 1984, p. 309). On the one hand, population parameters are estimated (mean, deviation) based on sample results as in market research (see: generalization in subsection 6.4.3: Validity and reliability; Moors & Muilwijk 1975, p. 41). The samples must be representative for the population. On the other hand, relations between variables (theory) are studied (Van der Zwaan 1990, p. 84). Then the internal validity of the test is the crucial issue (see subsection 6.4.3: Validity and reliability).

Our research is concerned with relations between variables. Therefore, there must be a sufficient number of observations on the different values of the independent variables IT, competitive strategy and organizational structure to enable the exploration of their interaction. The selection of organizations was aimed at realizing this variation. A direct approach to select organizations was not possible. The IT, strategy and structure of the organizations was not known before the first analyses were performed. Therefore an indirect approach was chosen, based on the supportive variables of size and industry. It was assumed that the variation in the independent variables was supported by means of a balanced selection that strove for an equal amount of organizations in the different classes, determined by size and industry. The supportive variables were not expected to cause bias via spurious effects. This assumption was tested and confirmed (see the internal validity in subsection 6.4.3: Validity and reliability).

The random sampling procedure was as follows:

- contact as many large organizations as possible (100 +);
- contact as many medium-sized (10-100) insurance and publishing organizations as possible;
- contact a diversity of small (5-10) organizations;
- contact a large amount of medium-sized transport organizations, to enlarge the sample and hence the variation in the independent variables.

The result was a sample with a broad representation of information-intensive organizations (see Table 6.2). The largest deviation was that the sample contained a relatively large number of medium-sized transport organizations, necessary to enlarge the sample.

6.3.3 Response

To enlarge the response, the organizations were contacted before we sent the questionnaire mentioned in section 6.1. We approached them as follows:

Table 6.2 SAMPLE

number of employees	transport	insurance	publishing	total
5-9	20	20	14	54 (10%)
10-99	301	28	45	374 (71%)
100 +	41	21	35	97 (19%)
total	362 (69%)	69 (13%)	94 (18%)	525 (100%)

Before the summer holidays of 1993:

- 1500 persons were contacted by telephone. This resulted in 600 promises to answer the questionnaire.

After the summer holidays:

- the 600 respondents were contacted again to verify their commitment. 525 respondents repeated their promise to answer the questions.

November 3:

- 525 questionnaires (accompanied by a letter and an answering card for getting the results of the research) were sent by mail.

November 24:

- 171 questionnaires had been returned. A telephone reminder was started.

December 8:

- 255 questionnaires had been returned. A reminder by mail was started.

The final result was that 273 questionnaires were received back from the respondents, the majority with a response and the remaining minority without any response: for this, see the observations under the heading Non-response.

Of the 273 questionnaires returned, 261 were in the response group vs. 12 in the non-response group. Out of the response group, 18 questionnaires were answered very incompletely and could not be used. This left 243 questionnaires usable for the analyses. This response (see Table 6.3) was further split up as follows:

205 with factors complete	38 with factors partially answered
146 with performance measures complete	59 with performance measures

	partially answered
137 with usable performance data	9 outliers in performance data
133 with all questions answered	4 with SISP data missing

The 243 questionnaires were divided over the different industries and sizes as follows:

Table 6.3 RESPONSE

number of employees	transport	insurance	publishing	total
5-9	6	7	7	20 (8%)
10-99	120	23	24	167 (69%)
100 +	23	14	19	56 (23%)
total	149 (61%)	44 (18%)	50 (21%)	243 (100%)

The 'cases' were stored in a dBase III+ file (De Boer & Frowein 1987). The record structure was based on the code book of the questionnaire. This questionnaire, which itself is not included in this thesis, has been deduced from the operationalization of the variables (see subsection 6.4.2). The final items, and their descriptions, are presented in appendix B.2: Dimensions.

Non-response

The primary aim of non-response research is to compare the response group and the non-response group on their dependent variable. If there is a significant difference between these two groups, then there are unknown but important factors that are related with not returning the questionnaires. To study this possibility, people who did not respond were asked to answer a few questions. This aim could not be achieved in this research because of the lack of respondents in the non-response group. By telephone, we asked 161 persons to answer these few questions. We could not get a clear picture of the dependent variable because only 12 persons reacted.

A secondary aim of the non-response research is the inventarization of reasons for not cooperating. The reasons were of a general nature, such as:

- no time for answering another questionnaire;
- not willing to distribute company (profit) data.

More specific comments on the questionnaire were that it was:

- too difficult and too long;
- not found relevant by the respondents.

6.3.4 Data collection: the respondents in the organizations

The questionnaire used was sent to specific persons in the information-intensive organizations. These persons had to meet the following criteria. They must be able to answer the questions on:

- information services, SISP and IT;
- competitive strategy, organizational structure and strategic performance.

The highest executives in the field of information services in their organizations fulfilled these criteria. They could be members of the board of directors dealing with information services, information managers functioning at a high level in the hierarchy, or members of the staff management.

The questionnaire guaranteed anonymity, meaning that the answers could not be traced to the particular organizations of the respondents.

6.4 RESEARCH INSTRUMENT: THE DEVELOPMENT OF THE QUESTIONNAIRE

6.4.1 Structured mail questionnaire

Complex personal interviews with open questions, where the respondents formulate the answers themselves, are usually used to sharpen the concepts and their relations, so that standardized questions emerge. In 1992, five elaborate interviews were conducted. In combination with suggestions from the literature, these interviews led to measurable variables (see 6.4.2: Operationalization of variables).

Then a questionnaire could be constructed with structured, closed questions, where the answering options were already stated. The order and content of the questions was arranged so that the comparability of the answers was high (Emans 1985, p. 118; Reuling 1987, p. 32). One advantage of such questionnaires is the opportunity to process the many answers of the many respondents (Baarda & De Goede 1990, pp. 128-129; Bartelds 1989, pp. 54, 70). Another advantage is the ability to deal with many respondents at the same time (Emans 1985, pp. 30-31).

After checking the comprehensibility of the questions, this questionnaire was sent by mail (see subsection 6.4.3: Validity and reliability; Baarda & De Goede 1990, p. 139). The disadvantage compared with personal interviewing is the rate of response and the lack of control over the response. The advantage is a higher number of questionnaires answered and the previously-mentioned need to guarantee the anonymity of the respondents.

6.4.2 Operationalization of variables

The operationalization was based on the definitions and interrelating dimensions of the variables as indicated in the foregoing chapters. Measurements from the literature were often used.

IT

The function of IT, efficiency, effectiveness or innovation, was determined by means of the analysis of the various business functions of the firm. Porter distinguishes primary direct value-adding activities and secondary indirect supportive activities. The primary activities are concerned with directly adding value to the materials, products and/or services. The indirect activities are concerned with encouraging and stimulating the direct activities. Competitive advantages can be realized by performing and coordinating the value-adding activities. Lower costs and differentiation (including innovation) are basic ways to discriminate.

Compared with the original value chain functions of Porter, there were some modifications for the operationalization in this research:

- administrative activities like (strategic) top management and (tactical) planning were also added as indirect activities (see also Simons & Verheijen 1991, p. 19). Operations management constituted part of the value-adding functions themselves;
- the sales, services and logistics were added to the production/service function;
- the purchase and marketing had registrative and administrative functions concerning the materials to be purchased and the products to be sold.

The IT's importance for the efficiency, effectiveness and innovation of each value chain function was measured. By analyzing the data it should become clear whether or not there was an overall efficiency, effectiveness or innovation tendency for the IT usage.

Not only was the IT function operationalized, but also the IT structure was made operational. This operationalization (see appendix B.2: Dimensions) was based on the work of Ein-Dor & Segev. They recognize three dimensions (Ein-Dor & Segev 1982; see also 2.3.2.3: Elaborating on IT: dimensions and configurations):

- centralization of IT:
  refers to the centralization of development and implementation of applications (Ein-Dor & Segev 1982, p. 56). This concerns the locus of responsibility: the lower the user's responsibility, the higher the degree of central-

ization (Tavakolian 1989, p. 311);

- concentration of IT:
  refers to the deployment of hardware through the organization, ranging from a central mainframe to dispersed minis and micros (Ein-Dor & Segev 1982, p. 56). Besides the dispersion, the place of data processing is also important for the concentration: in the IT department or in the user's own location. Although a stand-alone PC could be seen as the concentrated mainframe of a small organization (Leifer 1988, p. 65), the data are still processed near the user;
- integration of IT:
  by means data distribution, organizational members can be integrated without the use of lateral organizational devices.

Competitive strategy

The concept of competitive strategy is described via several dimensions (see also 2.3.3.3: Elaborating on competitive strategy: dimensions and configurations);

- innovation: indicates how an organization differs from the competitors by the use of new products, services and technologies;
- focus: states in which way the organization is aimed at the particular needs of certain customers;
- marketing differentiation: indicates the organization's efforts like service, advertising and quality image, which add to the function of the product or service to distinguish the organization from others;
- low costs: makes clear that the organization is distinguished by the lowest costs in the creation of its products and services.

These descriptions are the basis for the operationalization (see appendix B.2). In the literature, various authors have already measured these dimensions (Miller 1986, p. 238; 1988, p. 308; Ramaswami et al. 1992, p. 161; Romme et al. 1990, p. 60).

Organizational structure

The concept of structure is described via several dimensions (see also 2.3.4.3: Elaborating on organizational structure: dimensions and configurations):

- formalization: aimed at regulating the individual behavior using formal prescriptions for jobs and the work flow or general rules for all kinds of situations (Mintzberg 1979, pp. 81-82);
- vertical centralization: concerns the vertical division of decision-making power, up or down through diverse (management) levels (Mintzberg 1979,

p. 185);

- integration: refers to direct contact between people to direct their actions and decisions without asking for approval at higher management levels;
- training: training in skills outside the organization and indoctrination inside the organization is aimed at the standardization of behavior for that particular organization.

These dimensions were also often measured (Inkson et al. 1970, pp. 327-329; Miller 1987a, p. 31; Miller & Dröge 1983, pp. 558-560; Mintzberg 1979). The result of the operationalization is shown in the appendix B.2: Dimensions.

SISP

The operationalization of SISP in the survey was not based on a method such as BSP or ISP, but on broader aspects such as the content and the level of management commitment to SISP. Also the proactive and reactive aspects were dealt with. Finally, some questions about the evaluation of SISP were asked.

Content:

- the presence of strategic IT objectives;
- the presence of formal assessment of strategic IT objectives;
- the presence of formal statements about the information architecture and application portfolio priorities (information planning);
- the importance of aspects of the competitive strategy for the SISP;
- the importance of aspects of the organizational structure for the SISP;
- the concern for the overall IT situation instead of specific automation problems.

Management commitment:

- top management support for IT;
- line management support for IT;
- integration of IT activities in the line departments;
- position of the highest IT officer.

Proactive/reactive:

- the usage of IT guides the competitive strategy and organizational structure / is guided by the competitive strategy and organizational structure.

Evaluation:

- the attendance of evaluation of the realization of SISP;
- the results of the realization of SISP.

Strategic performance

In accordance with many IT researches, it was concluded that the competitive position of information-intensive organizations could be used as an indicator for IT exploitation because to explore the precise costs and benefits of IT investments was found to be very complex (see section 2.2 and subsection 2.3.2.4). The internal and external situations of the organizations were explored.

There are many strategic performance measures used in the literature to measure the internal situation of an organization, i.e. the way the organization exploits its assets (Chan & Huff 1992, p. 204). All those profitability ratios, judging how well the firm is using its assets, have their limitations (varying depreciation methods, inventory valuations). They do not necessarily reflect the fitness of the business for the future (Hambrick 1983, p. 694; see also Van Horne 1989, p. 755).

Despite knowing these limitations, Bouma still maintains that the use of these indicators is a valid way to compare firms on their effectiveness. Using a cross-sectional study, the strength of an organization in the industry can be determined (Bouma 1987, pp. 507-510; Brealy & Myers 1991, p. 675). A general profitability ratio is the return on assets (ROA): net profits after taxes divided by total assets. The disadvantage of this ratio is that the net profits are calculated after interest is paid to the creditors, who contributed to the total assets (Van Horne 1989, p. 767). In the ratio called the net operating profit (NOP), which is found by dividing the returns before taxes plus the interest paid by the total assets, this disadvantage is not present because the interest is included (in Dutch: rentabiliteit op totaal vermogen). In this measure, there is a fair relation between the returns and the assets used (Bouma 1987, p. 509).

Also the external situation, the position on the market, shows a valuation of the firm. It is very difficult to gather comparably 'objective' hard market share figures. This needs a common definition of the size of one or more markets.

As a solution, we decided to use subjective measures for the dependent variable. We asked the respondents to compare the NOP and the market share with equally-sized competitors. To verify the validity of these assessments, we correlated the objective and the subjective operating net profit (Dess & Robinson 1984). Some examples are shown in the following tables, 6.4 and 6.5:

These correlations were significant at a level of 0.1%. The other correlations pointed in the same direction as well, but were not significant due to the amount of organizations involved and the strength of the correlation. However, it showed that the respondents were generally able to judge the internal situation of the firm. It was therefore to be expected that they were also able to judge their external situation.

A drawback of this measure is that it depicts the organizations's functioning at a given moment in time. Improvements (due to well-exploited IT) should also be integrated. Therefore, the questionnaire also included items on the development in the net operating profit and the market share over the last five years (1987-1992).

Table 6.4 THE RELATIONS BETWEEN SUBJECTIVE AND OBJECTIVE MEASURES: MEDIUM-SIZED TRANSPORT ORGANIZATIONS: CORRELATIONS

	NOP-objective	NOP-subjective
NOP-objective	1.0000	0.5544 *
NOP-subjective	0.5544 *	1.0000

number of cases: 75 2-tailed significance: * = 0.001

Table 6.5 THE RELATIONS BETWEEN SUBJECTIVE AND OBJECTIVE MEASURES: LARGE-SIZED PUBLISHERS: CORRELATIONS

	NOP-objective	NOP-subjective
NOP-objective	1.0000	0.9869 *
NOP-subjective	0.9869 *	1.0000

number of cases: 6 2-tailed significance: * = 0.001

These further items were:

- objective size of net operating profit (NOP) = profits before interest and tax divided by total assets;
- subjective size of NOP, compared to equally-sized competitors;
- subjective development of NOP since 1987, compared to equally sized competitors;
- subjective size of market share, compared to equally-sized competitors;
- subjective development of market share since 1987, compared to equally-sized competitors.

If the last four variables were to have a latent common factor with a high reliability, the subjective competitive position of the firm might be seen as the sum of the four indicators (see subsection 7.2.2).

Likert-scales with 5, 6 or 7 options are often used to indicate the answer (Emans 1985, p. 115). A five-point scale is usually sufficient to specify the answer. The advantage of the odd scale is that there is an answering option in the middle.

Only for the strategic performance compared with other organizations were the respondents forced to make a choice via a six-point scale. The scales were constructed on the ordinal level (Reuling 1987, pp. 44-45). Certain (parametric) statistical techniques are officially not permitted on the ordinal level, because the distance between the various points is not necessarily the same. However, Swanborn stated that the majority of the respondents will consider the ordinal level as an interval, so that parametric techniques can be used (Swanborn 1984, p. 248).

6.4.3 Validity and reliability

Validity and reliability are the determining conditions for the quality of an empirical research. These terms indicate the correctness of the measuring instrument: the questionnaire.

Validity is usually concerned with the relation between the concepts and the operationalized variables (Venkatraman 1986, p. 78). Do the items of the questionnaire measure the concepts in question (Baarda en De Goede 1990, p. 156). However, the concept of validity is broader than that alone (Yin 1989, p. 40). It refers to the best available approximation of truth or falsity of the propositions (Cook & Campbell 1979, p. 37).

Reliability indicates the stability of the measurement. Repeatedly used, the measurement should lead to the same results so that accidental errors are avoided (Swanborn 1984, p. 204).

There are several classifications for validity and reliability (Cook & Campbell 1979, pp. 37-80; Swanborn 1984, pp. 220-223; Venkatraman & Grant 1986, p. 79; Yin 1989, pp. 40-41). We followed the classic work of Cook & Campbell, and combined their ideas with the components of construct validity (Bagozzi 1980; Venkatraman & Grant 1986). This approach gives a broad overview of several validity and reliability ideas. In fact, reliability is seen as a part of validity, because it adds to the homogeneity of the operationalized variables and therefore to the testing of the validity of the propositions (Venkatraman & Grant 1986, p. 78).

Internal Validity

Internal validity deals with the truth or falsity of the causal relations between the operationalized variables (the questionnaire items). This is the basic criterion for the test of a theory.

To test our theory, the variation in IT, strategy and structure should be optimized. Comparable with an experimental approach, selective sampling is used in comparative research to reach this (Swanborn 1984, p. 326; Van der Zwaan 1990, p. 84). The values of strategy, structure and IT of each organization were not known beforehand. To provide the variation, two supportive variables were used to select the research objects (organizations in information-intensive industries):

- size;
- industry.

It was assumed that levelling the sizes and types of organizations supported the variation in the independent variables. It was expected that size and type of industry were not related to the competitive position (COMPOS) so that these factors could not cause spurious effects. The first reason for this expectation was the definition of the dependent variable that takes the size (SIZE) and the type of industry (INDY) into account. The second reason is that there were no theoretical grounds for this. This assumption was tested (see Table 6.6).

Table 6.6 THE RELATIONS BETWEEN INDUSTRY, SIZE AND COMPETITIVE POSITION: CORRELATIONS

	INDY	SIZE	COMPOS
INDY	1.0000	0.0817	0.1860
SIZE	0.0817	1.0000	-0.0106
COMPOS	0.1860	-0.0106	1.0000

number of cases: 137
(all the organizations that answered the relevant questions completely were used in the analysis)

The result of this correlation analysis indicated that the competitive position was not significantly dependent on the size or the type of industry in which the organization operated. This result was supported by an analysis of variance (ANOVA) where no significant (5%) main or interaction effect was found either (see Table 6.7). The size and the type of industry of the organizations could not cause spurious effects.

Only if there is a sufficient statistical relation between dependent and independent variables, is it useful to continue (Cook & Campbell 1979, p. 37). There must be enough observations for statistical analyses. The interaction between the operationalized variables IT, strategy and structure was believed to be relevant for the dependent variable, based on the theory. There was a sufficient statistical basis to continue the research (see subsection 7.2.4).

Furthermore, other explanations must be ruled out. In survey research, it is not possible to eliminate the undesired effects with randomization in advance (Cook & Campbell 1979, p. 56; Yin 1989, pp. 42-43). The quasi-experimental and control groups are already present in the population. By means of elaboration of causal relationships, surveys can be used to protect internal validity. Factors other than the research variables could cause variances in the dependent variables, and in that way could cause spurious effects. The other variables should then be related with the dependent variable (Swanborn 1984, pp. 326-327).

A potentially disturbing variable could be the level of IT investment (related to the profits and to the assets of the organization), although theoretically no relation was to be expected with the dependent variable (see Table 6.8).

Table 6.7 THE RELATIONS BEWEEN INDUSTRY, SIZE AND COMPETITIVE POSITION: ANALYSIS OF VARIANCE

source of variation	SS	DF	MS	F	sig of F
WITHIN CELLS	1238.43	128	9.68	-	-
CONSTANT	9300.25	1	9300.25	961.24	0.000
INDY	48.82	2	24.41	2.52	0.084
SIZE	0.16	2	0.08	0.01	0.992
INDY BY SIZE	6.35	4	1.59	0.16	0.956

number of cases: 137
(all the organizations that answered the relevant questions completely were used in the analysis)

An ANOVA was not performed because of the level of the data was of a ratio level ratio.

The level of IT investment did not show any significant relation with the performance measures. Due to this result, the relation between the interaction and the performance could not be spurious via the IT investments. This empirical result further supported the conclusion that IT alone cannot explain successful strategic performance.

We now see that the several possible variables (the level of IT investment, the size and type of industry of the organizations) did not affect the competitive position. Of course, there could be other non-researched variables that do influence the competitive position. We cannot, however, eliminate the influence of all those variables. In comparative research, it is accepted that not all possibly relevant variables are controlled: it is not an experiment. The focus of the attention is directed towards the theoretically relevant variables, in our research the IT and the organizational context (Yin 1989, pp. 47, 53-55; Van der Zwaan 1990, p. 84). If the variation in the independent variables systematically relates with the dependent variable as predicted, then it is said that the theory is supported. Only if it is theoretically expected that other, third, variables are relevant for the theory, should these variables checked in further research. This results in a refinement of the theory.

Table 6.8 THE RELATIONS BETWEEN IT INVESTMENTS AND COMPETITIVE POSITION: CORRELATIONS

	COMPOS	ITPROFITS	ITASSETS
COMPOS	1.0000	-0.0846	-0.0016
ITPROFITS	-0.0846	1.0000	0.1236
ITASSETS	-0.0016	0.1236	1.0000

number of cases: 129
(all the organizations that answered the relevant questions completely were used in the analysis)

External validity
External validity indicates the domain to which conclusions of the relations can be drawn (Cook & Campbell 1979, pp. 37-39):

- theoretical constructs (construct validity);
- populations (generalization, external validity).

Construct validity
Construct validity indicates whether or not the measured variables are indeed the intended concepts. Several construct validity tests are possible. Venkatraman & Grant lists five components for construct validity (Venkatraman & Grant 1986, pp. 78-79):

1. content validity;
2. internal consistency (uni-dimensionality and reliability);
3. convergent validity;
4. discriminant validity;
5. nomological validity.

1. Content validity
The content validity verifies whether or not the items cover the concept (Swanborn 1984, p. 221; Venkatraman & Grant 1986, pp. 81-82). Content validity should start with a thorough theoretical research to find a complete measuring instrument per concept, as needed for the theory. Discussions with colleagues and tests with future respondents are suggested in order to prepare the items for future response.

In this research:
The definitions of the concepts were based on the research questions. The definitions were made measurable, based on five elaborate explorative interviews in 1992 and a theoretical exercise (chapter 2). This finally resulted in the operationalized variables. The operationalizations followed the accepted measures in the literature.
After this exercise, the operationalization was discussed in a series of interviews with:

- six colleagues in the field of information management and organizational and management theory;
- six future respondents (who were removed from the sample).
  The result of this approach was assumed to be a complete basis for the concepts.

2. Internal consistency
The internal consistency concerns the relations between the items of one concept. It is the combination of (Venkatraman & Grant 1986, p. 82):

- assessing the number of dimensions of the underlying concept.
  Via factor analyses, the number and nature of the dimensions can be explored (see section 6.5: method of data analysis);
- the reliability or homogeneity of several items representing the specific dimensions (Cook & Campbell place this reliability under the internal validity (Cook & Campbell 1979, p. 43)).
  If the items of dimensions are homogenous (strong correlating items), then the effects of a coincidental mistake in one of the items will be corrected

by the others. There are several methods to test the homogeneity of items:

- the split-half method;
- relating items with all the other items. The Cronbach alfa indicates the level of homogeneity. The number of three items is accepted although the use of more items per dimension is preferable. The level of 0.50 is a minimum for further analysis (Van Heck 1993, p. 117; Nunually 1978; Ramaswami 1992, p. 156).

In this research:
The factor analyses confirmed most of the theoretically-assumed dimensions of most of the concepts. The reliability ranged from sufficient to excellent. A detailed survey is presented in the next chapter 7 (the results). These findings supported the expectations that were based on the content validity of the measurements.

3/4. Convergent/discriminant validity
More than one method (questionnaire, observation) can be used to measure the variables. If different methods on the same concepts come to the same result, then there is convergent validity. If different methods measuring different concepts find different scores, then there is discriminant validity. The multitrait-multimethod matrices are applied to compare the methods (Venkatraman & Grant 1986, pp. 78, 82).

In this research:
Only one questionnaire was used to find results. Therefore, there were no conclusions drawn on convergent and discriminant validity.

5. Nomological validity
The last part of the construct validity is the nomological validity. This refers to the confirmation of predictions based on a theoretical framework. The operationalized variables should reflect predictions based on already confirmed theory (Swanborn 1984, p. 221; Venkatraman & Grant 1986, p. 82). Then the instrument can be used to test the theory under scrutiny because the instrument obviously measures what it is supposed to measure ('pure' construct validity).

Table 6.9 THE RELATIONS BETWEEN STRATEGIC AND STRUCTURAL MEASURES: CORRELATIONS

	innovation	focus	low costs
formalization	0.0451	-0.1240	0.2486 *
centralization	-0.2782 **	0.2167 *	0.0508
integration	0.2024	-0.1047	0.0478

number of cases: 145 2-tailed significance: * = 0.01 ** = 0.001
(all the organizations that answered the relevant questions completely were used in the analysis)

In this research:
To validate the measures, we used previously developed theories on the relation between strategy and structure on the one hand, IT and structure on the other. There were no applicable theories on IT and strategy.

Strategy and structure
Based on work of Miller and empirical research of Romme et al., the following propositions were predicted (Miller 1986; Romme et al. 1990):

- cost leaders relate with machine bureaucracy
  (cost relates with formalization);
- niche marketers relate with simple structure
  (focus relates with centralization);
- innovators relate with adhocracy
  (innovation relates with integration: see also Miller 1988).

These predictions were verified. The results are shown in Table 6.9

The measures seemed to confirm the propositions, although innovation and integration did not relate significantly and innovation and centralization had an unexpected significantly negative correlation.

Table 6.10 THE RELATIONS BETWEEN IT STRUCTURAL AND STRUCTURAL MEASURES: CORRELATIONS

	info-centralization	info-concentration	info-integration
formalization	-0.0302	-0.0243	0.1041
centralization	0.1629	-0.1009	0.0176
integration	0.0893	0.3391 *	0.3064 *

number of cases: 139 2-tailed significance: * = 0.001
(all the organizations that answered the relevant questions completely were used in the analysis)

IT and structure
The relations between IT and structure were conceptually described in two articles (Ein-Dor & Segev 1982; Leifer 1986):

- machine bureaucracy relates with centralized systems (formalization relates with IT concentration);
- simple organizations relate with stand-alone systems (centralization relates with IT centralization);
- adhocracy relates with decentralized systems (integration relates with IT integration).

These predictions were verified. The results are shown in Table 6.10

The relations shown did not follow the predictions precisely. This theoretical framework was, therefore, not validated very strongly.

Conclusion:
The nomological (construct) validity of IT, strategy and structure was weakly supported by the measurements.

Generalization
The conditions under which the theory is believed to be true (the domain) are the borders for the generalizations of theory-testing research. The results are said to be analytically generalized to the theory in the domain that is formed by the conditions (Yin 1989, p. 41). The effect of the variables is under scrutiny, and therefore optimizing the variation of the independent variables is crucial to support

the internal validity.

If the frequency of population parameters is researched, as in many survey studies, then the sample should be taken at random. The size of it should be assessed via the significance level chosen and the standard deviation of the variables (Moors & Muilwijk 1975, pp. 32-34; Yin 1989, pp. 38, 43, 44). Then the results are said to be statistically generalized to the population.

In this research:
The theory, if supported, is valid in the domain of information-intensive industries. A further refinement (culture, environment) can be studied in further research (see subsection 8.5.2).

6.5 METHOD OF DATA ANALYSIS: FROM CHECKING THE DATA TO ANSWERING THE RESEARCH QUESTIONS

6.5.1 Introduction

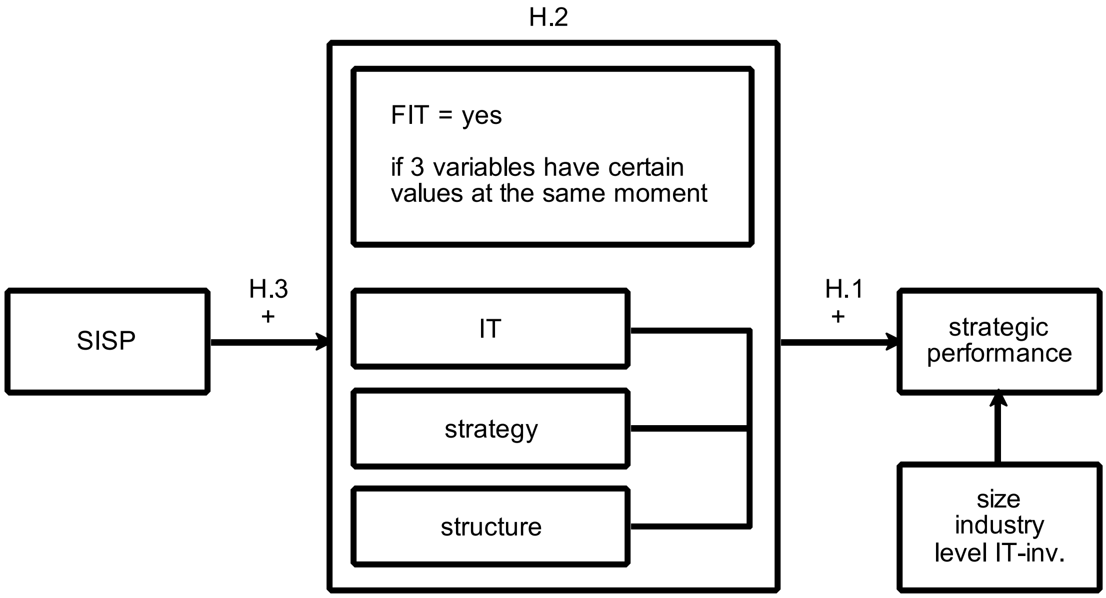
In this final section, a plan for the analysis of the data to test the hypotheses is presented. To process the data, the cases were transported to SPSS (Huizingh 1993; Norusis 1992a).

Before we started the analyses, several checks had been performed (Baarda & De Goede 1990, pp. 184-185, 196-208):

- checking coding and redressing false coding;
- checking the distributions. The various methods had conditions concerning their distribution, such as the normality of the data (see subsections 6.5.2 and 6.5.4);
- checking the reliability of the items (see subsection 6.4.3: Validity and reliability).

The data were analyzed in several steps to test hypotheses 1, 2 and 3, which are put forward in the following subsections (see also Figure 6.2).

Figure 6.2 RESEARCH HYPOTHESES



6.5.2 Step 1: aligning the values of the variables IT, competitive strategy, organizational structure, SISP and strategic performance from the questionnaire data via a factor analysis

The scores on the variables had to be determined to test the hypotheses. We started with the test of hypothesis 1 (see Figure 6.3).

Hypothesis 1. Fits between IT, competitive strategy and organizational structure have a positive effect on the realization of the strategic opportunities of IT.

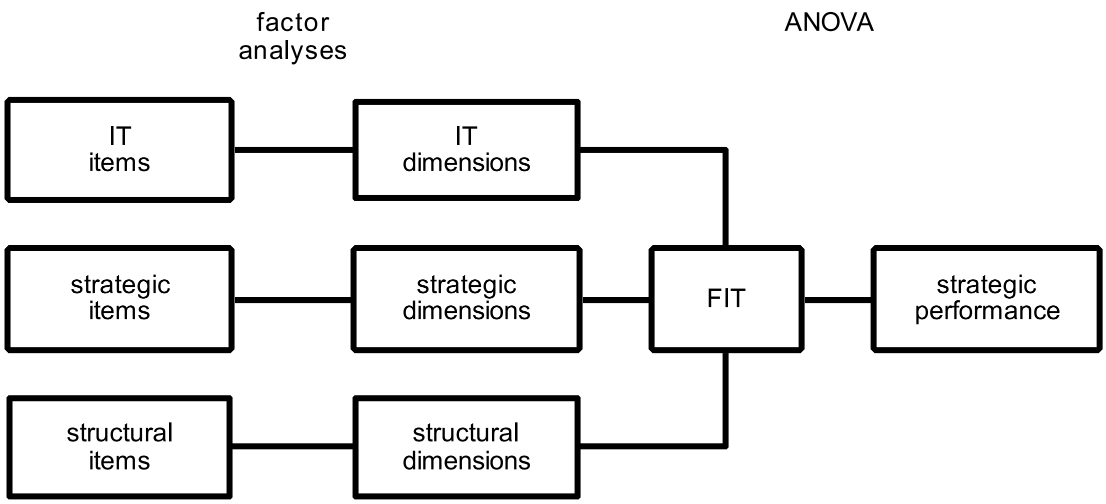
There were several methods possible to determine the scores on the variables:

- using discriminant analysis or cluster analysis, organizations can be classified into certain types;
- using factor analysis, organizations can be assessed on a set of dimensions.

Although the grouping of organizations would be convenient considering the hypotheses, where ideal types are stated, we chose for the factor analyses. This choice is explained below.
Discriminant analyses can be used for classification and for analysis (Reuling 1987, p. 171). In the classification, a linear combination (discrimination equation) of independent variables serves as the basis for assigning organizations to groups

(Norusis 1992b, p. 7). An example is the prediction of a person's suitable profession based on scores on several variables.

Figure 6.3 RESEARCHING HYPOTHESIS 1



Discriminant equation:

$$D_j = d_{j1}.x_1 + d_{j2}.x_2 + ... + d_{jm}.x_m$$

The construction of such equations is done in the analysis phase of discriminant analysis (Reuling 1987, p. 171). The organizations of the same groups should not differ much in their D values, and organizations of different groups should differ considerably on the D values (Reuling 1987, pp. 172-173).

These equations for the determination of the IT, strategy and structure of organizations were not known beforehand. Therefore, a classificatory discriminant analysis was not possible. For an analytical use of the discriminant analysis, the group membership of the organizations should be known in advance to develop these rules (Norusis 1992b, p. 1). In this research, there was no previous information about the group membership of organizations. Therefore, the discriminant analysis was not appropriate.

Organizations can also be assigned to groups via cluster analysis. This assignment is based on the similarity of organizations on several variables. Cluster analyses are used for exploration to find groupings (Slotboom 1987, pp. 37-38). It was possible that clustering might result in an organizational clustering that was not hypothesized (compare the cluster approach from Miller & Friesen 1984). Therefore, it would be difficult to test the hypotheses.

Both discriminant and cluster analyses display some disadvantages. Instead of these analyses, however, a factor analysis can also be used to gain insight into the type of organizations. Types are determined by scores on the dimensions. These factors emerge as underlying dimensions via the correlations between several items (Reuling 1987, p. 154). As an example: mathematical and literary qualities are dimensions latent in scores of high school courses.

Factor equation:

$$x_{ij} = a_{j1}.F_{i1} + a_{j2}.F_{i2} + a_{jk}F_k + ...a_{jm}.F_m + d_jU_j$$

The factors F explain a part of the variance of the items x. This is demonstrated in the factor loadings (a), the correlations between the items and the factors (Norusis 1992b, pp. 62-63; Reuling 1987, pp. 156-159). A correlation of 0.7 means 49% explanation of the variable x. The total variance explained by a factor is called the eigen value. This lists the sum of the factor loading squares (Norusis 1992b, p. 60). The eigen value determines the choice for the amount of factors in further analyses.

The advantage of using factor analysis to determine the value of variables like strategy and structure is the already present line of research. Factor analyses have often been used (Ramaswami 1992). Using factor analysis would probably result in appropriate dimensions for further research. Therefore, the factor analysis was preferred. Its usage is elaborated below.

Principal component analysis (PCA) is mostly used to conduct a factor analysis. Although used for extracting factors, it is not a precise factor analysis but a slightly different technique (Norusis 1992b, p. 60; Reuling 1987, p. 164; Slotboom 1987, pp. 182-183).

Cases with missing values on the independent variables were deleted. After running the factor analyses, the following assumptions were checked (Norusis 1992b, pp. 56-59):

- the factor analysis equations do not result in the identity matrix. Bartlett's sphericity test verifies the hypothesis that the factor analysis results in an identity matrix;
- there is not too much partial correlation between variables of different factors: the Kaiser-Meyer-Olkin measure has to exceed 0.5.

Then the choice for the number of factors was made based on the variance explained using the factors with an eigen value >1 before the sudden drop of eigen value (scree) (Reuling 1987, pp. 168-169).

6.5.3 Step 2: making the data usable for testing hypotheses

After the factor analyses had been conducted, it was known which dimensions could be used. Types (IT, strategic, structural) were represented by characteristic dimensions (high innovation is unique for innovators, high integration is unique for adhocracies). However, there were also types without distinctive dimensions (a simple organization has no distinctive dimension: high centralization can also be seen in machine bureaucracies). In that situation, we used the concept of equifinality (Schoonhoven 1981); organizations of one type may act via different dimensions (a cost leader acts not only with a strong low costs dimension, but also with a weak focus). Using this other dimension, the types were also indicated, but not so exclusively. Via the specific combination of non-exclusive factors from IT, strategy, and structure, it was assumed that the types in question were involved. This concept was used carefully. Only when it was necessary were combinations used to give the fit the necessary possibilities to emerge. To verify whether or not the success really could be assigned to the hypothesized fit, we conducted simple test (of the ANOVA) (step 4).

6.5.4 Step 3: the effect of combining three variables on strategic performance was studied with interaction via an analysis of variance (ANOVA)

In this third step, the success of the fit between three variables was tested. The success of the fit was shown to be present if a better performance was reached in the fit between variables than could be expected on the basis of the values of the separate variables. This approach makes use of the synergy between variables, which can be tested via research on the interaction between variables (Schoonhoven 1981, p. 351). This means that the influence of an independent variable on a dependent variable is dependent on the level of a third variable (Venkatraman 1989, p. 424). Examples are:

- a lower blood pressure is caused by medicine, only under diet situations (Maxwell & Delaney 1990, p. 325);
- the nutrition of ground is high, only under certain sun and fertilizer conditions (Drazin & Van der Ven 1985, p. 517);
- the lethal effect of drunken driving.

Interaction is used both in regression analysis and in analysis of variance (ANOVA). These techniques divide variance in the dependent variable between the explained variance by the independent variables (and their interaction between groups) and the remaining unexplained variance (within groups) (Knippenberg & Siero 1980, pp. 12-13; Reuling 1987, pp. 192, 199).

Regression analysis

Regression analysis is performed as follows (Harnett 1982, p. 551; Knippenberg & Siero 1980, pp. 12-13, 15-18, 29-31; Reuling 1987, pp. 118-119):

1. select a regression line given by an equation

$$Y = XB + E$$

with

$$Y = \begin{bmatrix} y_1 \\ y_2 \\ .. \\ .. \\ y_n \end{bmatrix} \quad X = \begin{bmatrix} 1 & x_{11} & x_{21} & \cdots & x_{m1} \\ 1 & x_{12} & x_{22} & \cdots & x_{m2} \\ .. & \cdots & \cdots & \cdots & \cdots \\ .. & \cdots & \cdots & \cdots & \cdots \\ 1 & x_{1n} & x_{2n} & \cdots & x_{mn} \end{bmatrix} \quad B = \begin{bmatrix} a \\ b_1 \\ b_2 \\ .. \\ .. \\ b_m \end{bmatrix} \quad E = \begin{bmatrix} e_1 \\ e_2 \\ .. \\ .. \\ e_n \end{bmatrix}$$

2. determine correlation (R). R squared indicates the percentage of explanation of the variance of Y by X;
3. test if R squared differs significantly from 0.

Multiple regression connotes that more X variables are used to explain the variance of Y ($m > 1$). In that situation interaction is possible between those X variables.

Analysis of variance (ANOVA)

ANOVA is performed as follows (Reuling 1987, pp. 183-184, 192):

1. determine the average value of the dependent variable corresponding with the different values of the independent variables;
2. determine the F-value: relate the variance between the groups with the variance within the groups. A high F-value means that a certain amount of variance of the dependent variable is caused by the independent variable;
3. check if the F-value is significant.

There are several sorts of ANOVAs:

- one independent factor and one dependent factor:
  - two groups: T-test;
  - several groups: F-test (One-way);
- several independent factors: Anova (Two-way or more-way):
  - one dependent variable: uni-variate ANOVA;
  - several dependent variables: multi-variate ANOVA (MANOVA).

A two- or more-way ANOVA offers the opportunity to test for interaction (Reuling 1987, p. 186). This interaction is more easily studied using an ANOVA than using a regression analysis, because the interaction terms are automatically generated. The factor scores on the IT, strategic and structural dimensions are standardized using a z-transformation (Nijdam & Van Buren 1980). These standardized scores made it possible to divide the organizations into groups with a (relatively) high and low score.

In this survey, the amount of cases in the different experiment and control groups was not the same because the groups were formed via the analyses. The factors may relate with each other so that their effect on the dependent variable overlaps. In a regression analysis, this is known as multicollinearity, in ANOVA as a non-orthogonal design. Via the regression method, all effects were corrected (Norusis 1992a, p. 257; Norusis 1992c, pp. 53, 110; Reuling 1987, p. 193).
In order to perform an ANOVA, the following conditions must be fulfilled (Maxwell & Delaney 1990, p. 107; Reuling 1987, pp. 192-193):

- normality of the dependent variable:
  - Kolmogorov-Smirnov/Lilliefors test (Norusis 1992a, p. 169);
  - normal and detrented plots (Norusis 1992a, pp. 169-171; 1992c, pp. 60-65):
  - median = mean;
  - kurtosis and skewness < 1 (Baarda en de Goede 1990, pp. 197-198);
- homogeneity (equality of variance):
  - Bartlett test;
  - plots: the cell averages (cell means) and cell variances (deviations) should not relate;
- there is no relation between the residuals (Norusis 1992c, pp. 46-47).

The ANOVA is robust in resisting departures from normality and homogeneity. However, if the deviations are too large, three possibilities remain (Maxwell & Delaney 1990, p. 110):

1. transformation of data
2. F*-tests: parametric adjustments
3. usage of non-parametric tests like Kruskal-Wallis

In this research, the deviations proved not to be too large (see chapter 7).

6.5.5 Step 4: analyzing if the hypothesized fit between three variables causes the interaction via simple tests

Based on the theoretical model, it was predicted that the performance was significantly higher in situations of certain IT - strategy - structure combinations than could be expected based on the effect of IT, strategy and structure themselves. All the ANOVAs measure this interaction effect. This causes chance capitalization. As the number of ANOVAs increases, so does the likelihood that a significant interaction effect for the performance quality is found by coincidence (Knippenberg & Siero 1980, pp. 91, 94; Norusis 1992a, p. 241). The question is: how many significant values have to be found so that the hypothesis can be really accepted? There are three criteria for a sufficient number of significant values:

- the chance that critical values appear if the null hypothesis is correct;
- the amount of tests performed;
- the significance level: usually 5%.

The next two examples illustrate these criteria:

1. The null hypothesis is that a dice is correct. Every number has the probability of 1/6. There are 12 tests. The number '6' will appear about two times if the null hypothesis is true. The chance that a '6' will appear 5 times or more if the null hypothesis is true is less than 5%. If more than 5 tosses out of 12 produce a '6', the null hypothesis is rejected. It is said that the dice is not correct.
2. The null hypothesis states that there is no relation between two variables. The probability of finding a critical F-value is fixed at 5%. There are 100 tests. If the null hypothesis is true, about 5 critical F-values will be found. The chance that 9 or more critical F-values will be found is less than 5%. If more than 9 tests of the 100 produce critical F-values, the null hypothesis is rejected. It is said that there is a relation between the variables.

In this research the null hypothesis was: there is no interaction between IT, strategy and structure. A number of ANOVAs was performed to check this hypothesis. If the probability is 5% or less that there are so many significant results under the condition that the null hypothesis is true, than the null hypothesis would be rejected. The overall conclusion would be: there is a significant interaction between IT, strategy and structure.

However, interaction between three variables as such does not automatically refer to the hypothesized fit. So, before hypothesis 1 can be confirmed, the cause of the interactions must be studied. A significant interaction means that the main effects of the factors are not consistent across the levels of the other factors (Maxwell & Delaney 1990, pp. 262-263). Therefore, the significance of a single factor was tested at each level of the other factor. The analysis started with fixing the level of the first variable to examine the effect of the other factor. In this way, it became clear where the interaction took place. This is called a simple test, checking the simple (main) effects of a separate factor by fixing the other (Maxwell & Delaney 1990, p. 264). If necessary, the mean values of the individual cells were compared.

In this research, a three-way design was used to study three-way interaction. If three-way interactions are present, then two-way interactions and main effects cannot be interpreted unambiguously (Maxwell & Delaney 1990, p. 327). The effect of a factor is not consistent across the combinations of the other factors. Maxwell & Delaney give a guide to find out which fit causes the interaction rises (Maxwell & Delaney 1990, p. 329). This scheme starts with the observation that there is a three-way interaction effect between A, B and C. This remark is equivalent to stating:

- A x B interaction is different at the different levels of C or,
- A x C interaction is different at the different levels of B or,
- B x C interaction is different at the different levels of A.

If the interaction of A x B is tested at each level of C, a simple interaction test is conducted by fixing C. Further simple test are conducted to find out where the two-way interaction originates, if it is found at which level of C the interaction exists (simple simple tests: two factors are fixed: Maxwell & Delaney 1990, p. 332). Following this procedure, it was explored whether or not the three-way interaction effect is caused by the hypothesized fit (hypothesis 1).

6.5.6 Step 5: studying the relation between several variables via loglinear models

Step 5 is used for testing the two remaining hypotheses, 2 and 3. We explain the use of loglinear models for testing hypothesis 2, and follow by applying this method to test hypothesis 3.

Hypothesis 2. Organizations are not relatively often situated in those balanced fit situations.

A test of hypothesis 2 investigates if there is a correlation between IT, strategy and structure so that organizations find themselves in these favorable combinations (fits), significantly more often than could be expected on a random basis, based on the main effects of IT, strategy and structure. Then organizations obviously manipulate IT, strategy and structure so that IT is used in a favorable way. A chi-square analysis (cross tabulation) is often used to test this kind of relation (see for instance Baarda & De Goede 1990, pp. 208-211). By comparing the distribution of the separate variables (marginals) and the number of cases in the cells (frequencies), the (significance of the) relation between the variables becomes clear.

To study the relations between more than two variables, loglinear models are more appropriate. These models help to explore the relations between variables in multi-way cross tabulation (Norusis 1992c, p. 162). The method is based on the natural logs of the frequencies. The impact of the relation between two or more variables is subtracted from the saturated model that contains all the main effects and the interaction effects.

Saturated model of two variables:
Ln (cell 1,2) = mean + effect variable 1 + effect variable 2 + effect relation variable 1 and 2.

Independency model of two variables:
Ln (cell 1,2) = mean + effect variable 1 + effect variable 2.

If the difference between the two situations is significantly high, it is stated that there is a relation between the variables (Norusis 1992c, pp. 162-171). This model is also used for three variables. Via backward elimination, the model that fits the distribution in the most parsimonious way is sought (Norusis 1992c, p. 174). In this research, we were only interested in the possible influence of the relation between IT, strategy and structure, so that the next question was relevant: does the drop of this relation cause a significant effect?

Conditions
To verify if the best model fits the data well, the residuals were researched. They should not be too large. This is tested via standardization of the residuals or via

plots:

- standardized residuals must be between -1. 96 and 1.96;
- the plots should not show major deviations.

Hypothesis 2 would be confirmed if the elimination of the relation between IT, strategy and structure did not show enough significant deviations from the saturated models. This would mean that there are not significantly more organizations showing the fit compared with the other possible combinations. The variables do not influence each other in such a way that organizations use their IT in the most favorable way.

Hypothesis 3. The existence of mature SISP has a positive effect on the presence of organizations in those balanced fit situations.

It is interesting to explore the influence the management can apply of to 'guide' organizations to the right combinations. To study this hypothesis, the sample was divided into two groups:

- group 1: organizations using SISP;
- group 2: organizations not using SISP.

If the hypothesis was correct, then organizations in the first group should be significantly show a fit combination, in contrast to organizations in the second group. Therefore, in the first group the elimination of the IT, strategy and structure relations should cause a significant amount of critical deviation from the saturated model, and in the second group there should be no (or only an insignificant number of) deviation. This result would mean that organizations with SISP are relatively more situated in the fit, and therefore that they successfully use the opportunities of their IT.

This idea was easily tested by eliminating the relation between SISP - IT - strategy - structure from the saturated model. Based on the expectation that the strategy - structure - IT relations would not influence the frequencies of organizations in the fit combinations (hypothesis 2), a significant effect would indicate the importance of SISP for the presence of organizations in the combinations. If the elimination of the relation between the four variables were to cause significant deviations from the saturated model, further research would be carried out as to whether organizations tend to be naturally present in the fits (and not in other combinations).

6.5.7 Conclusion on the method of analysis

In this section, we explained the series of analyses that brings us from the raw data to the answers on the three research questions. This scheme of analysis is applied in the following chapter, which starts with the factor analyses. The recoding is not further reported in this text, and the check of the distributions and reliability are presented within the context of the analyses themselves.

CHAPTER 7

RESULTS

7.1 INTRODUCTION

In this seventh chapter, the results of the study are presented. These results are the outcomes of the testing of the hypotheses. To that end, the data have been analyzed as indicated in the previous chapter. The outcomes were also used to answer the research questions. A profound discussion regarding the theoretical and practical consequences of these results will take place in the following, eighth, chapter.

The structure of this chapter is based on the scheme of analyses described in the previous chapter. We start with the test of the first main hypothesis, in which the effect of the fit between IT, strategy and structure on the competitive performance is stated (section 7.2). Testing this hypothesis required various analyses which were performed in several steps. The following two sections (7.3 and 7.4) handle the other two main hypotheses, in which are the extent to which the opportunities of IT are exploited by organizations are assessed. The chapter finishes with the conclusion, in which the outcomes of the tests of the hypotheses are summarized and the answers to the research questions are given.

7.2 THE STRATEGIC IMPORTANCE OF THE FIT BETWEEN IT, COMPETITIVE STRATEGY AND ORGANIZATIONAL STRUCTURE

7.2.1 Introduction

In this section, the first hypothesis is tested. The hypothesis, as worded in section 5.7, is repeated here as a reminder:

Hypothesis 1. Fits between IT, competitive strategy and organizational structure have a positive effect on the realization of the strategic opportunities of IT.

Answering the first hypothesis started with determining the scores of the organizations on the variables IT, competitive strategy, organizational structure and strategic performance. For this, factor analyses were used. At the same time, the assumptions, like the partial correlations between variables and the reliability of the factors, were to be verified . After the factors of strategy, structure and IT had been detected, the hypothesis could be made operational in terms of the factors found.
Subsequently, study was performed as to whether the three variables had synergetic effects on performance. For this purpose, the interaction effects of the variables were studied with ANOVAs. Again, the assumptions, such as the normal distribution of the data, were evaluated.
Finally, study was carried out as to whether the synergetic effects were in line with the predictions. To analyze the effects in a three-factor design, simple interaction tests were used to compare the cell means. The results of these test were examined to see if they provided support for the first hypothesis.

7.2.2 Step 1a: aligning the values on the variables IT, competitive strategy, organizational structure and strategic performance from the questionnaire data via a factor analysis[1]

IT

First the IT items were analyzed (see appendix B. 3). Four factors emerged with an eigen value higher than 1 with a drop after the fourth factor. We recognized the three predicted IT structure dimensions from Ein-Dor & Segev using the factor analysis, namely (Ein-Dor & Segev 1982):

IT centralization:	refers to the centralization of development and implementation of applications. The items used can be found in the appendices B. 2;
IT concentration:	refers to the deployment of hardware through the organization, ranging from a central mainframe to dispersed minis and micros;
IT integration:	via data distribution, organizational members can be integrated without the use of lateral organizational

[1] For step 1b, see subsection 7.4.2

devices.

Also a fourth factor arose. However, this fourth factor consisted of only two items. Therefore, it was excluded from further analyses. The content of the remaining three dimensions (IT concentration, IT centralization and IT integration) was thoroughly discussed in the second chapter, subsection 2.3.2.3. The IT function variables (IT for enhancing the efficiency, effectiveness and innovation) did not arise from the data at all. Hence, we continued the research with the IT structure variables.

The assumptions concerning the factor analysis were met. The reliability of the items of the three factors was satisfying to low. Although IT integration had a reliability which was less than desirable, it was retained because of its theoretical centrality.

Competitive strategy

Subsequently, the competitive strategy of the organizations studied was analyzed (see appendix B.4). There were four factors with an eigen value higher than 1. The plot indicated a scree (drop) after the ninth factor. We identified the four dimensions expected, namely:

- innovation: indicates how an organization differs from the competitors by the use of new products, services and technologies;
- focus: states in what way the organization is geared to the particular needs of certain customers;
- marketing differentiation: indicates the organization's efforts like service, advertising, quality image, which add to the function of its product or service in order to distinguish the organization from others;
- (low) costs: makes clear that the organization is distinguished by the lowest costs in the creation of products and services.

The assumptions concerning the factor analysis were met. The reliability of the items of the four factors was also satisfying.

Organizational structure

After researching the competitive strategy, we analyzed the organizational structure (see appendix B.5). Four factors had an eigen value higher than 1. The plot indicated a drop (scree) after the seventh factor. We saw the same three dimensions as Miller & Dröge, namely (Miller & Dröge 1986):

- formalization: aimed at regulating individual behavior using formal prescriptions for jobs and the work flow or general rules for all kinds of situations;

- (vertical) centralization: concerns the vertical division of decision-making power, up or down through diverse (management) levels;
- integration: refers to direct contact between people to direct their actions and decisions without asking for approval of higher management levels.

The evaluation of the assumptions delivered satisfying results. The reliability of the items of three of the four factors was good. The reliability of the training items was only 0.28. Therefore this factor was excluded from further analysis.

Competitive position

Finally the dependent variable, the (subjective) competitive position, compared with equally-sized organizations in the same industry, was determined (see appendix B.6). The factor analysis confirmed that there was one latent dimension underlying the four items: NOP (related to equally-sized competitors), NOP development (related to equally-sized competitors), the market share (related to equally-sized competitors) and the market share development (related to equally-sized competitors). We refer to this dimension as the (subjective) competitive position. The scores of the four items were added because they all contributed to the one factor. This sum reflected the relative competitive position (COMPOS).

The ability to assess the 'right' competitive position was supported by the significant positive correlation between the subjective and objective return figures (see subsection 6.4.2).

Determining the competitive position completed the first tentatively step. The value of SISP was determined at a later stage in accordance with the same procedure (see subsection 7.4.2). We could proceed with specifying the measurable hypotheses, based on the 8 partial hypotheses of hypothesis 1 (see section 5.7).

7.2.3 Step 2: making the data usable for testing hypotheses

This second step started with excluding several partial hypotheses (see section 5.7), because they could not be tested with our data. We already deleted 'training' from the organizational structure factors (see the previous subsection 7.2.2). Therefore partial hypothesis 3 could not be tested. Then partial hypothesis 7 was also excluded from the test. Distributed IT could not be tracked, because the factor analyses did not produce the IT function factors.

The translation of the partial hypotheses a measurable state took place according to the rules given in the scheme of analysis (see section 6.5). The application of these rules is stated below.

1.1 Niche marketers with simple structure with unconnected IT have a high strategic performance.

Measurable hypothesis I: high focus - low formalization - low IT integration

A high focus is not unique to niche marketers. Niche innovators have a high focus too. Low formalization is not unique to simple structures. Adhocracies have a low formalization too. Low IT integration is unique to unconnected IT, although concentrated IT has a low to average IT integration. The combination of factors, however, is unique to the combination of types of niche marketers, simple structure and unconnected IT, as stated in partial hypothesis 1.1.

1.2 Cost leaders with a machine bureaucracy with concentrated IT have a high strategic performance.

Measurable hypothesis II: high (low) costs - high formalization - high IT concentration

High (low) costs are not unique to cost leaders. Low cost marketers have high (low) costs too. The other two factors are unique to their types as stated in partial hypothesis 1.2.

Measurable hypothesis III: low (marketing) differentiation - high centralization - high IT concentration

This measurable hypothesis, which is also deduced to test partial hypothesis 1.2, refers to the use of the high centralization of machine bureaucracies, based on Mintzberg's connotation on the centralized nature of machine bureaucracies (Mintzberg 1979, pp. 195, 209-210). High centralization is not unique to machine bureaucracies, it is also seen by niche marketers. Also the low emphasis on marketing differentiation is used, in contrast to partial hypothesis 6, using a high marketing differentiation. A low marketing differentiation is unique to cost leaders. Finally, a high IT concentration is unique to concentrated IT. The combination of factors is unique to this combination of types.

1.3 Marketers with a professional bureaucracy with distributed IT have a high strategic performance.

This partial hypothesis was excluded from testing because of the reasons stated at the start of this subsection.

1.4 Innovators with an adhocracy with decentralized IT have a high strategic performance.

Measurable hypothesis IV: high innovation - high integration - high IT integration

The high innovation is not unique to innovators. Niche innovators have a high innovation too. High integration and high IT integration are unique to their types. The combination of factors is unique to the combination of these types.

1.5 Marketers with a simple structure with unconnected IT have a high strategic performance.

Measurable hypothesis V: high (marketing) differentiation - low formalization - low IT integration

High marketing differentiation is not unique to marketers. Low costs marketers have it too. Low formalization is not unique to simple structures. Adhocracies have a low formalization as well. Low IT integration is unique to unconnected IT, although concentrated IT has also a low to average IT integration. The combination of factors, however, is unique to this combination of types.

1.6 Low cost marketers with a machine bureaucracy with concentrated IT have a high strategic performance.

Measurable hypothesis VI: high (marketing) differentiation - high formalization - high IT concentration

It has been stated earlier that high marketing differentiation is not unique to low cost marketers. Other marketers also have a high marketing differentiation. A high centralization cannot be used here for machine bureaucracies. In that situation, the measurable hypothesis VI would use the same ANOVA design as the second measurable hypothesis III. Therefore, high formalization is applied, unique to machine bureaucracies. Finally, a high IT concentration is unique to concentrated IT. The combination of factors with these values is unique to the combination of these types.

1.7 Low cost marketers with a machine bureaucracy with distributed IT have a high strategic performance.

This partial hypothesis was excluded from testing because of the reason stated at the start of this subsection.

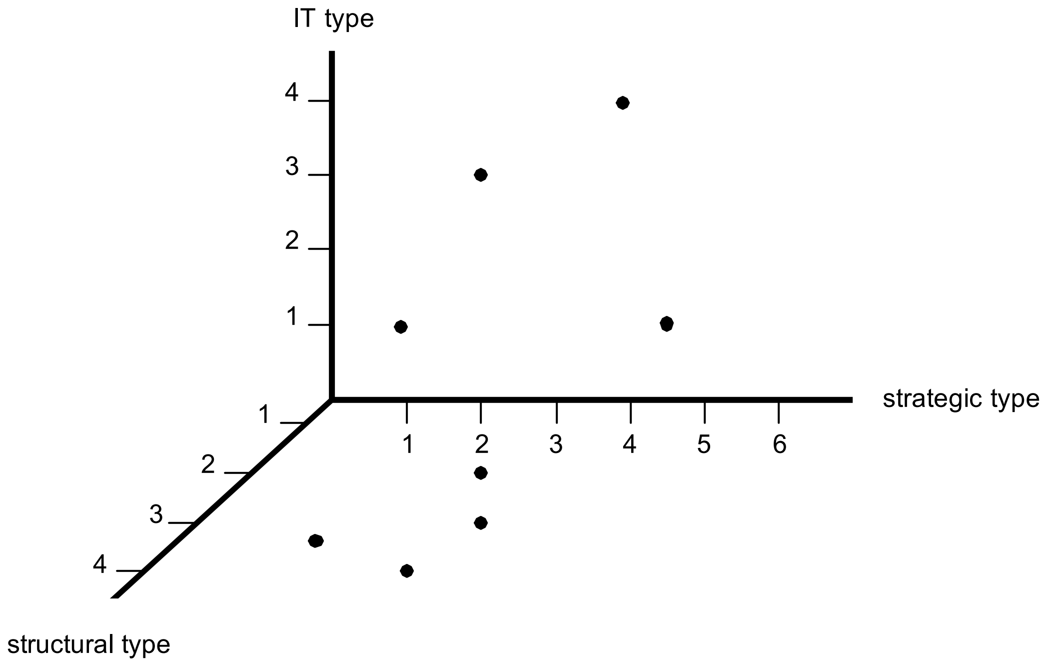
1.8 Niche innovators with adhocracy with decentralized IT have a high strategic performance.

Measurable hypothesis VII: high focus - high integration - high IT integration

High focus is not unique to marketers. Niche marketers have it too. High integration, however, is unique to adhocracies and high IT integration is unique to decentralized IT as well. The combination of these factors, however, is unique to the combination of the types of niche innovators, adhocracy and decentralized IT.

Thus, the translation resulted in the 7 measurable hypotheses, which all measured a particular fit between strategy, structure and IT. Figure 7.1 below indicates these fits, which are hypothesized to have a significant high strategic performance.

Figure 7.1 RELATING IT TYPES, STRATEGIC TYPES AND STRUCTURAL TYPES
(see also figure 5.3)



7.2.4 Step 3: the effect of combining three variables on strategic performance was studied with interaction via an analysis of variance (ANOVA)

Synergetic effects demonstrate that certain combinations of variables result in a higher performance than is to be expected, due to the competitive impact of the variables itself. Interaction tests are a way to find these synergetic states. Interaction demonstrates that the effect of one variable on another variable is changed by variation in a third variable.

Three of the seven designs (of the measurable hypotheses) showed significant three-way interactions, namely:

III: low (marketing) differentiation - high centralization - high IT concentration;
IV: high innovation - high integration - high IT integration;
V: high (marketing) differentiation - low formalization - low IT integration.

The ANOVAs and the check of the assumptions are presented in the appendix B.7.

Reviewing step 3, we concluded that hypothesis 1 could be supported by affirmative answers to the following questions:

A. was the number interactions found sufficient to statistically support the first main hypothesis?

B. did the interactions shown by the three supported measurable hypotheses allude to the predicted fits?

These questions are answered in step 4 of the analyses.

7.2.5 Step 4: analyzing if the hypothesized fit between three variables causes the interaction via simple tests

About half the hypothesized measurable interactions were supported by the data. To answer question A., we had to investigate whether the 3 interactions found were sufficient to statistically support the first main hypothesis. Obviously there was some three-way interaction measured, but this might be the result of chance capitalization. For instance, without any interaction at all, 100 tests at a significance level of 5% would deliver about 5 critical values, and 20 tests about 1 value. Therefore, we had to calculate the chance of finding 3 out of 7 interaction effects if there had been no three-way interaction at all. If this chance were less than 5% we could conclude that there was interaction.

We started by stating the null hypothesis that there was no interaction between the three variables. At a significance level of 5% there was a probability of 95% that non-critical values would be found if this hypothesis were true. Now we could calculate the probability that 2 or more significant values would be found using 7 tests, under the condition that the null hypothesis would be true (at a significance level of 5%).

For the 5% level alpha this probability is:

$$1 - \sum_{i=0}^{1} \binom{7}{i} (\alpha)^{i}(1-\alpha)^{7-i} = 0.04$$

Because the probability that our two significant values would be found, if the null hypothesis were true, was less than 5%, we had to reject the null hypothesis, and could state that there was a significant interaction between the three variables IT, competitive strategy and organizational structure. In addition, we found a third

6.5% interaction.

The next question was whether the interactions alluded to the predicted fits (question B.). Three-way interaction demonstrates that the effect of a two-way interaction is not consistent across the third variable. There had to be combinations of IT, strategy and structure where the competitive position was significantly high (or low), compared with the sum of the main effects. The cells of the ANOVA could be studied via simple interaction tests, to explore whether the significantly high competitive positions were present in the cells as predicted in the measurable hypotheses. We applied the procedure that Maxwell & Delaney stated to find fits (Maxwell & Delaney 1990).

1. Fixing the level of strategy.
   Three-way interaction meant that the interaction between two variables (IT and organizational structure) was not consistent across the third variable (competitive strategy).
2. Comparing the two-way designs (structure x IT) via simple interaction tests.
   The interaction effect of structure and IT depended on strategy. That meant that in the one design, the interaction effect of structure and IT was absent, whereas in the other design, this interaction (indicating that the effect of structure was dependent on the value of IT) was present. Accordingly, there was a favorable combination of IT, strategy and structure.
3. Fixing IT to research simple, simple main effects (contrast research).
   It was explored which use of IT was favorable because of the interaction between structure and IT. If structure had a positive significant effect on using IT in a certain way, then the cell means had to be studied to see if its value was higher or lower than the other cell means. This would indicate whether or not the predicted fit was really present.
4. Checking the synergy
   The sums of the main effects had to be compared with the observed cell means of the fit combination to control the synergetic effect. The utilization of IT with certain levels of strategy and structure had to perform better than with other combinations.

Applying this procedure resulted in the following results. Firstly, it was explored if the three-way interaction between marketing, centralization and IT concentration was caused by the favorable combination of low (marketing) differentiation - high centralization - high IT concentration (measurable hypothesis III, see subsection

7.2.4). This proved to be true: we found that the fit showed a mean competitive position of 15.3, while using IT in a decentralized structure resulted in a competitive position of 12.7 (scale of the competitive position: 4-24). If there were no interaction at all, the fit combination would have had a competitive position of 14.6. The data supported the existence of the hypothesized fit.

The second three-way interaction (significance 10%) was then studied. High innovation - high integration - high IT integration (measurable hypothesis IV) should give the highest competitive position. However, not the predicted combination, but another combination was responsible for the interaction. If IT had a low level of integration, the average competitive position was 17.4. If the level of IT integration was raised, the average competitive position dropped to 14.5. If interaction were absent, the non-hypothesized fit had a competitive position of 15.6. The data supported the existence of another, reverse, fit, compared with the predictions.

A possible explanation is that organizations which were already structured for integration, did not need the integrative opportunities of the IT as well. This is not necessary and thus too expensive. Hence IT does not reflect the decision-making structure. Maybe they used specialized, unconnected applications with innovative opportunities. However, the IT function variable did not emerge, therefore this element remains unknown in our research.

Finally, the third three-way interaction was studied. High (marketing) differentiation - low formalization - low IT integration (measurable hypothesis V) was supported by the data as the right combination with a competitive position of 18.2. If the organizational structure were formalized, the position would drop to 15.2. The lack of interaction would result in a competitive position of 15.5.

Summarizing, we see that two out of three interactions were caused by the predicted fits, and even the non-predicted combination could support the concept of fit. This was sufficient to support the first main hypothesis. In section 7.5 of this chapter, we shall go deeper into this result.

7.3 THE LACK OF EXPLOITATION OF THE IT OPPORTUNITIES

7.3.1 Introduction

In this section, the second main hypothesis is handled. The hypothesis (as worded in section 5.7) is repeated below.

Hypothesis 2. Organizations are not relatively often in those balanced fit situations.

The 7 translations from the partial hypotheses into measurable hypotheses also formed the basis for the testing of the main hypotheses 2 and 3. As stated in chapter 6 (section 6.5.6), hypothesis 2 can be tested by researching the correlations between IT, strategy and structure in these measurable fits. If these correlations are present, organizations would be represented in the favorable IT - strategy - structure combinations to a significantly greater extent than the main effects of IT, strategy and structure would predict.

Table 7.1 THE DISTRIBUTION OF ORGANIZATIONS DETERMINED BY THEIR MEASURES ON IT CONCENTRATION, MARKETING AND CENTRALIZATION

	INFOCON			
	1.00		2.00	
	CE		CE	
	1.00	2.00	1.00	2.00
MA				
1.00	16	21	9	19
2.00	10	19	20	23

Loglinear models can measure the relation between these three variables. However, we shall first give an indication of the attractive power of the three fits. How many organizations were observed in the fits? This indication was only illustrative because the effects of the relation between two variables were not subtracted. For this, we needed the loglinear analyses in subsection 7.3.3, which are presented after the illustrations, shown in subsection 7.3.2.

7.3.2 The distribution of organizations over the various IT - strategy - structure combinations

Measurable hypothesis III low (marketing) differentiation - high centralization - high IT concentration

As far as III is concerned, we see in Table 7.1 that only 19 of the organizations in the ANOVA-design were represent in the low (marketing-)differentiation - high centralization - high IT concentration fit. If the three variables had no relation at all, the expected cellcount would be 20 organizations. We see that organizations were not attracted to the fit.

Table 7.2 THE DISTRIBUTION OF ORGANIZATIONS DETERMINED BY THEIR MEASURES ON IT INTEGRATION, INNOVATION AND INTEGRATION

	INFOINT			
	1.00		2.00	
	INTEG		INTEG	
	1.00	2.00	1.00	2.00
IN				
1.00	29	8	23	14
2.00	13	15	14	21

Measurable hypothesis IV high innovation - high integration - low IT integration

There were 15 organizations in the high innovation - high integration - low IT integration fit (see Table 7.2). Without any relations between strategy, structure and IT, this would be 13 organizations. Hence, organizations were not in the right situation to exploit the IT opportunities to a significantly greater extent than a random sample.

Measurable hypothesis V high (marketing-)differentiation - low formalization -

low IT integration

Finally, high (marketing-) differentiation - low formalization - low IT integration did not attract either. Table 7.3 shows that the observed amount of organizations (12) was not significantly higher than the expected cellcount without any relations (15), in fact, it was but even lower (3).

Table 7.3 THE DISTRIBUTION OF ORGANIZATIONS DETERMINED BY THEIR MEASURES ON IT INTEGRATION, MARKETING AND FORMALIZATION

	INFOINT			
	1.00		2.00	
	FOR		FOR	
	1.00	2.00	1.00	2.00
MA				
1.00	18	20	15	12
2.00	12	15	17	28

These illustrations gave reason to suppose that hypothesis 2 was correct. However, the evidence did not take into account the possible relations between two of the three variables. To subtract this influence, we needed to use the loglinear analyses.

7.3.3 Step 5a: studying the relation between several variables via loglinear models[2]

Loglinear analyses are based on functions that relate the number of organizations in the different cells to the various effects of the variables and their mutual relations. If variables are related with each other, then the amount of variables in

2 For step 5b, see subsection 7.4.3

a cell differs from a random distribution. Loglinear analyses start with the creation of the saturated, model in which the effects of all the variables and their interactions are taken into account. Then the effects of the relations between three and two variables is subtracted from the model, and subsequently the effect of the variables (the main effects) themselves. The aim of the analysis is finding the most stripped (final) model which does not differ significantly from the saturated model. Then the subtracted effects do not have a significant impact.

All three analyses made clear that deleting the relations between the three variables did not have a significant impact on the cellcount (see appendix B.8). Also the assumptions were verified. These results supported the second main hypothesis[3]. Organizations were not attracted to the fits. This might be a reason for under-exploiting the IT. In chapter 8 we shall discuss this result.

7.4 THE MANAGEMENT OF IT: THE EFFECTIVENESS OF SISP FOR THE EXPLOITATION OF IT

7.4.1 Introduction

In this section the effect of the SISP on the exploitation of IT is researched. The hypothesis is, that the existence of SISP has a significantly positive effect on the presence of organizations in fit situations. The fit is seen as an intervenient variable between SISP and competitive performance (Jansen 1982, p. 35).

This section has the following structure. Firstly, the values of SISP per organization had to be known. Therefore, we performed factor analyses, comparable with the analyses for the IT, strategy, structure and strategic performance (subsection 7.4.2). Then the effect of SISP was studied via several analyses (subsection 7.4.3). Finally, at the end of subsection 7.4.3, the conclusion on the effectiveness of SISP was drawn.

7.4.2 Step 1b: aligning the values on the variables of SISP from the

3 The four measurable hypotheses which were not supported by the ANOVA's were also checked on their distribution of organizations. Nowhere the distribution was influenced by the relation between the three variables.

questionnaire data via a factor analysis

In the factor analysis, the following two dimensions of SISP were found (appendix B. 9):

- SISP1, which stands for the content of SISP: formal SISP was present (containing strategic IT objectives, information architecture and applications portfolio), and the strategy and structure were relevant for making SISP. The reactive or proactive nature of SISP did not become clear from the data.
- SISP2, which represents the support of top management and line management. The IT management is not the only stakeholder in planning, developing, implementing and using the IT.

These two factors had an eigen value higher than 1. Although the second factor consisted of only two items, it was still included because of its high reliability (0.90) and its important theoretical value. The factor analysis assumptions were met.

7.4.3 Step 5b: studying the relation between several variables (including SISP) via loglinear models

The third hypothesis, as worded earlier in section 5.7, is stated as follows:

Hypothesis 3. The existence of mature SISP has a positive effect on the presence of organizations in those balanced fit situations

There were two ways of testing this hypothesis with loglinear modelling. The first way was to split the sample into two groups: organizations with high values on SISP and organizations with low values on SISP. It was expected that in the 'high SISP' group, the three variables were related to each other in such a way that significantly more organizations were represented in the observed fit situation.

The second way was to directly add the SISP factors as new variables to the loglinear analyses. We have already seen that IT, strategy and structure did not cause favorable distributions of organizations within the fit cells. If SISP1, IT, strategy and structure had a four-factor relation that could not be not deleted from the saturated model, then SISP1 would have caused the skewed distribution of organizations that favors the exploitation of IT.

Three situations had to be explored because SISP was not a uni-dimensional construct:

- organizations using SISP1;
- organizations using SISP2;
- organizations using SISP1 and SISP2.

The impact of SISP on the three observed fits was studied. The first fit under scrutiny was fit situation III: low (marketing) differentiation - high centralization - high IT concentration (see appendix B. 10).

The loglinear tests indicated that in the situation of high SISP1, organizations were not represented to a significantly greater extent in fit situation III than in the other combinations between marketing, centralization and IT concentration.

The impact of SISP2 on the three observed fits was also studied. The loglinear tests indicated that in the situation of high SISP2 organizations were not represented to a significantly greater extent in fit situation III either.

Finally the impact of SISP1 and SISP2 on the three observed fits was studied. This combination referred to the most mature form of SISP as determined in this research. The loglinear tests indicated that in the situation of high SISP1 and high SISP2 organizations represented to a significantly greater extent in fit situation III than in the other combinations.

These results indicate that SISP did not have a significantly positive effect on organizations in terms of being represented in fit situation III, where the opportunities of IT are exploited in a relatively good way. Also the loglinear analyses in which SISP was directly related with the variables of (marketing) differentiation, centralization and IT concentration did not yield positive results (see appendix B. 10).

The impact of SISP on the distribution of organizations in the other two observed fits (fit situation IV: high innovation - high integration - high IT integration; fit situation V: high (marketing) differentiation - low formalization - low IT integration was also studied. Here the impact was absent too [4].

Now we can conclude that organizations with a high level of SISP did not find themselves in fit situations to a significantly greater extent than in non-fit situations. Against the expectations we must reject hypothesis 3. Using SISP did

[4] These results havenot been included in the appendix. They can be supplied by the author, if requested for.

not have a noticeable effect on the exploitation of IT. In the following chapter we shall give possible reasons for this result and its theoretical and practical consequences.

We presented the result that there was no effect of SISP on the competitive position via the intervenient variable of 'fit'. Although theoretically not assumed, there could be a direct effect of SISP on the competitive position. The direct relation between SISP and the competitive position was researched with correlation and ANOVA analyses (see also appendix B.11). None of these analyses demonstrated a significant relation between SISP and the competitive position. SISP influenced the competitive position neither directly nor indirectly.

7.5 CONCLUSION

In this concluding section of chapter 7, the results are summarized. Firstly, the outcomes of the testing of the hypotheses are stated. Then the research questions, as given in chapter 5 (section 5.6), can be answered.

Hypothesis 1. Fits between IT, competitive strategy and organizational structure have a positive effect on the realization of the strategic opportunities of IT.

Partial hypotheses belonging to hypothesis 1:

1.1 Niche marketers with a simple structure with unconnected IT have a high strategic performance: not supported.
1.2 Cost leaders with a machine bureaucracy with concentrated IT have a high strategic performance: supported.
1.3 Marketers with a professional bureaucracy with distributed IT have a high strategic performance: not measured.
1.4 Innovators with an adhocracy with decentralized IT have a high strategic performance: not supported (supported with an adjustment to unconnected IT at a significance level of 10%).
1.5 Marketers with a simple structure with unconnected IT have a high strategic performance: supported.
1.6 Low costs marketers with a machine bureaucracy with concentrated IT have a high strategic performance: not supported.
1.7 Low cost marketers with a machine bureaucracy with distributed IT have a high strategic performance: not measured.
1.8 Niche innovators with adhocracy with decentralized IT have a high strategic performance: not supported.

Summarizing:

- two partial hypotheses could not be measured (1.3 and 1.7);
- the results of one partial hypothesis did not follow the theory precisely (1.4);
- two of the five remaining partial hypotheses are supported (1.2 and 1.5).

These results gave enough support for the main hypothesis as a whole. Hence research question 1 (do fits between IT, competitive strategy and organizational structure have a positive effect on the realization of the strategic opportunities of

IT?) is answered positively.

Although the first hypothesis was supported in a significant way, the effect is not very large. We can see this in the simple tests. Besides, four of seven measurable hypotheses were not supported. A possible reason might be that the power of the tests is too low (Slotboom 1987, pp. 82-85).

Hypothesis 2. Organizations are not relatively often situated in those balanced fit situations.

Organizations did not position themselves in the three observed fits. Therefore, hypothesis 2 can be confirmed with the data. They generally do not exploit the strategic IT opportunities. Hence research question 2 (are organizations relatively often situated in those balanced fit situations?) is answered negatively.

Hypothesis 3. The existence of mature SISP has a positive effect on the presence of organizations in those balanced fit situations.

SISP did not yield any effect on the presence of organizations in the fit situation. The third hypothesis is not supported. Hence research question 3 (does the existence of mature SISP have a significantly positive effect on the presence of organizations in those balanced fit situations?) is answered negatively.

This chapter does not discuss the results in terms of their position in the literature, nor in the light of the theoretical and practical goals of this research. That discussion will take place in the following chapter.

CHAPTER 8

CONCLUSIONS

8.1 INTRODUCTION

In this chapter, we present the conclusions on the strategic exploitation of IT. We shall elaborate on several theoretical and practical implications of the research. These implications are suitable to support researchers in their studies and practitioners in their usage of the technology.

With regard to the theoretical conclusions, we shall direct these especially towards researchers in the field of Information Systems. Many of them are familiar with the models of SISP, which are often published in journals and discussed at conferences. One of the important characteristics of these models is their conceptual nature. However, variables like business strategy, the IT platform and organizational processes and structures are often not expressed in measurable items. Therefore, the content of the relations between variables, such as the well-known alignment between business strategy and IT strategy, stays hidden. Instead the content of the relations is described in broad terms. The verification of the models via an empirical test is neglected although the models are rather plausible. This issue takes an important place in this chapter. Another point of interest is of a more fundamental nature, and concerns the value of SISP as such. The information policy paradox states that the use of SISP as such does not lead to a successful exploitation of IT. In this chapter this statement is discussed in the light of the results of the quantitative analyses.

When it comes to the practical conclusions, concrete guidelines on the use of IT are given to the (IT) management of organizations. These guidelines are useful if the application of SISP models leads to the exploitation of the strategic opportunities of IT. These guidelines represent possible managerial choices on the use of IT with regard to the future, which are based on the different fits in the SISP models. A choice between them can be made by integrating the diagnosis of the present use of IT with the managerial vision on the future use of IT.

This chapter is structured as follows. It starts with a short recapitulation of the preceding chapters. The line of thought of the research is summarized in order to reach a strengthened comprehension of the practical findings, i.e. the results, as presented in the fourth chapter (8.2). This enhances the discussion of these results, which will lead us to the research conclusions. Firstly, the theoretical value of the study is established. The outcomes of the tests of the three research hypotheses are reviewed in the light of theoretical and empirical findings in the literature (8.3). Accordingly, practical implications are given for the management (or managers) of IT. It is demonstrated how the results of the research can be used (8.4). After stating the theoretical and practical research implications, the way in which the research goal has been reached will become evident. Nevertheless, several remaining problems are observed. In the final section these issues are discussed, providing suggestions for further research (8.5).

8.2 RECAPITULATION: SUMMARIZING THE ARGUMENT

8.2.1 Introduction

This section provides a brief survey of the study. It starts with introductionary issues about the strategic opportunities and the (lack of) exploitation of IT. The theoretical model that was developed in this research in order to deal with these issues leads us to the final research goal and research questions. The review ends with the results of the study. The function of this section is to offer an overall comprehension of the subject in order to support the further discussion of the results in sections 8.3 to 8.5.

8.2.2 Context and issues

The primary question of this study concerns the strategic exploitation of IT. This strategic exploitation refers to the competitive position of the organizations. The study is triggered via the combination of observations from three different angles:

1. IT is relevant for the competitive position.
   The practical evidence for this statement consists of a large amount of case studies demonstrating the strategic value of IT. It is evident that the technology offers strategic opportunities (Benjamin et al. 1984; Parsons 1983). These strategic improvements have a high priority for IT managers (Bots & Van der Putten 1994, p. 96; Niederman et al. 1991, p. 481; Saunders &

Jones 1992, p. 72). The theoretical argument is based on the importance of IT as a means of production in the performance, management and support of the organizational processes of the value chain. Optimizing the performance of this value chain leads to competitive benefits especially in information-intensive organizations (McFarlan 1984, p. 98; Porter 1985).

2. IT investments are high.
   Studies discuss the major IT investments (Davenport & Short 1990; Nolan & Schotgerrits 1989, p. 997; Saunders & Jones 1992). A long ago as 1983, investments of $ 1 trillion were mentioned (Parsons 1983). Capital investments of this magnitude should deliver fair earnings.
3. IT opportunities are often not effectively exploited.
   It is no triviality to gain from IT (Bakos & Treacy 1986, p. 108). Cases support this remark. Jaikumar describes IT usage that delivers disappointing results (Jaikumar 1986). Besides, there is not a clear relation between the level of IT investment and several return measures (Thurow 1990). Thurow maintains that the overall IT benefits are disappointing (see also Davenport & Short 1990). Gaining an advantage by means of strategic opportunities is often not the case (Gerstein & Reisman 1982, p. 53).

Current SISP methods also do not offer the solution to the strategic utilization of IT (Lederer & Sethi 1988). The consequence could be that management in organizations loosen their commitment to IT, so that future investments and usage are hampered. Therefore, we state the next preliminary research goal: to gain insight into the strategic usage of IT.

8.2.3 Theoretical model

Gaining competitive success with IT is obviously not a question of the presence of the technology as such (uni-variate research). Organizational aspects also have to be taken into account when studying the success of IT. However, the relations between IT and strategy and between IT and structure display inconsistent competitive results in the literature (bi-variate research). This can be the result of the moderating effect of the third variable. Therefore, a more elaborate organizational usage of IT was under scrutiny (multi-variate research).

Several theoretical models in the field of Organizational Studies and Information Systems investigate the relation between organizational and technological variables (Baets 1992, p. 207; Boersma 1989, p. 167; Rockart & Scott Morton 1984, p. 90). Two elements in these models repeat over and over again:

- the balance between organizational and (information) technological variables is essential for the functioning of organizations. However, these theories are conceptual in nature, so that concrete alternatives for the (IT) management stay hidden. Our research strives for a reduction in complexity via operationalization of the conceptual variables;
- the commitment of top and line management is seen as a necessary condition for the exploitation of IT. But involving management is often obstructed by the lack of clarity in guidelines for IT usage (Lederer & Mendelow 1988).

Subsequently the next question arose in our research: which variables have to be chosen in order to find strategic fits between IT and the organization? The criterion for the selection of IT, competitive strategy and organizational structure as those chosen variables was their logical relation (congruence). The bi-variate empirical researches showed that the variables could be logically related, so that their adjustment was positive for the functioning of the organizations. They had the following common features:

- the variables were connected with the organizational processes:
  - goals (strategy);
  - differentiation and integration of tasks (structure);
  - execution, management and support of the value chain;
- the management had a necessary and enabling role for the relations between the variables (Rockart & Scott Morton 1984, p. 90). A means of production like IT concerns the organization as a whole;
- there was no causal imperative (no one variable determines another);
- there were several possibilities of a fit (no 1:1 relation).

The relevance of the fit between the three variables was promising because of the content of the SISP models. Therefore, the relation between the three variables was hypothesized as important for the competitive position. This kind of research is a concrete test of the conceptual models of fit, and tries to explain inconsistencies between bi-variate researches.

8.2.4 Research goal, questions and hypotheses

Via the two angles of 'fit' and 'management support', the preliminary research goal was detailed in the ultimate goal. The mismatch between organization and IT may impede the realization of the strategic opportunities. This can result in a decreasing commitment of the management, which would hinder further IT investments and IT usage. Finding a good match is a complex problem. This research wanted to deal with that problem by studying the concerted effect of several organizational variables and IT. Therefore, the final research goal was stated as:

> the finding of concrete fits between IT, strategy and structure as targets for the management of organizations to use IT strategically. Via the use of these targets, the use of SISP can be concretized.

To reach the research goal, it was necessary to discover which fits between strategy, structure and IT were really successful.

1. Do fits between IT, competitive strategy and organizational structure have a positive effect on the realization of the strategic opportunities of IT?

The theoretical model, as developed in chapter 2, gave 8 states in which it was expected that organizations in one of these states would have a significantly higher strategic performance than organizations in other states. This synergetic effect was the result of interaction between the three variables, meaning that the (strategic) effect of one variable was influenced by the values of the other two variables. The strategic effect of the three variables combined together was higher than could if the variables were simply added up (Drazin & Van de Ven 1985, p. 517; Maxwell & Delaney 1990, p. 338).

Hypothesis 1. Fits between IT, competitive strategy and organizational structure have a positive effect on the realization of the strategic opportunities of IT.

In addition, we wanted to verify whether the opportunities of IT were really neglected. This would be the case if organizations were not relatively often situated in those fitting combinations.

2. Are organizations relatively often situated in those balanced fit situations?

In the first and second chapter, it was made clear that the exploitation of IT was generally disappointing. Organizations were not expected to be represented to a greater extent in the fits than in the other combinations. Accordingly, within these organizations there should be no significant relation between the three variables. This was measured via the elimination of the effect of this relation.

Hypothesis 2. Organizations are not relatively often situated in those balanced fit situations.

If this hypothesis are to be confirmed, then organizations would need insight into strategic IT usage. SISP might well be a useful instrument for implementing the right usage of IT.

3. Does the existence of mature SISP have a positive effect on the presence of organizations in those balanced fit situations?

We viewed SISP as a managerial instrument that considers the (automation of the) information services and the role of organizational aspects. Earl found some preliminary positive results for this model which he called the Organizational Approach (Earl 1993). In this research, IT and the organizational aspects were seen as mutually influencing, related via the business functions of the value chain. Therefore, it was expected that this SISP would be successful.

Hypothesis 3. The existence of mature SISP has a positive effect on the presence of organizations in those balanced fit situations

8.2.5 Results

Chapter 7 provided the answers to these research questions. The data were analyzed according to the scheme of analysis in chapter 6. Hypothesis 1 was confirmed. The synergetic effect was present in a significant number of the hypothesized fits. Hypothesis 2 was also confirmed. The variables did not relate, so that there were not significantly more organizations represented in the fits. Therefore, the opportunities of IT were not being properly used. Organizations did not seem to be attracted to the fits. Hypothesis 3 was not confirmed. Organizations using SISP were not represented in the fits to a significantly greater extent than in the other combinations. SISP also did not relate directly to the competitive position.

8.3 THEORETICAL CONCLUSIONS: PROVING THE SYNERGY OF THE MODEL

8.3.1 Introduction

In the following two sections, 8.3 and 8.4, the way in which the goal of the research is reached is verified. Section 8.3 concentrates on the theoretical part of the research, whereas section 8.4 deals with the practical implications. The structure of section 8.3 onwards is based on the three hypotheses, stated in subsection 8.2.4.

8.3.2 The strategic importance of the fit between IT, competitive strategy and organizational structure

The results indicate that the effect of a technological or organizational variable on the performance of organizations is moderated by other variables. Also the competitive effect of the relation between two variables, such as the realized competitive strategy and the current IT in the organization, is influenced by another variable, like the organizational structure. This result has two main implications.

Firstly, we must be careful with the interpretation of uni- and bi-variate research. Three-way interaction means that main effects and two-way interaction effects are ambiguous because they ignore the disturbing effect of an important third variable (Maxwell & Delaney 1990, p. 327). This is a reason for inconsistencies between these studies.

Secondly, these results support the concept of fit between several variables as claimed by the SISP models. The literature on SISP and CT offers a theoretical framework, based on the idea of adjustment between several organizational and technological variables (see for instance Boersma 1989 and Venkatraman 1989a). So far there has been a lack of comparative studies with empirical data from many organizations to support this claim for adjustment . This gap has now been partially filled by our research. Conceptual variables have been operationalized into detailed measures. The opportunities of IT are better exploited when IT is aligned with several organizational variables simultaneously. Obviously, it is advantageous to adjust organizational and technological variables to find a balance between them.

The importance of this conclusion is linked with the conceptual nature of the many models in the fields of Organizational Studies and Information Systems. The problems of these models are twofold. The first problem deals with the practicability. The general function of theoretical models is to reduce the complexity of the real world to support understanding and decision-making. Models offer the opportunity to organize (problem) situations. The difficulty in using abstract, conceptual models is the interpretation (for instance by operationalization) of their concepts and relations. The number of problem-solving alternatives remains very high without a guideline for the interpretation of the concepts. Hence, the individual decision maker still experiences many options, as long as the theory allows all the options, without discerning better solutions from inferior ones.

The second problem of these models deals with the validity. Assume that (the use of) a conceptual, non-operationalized model does not lead to the desired outcome. This 'failure' can be caused by:

1. misinterpretation and misusage of the theory itself;
2. neglecting variables which are not mentioned in the theory.

However, without rules of interpretation for the theoretical concepts in the model, the origin of the lack of success is not clear. Using conceptual models, the theoretical conditions are easily fulfilled. In that case 'failures' directly falsify the theory. That means that new concepts have to be adopted. Then, however, the complexity is enlarged again. This route is not desirable. Another path is the operationalization of the concepts to really test the explanatory 'power' of the theory. Decision makers have a stronger basis to trust its claims if the theory is thus supported.

A conceptual theory that could be tested (next to the SISP alignment ideas tested in our research) is found in the field of Information Systems. It concerns the ideas of business process redesign (BPR). The general rules are clear. A few examples are (Davenport & Short 1990, p. 14):

- develop a business vision;
- develop process objectives (prioritize objects and set targets);
- identify processes to be redesigned (identify critical or bottleneck processes).

The translation of the concepts into concrete measures is not prescribed. Therefore, the interpretation and the use of these ideas are never incorrect. An example of a mission is to offer quality to the organization's customers in a unique way. It is probably not too difficult for top management (of an arbitrary organization) to defend this mission. With this, the first condition (develop a business vision) is already fulfilled. The lack of the interpretation requirements of 'mission' and its relation to 'redesigning processes' makes it impossible to give 'wrong mission statements'. Therefore there are many good options according to the theory. But why then are there also failures in practice? This can not be explained with BPR theory.

8.3.3 The lack of the exploitation of the IT opportunities

The result of the investigation of hypothesis 2 supports the observation of the under-exploitation of IT that is stated in the literature (Gerstein & Reisman 1982). In the last decade, there has been much speculation on the reasons of this observation. So far, the studies on the success of IT have been concentrated on the level of investments, or the number of applications, without consideration for the actual usage of the technology. Now that we have placed the usage of IT under scrutiny by studying the organizational context (by introducing the realized strategy and the organizational structure as well), a tentative explanation may well be found. From the first research results it is now known that the fit between the organizational context and the IT is an explanation for the strategic success of IT. However, IT, strategy and structure do not influence each other in such a way that a large amount of organizations are attracted to those fit situations. Hence our explanation lies in the lack of a proper alignment between the organization and the IT in many organizations. This explanation is the basis for the practical conclusions in section 8.4.

8.3.4 The management of IT: the effectiveness of SISP for the exploitation of IT

The third hypothesis was not supported. Organizations using SISP were not relatively often represented in the fit combinations. The distribution of SISP organizations did not follow the pattern of fits. These results indicate that SISP does not lead to a strategic exploitation of IT. This observation is also backed by supportive analyses (see subsection 7.4.3).

On the one hand, these results were unexpected, and contradict the observations in literature (Earl 1993; Lederer & Sethi 1988, p. 449). On the other hand, authors warned against positive expectations on the strategic success of IT via the usage of SISP. Galliers brought up the coincidental nature of strategic IT. He considers strategic IT to be unrelated with directives resulting from the top-down usage of SISP (Galliers 1993, p. 286). The success cases from the 1980s had not been based on alignment with strategic organizational goals at all, but had originated from dealing with operational transactional problems. Other authors indicated the paradoxal situation that well-functioning organizations did not need distinct SISP, whereas organizations confronted with managerial problems were not able to solve these problems via explicit SISP (Simons & Verheijen 1991, p. 51).

We chose for hypothesizing SISP resulting in successful IT usage, because the major obstacle for using SISP successfully was thought to be the isolated way in which traditional SISP regarded the organization's information, information services, and IT. The conceptual idea of SISP was not seen as a reason for lack of success (see also the successful mixed SISP approach: De Jong 1994, pp. 143-150, 154-156, 174-175).

SISP, as measured, was 'mature' of nature. Namely, two dimensions had been brought up in the analyses to indicate the organizational approach of SISP (subsection 6.4.2: Operationalization of the variables; subsection 7.4.2: Step 1b: Aligning the values on the variables of SISP from the questionnaire data via a factor analysis):

- SISP1 stated the content of SISP: IT had been related with strategic and structural issues;
- SISP2 stated the top and line management support behind the SISP.

The relations between IT, strategy and structure were clearly acknowledged in the theory, and also in the questionnaire, by using the business processes of the value chain. SISP was seen as a mature instrument dealing with managerial issues in the light of the organization's information services (subsection 4.2.6: SISP as a conceptual framework for research on strategic IT).

This SISP, however, was not successful. The absence of successful SISP may frustrate (IT) management regarding the effective use of IT. Although they are willing to use SISP, there is no clear effect visible. Our main suggestion is, however, that the usage of SISP should adjoined a further specification of the conceptual terms of IT, strategy and structure. We shall give an example of this in section 8.4. The theoretical issue concerning the value of SISP is discussed further in section 8.5.

8.4 PRACTICAL CONCLUSIONS: ORGANIZATIONAL IMPLICATIONS FOR IT USAGE

In practice, the research goal was the finding of concrete fits between IT, strategy and structure as targets for the management of organizations to use IT strategically. We observed that the idea of fit was supported via the finding of the 8 fits. The significant strategic effects may be helpful for the management in supporting the successful usage of IT. However, the results on hypothesis 3 indicate that mature SISP, as measured in this research, is not suitable to enhance this successful IT usage. Therefore, the usage of SISP has to be enhanced, or other managerial efforts outside the framework of SISP are necessary in order to use the research results. This theoretical choice is discussed in the next section (see subsection 8.5.4). Here we demonstrate in what way the development and realization of SISP may be improved by means of the practical insights. The procedure proposed to use the 8 targets is as follows:

1. Start with diagnosing the dimensions of the competitive strategy, organizational structure and IT in terms of a high or a low emphasis on the several dimensions (see for instance the measurable hypotheses in subsection 7.2.3).
2. Choose one of the dimensions of the competitive strategy to determine the future competitive behavior: on which dimension does the organization want to differentiate?
3. Choose for the consolidation or change of this strategic dimension: how does the organization want to differentiate strategically?
4. Search for IT - organizational structure relations for that competitive strategic option that comes into account as one of the eight fits.

a. → no fit: Differentiating with the chosen value for strategy (3.) does not produce favorable IT opportunities. Return to step 3. to change the value of the strategic dimension. If there is still 'no fit', then there is no way that strategic IT can be stimulated via this strategic dimension. Return to step 2. for another strategic dimension.

b. → fit: Start a process of organizational development and/or information system development to arrive at the desired fit.

→ fit: The organization already finds itself in a fit situation.

The four steps above suggest some kind of crystallized method to make direct gain from the IT, starting with a diagnosis and resulting in a suitable fit situation. This suggestion however is not correct. Our research was aimed at getting insight into the reasons for attaining successful IT usage (a descriptive study), and not in presenting a method to actually realizing that objective (a prescriptive study). Such a prescriptive method would require deeper research into the process of organizational development or transformation (see: suggestions for further research in 8.5.4).

This comment does not mean that the descriptive research results cannot be used at all. Via the first step, an initial impulse to a real diagnosis is given, via the second and third step, lucid managerial choices on the competitive strategy are suggested and the final fourth step gives guidelines for the global use of IT related with the organizational configuration. As an example, we consider the following case.

Assume that an organization behaves as a cost leader and is not focussing on one or two market segments. In addition, it has concentrated IT. However, thanks to the organizational history, it is still full of experts following their own insights. In this case, integration is the main coordinating mechanism. The diagnosis (see step 1. below) results in three configurations, namely cost leader behavior as the competitive strategy, concentrated IT as the IT (structure) and an adhocracy as the organizational structure.

1. Diagnosis
   - Cost leader: scores as follows:
     - innovation: average
     - focus: low
     - marketing: low
     - low costs: high

- Adhocracy: scores as follows
  - formalization: low
  - centralization: average
  - integration: high
- Concentrated IT: scores as follows
  - info centralization: average
  - info concentration: high
  - info integration: low to average

This combination is not one of the eight partial hypotheses, and thus not a fit. Therefore one or more of the variables have to be adjusted. Firstly, the competitive strategy is explored by the management on its value for the organization. Assume that it is decided that the organization does not want to strengthen its marketing efforts, and wants to stay a cost leader (steps 2. and 3.)

2. Choose a dimension of competitive strategy, depending on the managerial insights. The dimension of marketing differentiation could be a relevant choice.
3. Determine the required level (high or low) of the marketing differentiation. A cost leader does not want to compete primarily via marketing. It does not want to spend assets on advertisements and so on, and the marketing efforts that might be important should not hinder the low costs of the production process. Therefore, the level of marketing differentiation should stay low.

To reach a fit between IT, strategy and structure, the management must now choose between adjusting the IT or the structure. Because a fit is within reach (see step 4b., step 4a. is not taken into consideration):

4b. → fit: the organization may choose to become more innovative and change the IT investment policy (based on the present adhocracy), or the organization may choose to abandon the emphasis on experts and try to formalize and centralize (based on the low costs and the concentrated IT).

Due to rationalization and external control, the management of the organization favors the development of an adhocracy into a machine bureaucracy (Mintzberg 1979, p. 470). This means more formalization as the main coordinating mechanism, a higher level of centralization and less dependency on lateral communication of experts.

- formalization: high

- centralization: high
- integration: low

This prescription is obviously simplified. Deliberately changing IT, strategy and/or structure to realize congruence and configuration may be impossible (see for instance the discussion on realized vs. intended strategy, Mintzberg & Waters 1985). Notwithstanding, Miller & Friesen plead for quantum changes when the performances of organizations are under high pressure (Miller & Friesen 1984, pp. 2, 3; see also the discussion about organizational transformation and incremental change in 2.3.4.3: Elaborating on organizational structure: dimensions and configurations). Their main argument is that the harmony between several organizational aspects must be correct, and that small adjustments would hamper this fine-tuning. Such a fundamental organizational change would probably only be possible under strained conditions. The change management has however not been a subject in our research. Notwithstanding, the significance of these targets gives the (IT) management an idea of a concrete application of SISP. The relevance of the study lies in the notion that management, via its choices on the strategic use of IT, is also aware of the relevance of the other managerial areas.

8.5 PROBLEMS FOUND AND ISSUES REMAINING: DIRECTIONS FOR FURTHER RESEARCH

8.5.1 Introduction

In this last section, we outline several issues that are still open for discussion. The discussion is organized in the same way as the approach to the theoretical conclusions, namely via the three hypotheses. For each hypothesis, there is a discussion on the theoretical and methodological aspects of the research, which is followed by the resulting suggestions for further research.

8.5.2 The strategic importance of the fit between IT, competitive strategy and organizational structure

Hypothesis 1 is confirmed. Three of the eight measurable hypothesis (subsection 7.2.4) were supported, and this result was significant. Several theoretical and/or methodological background comments on the findings are the following.

Theoretical discussion
The interaction effect of the fit between the three variables is certainly not the only reason for variation in the dependent variable. The main and two-way interaction effects caused variation in the strategic performance at certain places in the analyses as well. This is in line with results of the uni-variate and bi-variate researches. However, as stated before, the three-way interaction makes it clear that the main effects and the two-way interaction effects are not to be trusted without reserve. The effect of one or two variables is interfered by the third variable because the idea that interaction was not true at all (and the results were caused by coincidence) is rejected. The fit concept is supported by this research.

Even without the effects of the distinct variables or their interactions, a large amount of unexplained variation still remains. Other variables, which were not explored in this research, have to be taken into account to explain this variation as well. A fourth, fifth, sixth or seventh variable could be added to the model (see for instance the 7-S model in Hax & Majluf 1984, pp. 94-96). However, this remark misses the point of the research argument. The claim of the theoretical models in the field of Organization Studies and Information Systems (a fit between several variables is necessary for the competitive use of IT) was questioned. Was it true that the relation between IT (related with organizational variables) and the competitive position was disturbed by the variation in other variables? This question could be answered by studying the relation between three variables, which had not been done previously. The claim had to be operationalized and tested via measurement, and therefore variables had to be chosen. The choice was based on:

- the logical relation (congruences) between SISP variables in the bi-variate researches;
- the equal conditions of the SISP framework and bi-variate researches like the enabling role of managerial decision making processes.

The fact that the claim was supported means that the basic idea of the models, viz. the relevance of the adjustment between several variables, was true for three variables, namely competitive strategy, organizational structure and IT. It is plausible that the same will be true for more than three variables. Many other factors also influence the competitive position: environment, strategy, culture, technology and so on. They could be taken into account in further research.

Another point of interest that is not concluded is the estimation of the IT benefits. So far there is not a complete method to estimate the IT benefits. IT based applications influence the value chain at many places, and their effects ultimately had a surplus effect. This combined effect is very difficult to allocate to the separate applications. This was one of the reasons for performing the research on the meso (organizational) level (Mahmood 1993; Porter & Millar 1985; Saunders & Jones 1992). We took the total competitive effect as a criterion, and researched the surplus effect on the competitive position. The first hypothesis was tested via comparing systematic variation in IT organization adjustment with variation in competitive position: the more adjustment, the better the competitive position due to the IT benefits (Van Irsel & Swinkels 1992, p. 634; Nolan & Schotgerrits 1989, p. 997).

Research method discussion

The operationalization of the variables is often a subject of discussion. Our items for competitive strategy, organizational structure and IT are recognized in the literature. In the literature, the competitive position is viewed in many ways. Surveys often concentrate on the internal side, the return figures and sometimes on the external side (Chan & Huff 1992; Mahmood 1993). Bakos & Treacy point to the importance of combining the internal and external sides (Bakos & Treacy 1986, pp. 113-114). Often objective figures are chosen, but also the subjective rating is known (Dess & Robinson 1984). In this research, we have used a self-rating procedure. The respondents have been asked to judge their own situation in terms of independent and dependent variables. Another way of researching is observing and then determining values. There is, however, always a subjective interpretation during meetings, even when using information leaflets and so on. Maybe financial data can be considered as objective, but even here there are different accounting procedures. Therefore, the conclusion on the operationalization is that the chosen alignment from the theoretical variables towards the measured items is in line with the observations in the literature.

Next to the theoretical research variables i.e. IT, strategy and structure, several other variables (sector, size, level of IT investments) were also taken into account. They did not cause spurious effects because they lacked a significant relation with the competitive position. The effect of non-observed variables is, of course, not verified. As long as this kind of research cannot be performed in a laboratory setting, we have to accept this.

Suggestions for further research

In this fast developing field of research, there is still a lot of research work to be done. For instance: new insights are desired regarding the further check of the claims of the SISP models. Which other variables may also be relevant in terms of their adjustment with IT and the competitive strategy?

The organizational culture could be an interesting candidate for further research. Cash et al. state the relevance of the organizational culture as an important contingent variable for the SISP process (Cash et al. 1988, p. 238). The culture, in particular, influences the level of commitment and the way of organizing the tasks for the SISP process. Cash et al. maintain that, in the more informal organizations, formal SISP is not really relevant for the effectiveness of IT, whereas in the more formal organizations SISP is explicitly needed (Cash et al. 1988, p. 250).

Davis & Olson also devote attention to the organizational culture as being relevant for the understanding of the relation between organization and IT (Davis & Olson 1985, pp. 342-344). They start by saying that the organizational structure does not explain organizational behavior in a significant way. This observation is in line with our conclusions on the strategic implications of the organizational structure (see subsection 2.3.4.5). They continue by stating some differences in the organizational culture, and follow with the remark that the information system function has its own culture, which is reinforced by the computer jargon. The lack of a fit between the organizational culture and the culture of the information systems function leads to problems in the development and use of IT.

In the usage of the concept of corporate culture, as stated by Cash et al. and by Davis and Olson as well, the precise fit of IT, culture and other organizational variables is lacking. Future research should concentrate on the finding of a definition and measurements of organizational culture that are usable to link the culture with dimensions of IT and other organizational variables, like competitive strategy and organizational structure, although the dimensions of organizational culture are maybe more difficult for the management to grasp and guide than, for instance, the dimensions of the organizational structure. However, research in which the effect of variables on the relations between other variables is studied, is aligned with complex analyses. In our research, studying the relations between three independent variables and a dependent variable, we have already been confronted with a high complexity. Adding a new variable will only multiply this level of complexity.

Another angle for new research originates from new operationalizations of used concepts. Although the measurements of the competitive strategy and organizational structure showed satisfying outcomes in the analyses, comparable with results in earlier studies, IT could be measured in a better way. IT had two basic dimensions, namely the IT structure and the IT function. The IT structure dimensions are slightly old-fashioned, because the newer developments of the IT (will) offer opportunities for integration and the power of concentrated IT. Nevertheless, these IT dimensions were clearly recognized by the IT management. The IT function was not recognized. This newer variable did not deliver usable results in the analyses. It would be convenient to find better operationalizations of IT in order to relate them with their significance for the organization.

8.5.3 The lack of exploitation of the IT opportunities

The discussion on the confirmation of hypothesis 2 can be brief. In line with the literature, the majority of organizations did not seem to exploit IT opportunities. The fits are not 'natural'. A methodological complaint could be the abstract nature of the statistical methods used (logarithms) so that the reality was obscured. Therefore, the analyses were supported with a plain illustration that compared the expected number of organizations without any interaction effects with the real number of organizations. These results also indicated that there were not more organizations in situations of 'fit' than could be expected on the basis of the marginals.

8.5.4 The management of IT: the effectiveness of SISP for the exploitation of IT

The discussion on hypothesis 3 is profound. Some authors suggest that SISP is successful if the development and usage of IT is linked with the organization's policy, the current organizational structure, commitment of the management and so on (subsections 4.2.5 and 4.2.6). In our research, SISP proved not to be successful, although these criteria were fulfilled. In this final part, we want to discuss the possible reasons for this contradiction. Several theoretical and methodological arguments are addressed before we finish with suggestions for further research on this issue.

Theoretical discussion
Denying hypothesis 3 seems to support the information policy paradox (see subsection 1.2.5; subsection 4.2.5; Simons & Verheijen 1991, p. 51). In this view, 'information' is seen as distinct object that has to be managed while little consideration is given to the integrative aspects of information (thus IT) with the overall administration of organizational processes. We repeat the paradox briefly as a reminder:

- organizations which want to implement SISP (because their information services are poorly organized) are not capable of implementing (successful) SISP;
- organizations which are capable of implementing (successful) SISP (because their management is well-organized), do not require to do so.

This paradox says that:

- organizations that lack global organizational managerial ability are not able to solve information services problems solely with the use of (distinct) SISP. General managerial issues have to be tackled, and without much attention for these organizational aspects, SISP cannot be successful;
- distinct SISP is not necessary if there is ample managerial ability. Organizations that function successfully do not need supportive SISP because their information resources, related with the general organizational processes, are exploited properly without SISP.

Accordingly, such SISP does not relate with successful exploitation of IT.

The studies of Mantz et al. and Van Dissel & Park support the notion that SISP does not generally lead to a better management of IT and the information services (Van Dissel & Park 1989; Mantz et al. 1991). Although IT can deliver strategic advantages, its exploitation is not prescribed in SISP. Mantz maintains that a management frame is missing and is necessary, whereas Van Dissel states that the traditional approach is too mechanistic. A more organizational view is needed to support the administrative power of the organization.

The question whether the concept of SISP, supplemented with more attention for organizational issues, can be used to gain strategic success with IT is still open.

On the one hand, the traditional methods do not seem interesting enough for further research because of their lack of success (subsection 4.2.5; see also De Jong 1994, pp. 193-195). Traditional SISP is aligned reactively from the organizational strategy. Subsequently, the processes and data are modelled in architectures, and finally a prioritization of applications to be developed is realized (Pruijm 1990). This route takes a lot of time so that in a dynamic and complex environment, many changes could occur (Lederer & Sethi 1992, p. 33). Then the information systems are no longer related to the organizational reality (environment, goals, structure: De Jong 1994, pp. 138-139). Also, even when measured as non-traditional SISP, the use of SISP did not result in better exploited IT. The content of the SISP or the management support guiding the SISP related neither separately nor together with the fit situations and the competitive advantages of IT. So the paradox raises a legitimate question on the possibility of reaching successful IT via SISP.

On the other hand however, the fit concept, a major element of the models on SISP, is supported in this research. Besides, SISP may be linked with ideas in the literature on the success of innovations. Burgelman describes the managerial process of supporting internal corporate innovations. The initiative of ventures lies within the presence of entrepreneurship of individuals at the operational level of the firm (Burgelman 1983, p. 241). These initiatives have to be picked up by the middle-level managers and have to be translated into more general strategic terms. These managers thus perform the role of product-championing (Burgelman 1983, p. 240). Top management should retroactively rationalize this strategic process and stimulate it by changing the structural context (Burgelman 1983, p. 239). Summarizing, we see that technological developments are combined with strategic and structural changes, not only via the impetus at top managerial level but especially via linking the capabilities of the individuals at the operational level with the available technologies.

Successful IT often has an emergent, coincidental origin as well (Galliers 1993, p. 286). The combination of coincidental-occurring technologies and the expertise of the staff in the primary processes of the value chain results in appropriate usage of IT. Many strategic IT applications resulted from end-users trying out unique ideas and practical solutions, and not from structured SISP approaches (Ciborra 1991, p. 284). In the perspective of innovation, successful technologies are merely the result of trying, learning, prototyping, guessing and luck, more than of strategic planning. To realize successful IT, the specific capabilities of the firm have to be exploited (Ciborra 1991, p. 286). The role of the management should be geared to supporting this exploitation. The questions arise as to whether if this kind of managerial behavior can still be seen as explicit SISP, and doesn't it concern the managerial ability of the organization as such?

The second argument brings the possibility of further differentiating SISP. The management should encourage (emerging) initiatives on the development of IT at the operational level and support them with appropriate strategic and structural changes in the process of SISP (the mixed approach: De Jong 1994; the tinkering idea: Ciborra 1991). Not only should a reactive top-down approach be followed, but a proactive adjustment of the business strategy, as a result from successful IT, must especially be considered (compare the inside-out element: Earl 1991). The fits found in this research could then be used as guiding lines (targets) in this process (compare this with the strategic and structural anticipations towards particular initiatives: Burgelman 1983). This targeting is also used in the (reactive) model of SST, but there the amount of interpretations is vast (King 1978). The operationalization of the theoretical concepts of our research, via eliminating the amount of interpretations, adds important new insights.

This kind of SISP is in line with the mixed approach from De Jong (1994). He states that, bottom-up development of information systems started in reaction to the top-down approaches (De Jong 1994). Here however, the integration between applications could be lacking. Via a mixture of these two approaches, a mixed approach was developed where top-down and bottom-up opportunities were combined (Earl 1991, pp. 98-103; De Jong 1994, pp. 134-150). If the feedback loop was so short so that deviations could be recovered (via the process of negative feedback), then information systems were attuned to the organizational reality. In effect, this approach was successful (De Jong 1994, pp. 154-156, 174-175). Organizations were able to exploit strategic opportunities of IT which were not predicted by the competitive strategy beforehand but were taken into account in the proactive SISP.

Research method discussion

An important methodological issue is the nature of the research. In chapter 2 we distinguished content research and process research (subsections 2.3.3.2 and 2.3.4.2). We opted for the content approach. The reason for this choice was the need to explain the dependent research variable (the competitive position, which is a content variable) via a theory of other content variables by comparing between organizations. The operationalization and relating of several conceptual variables had not been done before, and we wanted to fill this gap. The indicators cover the most important issues of the SISP concept (see content validity, chapter 3). This also meant that SISP was measured at a certain moment in time. In this way, the precise insights into the process within the framework of SISP were rather superficial. The usage and the decision-making processes of SISP did not become clear in this way. We continue on this subject under the heading 'suggestions for further research'.

Suggestions for further research

Follow-up research could be done on the use of the fits in the development of SISP, based on the previous discussions. A research question could be: does the use of SISP, combined with the concrete fits, support an organization in reaching a balanced situation which will really deliver strategic advantages?

The design of such a study could be as follows. The research should start with the exploration and support of individual initiatives at the operational level in the organization under scrutiny. Parallel, a diagnosis of the present IT, competitive strategy and organizational structure must be made (see section 8.4: practical conclusions: organizational implications for IT usage). Subsequently, one of the fits should be chosen as a target for further IT usage. This choice must based on the emerging direction of IT developments and on the managerial goals regarding the further organizational development (compare this approach with the emergent approach of Markus & Robey 1988, pp. 585-589). An important question here is whether the IT developers and final users at the operational level are really involved in the translation of the general IT direction to the distinct information systems? Their commitment enhances the realization and usage of the information systems, in line with the intentions of the management (see the distinction between intended strategy and realized strategy from Mintzberg & Waters 1985). Another issue is the support of the middle-level line managers: are they championing the IT projects (see Burgelman 1983)? They must translate the operational initiatives into strategic goals on IT.

To gain insight into these topics, research should focus on the details of the communication and decision-making processes in the light of SISP by means of the following research questions:

1. Which IT users, IT developers, IT managers and general managers on the various hierarchical levels (line management and/or top management) are involved in the decision-making processes concerning the general IT direction?

   This question produces answers on the way in which the decision-making processes take place (who are committed, which items are discussed), and the communication flows that can be detected (who triggers the decision-making process?).

2. What is the result of the decision-making processes mentioned above?

   The answer to this question has to be stated in terms of policy statements about IT and the organizational configurations required.

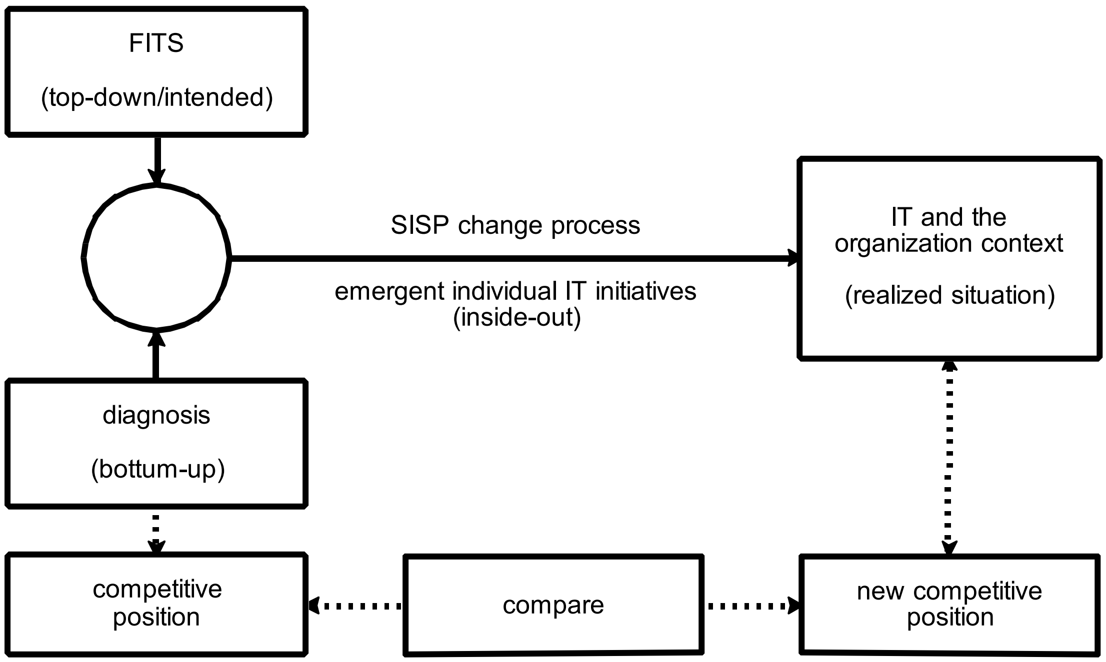
This policy statement concerning the general direction has to be followed by a process of information planning to realize a coherent collection of information systems. Two issues are central at this stage: the correct architectures for certain IT goals, and the prioritization of information systems to be (further) developed and supported

After this planning phase, the (further) implementation has to start. This stage should finally produce working information systems. The necessary research questions in such research would be:

- is the realized fit between the organizational context and the IT actually in line with the policy statement on the intended fit?
- is the functioning IT strategically successful?

Reaching the desired situation in this way is, of course, extremely complex and apparently goal-directed. It would include changes in IT, strategy and/or structure, a very wide and complex area of study. As stated before, this research gives a picture at one given moment. It is not known how organizations should change from their current situation into a future fit. This change process could only be studied with a longitudinal approach, probably by using a case study (see Figure 8.1). The mature SISP, as the research model for the reorganization, covers a wide amount of managerial areas for such a study, from the angle of information services. The combination of proactive and reactive alignment on a range of business areas, which are related via the business process of the organization (made concrete in this research), and the managerial choices to be made on these issues, may contribute to the success of IT.

Figure 8.1 FURTHER RESEARCH: THE ROUTE FROM DIAGNOSIS TO THE NEW REALIZED SITUATION



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APPENDIX A

TYPES

A.1 Introduction

In appendix A, the typologies of the three variables IT, competitive strategy and organizational structure are shown. Each type is determined by the values of the dimensions of the variables. For instance, a cost leader has a high value on the dimension 'low cost', and a low value on the dimension 'focus'. Firstly, the IT typology is presented (appendix A.2), after which the typologies of the competitive strategy (A.3) and the organizational structure (A.4) are commented upon.

A.2 IT types

1. Unconnected IT
Separate PCs are used as low costs tools by operators and managers of small organizations for all kinds of handy supportive activities pertaining to their tasks. This support has a rather general nature and is neither very complex nor innovative, in the industry within which the organization competes. The information-processing is local (near the user). This IT does not have (the demands for) large information-processing capacity. In most cases, the applications are standard (e.g. financial administration applications), and are chosen by the management. Sometimes the PCs are linked in a standard network, but the integration offered is low because the PCs are generally used to enhance individual job performance (word processing, sales estimations, inventory control). Face-to-face meetings and telephone facilities offer better opportunities for lateral contact.

Concluding:

- efficiency: low
- effectiveness: high
- innovation: low
- centralization: high
- concentration: low
- integration: low

2. Concentrated IT

IT, often in the form of central mainframes/mini's with dumb terminals (workstations), is used for large routine activities, mostly of a transactional nature. This includes computerization for supportive administrative paperwork processes, but also monitoring the production processes for enhanced control. The information-processing is highly regulated, based on standard transactions. This IT usage is primarily necessary for efficiency reasons; it lowers the costs for the organization. Specialized centralized information processing and databases are used for this kind of support. There is much communication between the IT department, software developers, hardware vendors and the general management for the development of this IT. The general management is not able to decide independently on the desired application.

Concluding:

- efficiency: high
- effectiveness: low
- innovation: low
- centralization: average
- concentration: high
- integration: low to average

3. Distributed IT

This IT resembles the concentrated IT, but has the disposal over more or less independent local units with their own computing capabilities and storage devices for professional support, like computing, data control and word processing that does not need central processing. Users, such as operators (granting loans to specific clients) and tactical and strategic managers (marketing scenarios), can use this IT for the support of complex tasks. Besides, the organization has the advantages of the large capacity of the central unit, so that large routine operations can also be performed (batch processing). Communication: via this central unit.

Concluding:

- efficiency: high
- effectiveness: high
- innovation: low
- centralization: average
- concentration: average to high
- integration: average

4. Decentralized IT

Recent developments in IT offer users the ability to communicate independently (client-server models). Advanced communication linkages, within and outside (EDI, telecommunication) the organization deliver new innovative opportunities, for instance for management (group decision-making) and non-face-to-face work teams. This IT can also be used in expert teams to coordinate and execute specific operations. Therefore, the users are clearly involved in the IT development. After the implementation they control their own data, making innovative use of IT when this is possible. This IT is not meant to perform large routine operations.

Concluding:

- efficiency: low
- effectiveness: low to average
- innovation: high
- centralization: low
- concentration: low
- integration: high

A.3 Competitive strategic types

1. Niche marketer

Some companies do not have the capacity (resources, scale) to differentiate with the most efficient production process. It would be expensive and dangerous to allocate a lot of resources to specific (batch) technologies because the organization would then be limited to few groups of customers. This would result in a vulnerable position in a changing market. The organization must be able to switch between segments in this competitive market if necessary. The firm, therefore, has to differentiate with other strengths.

Innovation also requires heavy investments in resources such as experts and technology. In addition, the capacity of these firms is a often too small for these investments. Therefore, aspects like image, service and attainability are more feasible. These aspects strengthen the attractiveness of the products for specific customers. For smaller companies in particular, it is handy to limit themselves to a smaller assortment of products for these customers.

Concluding:

- innovation: low
- focus: high
- marketing differentiation: average to high
- low cost: low

2. Cost leaders

For the attainment of cost leadership, it is important not to interrupt the production process. Cost leaders have the capacity to invest in the required technologies. These technologies must be utilized efficiently so that competitive advantages can be reached with low unit cost production. Cost leaders operate in stable environments and want to control their inputs; therefore, they make use of backward vertical integration. Innovation could become problematic when it disturbs the efficiency of the production process too much. Of course, new products and production technologies are needed. Cost leaders (must) pay attention to innovative aspects. Often already proven 'new' developments are used. Their main concern, however, remains an efficient production process. The emphasis on innovation is not as quite as comprehensive as in the case with innovators. It is nearly impossible for cost leaders to produce for only one market segment, while these organizations have large outputs. These niches have only a limited market capacity. Besides, it would be unsafe to produce for only one segment. They do not diversify very much, because the specialized production is not appropriate to supplying to many various markets. Following the first rule of thumb, (marketing) differentiation is not necessary: the price is the major competitive weapon.

Concluding:

- innovation: average
- focus: low
- marketing differentiation: low
- low cost: high

3. Marketers

Organizations which are not able to be the cheapest producers can offer added value by means of more user-convenience of use and better service than their competitors. They create buyer loyalty in more market segments, based on a thorough understanding of customer preferences. This strategy is less dangerous in a dynamic environment, in comparison with the more costly innovation and low costs strategies. The organizations are market share leaders competing via image, service and quality rather than via price. They are not very efficient producers because they have unused capacity (Hambrick 1983, p. 698). Being larger than niche marketers, they have more potential to pay attention to product improvements without becoming very innovative. Customers are willing to trade novelties for reliability.

Concluding:
- innovation: average
- focus: average
- marketing differentiation: high
- low cost: average

4. Innovators
Organizations can differentiate through a repetitive introduction of new products (and services). The development of these new, often high-quality products is a central issue for pioneers: expenses for R&D are relatively high compared to organizations of other strategic types. A result is a low average age of the products. It is dangerous to compete in only one market segment. The organization must not become dependent on one single market. Diversification is a method to prevent this dependency. However, much diversification is not permitted; it would be too difficult to pioneer in a large number of markets. The emphasis on innovation makes attention to side-effects like advertisements or delivery aspects superfluous. The customer wants to pay a price for the state-of-the-art products. The resources obtained in this way can again be spent on innovation. This innovative character contradicts the stable production processes needed for cost leadership.

Concluding:
- innovation: high
- focus: average
- marketing differentiation: low to average
- low cost: low

The strategic types described above are more or less 'standard' configurations (Miller 1986). There are also some mixed types combining dimensions in a slightly different way.

5. Niche innovators
These organizations combine elements valid for niche marketers and innovators. Using the present innovative potential is their first aim. If one market segment has

enough potential to absorb all the new developments, they can afford to focus on this segment. There is still no need for low costs production and for paying attention to 'ornaments' relating to products and services.

Concluding:

- innovation: high
- focus: high
- marketing differentiation: low to average
- low cost: low

6. Low costs marketers
The dimensions of low costs and the marketing differentiation are both emphasized. As long as the production process is not hampered by adding extra features, like smooth distribution, advertising efforts, high image building and so on, the dimension of marketing is highly rewarded. Selling a standard product in bulk, differentiation may result in competitive advantages. Then the firm not only competes on price. Forward integration can support the marketing and service efforts.

Concluding:

- innovation: average
- focus: low
- marketing differentiation: high
- low cost: high

A.4 Organizational structure types

Firstly, the content of the dimensions of the organizational structure is identified. These dimensions were not discussed in the main text (chapter 2) because they are supposed to be widely-known. Mintzberg suggests nine dimensions (design parameters) divided over four groups (Mintzberg 1979, p. 66-67).

1. Design parameter of individual positions. These dimensions concern the basic elements of the structure on the individual level. They are especially aimed at regulating behavior:

- (job) specialization. The division of labor into tasks has a horizontal side (the more specific a worker's job, the more horizontally specialized) and a vertical side (the less control over his own labor, the more vertically specialized). Horizontal specialization is the basis for the division of labor;
- formalization is aimed at regulating individual behavior using formal prescriptions for jobs and the workflow or giving general rules for all kinds of situations. In bureaucratic organizations, work is (often) predetermined in this way, resulting in standardized behavior. In organic organizations, there is a lack of standardization. The work is coordinated via direct supervision or mutual adjustment;
- training and indoctrination are needed if the primary business functions are very complex and non-rational. Workers must make a lot of training effort to learn these functions. In this way, their (future) behavior is also standardized (thus: bureaucracy). When they complete their education, they become professionals who (can) work independently to perform their jobs. This education is often accomplished outside the organization (in universities and other institutions). Therefore, the organization needs indoctrination to socialize its members, especially because they work is quite independently.

2. Design parameter of superstructure. These variables describe the grouping of the individual positions into units:

- unit grouping. Via a grouping based on functions, skills and work processes (functional grouping) or based on products, places and clients (market grouping), a fundament is created for the coordinating of the work of the organization. Via this grouping, direct supervision and mutual adjustment can be enhanced;
- unit size.

3. Design parameter of lateral linkages. These variables refer to the lateral relation between the positions, jobs and workers:

- planning and control systems. Performance control is a useful instrument to standardize and check the desired outputs. It particularly serves this goal in market-grouped organizations, leaving the management of the relatively independent units room to make their decisions. In a more functionally arranged organization, action planning deals with decisions concerning non-routine situations;

- liaison devices encourage direct contact (resulting in actions and decisions) between people without asking for approval at higher management levels. There are four forms distinguishable: liaison positions, task forces, integrating managers and matrix structure.

4. Design parameter of decision-making systems. Centralization is the most secure way to coordinate. However, when too many decisions have to be taken in (larger) organizations, the decision-making authority must be dispersed over several people. Organizations can then react better to all kinds of environmental situations. Centralization can be selective (different decisions are taken at different levels/places) or parallel (decisions are all made at the same (de)centralized place:

- vertical centralization concerns the vertical division of decision-making power, up or down through diverse (management) levels;
- horizontal centralization regards the dispersion of decision-making authority between managers (centralized) and non-managers like operators/ workers and analysts (decentralized).

These dimensions are the basis for the following typology (see subsection 2.3.4.3).

1. Simple structure
In many organizations, the chief executive has the authority to take all the important formal/informal decisions (Mintzberg 1979, p. 308). Often he/she is the founder of the organization. This decision-making power is not dispersed to others. Entry barriers in this industry are mostly low. The tasks for the primary process are not very difficult (no sophisticated training required) and the organization cannot afford to invest many resources in comprehensive technologies. In their competitive environments, the organizations must be able to react quickly to changes. Formalization would hamper flexibility. However, formalization it not even necessary because non-complex-tasks can also be coordinated via direct supervision (organic).

Concluding:

- formalization: low
- centralization: high
- integration: low
- training and indoctrination: low

2. Machine bureaucracy

Companies can also function by performing routine activities, mostly of a simple, stable and repetitive nature. Therefore, their work can be regulated via formal prescriptions created by the technical support staff (technostructure), resulting in a bureaucratic organization. This formalization takes away decision-making power concerning the jobs from the operating core and gives it to higher management levels (vertical centralization, limited horizontal decentralization: Mintzberg 1979, pp. 195, 209-210). Due to the uncomplicated character of the tasks, extensive training outside the organization, leading to independent decision-making on the job, and mutual adjustments are not necessary and are unwanted (organizations themselves offer supportive education to the workers). The technologies used range from simple to moderately complex, and have a very regulating nature since this makes the work a matter of routine (Mintzberg 1979, p. 326). Their efficient functioning can only be afforded in calm environments where demand is known and is stable.

Concluding:

- formalization: high
- centralization: high
- integration: low
- training: low

3. Professional bureaucracy

If the tasks are complex, organizations can be bureaucratic without being formalized and centralized. Formalization and training are substitutes for work standardization. If standardization is still necessary but it is not possible due to the complexity of the tasks, comprehensive training for workers is needed, so that they can perform their tasks independently. This results in decentralization. That transfers decision-making power about the tasks to the operators. In a complex but stable environment, management does not have the capacity to regulate the work of the primary process themselves; it has to rely on the craftsmanship of the professionals.

Concluding:

- formalization: low
- centralization: low
- integration: low to average
- training and indoctrination: high

4. Adhocracy

Sophisticated innovation requires expert teams from different disciplines. This innovation takes place in complex and dynamic environments. The management does not have the accurate insight in order to decide on the precise job performance requirements. It must hire experts. The expert teams (work constellations) consist of operators and staff on different places in the organization (hierarchy, disciplines). Therefore, the vertical decentralization is not very thorough, compared with the professional bureaucracy. Decision-making power is handed over to those constellations where the experts can judge the relevant problem situations, alternatives and choice criteria. These organizations are not standardized; complex work makes standardization via formalization impossible. Cooperation is needed between the experts. That excludes standardization via training. In these organic, decentralized companies, one-way direct supervision is not appropriate. Coordination takes place via frequent contacts within and between the constellations of experts.

Concluding:

- formalization: low
- centralization: average
- integration: high
- training: high (indoctrination: low, mutual contact results in socialization)

APPENDIX B

ANALYSES

B.1 Introduction

This appendix B starts with a survey of the dimensions and items that were used in the various analyses and their descriptions (section B.2). The interpretation of the dimensions are characterized in the chapters 2, 6 and 7. Then the main analyses are presented: the factor analyses (sections B.3-6, B.9), the analyses of variance (B.7), the loglinear analyses (B.8, B.10) and finally several supporting correlation analyses (B.11).

B.2 Dimensions

Dimension (Factor)	Items	Description
IT		
INFOCON		IT concentration
	ITCONHW	Concentration of hardware
	ITCONGEG	Concentration of data processing
	ITCONDB	Concentration of data bases
INFOCEN		IT centralization
	ITCENINI	Centralization of initiation of IT
	ITCENANA	Centralization of system analysis
	ITCENONT	Centralization of system design
	ITCENBW	Centralization of system building
	ITCENIMP	Centralization of system implementation
	ITCENINV	Centralization of data input

INFOINT		IT integration
	ITINTDB	Integration via shared use of data bases
	ITINTGEG	Integration via common data
	ITCENAP	Centralization of using application
	ITINTCOM	Integration via direct IT usage
	ITINTRW	Range of data exchange

Competitive strategy

KO		Low costs
	KOSEFFUN	Cost efficiency in business functions
	KOSEFPRO	Efficient utilization of means of production
	KOSVOL	Efficiency via high volumes
MA		Marketing differentiation
	MARAD	Extensive advertizing
	MARSEG	Using market segmentation
	MARIM	Importance of product image
FO		Focus
	FOCPRD	Differentiation with specific products
	FOCPRC	Differentiation with specific production
	FOCKLANT	Differentiation with specific customers
	FOCMAR	Differentiation with specific marketing
IN		Innovation
	INVAAK	Introducing innovations more often than the competitors
	INLEIDEN	Introducing innovations earlier than the competitors
	INPROD	Innovative orientation for products
	INRES	Innovative nature of research and development

Organizational structure

CE		Centralization
	CENINK	Centralization of decision-making on purchasing
	CENMAR	Centralization of decision-making on marketing
	CENPLAN	Centralization of decision-making on production planning
	CENPERS	Centralization of decision-making on personnel policy
	CENINV	Centralization of decision-making on investments policy
FOR		Formalization
	FORCONTR	Formal contracts
	FORWERK	Formal work instructions
	FORINFO	Formal information leaflets
	FORREGEL	Formal regulation
	FORBLD	Formal policy
TR		Training
	TRVAARD	Learning professional skills
	TRTAKEN	Managing professional tasks
INTEG		Integration
	INTCOM	Integrating committees
	INTTAAK	Integrating interim tasks groups
	INTMNGT	Integrating managers

SISP

SISP1		The content of SISP
	INFOBEL	Level of (information policy) goals about the use of IT

	INFOFOR	Presence of formal information policy
	INFOPLAN	Presence of formal information planning
	INFOSTRA	Importance of competitive strategy for SISP
	INFOSTRU	Importance of organizational structure for SISP
SISP2		The support of top management and line management
	INFOTOP	Commitment top management for using IT
	INFOLYN	Commitment line management for using IT

Strategic performance

RTV	Net operating profit (in Dutch: rentabiliteit op totaal vermogen): NOP (percentages)
RTVCONC	NOP related to equally sized competitors
RTVJAAR	NOP-development related to equally sized competitors
MACONC	Market share related to equally sized competitors
MAJAAR	Market share development related to equally sized competitors

B.3 Factor analysis of IT (hypothesis 1)

For the results of the factor analysis of IT see Table B3.1

Assumptions:

1. The factor matrix is not the identity matrix: Bartlett Test of Sphericity = 893.53351, Significance = 0.00000;
2. Partial correlation did not between variables occur: Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.76469. There was little partial correlation between the variables (KMO > 0.5);

Reliability:

INFOCON 0.56
INFOCEN 0.82
INFOINT 0.48

B.4 Factor analysis of competitive strategy (hypothesis 1)

For the results of the factor analysis of competitive strategy see Table B4.1

Assumptions:

1. Bartlett Test of Sphericity = 615.54501, Significance = 0.00000. The identity matrix was rejected;
2. Kaiser-Meyer-Olkin Measure (KMO) of Sampling Adequacy = 0.67229. There was not too much partial correlation between the variables (KMO > 0.5).

Reliability (Cronbach's alfa, indicating the average correlation of items):

IN	0.72
FO	0.62
MA	0.61
KO	0.55

B.5 Factor analysis of organizational structure (hypothesis 1)

For the results of the factor analysis of organizational structure see Table B5.1

Assumptions:

1. Bartlett Test of Sphericity = 1310.1328, Significance = 0.00000
   The identity matrix was rejected;
2. Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.81262. There was little partial correlation between the variables (KMO > 0.5).

Reliability:

FOR	0.89
CE	0.74
INTEG	0.76
TR	0.28

Table B3.1 FACTOR ANALYSIS OF

	factor 1	factor 2	factor 3	factor 4
ITCENONT	0.82069			
ITCENANA	0.78619			
ITCENIMP	0.70752			
ITCENBW	0.70646			
ITCENINI	0.65096			
ITCENINV	0.59451			
ITCONHW		0.74436		
ITCONGEG		0.73613		
ITCONDB		0.63967		
ITINTDB			0.56572	
ITINTGEG			0.81362	
ITCENAP			0.64633	
ININTCOM				0.84925
ITINTRW				0.82121
eigen value	4.02	1.68	1.30	1.28
percentage of variance	30.90	12.90	10.00	9.80

total number of cases used: 217

total percentage of variance: 63.7

Table B4.1 FACTOR ANALYSIS OF COMPETITIVE STRATEGY

	factor 1	factor 2	factor 3	factor 4
INLEIDEN	0.85863			
INVAAK	0.82203			
INPROD	0.57036			
INRES	0.54592			
FOCPRD		0.75989		
FOCKLANT		0.74477		
FOCPRC		0.60137		
FOCMAR		0.54799		
MARSEG			0.73400	
MARIM			0.73275	
MARAD			0.68678	
KOSEFPRO				0.76314
KOSEFFUN				0.75407
KOSVOL				0.65494
eigen value	2.83	1.94	1.68	1.30
percentage of variance	20.20	13.90	12.00	9.30

total number of cases used: 232

total percentage of variance: 55.4

Table B5.1 FACTOR ANALYSIS OF ORGANIZATIONAL STRUCTURE

	factor 1	factor 2	factor 3	factor 4
FORREGEL	0.87788			
FORWERK	0.86750			
FORCONTR	0.84054			
FORINFO	0.82804			
FORBLD	0.64221			
CENINV		0.74593		
CENMAR		0.74043		
CENPERS		0.73142		
CENINK		0.72471		
CENPLAN		0.57521		
INTTAAK			0.87486	
INTCOM			0.82892	
INTMNGT			0.68372	
TRTAKEN				0.89864
TRVAARD				
eigen value	4.17	2.57	1.96	1.04
percentage of variance	27.80	17.20	13.10	6.90

total number of cases used: 231

total percentage of variance: 65.0

B.6 Factor analysis of strategic performance (hypothesis 1)

Table B6.1 FACTOR ANALYSIS OF STRATEGIC PERFORMANCE

	factor 1		factor 1
RTVCONC	0.70965	eigen value	2.36
RTVJAAR	0.78031	percentage of variance	59.10
MACONC	0.80500		
MAJAAR	0.77687		

total number of cases used: 146
(only those cases used when factor scores on IT, strategy and structure were available)

Assumptions of the analysis were met:

1. Bartlett Test of Sphericity = 162.56026, Significance = 0.00000. The identity matrix was rejected;
2. Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.70200 (>0.5).

Reliability: 0.76

B.7 Analyses of variance (hypothesis 1)

Table B7.1 ANOVA OF (MARKETING) DIFFERENTIATION, CENTRALIZATION AND IT CONCENTRATION

source of variation	SS	DF	MS	F	sig of F
WITHIN CELLS	1239.98	129	9.61	-	-
CONSTANT	26528.66	1	26528.66	2759.87	0.000
MA	17.51	1	17.51	1.82	0.179
CE	21.14	1	21.14	2.20	0.141
INFOCON	3.26	1	3.26	0.34	0.561
MA BY CE	0.39	1	0.39	0.04	0.841
MA BY INFOCON	3.82	1	3.82	0.40	0.529
CE BY INFOCON	5.99	1	5.99	0.62	0.431
MA BY CE BY INFOCON	45.36	1	45.36	4.72	0.032

total number of cases used: 137

tests of significance for COMPOS using UNIQUE sums of squares

III low (marketing-)differentiation - high centralization - high IT concentration

The three-way interaction effect was accepted although the probability that there was no an interaction effect at all was 3.2%. This probability was smaller than the significance level of 5%. Therefore the existence of the interaction effect was accepted.

The ANOVA used a 2 x 2 x 2 design. Hence 8 cells were filled with organizations. The 137 organizations were allocated to one of the eight cells on the basis of their factor scores. The ANOVA used the unweighted means of the competitive position because the amount of organizations in each cell was not necessarily the same. This created a non-orthogonal design in which there were relations between the independent variables. Therefore the factors created overlapping effects on the dependent variable. This was corrected via the default regression approach of the MANOVA analysis.

However, to accept the results of the ANOVA, two conditions had to be met.

1. Normality of the dependent variable in each of the groups.
Several tests indicated that the dispersion of the competitive position in each of the cells followed the normal distribution:

- the Shapiro-Wilks and K-S (Lilliefors) measures showed that the null hypotheses of normality of the competitive position could not be rejected in each of the cells;
- this result was supported with normal and detrented plots of the distribution;
- also the histogram, supported with the printed measures for the measures of central tendency (mean, modal, median) and the skewness and kurtosis, indicated normality.

2. The cell variances of all the groups were equal: homogeneity.
The homogeneity was measured with two tests: Cochrans C and Bartlett-Box. Each of these tests did not show violations from equal cell variances:

- Cochrans C(16,8) = 0.19615 P = 0.439 (approx.)
- Bartlett-Box F(7,12921) = 1.20360 P = 0.297

The variances and standard deviations were also plotted against the cell means to check this random distribution of variance over the cells.

These two conditions were also controlled via studying the residuals (observed values minus the effects of the full factorial model including the interactions). The normal and detrented plots supported a normal distribution, and the scatter plot supported equal variances.

Concluding we could state that the ANOVA assumptions were met.

IV high innovation - high integration - high IT integration

Table B7.2 ANOVA OF INNOVATION, INTEGRATION AND IT INTEGRATION

source of variation	SS	DF	MS	F	sig of F
WITHIN CELLS	1124.09	129	8.71	-	-
CONSTANT	26942.15	1	26942.15	3091.87	0.000
IN	46.99	1	46.99	5.39	0.022
INTEG	18.70	1	18.70	2.15	0.145
INFOINT	53.92	1	53.92	6.19	0.014
IN BY INTEG	1.14	1	1.14	0.13	0.718
IN BY INFOINT	0.05	1	0.05	0.01	0.939
INTEG BY INFOINT	9.55	1	9.55	1.10	0.297
IN BY INTEG BY INFOINT	30.19	1	30.19	3.46	0.065

total number of cases used: 137

tests of significance for COMPOS using UNIQUE sums of squares

This three-way interaction effect was significant at a 10% level (6.5%). Notwithstanding we investigated this result because it referred to a predicted fit.

Also the two conditions were met.

1. Normality:
   - Shapiro-Wilks and K-S (Lilliefors) in all the cells were satisfactory;
   - This result was supported with normal and detrented plots of the distribution
   - Also the histogram, supported with the printed measures, indicated normality.
2. Homogeneity:
   - Cochrans C(16,8) = 0.16932 P = 1.000 (approx.)
   - Bartlett-Box F(7,12009) = 1.11110 P = 0.353

The plots supported this equal variances.

The check via the residuals supported the feasibility of the data for the ANOVA.

The assumptions of this ANOVA were met as well.

V high (marketing) differentiation - low formalization - low IT integration

Table B7.3 ANOVA OF (MARKETING) DIFFERENTIATION, FORMALIZATION AND IT INTEGRATION

source of variation	SS	DF	MS	F	sig of F
WITHIN CELLS	1116.37	129	8.65	-	-
CONSTANT	28467.17	1	28467.17	3289.46	0.000
MA	32.42	1	32.42	3.75	0.055
FOR	12.13	1	12.13	1.40	0.239
INFOINT	97.23	1	97.23	11.24	0.001
MA BY FOR	0.52	1	0.52	0.06	0.808
MA BY INFOINT	19.85	1	19.85	2.29	0.132
FOR BY INFOINT	18.30	1	18.30	2.12	0.148
MA BY FOR BY INFOINT	68.90	1	68.90	7.96	0.006

total number of cases used: 137

tests of significance for COMPOS using UNIQUE sums of squares

The probability that the interaction effect was accepted whereas there is no interaction effect at all was 0.6%. This probability was smaller than the significance level of 5%. Therefore the interaction effect was accepted.

Also the two conditions were met.

1. Normality:
   - Shapiro-Wilks and K-S (Lilliefors) measures in all the cells were satisfactory;
   - This was supported with normal and detrented plots of the distribution;
   - Also the histogram indicated normality.
2. Homogeneity;
   - Cochrans C(16,8) = 0.19726 P = 0.421 (approx.)
   - Bartlett-Box F(7,14241) = 1.12040 P = 0.347

The plots supported this equal variances.

The check via the residuals supported the correctness of the data for the ANOVA. The assumptions of the third ANOVA were met too.

B.8 Loglinear analyses (hypothesis 2)

Table B8.1 THE RELATION BETWEEN (MARKETING) DIFFERENTIATION, CENTRALIZATION AND IT CONCENTRATION

K	DF	L.R. X^2	prob	Pearson X^2	prob	iteration
1	3	5.897	0.1168	4.934	0.1767	0
2	3	3.966	0.2652	3.896	0.2729	0
3	1	1.864	0.1722	1.849	0.1739	0

total number of cases used: 137

III Low (marketing) differentiation - high centralization - high IT concentration

The loglinear test made clear that deleting the relations between the three variables (K = 3) did not have a significant impact on the cellcount (low chisquare, high probability). Only those cases were used that had a score on COMPOS.

Also the assumptions were checked. The standardized residuals did not exceed the absolute value of 1.96. Also the residuals (plots) indicated that the final model fitted properly to the data.

IV High innovation - high integration - high IT integration

Table B8.2 THE RELATION BETWEEN INNOVATION, INTEGRATION AND IT INTEGRATION

K	DF	L.R. χ^2	prob	Pearson χ^2	prob	iteration
1	3	4.474	0.2146	4.735	0.1922	0
2	3	13.089	0.0044	13.129	0.0044	0
3	1	0.524	0.4692	0.522	0.4699	0

total number of cases used: 137

The loglinear test made clear that deleting the relations between the three variables (K = 3) did not have a significant impact on the cellcount.
The assumptions were met as well.

V High (marketing) differentiation - low formalization - low IT integration

Table B8.3 THE RELATION BETWEEN (MARKETING) DIFFERENTIATION, FORMALIZATION AND IT INTEGRATION

K	DF	L.R. X^2	prob	Pearson X^2	prob	iteration
1	3	1.951	0.5826	2.798	0.4238	0
2	3	7.584	0.0554	7.499	0.0576	0
3	1	0.731	0.3925	0.732	0.3922	0

total number of cases used: 137

The loglinear test made clear that deleting the relations between the three variables (K = 3) did not have a significant impact on the cellcount.
These assumptions were met also.

B.9 Factor analysis of SISP (hypothesis 3)

Table B9.1 FACTOR ANALYSIS OF SISP

	factor1	factor 2
INFOBEL	0.85331	-
INFOFOR	0.89744	-
INFOPLAN	0.88766	-
INFOTOP	-	0.91890
INFOLYN	-	0.91950
INFOSTRA	0.63154	-
INFOSTRU	0.69763	-
eigen value	4.13	1.16
percentage of variance	59.00	16.50

total number of cases used: 227

total percentage of variance: 75.5

Assumptions:

- Bartlett Test of Sphericity = 1087.1484, Significance = 0.00000. The identity matrix was rejected;
- The Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.79992 was sufficient (KMO > 0.5).

Reliability:

SISP1 0.89
SISP2 0.90

B.10 Loglinear analyses (hypothesis 3)

The impact of SISP1

The loglinear test made clear that deleting the relations between the three variables (K = 3) did not have a significant impact on the cellcount (low chi-square, high probability). Only those cases were used that had a score on COMPOS (see Table B10.1).

The model where the relation of SISP1 with marketing, centralization and IT concentration was studied supported this result (see Table B10.2).

The impact of SISP2

The loglinear tests indicated that in the situation of high SISP2, organizations were not significantly often present in fit situation III as well (see Table B10.3).

The model where the relation of SISP2 with marketing, centralization and IT concentration was studied supported this result (see Table B10.4).

The combined impact of SISP1 and SISP2

Finally the impact of SISP1 and SISP2 on the three observed fits was studied. - The loglinear tests indicated that in the situation of high SISP1 and high SISP2 organizations were not significantly more often situated in fit situation III than in the other combinations (see Table B10.5).

The model where the relation of SISP1 and SISP2 with marketing, centralization and IT concentration was studied supported this result (see Table B10.6).

According to the assumptions the final model fitted the data.

Table B10.1 THE RELATION BEWEEN DIFFERENTIATION, CENTRALIZATION AND IT CONCENTRATION (high SISP1)

K	DF	L.R. X^2	prob	Pearson X^2	prob	iteration
1	3	16.649	0.0008	18.140	0.0004	0
2	3	0.348	0.9507	0.350	0.9504	0
3	1	0.116	0.7336	0.116	0.7336	0

total number of cases used: 66

Table B10.2 THE RELATION BETWEEN DIFFERENTIATION, CENTRALIZATION, IT CONCENTRATION AND SISP1

K	DF	L.R. X^2	prob	Pearson X^2	prob	iteration
1	4	5.111	0.2761	4.171	0.3833	0
2	6	28.904	0.0001	30.962	0.0000	0
3	4	2.049	0.7267	1.978	0.7399	0
4	1	0.596	0.4401	0.595	0.4404	0

total number of cases used: 133

Table B10.3 THE RELATION BETWEEN DIFFERENTIATION, CENTRALIZATION AND IT CONCENTRATION (high SISP2)

K	DF	L.R. X^2	prob	Pearson X^2	prob	iteration
1	3	3.546	0.3148	3.163	0.3672	0
2	3	3.172	0.3658	3.079	0.3796	0
3	1	1.076	0.2996	1.068	0.3014	0

total number of cases used: 71

Table B10.4 THE RELATION BETWEEN DIFFERENTIATION, CENTRALIZATION, IT CONCENTRATION AND SISP2

K	DF	L.R. X^2	prob	Pearson X^2	prob	iteration
1	4	5.713	0.2216	4.529	0.3391	0
2	6	5.117	0.5290	5.573	0.4726	0
3	4	3.067	0.5467	3.029	0.5529	0
4	1	0.033	0.8554	0.033	0.8554	0

total number of cases used: 133

Table B10.5 THE RELATION BETWEEN DIFFERENTIATION, CENTRALIZATION AND IT CONCENTRATION (high SISP1 and high SISP2)

K	DF	L.R. X^2	prob	Pearson X^2	prob	iteration
1	3	21.823	0.0001	22.660	0.0000	0
2	3	0.298	0.9603	0.298	0.9604	0
3	1	0.193	0.6607	0.196	0.6581	0

total number of cases used: 39

Table B10.6 THE RELATION BETWEEN DIFFERENTIATION, CENTRALIZATION, IT CONCENTRATION, SISP1 AND SISP2

K	DF	L.R. X^2	prob	Pearson X^2	prob	iteration
1	5	5.720	0.3344	6.981	0.2220	0
2	10	31.331	0.0005	34.170	0.0002	0
3	10	10.378	0.4079	9.278	0.5059	0
4	5	2.604	0.7607	2.535	0.7713	0
5	1	0.022	0.8830	0.022	0.8831	0

total number of cases used: 133

B.11 Supportive analyses (hypothesis 3)

Table B11.1 THE IMPACT OF SISP BEFORE NOMINALIZATION: CORRELATIONS

	COMPOS	SISP1	SISP2
COMPOS	1.0000	0.0644	0.0930
SISP1	0.0644	1.0000	-0.0575
SISP2	0.0930	-0.0575	1.0000

number of cases used: 133

Table B11.2 THE IMPACT OF SISP AFTER NOMINALIZATION: CORRELATIONS

	COMPOS	SISP1	SISP2
COMPOS	1.0000	-0.0413	0.0348
SISP1	-0.0413	1.0000	0.1136
SISP2	0.0348	0.1136	1.0000

number of cases used: 133

This correlation analysis is supported by the outcome of the ANOVA (see Table B11.3).

Table B11.3 THE IMPACT OF SISP AFTER NOMINALIZATION: ANOVA

source of variation	SS	DF	MS	F	sig of F
WITHIN CELLS	1293.23	129	10.03	-	-
CONSTANT	28677.76	1	28677.76	2860.62	0.000
SISP1	3.03	2	3.03	0.30	0.583
SISP2	2.15	2	2.15	0.21	0.644
SISP1 BY SISP2	2.19	4	2.19	0.22	0.641

total number of cases used: 133

tests of significance for COMPOS using UNIQUE sums of squares

SUMMARY

Information technology (IT) has performed an important role in the functioning of organizations during the last decades. IT concerns the automation of the information services in and between organizations. Many authors consider the (automation of) information services as important because they regard "information" as a production factor in addition to the traditional production factors of "land, labor and capital". Information services concern the input, storage, processing and distribution of information for the execution, the planning and control, and the support of the primary processes of organizations. Via the automation of the information services, this execution, planning and control, and support of the primary processes may improve. The organization's use of IT is found in the field of (Management) Information Systems. This field is concerned with the planning, development and use of information systems for the performance, management and support of organizational activities.

Although the costs of certain components used in the automation of the information services, such as 'chips' and software, have been dropping, the total investment in IT has been rising. New technology and improvements in knowledge enable newer and more advanced applications with better opportunities than before. The exploitation of these opportunities is, however, no triviality. Therefore, the goal of the research is to gain insight into the exploitation of the IT. This study researches the ways in which organizations really improve their performance. It is aimed, in particular, at the strategic functioning of organizations; hence, we speak about the strategic usage of IT.

Chapter 1 offers the context of the research, and finishes with the preliminary research goal.

Firstly, several case studies are presented, dealing with the strategic advantages that organizations have realized by IT (this IT is referred to as strategic IT). In the literature, these advantages are mostly explained by Porter's concepts of the value chain and the forces in the industry. Porter and Millar used these concepts to explain the strategic advantages with the use of IT in particular, especially in information-intensive industries.

Subsequently, the major IT investments are discussed. Capital investments of this magnitude should produce fair earnings.

It is a problem that this is not always the case. Researches using data from many organizations show that there is hardly any relation between IT investments and the earnings of organizations. Several studies support this view, with cases in which the usage of IT did not deliver advantages. Gaining an advantage in terms of strategic opportunities is often not the case. Effective management of IT to gain strategic advantage with IT is of great importance, considering this problematic situation. Unfortunately, current Strategic Information Systems Planning (SISP) methods also do not offer the solution to the strategic realization of IT. The consequence could be that management in organizations loosen their commitment to IT, so that future investments and usage are hampered.

The research wants to deal with this issue via the following (preliminary) goal: to gain insight into the strategic usage of IT. To reach this goal, a conceptual model has been developed. This model contains variables that deal with the successful usage of IT. Chapters 2 to 4 deal with several variables and their relations in the development of the conceptual model, which is presented in chapter 5.

Chapter 2 discusses the impact of IT, as a single variable, for the strategic success of organizations (uni-variate research). The literature shows that IT alone does not offer enough explanation for the competitive position of organizations. This observation is also made for several organizational variables which seem to be relevant in the field of Information Systems, viz. competitive strategy and organizational structure. Researching only one variable does not offer a sufficient explanation for strategic success.

Subsequently, the question of the strategic usage of IT is studied from several angles at the same time. Chapter 3 studies the combined effect of IT and the competitive strategy on the strategic position, and also the combined effect of the IT and the organizational structure (bi-variate researches). The impact of the relation between the competitive strategy and the organizational structure is examined to make the study complete. These variables are related via the value chain processes. The bi-variate researches occupy an important place in the literature. They offer promising competitive result, but are inconsistent. An important reason for this drawback, besides the standard operationalization issues, could be the neglect of a third variable.

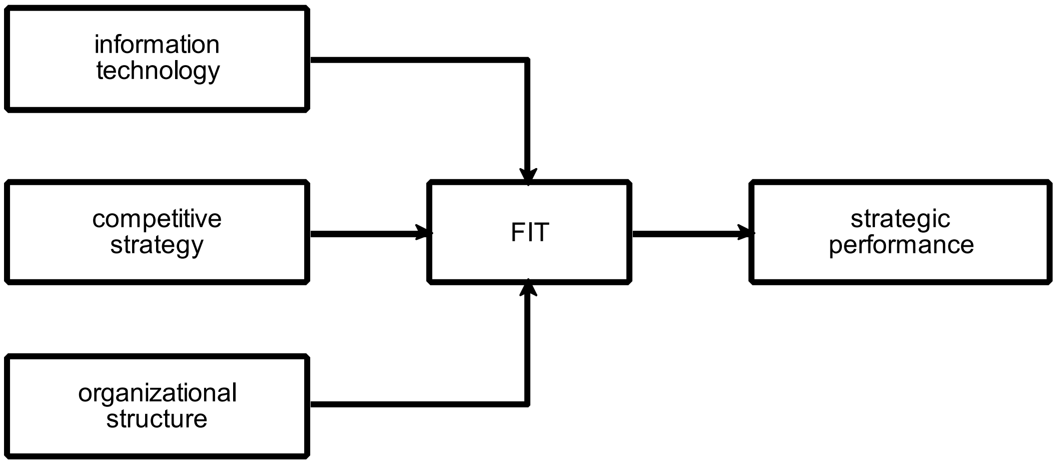
We asked the logical question whether the three variables of IT, strategy and structure could have a combined impact on the competitive position. It is possible to research this combined impact, because the three variables do fit:

bi-variate relations exist between the variables. Models in the field of SISP also indicate that this type of research is promising. Chapter 4 deals with SISP models in which several variables are simultaneously related to optimize the usage of IT (multi-variate research). The high level of abstraction is an essential feature of these models. Therefore, the nature of the relations remains unclear. The research strives towards a reduction in complexity by means of a concretization of the abstract variables. This means that the nature of good relations (fits) is verified. Another important element of the SISP models, and the bi-variate researches as well, is the role of the management. Management has an enabling function. The usage of the means of production, such as IT, is a managerial issue that concerns the organization as a whole. Beside the IT management, the top and line management (or, to be more precise: the management of departments where the IT is in operation) should consider it necessary to support the usage of IT. Otherwise it will be hard to exploit the strategic IT opportunities.

If SISP deals with the competitive strategy and the organizational structure, and if SISP is supported by the top management and line management, we consider SISP to be mature.

This view leads to the theoretical model as illustrated in Figure S1, which is elaborated in chapter 5.

Figure S1 THEORETICAL RESEARCH MODEL: THE STRATEGIC PERFORMANCE IS DEPENDENT ON THE FIT BETWEEN IT, COMPETITIVE STRATEGY AND ORGANIZATIONAL STRUCTURE



The model offers the opportunity to make a further specification of the preliminary research goal and to state the research questions.

Research goal

The mismatch between organization and IT hampers the realization of the strategic opportunities of IT. This may result in a decreasing commitment from the management, which would inhibit further IT investments and IT usage. A feature of the models that relate the IT and the organization is their high level of abstraction. Therefore, the finding of concrete fits is a complex problem. This research wants to deal with that problem via the operationalization of the conceptual variables. Hence, the ultimate research goal is stated as:

> The finding of concrete fits between IT, strategy and structure as targets for the management of organizations to use IT strategically. Via these targets, the use of SISP can be concretized.

Research questions

The research goal is reached by answering the following research questions.

1. Do fits between IT, competitive strategy and organizational structure have a positive effect on the realization of the strategic opportunities of IT?
   Hypothesis 1: Yes

The support of this first hypothesis involves two topics. Firstly, the SISP claim (several variables have to be studied simultaneously for insight in the strategic usage of IT) would be verified empirically. Secondly, it would become clear that inconsistencies between the bi-variate researches are partly explained by the moderating effect of a third variable.

2. Are organizations relatively often situated in those balanced fit situations?
   Hypothesis 2: No

   The problems with the exploitation of the strategic opportunities of IT are widely known in the literature. A possible explanation might be the lack of fit between the IT and the organizational context (i.e. the competitive strategy and the organizational structure).

3. Does the existence of mature SISP have a positive effect on the presence of organizations in those balanced fit situations?
   Hypothesis 3: Yes

   If the second hypothesis were to be confirmed, then organizations would need insight into strategic IT usage. The third question, and the corresponding hypothesis, deals with the impact of the instrument of mature SISP for the strategic exploitation of IT.

Chapter 6 presents the method of research that describes the testing of the hypotheses. This method is merely determined by the features of the research goal and research questions and the nature of the theoretical model. In the research goal, it is stated that various fits are under scrutiny. Therefore, comparable data from several organizations were gathered. In this sixth chapter, the following elements are dealt with:

- research strategy: primary data were gathered via an extensive survey;
- sampling: the primary data were obtained via a sample from a population. The following parts of this sample are discussed:
  - population: the research used organizations from the so-called information-intensive industries because in those industries the relevance of IT for the competitive position is evident and recognizable for the respondents;

  - sample: the hypotheses concern the relations between variables. In order to enlarge the internal validity of the research, it was necessary to reach an optimum variation of the independent variables;
  - response: the questionnaires returned were not always filled in completely. Therefore, the response was split up into several groups;
- instrument (questionnaire): the questionnaire was based on the operationalization of the variables. The reliability and the validity were also discussed;
- method of data analysis: to test the hypotheses, the data are related. The series of analyses used is also presented in chapter 6.

Chapter 7 presents the final results. The data are analyzed on the basis of the method of data analysis, and the results are organized per research question. The results are as follows:

1. Hypothesis 1 is confirmed. Organizations that were situated in the hypothesized fits showed a significant higher competitive position than organizations in the other IT - strategy - structure combinations. The competitive impact of the three variables combined together was higher than could be expected if the impact of the variables IT, strategy and structure was simply added up (synergy).
2. Hypothesis 2 was confirmed as well. The variables IT, strategy and structure did not relate, so that they were not represented to a significantly greater extent in the fits than in the other combinations. Organizations did not seem to be attracted to the fits.
3. Hypothesis 3 was rejected. Organizations using SISP were not represented in the fits to a significantly greater extent than in the other combinations. SISP also did not relate directly to the competitive position.

These results form the basis for chapter 8. In this chapter, the findings are reviewed in the light of the theory developed. The main conclusion is that the SISP claim, namely that the fit between several variables has synergetic effects, is supported empirically. In addition to that, it becomes clear that inconsistencies between various bi-variate researches is partly explained by the disturbing effect of a third variable (hypothesis 1).

In practice, this result can be applied to the usage of IT. The study offers targets to the management. SISP is, however, not suitable to enhance the realization of these targets. Namely, an important result of the study is that mature SISP, taking strategy, structure and the commitment of the top and line management into consideration, does not support strategically successful IT usage (hypothesis 3).

The question as to whether the concept of SISP might be used to gain strategic success is still open. The concept could be further differentiated, using the successful combinations of IT and the organizational configurations. In addition to that, the policy could be aimed more at supporting individual initiatives at the operational level of the firm to gradually bring strategic changes. Further research should test whether or not such SISP could bring strategic advantages. An appropriate study could use a case study approach or a longitudinal approach.

SAMENVATTING

In de afgelopen decennia is informatietechnologie (IT) een voorname rol gaan spelen in het functioneren van organisaties. IT heeft betrekking op de automatisering van de informatievoorziening binnen en tussen organisaties. Veel auteurs beschouwen deze (geautomatiseerde) informatievoorziening als belangrijk omdat ze "informatie" als produktiefactor hebben toegevoegd aan de traditionele produktiefactoren "grond, arbeid en kapitaal". De functie van de "informatievoorziening" betreft de verstrekking van informatie voor de uitvoering, de besturing en de ondersteuning van de primaire processen van organisaties. Door de inzet van automatisering van deze informatievoorziening kan deze uitvoering, ondersteuning en besturing van primaire processen verbeteren. Het organisatorisch gebruik van IT laat zich plaatsen binnen het vakgebied Bestuurlijke Informatiekunde (BIK). Dit vakgebied behandelt onder meer beleid, planning, ontwikkeling, gebruik en beheersing van informatiesystemen ten behoeve van het bestuur en de uitvoering van processen in organisaties.

Alhoewel de kosten van bepaalde onderdelen die voor de automatisering van de informatievoorziening nodig zijn, zoals 'chips' en software, zijn afgenomen, zijn de totale investeringen in de IT toegenomen. Nieuwere technologie en toenemende kennis omtrent de mogelijkheden maken steeds weer nieuwe, geavanceerde applicaties mogelijk, met telkens weer grotere mogelijkheden dan voorheen. Echter, de benutting van die toegenomen mogelijkheden is geen vanzelfsprekendheid. Het doel van het onderzoek is het verkrijgen van meer inzicht in die benutting van de IT. Dit onderzoek gaat derhalve na op welke manier organisaties met de inzet van IT daadwerkelijk beter presteren. Het richt zich hierbij met name op het strategische presteren van organisaties, tot uiting komend in de concurrentiepositie; we spreken dan ook over de strategische inzet van IT.

Hoofdstuk 1 geeft de context aan waarbinnen het onderzoek plaatsvindt, en eindigt met een voorlopige doelstelling.

Eerst worden enkele casestudies naar voren gebracht die aangeven hoe organisaties strategische voordelen met de inzet van IT hebben behaald. In de literatuur worden deze voordelen veelal verklaard aan de hand van Porter's concepten van waardeketen en bedrijfstak. Porter en Millar hebben deze concepten gebruikt om de specifiek strategische voordelen te verklaren die zijn te behalen met IT, vooral in de informatie-intensieve bedrijfstakken.

Vervolgens worden de grootschalige investeringen in IT aangeduid. Om rendement te halen uit deze zo belangrijke investeringen moeten de potentiële mogelijkheden van de IT worden benut.

Een probleem is dat dit vaak niet het geval is. Uit onderzoeken over grote aantallen organisaties blijkt dat er nauwelijks een relatie bestaat tussen de investeringen in IT en de prestaties van de organisatie. Er zijn voorbeelden die dit beeld ondersteunen; in enkele cases worden situaties beschreven waarbij de inzet van IT geen voordelen heeft opgeleverd. De strategische mogelijkheden van IT worden over de gehele linie kennelijk niet goed benut. Gezien deze problematische situatie is het effectief management van IT van groot belang om strategisch voordeel te behalen. Helaas bieden de traditionele methoden voor informatiebeleid en -planning (IBP) hiervoor geen oplossing. Het mogelijke gevolg is dat het management teleurgesteld kan raken over de resultaten van de inzet van IT. Dit kan leiden tot een afname van de betrokkenheid, zodat wellicht een toekomstige IT-inzet minder zal worden ondersteund en dat verdere investeringen op dat terrein zullen afnemen.

Het onderzoek wil dit probleem aanpakken door zich het volgende (voorlopige) doel te stellen: het verkrijgen van meer inzicht in het strategisch gebruik van IT. Hiertoe wordt een theoretisch model opgesteld. Dit model geeft variabelen aan die succesvolle inzet van IT verklaren. In de hoofdstukken 2 tot en met 4 worden verscheidene variabelen en hun relaties bestudeerd voor de opbouw van dit model, dat in hoofdstuk 5 wordt weergegeven.

In hoofdstuk 2 wordt allereerst de invloed nagegaan die IT als variabele heeft op het strategische succes van organisaties (uni-variaat onderzoek). Uit de literatuur blijkt echter dat IT als afzonderlijke variabele weinig verklaring geeft voor de concurrentiepositie van organisaties. Ook een aantal theoretisch belangrijke variabelen in de organisatiekundige literatuur, namelijk de concurrentiestrategie en de organisatiestructuur, zijn onderzocht op hun effect op de concurrentiepositie. Ook daarvoor geldt dat ze te weinig inzicht bieden. Kennelijk biedt één variabele te weinig verklaring voor het strategisch succes van organisaties.

Vervolgens wordt het vraagstuk van het strategisch gebruik van IT vanuit meerdere invalshoeken tegelijk benaderd. In hoofdstuk 3 is enerzijds het strategische effect van IT en de concurrentiestrategie tezamen nagegaan, en anderzijds het effect van de combinatie van IT en de organisatiestructuur (bivariaat onderzoek). Voor de volledigheid is ook de relatie van de concurrentiestrategie en de organisatiestructuur met de concurrentiepositie nagegaan. De variabelen worden onderling gerelateerd door de bedrijfsprocessen van de waardeketen. Deze bi-variate onderzoeken zijn prominent aanwezig in de literatuur. Toch zijn ook de resultaten van deze onderzoeken niet optimaal aangezien ze onderling niet consistent zijn. Enerzijds kan dit aan de verschillende operationalisaties liggen, maar anderzijds is het mogelijk dat derde variabelen een te grote verstorende invloed hebben.

De logische vervolgvraag is dan ook of de drie variabelen IT, strategie en structuur tezamen de concurrentiepositie beïnvloeden. Dat het mogelijk is om deze drie variabelen te relateren bleek al uit de bi-variate onderzoeken uit hoofdstuk 3. Dat het veelbelovend is om deze drie variabelen te relateren blijkt uit modellen op het gebied vanIBP. Hoofdstuk 4 behandelt deze IBP-modellen waarin meerdere variabelen tegelijkertijd op elkaar worden afgestemd om de inzet van IT te optimaliseren (multi-variaat onderzoek). Het hoge abstractieniveau is een wezenlijk kenmerk van deze modellen. Hoe de afstemming er concreet uitziet blijft door die abstractie onduidelijk. De modellen geven als het ware teveel vrijheid bij de inzet van IT, waardoor er weinig complexiteitsreductie plaatsvindt. Het onderzoek streeft naar een grotere complexiteitsreductie door een concrete invulling van de abstracte variabelen. Hiermee wordt nagegaan hoe "goede” afstemmingen (‘fits’) er uitzien.

Een ander belangrijk element bij zowel deze IBP-modellen als bij bivariaat onderzoek is de rol van het management. Management heeft 'enabling’ ofwel sturende invloed. De inzet van produktiemiddelen, zoals IT, voor de organisatorische processen is een vraagstuk dat de organisatie in zijn geheel aangaat. Indien naast het informatiemanagement de top en lijn (of preciezer gezegd: de afdelingen waar de IT wordt ingezet) niet de noodzaak en de behoefte zien om de IT-inzet te ondersteunen, zal het moeilijk worden om tot afstemming te komen en de strategische mogelijkheden van IT te benutten.

Indien bij het IBP expliciet rekening wordt gehouden met de concurrentiestrategie en organisatiestructuur en het daarbij wordt ondersteund door het top- en lijnmanagement, is er sprake van een rijp IBP.

Deze invalshoek leidt tot het theoretisch model zoals dat wordt geïllustreerd in figuur S2 en zoals dat in hoofdstuk 5 nader wordt uitgewerkt.

Dit model biedt de mogelijkheid tot de verfijning van de voorlopige doelstelling en tot de opstelling van concrete onderzoeksvragen en hypothesen. Deze worden hieronder weergegeven.

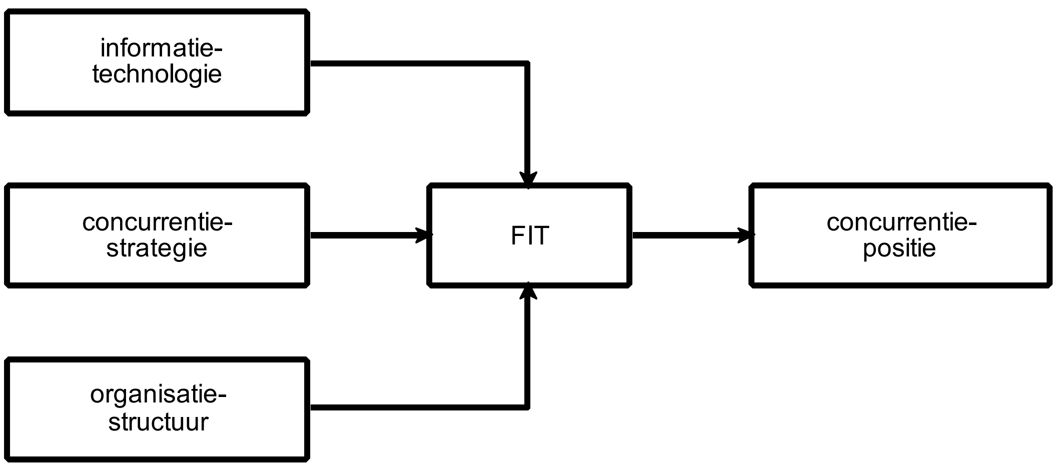
Doelstelling

Een niet met de organisatie afgestemde inzet van IT kan tot problemen leiden bij de strategische benutting ervan. Dit kan resulteren in teruglopend betrokkenheid bij het management, waardoor verdere inzet van en investeringen in IT kunnen afnemen.

Eén van de kenmerken van de modellen, die aangeven dat IT dient te worden afgestemd op de organisatie, is hun abstracte niveau, zodat het vinden van 'fits' een complex probleem is. Door de conceptuele variabelen te operationaliseren wordt getracht aan dit probleem tegemoet te komen. Het doel van het onderzoek wordt dus:

> Het achterhalen van concrete afstemmingen tussen IT, strategie en structuur die gunstig zijn voor de concurrentiepositie van de organisatie. Hiermee wordt aangeven in welke organisatorische context de strategische mogelijkheden van IT het best kunnen worden benut. Het management kan deze afstemmingen hanteren als streefpunten voor de inzet van IT in hun organisatie.

Figuur S2 THEORETISCH ONDERZOEKSMODEL: DE CONCURRENTIEPOSITIE HANGT AF VAN DE FIT TUSSEN IT, CONCURRENTIESTRATEGIE EN ORGANISATIESTRUCTUUR



Onderzoeksvragen

Met de antwoorden op de onderstaande onderzoeksvragen kan het hierboven omschreven doel worden bereikt.

1. Heeft de afstemming ('fit') tussen IT, strategie en structuur een positieve invloed op het benutten van de strategische mogelijkheden van IT?
   Hypothese 1: Ja

   Twee zaken worden aangepakt als de eerste hypothese wordt ondersteund. Ten eerste wordt hiermee de IBP-claim (meerdere variabelen dienen simultaan te worden bestudeerd voor inzicht in het strategisch gebruik van IT) empirisch bevestigd. Ten tweede wordt duidelijk dat inconsistenties tussen verschillende bi-variate onderzoeken gedeeltelijk worden verklaard door het verstorende effect van een derde variabele.

2. Bevinden organisaties zich relatief vaak in die situaties waarin de strategische mogelijkheden van IT worden benut?
   Hypothese 2: Nee

   Vanuit de literatuur is de tegenvallende benutting bekend van de strategische mogelijkheden van IT. Een mogelijke verklaring kan zijn dat de afstemming tussen de IT en de organisatorische context niet goed genoeg is.

3. Heeft rijp informatiebeleid en-planning (IBP) invloed op de aanwezigheid van organisaties in die situaties waarin de strategische mogelijkheden van IT worden benut?
   Hypothese 3: Ja.

   Zou de tweede hypothese worden bevestigd, dan is sturing van het management gewenst om de IT op de juiste manier in te zetten. De derde vraag en de bijbehorende hypothese behandelen het effect van dit ingrijpen van het management via het instrument van rijp IBP.

In hoofdstuk 6 wordt de methode van onderzoek aangegeven waarmee de hypothesen zijn getoetst. Deze methode is vooral bepaald door de kenmerken van de probleemstelling en door de staat van de theorie. In de probleemstelling staat aangegeven dat naar meerdere afstemmingen wordt gezocht. Daarom zijn bij meerdere organisaties vergelijkbare gegevens verzameld. In dit zesde hoofdstuk komen de volgende onderdelen naar voren:

- onderzoeksstrategie: er zijn primaire gegevens verzameld met een uitgebreide survey;
- steekproef: de primaire gegevens zijn verkregen via het trekken van een steekproef uit een populatie. Van deze steekproef worden de volgende onderdelen besproken:
  - populatie: het onderzoek vindt plaats onder organisaties in zogenaamde informatie-intensieve bedrijfstakken, aangezien daar de relevantie van IT voor de concurrentiepositie groot is en herkenbaar voor de respondenten;
  - steekproef: de hypothesen betreffen relaties tussen variabelen. Voor de interne validiteit van het onderzoek is het noodzakelijk om een zo groot mogelijke spreiding over de onafhankelijke variabelen te verkrijgen;
  - respons: de teruggezonden vragenlijsten zijn meestal geheel, soms gedeeltelijk en soms niet ingevuld. De uitsplitsing van de binnengekomen vragenlijsten wordt in dit hoofdstuk beschreven;
- instrument (vragenlijst): op basis van operationalisatie van de variabelen zijn de vragen van de vragenlijst opgesteld. Ook de betrouwbaarheid en de validiteit daarvan wordt besproken in dit hoofdstuk;
- methode van data-analyse: om de hypothesen te toetsen zijn de data aan elkaar gerelateerd. De hiervoor gehanteerde serie van analyses staat hier aangegeven.

Hoofdstuk 7 geeft de uiteindelijke resultaten weer. De data zijn volgens de methode van data-analyse geanalyseerd en de resultaten zijn per onderzoeksvraag geordend. De resultaten zijn in het kort de volgende.

1. Hypothese 1 is bevestigd. In de veronderstelde 'fits' van IT, strategie en structuur was de concurrentiepositie significant hoger dan in de overige situaties. Juist bij de als goed gehypothetiseerde combinaties van IT, strategie en structuur werd een hogere concurrentiepositie gemeten dan op grond van de invloed van de afzonderlijke variabelen mocht worden verwacht (synergie).
2. Hypothese 2 is bevestigd. De variabelen grepen niet zodanig op elkaar in dat er zich significant meer organisaties in de goede 'fits' bevonden. Dit betekent dat de strategische mogelijkheden van IT weliswaar door

sommige organisaties werden benut, maar dat het aantal organisaties in de 'fits' werd bepaald door de gemiddelde waarden van de variabelen. Organisaties leken de 'fit'-situaties dus niet op te zoeken.

3. Hypothese 3 is verworpen. Organisaties waar rijp IBP aanwezig was bevonden zich niet vaker in de 'fit'-situaties dan de andere organisaties. Ook had IBP geen directe relatie tot de concurrentiepositie.

Deze resultaten vormen de basis voor hoofdstuk 8. In dit hoofdstuk worden de bevindingen in het licht van de opgestelde theorie besproken. Hoofdconclusie is dat er bewijs is gevonden voor de IBP-claim dat afstemming tussen meer variabelen synergetische effecten heeft. Daarnaast wordt duidelijk dat inconsistenties tussen verschillende bi-variate onderzoeken gedeeltelijk worden verklaard door het verstorende effect van een derde variabele (hypothese 1).

Het resultaat kan in de praktijk worden gebruikt bij de inzet van IT. Het biedt namelijk streefpunten aan het management. IBP helpt echter niet bij het bereiken van deze streefpunten. Een belangrijk resultaat van het onderzoek is namelijk dat IBP, rekening houdend met aspecten zoals strategie, structuur en betrokkenheid van het management, toch geen succes oplevert (hypothese 3).

In hoeverre IBP kan worden genuanceerd voor het bereiken van strategisch voordeel is vooralsnog een open vraag. Het concept kan verder worden gedifferentieerd, gebruikmakend van de succesvol bevonden combinaties van IT en organisatorische configuraties. Daarnaast kan het beleid meer worden gericht op het zoeken en ondersteunen van initiatieven die op de werkvloer worden ondernomen en die langzamerhand strategische gevolgen hebben. Vervolgonderzoek dient een dergelijke vorm van IBP te testen, om na te gaan of dit daadwerkelijk tot strategische effecten kan leiden. Een geschikte strategie hiervoor zou bestaan uit het bestuderen van cases of het uitvoeren van een longitudinaal onderzoek.