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IMPACT ON BUSINESS PERFORMANCE BY THE ORGANIZATIONAL AND TECHNOLOGICAL INFRASTRUCTURES

Simona Solomon

A Thesis

in

The Faculty

of

Commerce and Administration

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ABSTRACT

Impact on Business Performance by the

Organizational and Technological Infrastructures

Simona Solomon

In recent years firms have been undergoing significant transformations in an effort to increase efficiency, effectiveness, and innovation. Organizations are also searching for ways to become more competitive in their environment. In this study, the relationships between organizational infrastructure, technological infrastructure, and business performance are investigated. An organizational design planning framework is introduced that incorporates functional alignment between emerging organizational goals and technology characteristics.

The study's findings do not indicate that strong organizational/technological linkages significantly impact the business performance of firms. The results, however, confirm past research that advocates the development of strong infrastructures. The study contributes to the current research by operationalizing the organizational and technological infrastructures and exploring the fit between the organizational and technological domains of firms.

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1.0 INTRODUCTION

Both organizational and technological factors in the business environment have undergone significant transformations within the past two decades. Many organizations have dramatically restructured and changed their appearances in an effort to increase efficiency, effectiveness, and innovation. The technology field has also evolved from being essentially authoritarian and scientific to more operational, purposeful, and technically practical. Despite nearly two decades and billions of dollars worth of investment, organizations still find it difficult or impossible to harness the power of information technology[1] (IT) for their own long-term benefits even though evidence suggests that IT has the power to transform whole industries and markets (Luftman and Oldach, 1996). Many economists have noted the "productivity paradox" in firms with the introduction of information systems, as productivity is found to often decline with investment in IT (Star and Ruhleder, 1996, p. 126).

The current difficulties to exploit IT give rise to the important issue of how organizations can better plan, organize, and manage the combination of people and machines in a business environment. A substantial amount of research in information systems[2] (IS) explores organizational planning issues. It is widely

[1]Information Technology refers to the "hardware and software with the capacity to collect, store, process, and retrieve words, numbers, and images to control and connect equipment and processes." (Henderson and Thomas, 1992).

[2]Information Systems are the collection of procedures, activities, people, and technology set up to collect, store, process and communicate relevant data and information in a business environment (Silk, 1991).

posited that to leverage IT functionality, business operations and IT investments should be strategically coordinated and closely aligned (e.g., King, 1978; Lederer and Sethi., 1988; Venkatraman, 1989; Das, Zhara, and Warkentin, 1991; Henderson, Thomas, and Venkatraman, 1992; Earl, 1993; Broadbent and Weill, 1993; Premkumar and King, 1994; Ferrand, 1994; Star and Ruhleder, 1996; Agarwal, Krudys, and Tanniru, 1997). There is a widespread acceptance that IT is a powerful and under-exploited source of strategic advantage (Venkatraman, Henderson, and Oldach, 1993), and it is suggested that the competitiveness of the firm can be enhanced through a strategic alignment between the business orientation and IT. To fully exploit IT, the firm's business strategy must be integrated with its IT strategy. Moreover, to fully leverage IT functionality, organizational and technological infrastructures should be integrated and aligned.

Literature reports numerous empirical studies on the alignment between business and IT strategies (e.g., Teo and King, 1996; Chan, Huff, and Copeland, 1996; Reich and Benbasat, 1996; Bergeron and Raymond, 1995). Other empirical studies feature organizational/technological issues, such as technological infrastructure (Duncan, 1995; Star and Ruhleder, 1996) and IS organizational design (Tavakolian, 1989; Brown and Magill, 1994). Research on organizational/technological alignment is still considered to be in its infancy as efforts are still being made to operationalize the constructs and accurately measure strategic linkages. Additional empirical studies are warranted to

provide added contribution to the IS research field. The focus of this study will be the organizational and technological domains of the enterprise and their impact on business performance. Contemporary organizational and technological themes will be examined, which have been attributed to increased competitive advantage. A research model will be developed and tested that suggests that the business performance of the modern enterprise is related to the organizational and technological domains of the enterprise.

The first chapter of the thesis will present a literature review of strategic IS and infrastructure alignment. The following chapters will discuss the proposed research model, theoretical background, and research methodology. The last chapters will provide the final results and the conclusions of the study.

2.0 LITERATURE REVIEW

In this study, the main topics under review are the strategic impact of IT and the alignment between the organizational infrastructure and the technological infrastructure.

2.1 Strategic Impact of Information Technology

Firms today incorporate IT planning in their strategic and administrative processes. Within the last two decades, the planning for information systems and information technology in the organizational setting has greatly evolved. The strategic impact of IT will be explored in the following paragraphs from an IT planning perspective.

2.1.1 Information Technology Planning

Since the mid-1960's IT planning has been a topic of growing importance, and interest in IT planning has increased in both practitioners and academics (Boynton and Zmud, 1987). Literature suggests that the heightened concern in IT planning primarily emerged from four factors: 1. The wide application of IT as a means of gaining competitive advantage (Boynton and Zmud, 1987); 2. Rapid changes in hardware and software technologies and the subsequent rise to potential investments in incompatible systems; 3. The scarcity of organizational resources, such as financing or experienced information systems professionals; and 4. Organizational dependence on information systems support to implement business systems (Ahituv and Neumann, 1990). The topic of IT planning is

widely perceived as an organizational management issue, and much of the research is aimed toward the investigation of effective deployment of IT resources.

IT planning is defined as an organizational activity directed toward: 1. Recognizing organizational opportunities for IT; 2. Determining the resources required to exploit these opportunities; and 3. Developing strategies for meeting the resource needs and realizing these opportunities (Boynton and Zmud, 1987). Past research scrutinized the quality and effectiveness of IT plans in a number of ways, some of which include: assessing their internal consistency and external validity (Henderson and Sifonis, 1988), analyzing the plans in terms of process and content issues (Das, Zhara, and Warkentin, 1991), and examining the planning processes and determining the extent to which they were improvement-oriented and subsequently fulfilled key planning objectives (Raghunathan and Raghunathan, 1994). The numerous perspectives used by researchers to study the topic of IT planning and the vast amount of IT planning literature available demonstrate that IT planning is widely viewed as a crucial information management issue (Boynton and Zmud, 1987).

Early IT planning was essentially reactive as independent systems were developed by IT specialists in response to user requests for operational information. The planning approach was mainly bottom-up as systems were developed and expanded in response to the real or short-term needs of the

organization (Ahituv and Neumann, 1990). The major disadvantage in the bottom-up IT planning approach is that that the overall information requirements cannot be estimated in advance, and consequently, the integration of the various applications is not optimal. As IS grew, they had to be redesigned because the initial design could not sufficiently account for the future scope of the system (Ahituv and Neumann, 1990).

During the 1970's and the 1980's, business managers assumed greater participation in the IT planning process. Their concern was to ensure information availability, efficiency and effectiveness of the system to the whole enterprise (Hufnagel, 1987). Management wanted to make more informed decisions regarding IT investments, and began implementing systems of measurement and control such as IBM's Business Systems Planning (BSP) (Zachman, 1982). These top-down planning methodologies were more proactive and incorporated the business objectives in the IT planning process (Hufnagel, 1987). Top-down IT planning approaches are advantageous in that they identify the overall information requirements of the organization, and IS are subsequently developed according to these requirements. Emphasis is first placed on the identification of the information requirements before the systems are developed and more easily integrated later on (Ahituv and Neumann, 1990). The top-down planning methodologies suggest the need for management to participate in the IT planning process as the future direction of the enterprise is the main priority (Hufnagel, 1987). The IT planning literature in these decades emphasize the

development of planning approaches that highlight a bi-directional relationship between business and IT planning. During this period of time, the IT domain was elevated to a new level of importance in the organization.

2.1.2 Strategic Information Systems

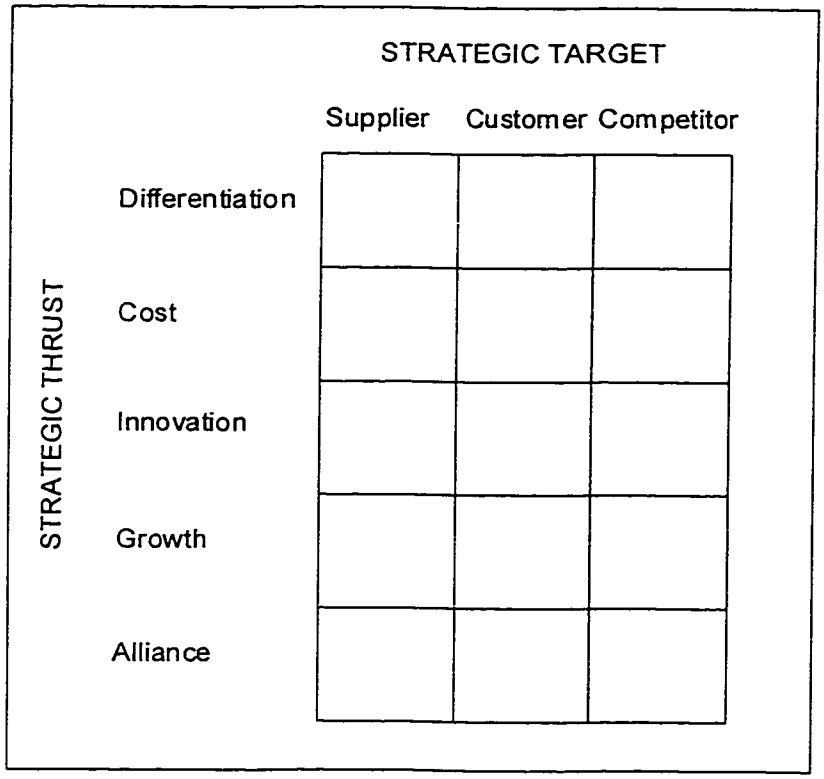
Management's participation in IS development advanced the use of policy support tools, such as management information systems (MIS), decision support systems (DSS) and executive information systems (EIS). These IS reflected management's control focus and contributed to the development of business strategies, however, they were not fully integrated with the business strategies as they were not an integral part of the firm's strategic thinking (Hufnagel, 1987). Strategic IS achieve full integration when the organizational strategic plan views IS as critical resources with the potential to create new products, open new markets or set new direction for the organization (Hufnagel, 1987). Strategic IS are also used by organizations to secure gains over its competitors (Bergeron and Raymond, 1995). As strategic IS emerge and complement the firm's competitive strategy, they elevate business processes to the point of providing the firm market-based competitive advantage. Strategic IS competencies are: 1. Novel - they are new to market or niche, which translates to new products to enhance user's utility function; 2. Enduring - they are difficult to imitate or duplicate through proprietary technology, skills, or knowledge resources; and 3. Large in magnitude - to be commercially viable (Das, Zhara, and Warkentin, 1991).

The literature proposes several tools for identifying strategic IS initiatives. The critical success factors (CSFs) (Rockart, 1979) method is often used to identify a limited number of areas (generally four to six) that contribute mostly to the success of the overall performance of the firm. Prior empirical research suggests that organizations whose strengths are aligned with their CSFs perform better (Sa and Hambrick, 1989). Furthermore, there is evidence that the alignment between an organization's CSFs and its IT capability facilitates organizational performance (Sabherwal and Kirs, 1994). Both the organizational infrastructure, which renders the business processes, and the technological infrastructure, which delivers the enabling IT, may be platforms for CSFs.

A second method frequently used to identify IS strategic initiatives is value chain analysis (Porter and Millar, 1985). Value chains are activities within organizations that can each add value to the customer as products move through the chain of steps from supplier to customer. An understanding of the translation of resources through processes into final products and services can lead to improvements in internal or interorganizational value chains, which can result in competitive advantage. IT is of strategic or competitive importance when it is used to automate each activity in the value chain, to make the process run more efficiently or lead to differentiation of the product or service.

A third method used to identify strategic IS initiatives is the strategic thrusts approach (Rackoff, Wiseman, and Ullrich, 1985). Refer to Figure 1 for a summarized framework.

Figure 1. Strategic Thrusts Matrix



This tool is used to find strategic IS initiatives that are consistent with the strategic thrusts of the firm. The major strategic thrusts include differentiation, cost, innovation, growth and alliance. The thrusts, which can be either offensive or defensive, represent competitive moves that an organization can make. The second dimension in the matrix is the strategic targets, such as supplier, customer and competitor, areas at which thrusts can be directed. An analysis of

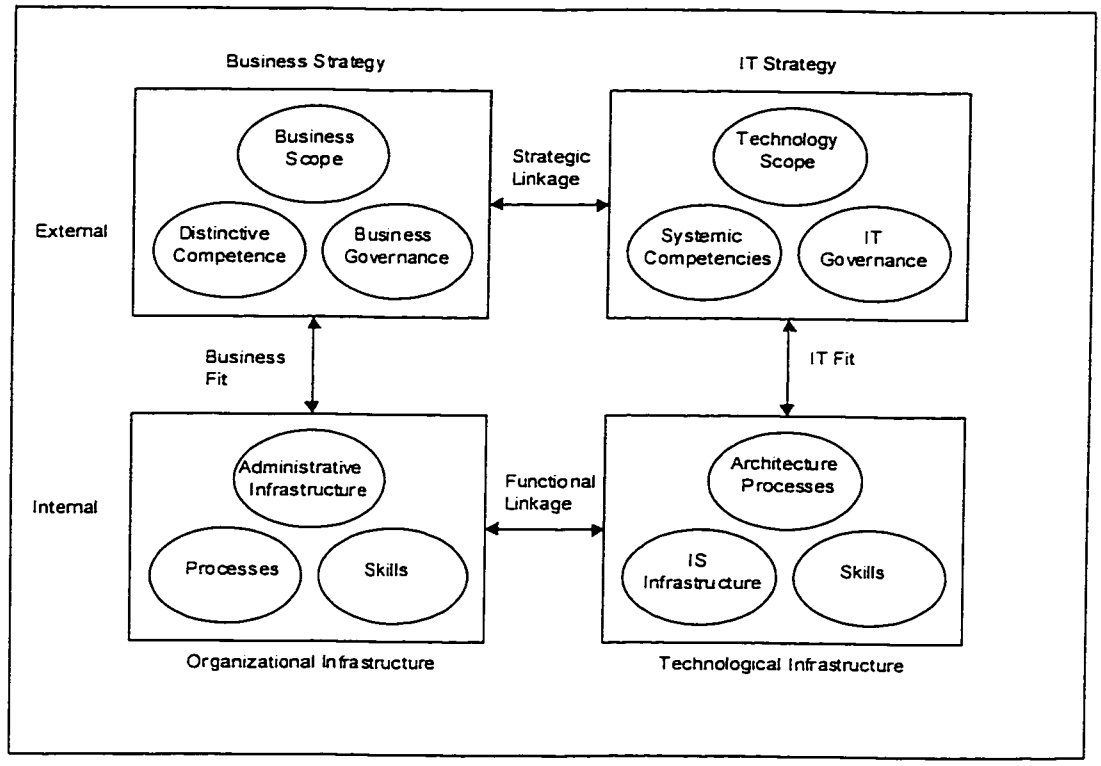
the possible competitive moves that an organization can make in relation to those areas in industry with which the organization must interact may generate possible strategic applications for each cell in the matrix. Subsequent evaluation of the possible strategic applications can generate top priority ideas, which can later be translated into strategic IS.

The two planning methodologies, value chain analysis and strategic thrusts approach were investigated and compared in an exploratory study to determine their impact in identifying IS opportunities in medium-sized enterprises (Bergeron, Buteau and Raymond, 1991). The research findings indicate that overall, the two methodologies were equally effective in identifying feasible opportunities for applying IT. Furthermore, the results also suggested that the strategic thrusts approach had a more outward orientation to assist organizations gain more competitive positions within the environment. The value chain analysis was found to have a more inward orientation to assist organizations to gain a competitive advantage through changes in internal processes.

2.1.3 Business / Information Technology Alignment

A new planning framework emerged in mid 1980's that addressed the business and IT domains of firms in a broad, holistic manner. Refer to Figure 2 for the business/IT planning framework (Henderson, Thomas, and Venkatraman, 1992).

Figure 2. Strategic Alignment Model

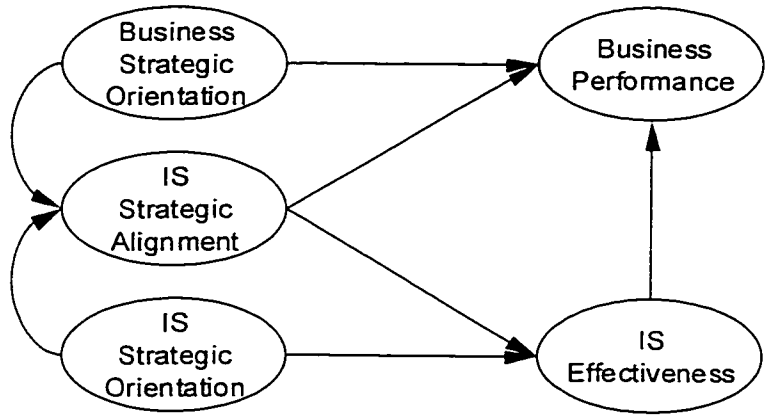


The model illustrated in Figure 2 argues that for a strategic alignment to exist, both external and internal fits must exist. External fit occurs when both IT and business strategies are consistent with key environmental contingencies, and internal fit occurs when IT strategy and infrastructure are consistent with the business strategy and infrastructure. The model advocates strong business/technology linkages and is generally referred to in the literature as the Strategic Alignment Model. The model can be fittingly applied in the current competitive, information-based era as it is business process-driven and advocates enterprise-wide information management. The planning framework illustrated in the model provides mechanisms for facilitating the move between

strategy, which involves novel ideas, and implementation, which involves behaviors which take action.

The strategic alignment model has issued further research in the strategic business/IT field. An empirical research was conducted to investigate the business strategic orientation, the systems strategic orientation, and strategic alignment (Chan, Huff, Copeland, and Barclay, 1996). Figure 3 illustrates the study's conceptual model and the links between the realized business and IT strategies, their alignment, and business performance.

Figure 3. The Strategic Business/IT Alignment Model



The study contributed to the understanding of IT and business strategy by validating, integrating, and expanding on earlier research, and by presenting and analyzing systems and bivariate models of business and IS strategy, alignment and performance. The results advocate the use of the higher-order systems

approach, which examines the firms' overall profiles rather than the bivariate perspective which details specific dimensions of interest.

Another research study investigated the link between IT and organizational performance (Bergeron and Raymond, 1995). The study explored the strategic orientation of the business, strategic management of IT, and their impact on organizational performance of firms. The findings of the research indicate that peak performance is achieved by organizations that combine a strong strategic orientation with a strategically oriented IT management. The study was based on the Contingency organizational perspective. The Contingency Theory has been widely used in previous research that sought to establish links between IT and organizational performance.

A third study explored the relationship between the deployment of IT, business strategy, and organizational performance (Croteau, 1998). The study examined the relationship between IT and business strategies and the impact of IT deployment on organizational performance and on business strategy. The business strategy was operationalized in terms of business strategy types, namely prospector, analyzer, defender, and reactor. The general results of the research survey suggest that the business strategy types prospector and analyzer contribute to organizational performance. The sampled firms' technological profiles were also observed for the two strategy types respectively,

and the research results indicate that organizations with prospector and analyzer business strategy types are in harmony with the deployment of IT in the firm.

2.2 Infrastructure Alignment

Infrastructure alignment refers to the alignment between the organizational and technological domains of the firm. The organizational domain comprises components that represent managerial and administrative choices about the formal structure, report relationships and coordination mechanisms for individuals or groups. The technological domain comprises technological components that represent managerial and administrative choices about the telecommunication and data architectures that drive the full portfolio of organizational IT activities. The literature defines this alignment as "functional linkage" between infrastructures that reflects "the need to insure internal coherence between the organizational requirements on one hand, and the delivery capability of the information systems function on the other." (Henderson, Thomas, and Venkatraman, 1992, p. 9). The alignment is also described in the literature as the operation level link between the infrastructures (Henderson, Venkatraman, and Oldach, 1996).

2.2.1 Concept of Infrastructure Alignment

The concept of infrastructure alignment or "integration" (Henderson, Venkatraman, and Oldach, 1996, p. 28) brings into view a representation of technology as a tool intended to support and aid human work and interaction. A

tool "is not just a thing with pre-given attributes frozen in time - but a thing becomes a tool in practice, for someone, when connected to some particular activity" (Star and Ruhleder, 1996, p. 112). Given this definition of a tool, IT infrastructure can be viewed as fundamentally a relational concept; as it becomes an infrastructure in relation to organized practices (Star and Ruhleder, 1996). Information technological infrastructure, the literature suggests, is interrelated with organizational factors, and any design issues should involve both technology and organization factors.

One stream of IS research suggests that the design of the organization's infrastructure often determines the needs and requirements for the technological infrastructure, which implies adapting the technology to the organization (Henderson, Thomas, and Venkatraman, 1992; Walton, 1989). However, it is argued that management can extend its efforts to detect and improve general organizational conditions favorable to IT (Walton, 1989). On the other side of the spectrum, "adapting the organization after the fact" and "relying upon the technology to automatically produce the appropriate organizational response often leads to poor technology design and unintended organizational response" (Walton, 1989, p. 208). Nevertheless, there may be sound reasons for deferring organizational design issues until the technology is introduced (Walton, 1989). The current academic literature on IT development advocates the simultaneous development of organization and technology (Walton, 1989), to be supported by managerial learning and skill acquisitions.

The literature recommends that business managers should be held responsible for IT developments and business and IS staff should extensively interact. Additionally, it is recommended that IS understanding should be developed in business managers and IS managers should develop business skills (Broadbent and Weill, 1993).

The generally favored option is the simultaneous development of IT infrastructure and organizational infrastructure, where many of the technology and organizational design issues are jointly addressed by both business and IS managers (Walton, 1989). Infrastructure alignment, as defined in this thesis, is the functional integration of organization and IT through simultaneous development of infrastructures, where respective design issues are jointly addressed.

2.2.2 Infrastructure Themes

The main objective of this study is to empirically investigate how the alignment of organizational and IT infrastructures impacts the business performance of firms. As firms adopt higher technology systems to meet their specific operational mission or need, additional administrative, managerial, and technical issues arise that need to be addressed. One of the major difficulties encountered is the problem of system integration where organizations seek to better integrate people and technology in order achieve an overall optimized and effective system (Shenhar and Bonen, 1997).

To initiate systems integration in an organizational setting, the literature recommends that organizational infrastructure should be aligned with the information technological infrastructure. For research purposes, the concept of infrastructure alignment can be operationalized by paralleling emerging organizational goals with main characteristics of technology. Refer to Table 1 for a listing of ten corresponding themes (Tapscott and Caston, 1993, p. 209-212).

Table 1: Organizational / Technological Themes

Organizational Theme	Technological Theme
Empowerment	Distributed Computing
Integration	Interconnection
Openness	Open Systems
Immediacy Real time	Real Time
Cooperation	Cooperative Processing
Commitment	Peer-to-Peer Network Protocols
Organizational Independence	Architectural Modality
Skill Specialization/Competency Building	Platform Specialization
Accessibility	User Friendliness
Time and Space Independence	Global Networking

The literature proposes business fundamental transformation by setting out on a course to create the new rather than fix the old, and it is suggested that the above-mentioned themes may assist organizations to 'reinvent' themselves (Tapscott and Caston,1994). Firms which have undergone business or systems reengineering have seriously considered applying one or more of these themes to their infrastructures.

The idea of paralleling emerging organizational goals with main characteristics of technology is suited for the purpose of a study that attempts to investigate infrastructure alignment. However, an empirical investigation necessitates refinement of the infrastructural themes in order to define and operationalize the constructs and make specific prediction about the outcomes of the study. In the process of construct development, the infrastructure themes were classified into five main categories of corresponding infrastructure themes (refer to Table 2).

Table 2. Main Categories of Infrastructure Themes

Organizational Theme	Technological Theme
Common/Shared Vision Accessibility	**User Involvement in IS** User Friendliness
Cooperation Integration Commitment	**Connectivity** Cooperative Processing Interconnection Peer-To-Peer Connectivity
Empowerment	**Distributed Computing**
Adaptability Openness Organizational Independence	**Flexibility** Open Systems Architecture Modality
Learning Skill Specialization/ Competency Building	**Technology Awareness** Platform Specialization

The infrastructure themes presented in Table 1 are initially introduced from an IT-enablement perspective that generally views both people and technology as important contributors to the organization in terms of value-added resources. The corresponding organizational and technological infrastructure themes are described as follows (Tapscott and Caston, 1994): the organizational theme

Accessibility is reflected when the enterprise is accessible to its members and unites them around a shared vision. The new theme category Common/Shared Vision focuses on the collective awareness of the organization's vision and main goal(s). The corresponding technological theme User-Friendliness refers to systems designed to be easy to learn and use by organizational members who identify with the corporation and are personally involved in the technologies. The corresponding theme category to Common/Shared Vision is called User Involvement, which focuses on involvement and participation in all aspects of information systems.

The themes Integration and Commitment are grouped in the theme category called Cooperation because they both reflect horizontal and diagonal interpersonal and intergroup cooperation and communication. The corresponding technological themes: Cooperative Processing, Interconnection, and Peer-to-peer Network Protocols are similarly grouped together under the theme category Connectivity because they all reflect the processing capability, enabled communication, and sharing of information and technology resources required for organization-wide networks.

The theme Empowerment is a state in which individuals and work groups are empowered to act and to create value. Intelligence, which involves the thinking, planning, human processing of information and application of knowledge to business problems, is distributed. The corresponding technological theme to

Empowerment is Distributed Computing. There is a shift from host-based hierarchical networks, such as a mainframe or minicomputer, to network computing where computer intelligence is distributed, close to the user.

The organizational themes Openness and Organizational Independence are grouped in a category called Adaptability because they both express the flexible organizational designs required to achieve business objectives in the current diverse, changing environment. Organizations whose organizational infrastructure are open in design are viewed by the literature as adaptable organizations. Similarly, the corresponding technological themes Open Systems and Architecture Modality both reflect the theme category, Flexibility, which involves portability and grouping of software and information required to meet frequently changing business requirements.

The organizational theme Skill Specialization/Competency Building focuses on the professional and the knowledge worker, where specialized competencies are encouraged and developed in individuals. The theme category Learning encompasses organization-wide learning and the knowledge worker which, by definition, requires specialization. The theme Platform Specialization focuses on specialized technology that is developed to meet unique requirements. Organization members need to keep up-to-date on the latest technologies and have sufficient organizational knowledge and technical skills to make the best possible technological investments for their firm. Consequently, the

corresponding technological theme category to Learning is called Technology Awareness, which focuses on the organizational concern to acquire unique computing capabilities.

The process of developing the concept of infrastructure alignment and refining it into testable hypothesis warranted the investigation of previously studied organizational/technological issues in research settings. The literature investigation accentuated the organizational/technological themes of interest to researchers, provided clear definitions of the research issues, and helped to remove any overlapping themes. For the purpose of this study, the infrastructure themes presented in Table 2 have been classified into five corresponding study themes which have been previously employed in research settings (refer to Table 3).

Table 3. Organizational / Technological Study Themes

Organizational Theme	Technological Theme
Common/Shared Vision	User Involvement in IS
Cooperation	Connectivity
Empowerment	Distributed Computing
Adaptability	Flexibility
Learning	Technology Awareness

All the infrastructure themes presented in Table 3 enable, facilitate, encourage and support the emerging organizational goal Immediacy and the technological

characteristic Real Time as organizations seek to compete in time effectively (Tapscott and Caston, 1993).

2.2.3 Organizational Infrastructure

The organizational infrastructure refers to choices pertaining to the particular configurations and internal arrangements that intend to support the organization's chosen position in the market (Morton, 1991). The literature defines organizational infrastructure in terms of three dimensions: 1. Organizational design, which includes choices about organizational structure, roles, responsibilities, and reporting relationships; 2. Processes, which articulate the workflow and associated information flows for carrying out key organizational activities; and 3. Skills, which include choices about the capabilities of organizational members needed to accomplish the key tasks that support a business strategy (Henderson, Thomas, and Venkatraman, 1992). Organizational infrastructure also delineates choices in the decision-making processes and accountabilities appropriate to the strategic orientation of the firm (Broadbent and Weill 1993). Moreover, the infrastructure encompasses issues such as resourcing, work design, education, training, and human resource management policies (Beaumont and Sutherland, 1992). Organizational infrastructure is defined in this thesis as the internal configurations and arrangements involving organizational structure, business processes, work design, training and education that intend to support the firm's business strategy.

2.2.3.1 Common / Shared Vision

A firm's vision describes the firm's overarching goal or objective for the organization. One example of a company vision is to provide customers with the best possible service in the industry. A firm's vision is a statement of purpose and a photograph of the firm's future, which sets the priorities for business planning and establishes criteria for investments (Keen, 1991). In order for the organization to attain its ultimate purpose, there is a need for common organizational orientation toward shared goals (Ferioli and Migliarese, 1996). A common vision is a vision that is shared by the people in the organization, whereby a shared vision means not only that they have a common vision but that they know that they have it (Devlin, 1997). A shared organizational vision is essential, as it brings about consistency in critical beliefs and assumptions and internal stability to the firm (Henderson and Sifonis, 1988).

Common organizational orientation and consistency in critical beliefs and assumptions are fundamental in the creation of an internally consistent behavioral or process model of the firm, as the abstract representation of the firm can be operationalized in a purposeful manner, and there is a corporate flow from corporate to business to functional or process planning and implementation (Henderson and Sifonis, 1988). A common/shared vision, as defined in this thesis, is the collective awareness of the company's overall goal, and consistency in beliefs and assumptions as to the purpose of the firm.

2.2.3.2 Cooperation

Literature describes the concept of cooperation as joint behavior toward a particular goal of common interest that involves interpersonal relationships (Pinto, Pinto, and Prescott, 1993). Cooperation is also described in the literature as working with others productively and resolving conflict in an effective manner (Green, 1989). Nowadays, firms often engage in direct business transactions with other parties, such as customers, suppliers, or other business firms, and individuals must collaborate and cooperate not only with members of their own organizations but with persons external to their firms. As environments become more interrelated, individual's job and tasks are interdependent with the jobs and tasks of other individuals (Dickson, 1976), and to manage knowledge people must be better collaborators (Saint-Onge, 1996). Attributes such as commitment (Reich and Benbasat, 1996) and trust (Ferioli and Migliarese, 1996; Hardy, 1995) conserve multi-dimensional linkages amongst individuals, organizational units, or interorganizational firms.

With regard to the internal dynamics of current organizations, the traditional era of the command and control mode of managerial work is slowly being replaced by more cooperative relationships with emphasis on business processes and teamwork. The emergence of new organizational configurations, such as cross-functional teams and self-directed work teams, have made reality more complex, and that creates a need for cooperative and collaborative efforts to reduce the uncertainties (Powel, Koput, and Smith-Doerr, 1996). Cooperation is defined in

this thesis as an orientation toward the collective interest where individuals work together to complete tasks.

2.2.3.3 Empowerment

Organizational empowerment refers to a working style that is autonomous in terms of making and executing decisions in the work environment. Empowerment has been defined as 'enhancing personal control by fostering involvement and inclusion in the decision-making process' (Bartunek, Foster-Fishman, and Keys, 1996, p. 707). Empowerment is also described as worker autonomy in business which should be directly aligned with strategic goals or business conditions (Ettorre, 1997). Empowerment or "power-sharing" (Ettorre, 1997, p. 13) must be accompanied by accountability and responsibility, as it is an entrusted obligation that can seriously impact the organization.

Empowerment is also defined as using the intellectual capital of human resources to solve strategic business problems and to create value (Ettorre, 1997). This latter definition implies that the empowered individual must be intellectually capable, trained, and sufficiently skilled to select the best courses of action for the organization. Hence, addressing empowerment in an organization revolves around issues of personal development and knowledge acquisition. Empowerment, as defined in this thesis, is the acquisition of relevant skills and knowledge in the work environment and the ability to make and execute business decisions.

2.2.3.4 Adaptability

Adaptable environment is an internal state of an organization that is flexible and responsive to the changing market and customer needs. Organizational adaptability and flexibility is required as companies need to change more frequently than in the past in order to adapt to new opportunities. Flexible forms, such as organic organizational structures, are suited in dynamic business environments (Das, Zhara, and Warkentin, 1991; Keller, 1978). Organic organizational structures emphasize project, product, or matrix structures, are more flexible and less hierarchical than functional forms, facilitate improved communications, and encourage cross-functional participation (Das, Zhara, and Warkentin, 1991). Organic structures are characterized by open communication, adaptation, consensus, and loose control, and behave in an ad-hoc manner (Doukidis, Lybereas, and Galliers, 1996). Therefore, an adaptable organization is one that displays organic form characteristics, and is flexible and yielding to the changing environment.

2.2.3.5 Learning

Learning creates value to the firm as individuals become qualified to solve organizational and business problems. A learning organization "is one that facilitates learning by all its members and continually transform itself by providing a climate for learning both within and outside organizational boundaries; thus, organizational learning is viewed as a metaphor for individual learning" (Agarwal, Krudys, and Tanniru, 1997, p. 25-26).

Contemporary learning is related to the concept of innovation, as organizations progressively apply their resources in a search for new ideas, opportunities, and innovation. Organizational innovation refers to "the adoption of an idea or behavior that is new to the organization adopting it" (Swanson, 1994, p. 1070). The organization must be open and willing to infuse learning and innovation (Lai and Guynes, 1994). Environments should be created that are conductive to learning and support individuals as they learn and adapt to changes (Senge, 1990) and support norms that encourage change, such as the encouragement of creativity, openness and responsiveness to change, and new or different approaches to tasks (Lai and Guynes, 1994). Hence, a learning organization can be defined as one that supports individual learning and has norms in place that encourage change and innovation.

2.2.4 Technological Infrastructure

Technological infrastructure provides the shared foundation of the technological capabilities for building business applications, and comprises two layers: 1. The technological components, such as computer and communications technologies, commodities which are readily available in the marketplace; and 2. A set of shared services such as management of data processing, provision of electronic data interchange (EDI) capability, or management of databases (Broadbent and Weill, 1997).

The technological components are the primary, tangible IT resources and include: a. "platform technology" (i.e., hardware and operating systems); b. Network and telecommunications technologies; c. Key data; and d. Core data-processing applications (Duncan, 1995, p. 39-40). The platform is the technological implementation of the infrastructure, and is described in terms of three information parameters: Reach, Range, and Grasp (Haeckel, 1990). Reach refers to the platform connectivity, and "who and what can be accessed: people, things, organization, data"; Range refers to platform sharing, which is the "automatic sharing between applications and systems."; Grasp refers to the structure of the platform, and describes the "context and meaning. Information about information." (Haeckel, 1990, p. 12). Technological infrastructure also is described in the literature as the IT resources that provide a foundation to enable present and future business applications (Duncan, 1995).

The technology domain, when viewed in analogy to the organizational infrastructure, can also be defined in terms of three dimensions (Henderson, Thomas, and Venkatraman, 1992): 1. Architecture consisting of applications, data, and technology, "articulated in terms of the configurations of hardware, software, and communications" (Morton, 1991, p. 155); 2. Work processes central to the operations of the technological infrastructure such as systems development and maintenance, and monitoring and control systems; and 3. Skills involving knowledge and capabilities required to effectively manage the technological infrastructure. Information technology infrastructure, as defined in

this thesis, is the configuration of technologies, IT work processes, and shared services that build and sustain present and future business applications.

2.2.4.1 User Involvement in Information Systems

User involvement refers to a psychological state, a state that reflects a user's beliefs that a system is both important and personally relevant, and user performance is described as a behavior or attitude of a user during systems use (Hartwick and Barki, 1994). A common/shared business vision must address the issues of user involvement and participation because of their impact on systems success in the organization.

As mentioned earlier, the literature reports that there is a need for an organizational orientation toward a common/shared goal in order to create an internally consistent behavioral or process model of the firm (Henderson and Sifonis, 1988). From a technology perspective, the potential role of IT should emanate from an organizational-based point of view, as oftentimes there is a mismatch between IT and organizations when IT applications are implemented without considering the social and organizational factors (Ferioli and Migliarese, 1996). The literature suggests that the success of the systems to support work is predicated on the creation of shared objects and practices (Star and Ruhleder, 1996), and, one can add that the creation of shared objects and practice in the IS domain is predicated on user involvement and participation. Firms, by advocating user involvement and participation in all aspects of IS, can help boost

the users' intentions to use the systems, and consequently raise systems usage (Hartwick and Barki, 1994). User involvement can therefore be defined as personal involvement and participation in all aspects of IT in the organization.

2.2.4.2 Connectivity

Connectivity is described in the literature as the extent to which telecommunications networks and computer systems are compatible to support enterprise-wide application (Brown and Magill, 1994). The objective of technological connectivity is to connect a firm's telecommunication networks and computer systems and successfully interrelate and integrate their systems and applications. The literature also suggests that IT connectivity sustains business processes and operations, and improves coordination among functional areas (Sethi and Carraher, 1993). IT connectivity leads to technological interdependence, as is evident with the growth of large-scale information infrastructures (Star and Ruhleder, 1996).

Connectivity in the form of global networking supports enterprise-wide applications and interorganizational systems, and enables both real-time communication and store and forward communications (Tapscott and Caston, 1993). In terms of access to information, global networking enables access to the collective information resource, as appropriate, from any location (Tapscott and Caston, 1993). One such network is the global Internet, which is the largest of all the networks. The Intranet is a network that integrates systems and

applications for a single organization, and the Extranet is another network that encompasses the integration of systems and applications of at least two organizations. The Internet, Extranet, and Intranet provide firms exposure to electronic commerce on a global, interorganizational, and organizational level respectively. Connectivity, as defined in this thesis, is the configuration of networks that integrates systems and applications that enables the access of information from any location.

2.2.4.3 Distributed Computing

Many organizations today have been restructuring their technical resources toward more decentralized business structures in an effort to streamline their operations and increase both efficiency and effectiveness. New IT parallels the organizational goal of empowerment by distributing information and processing power closer to the user (Tapscott and Caston, 1993). Decentralization came about in response to fundamental changes in the economics of decision making enabled by new information technologies (Malone, 1997), such as powerful microcomputers, client-server architecture, distributed networks, and electronic data interchange (EDI). Powerful microcomputers are capable of satisfying most of the computing needs of a single user or a small group of users; Client-server architecture is an expansion of the local area network (LAN) concept, whereby a powerful microcomputer holds the primary processing and file server capability at the center of the network; Distributed networks create internal or external organizational links; and EDI is the electronic transfer of information between

computers (Bologna and Walsh, 1997). Distributing computing is defined as the distribution of information and processing power to the user.

2.2.4.4 Flexibility

The current environmental uncertainties give rise to the need for flexibility. Organizations must change more frequently than in the past to adapt to new opportunities. Technology is also expected to exhibit more flexibility and versatility in information acquisition and processing, and in the reduction of response time required to adjust to changes in the company's definition of its markets (Das, Zhara, and Warkentin, 1991). As there is a need for a quick response to changing markets and customer needs, technology is expected to exhibit more flexibility with a lower degree of integration. Flexibility is defined in management literature as the "ability of a resource to be used for more than one end product", and infrastructure flexibility refers to the degree to which technological resources are sharable and reusable (Duncan, 1995, p. 42).

The emerging concept of open systems infuses both flexibility and control systems in a firm's technological infrastructure. Open systems represent a novel approach to implement a suite of interface standards between system software/hardware, applications, and communications systems whose purpose is to enhance compatibility, interoperability, scalability, and flexibility of the technological infrastructure (Chau and Tam, 1997). The literature defines open systems as "computers and communications environments based on *de facto*

and *formal* interface standards"; *De facto* standards are the popular hardware and software products which are widely available in the market; the standards are proprietary in nature, as they are developed, introduced and maintained by vendors (some well-known examples include Microsoft's Windows for PC operating systems and Excel for spreadsheet products); and *formal* standards are published by standards setting groups, such as the International Standard Organization (ISO) or the Open Software Foundation (OSF) (Chau and Tam, 1997, p. 2).

An explanation as to the role of data and applications in technological infrastructure is that these components are "subsumed into infrastructure as they become technically independent - standardized, sharable, and reusable in a variety of business implementations, present, future planned, and future unknown" (Duncan, 1995, p. 43). Open systems vision suggests a technological capacity for "anything to anyone at anytime" in the firm (Duncan, 1995, p. 38-39). A firm's technological infrastructure is therefore characterized as flexible if businesses experience a greater degree of freedom in communication and in information processing capabilities through data and application components that are independent, sharable and reusable.

2.2.4.5 Technology Awareness

Technology awareness entails a genuine interest in IT, both inside and outside the organization. As new technological innovations appear in the market on a

regular basis, practitioners and researchers must maintain an awareness of each other's efforts (Boynton and Zmud, 1987). Organizational members need to keep up-to-date on the latest technologies and have sufficient organizational knowledge and technical skills to make the best possible technological investments for their firm. An organization with a high level of technology awareness normally has a high tolerance for uncertainty and is generally eager to try out new ideas (Lai and Guynes, 1994). Technology awareness and openness in the organization to try out new ideas largely determine the extent to which IT innovations are infused in the firm (Lai and Guynes, 1994). Furthermore, the literature suggests that the norms that encourage learning, change and innovation also influence the adoption of IT innovation (Agarwal, Krudys, and Tanniru, 1996). Hence, technology awareness, as defined in this thesis, is a general concern to acquire IT knowledge and an openness to infuse new technology in the firm.

2.3 Business Strategy

Today, there is a new era of competition, and firms must continuously search for ways to reinforce and extend the company position. As the external environment is a major influence on the firm and its operations, strategies are formulated to direct the firm's energies (Mintzberg, 1994) to compete in business. A firm's business strategy answers such questions as: "What business should we be in?" or "How do we compete in this business?" (Hambrick, 1980, p. 567). Organizations define their own strategy, which is referred to in the literature as

the product-market domain (Miles, Snow, Meyer, and Coleman, 1978). Strategy making is a complex organizational activity. Its very essence is a process of learning, both formal and informal, through experiments, that converges gradually into viable patterns and produces new perspectives and new combinations that eventually become strategies (Mintzberg, 1994b).

Literature reports diverse perspectives on business strategy (Hambrick, 1980). One generic typology of competitive strategies, which is extensively used and cited in the literature, outlines four organizational strategy types: defender, prospector, analyzer, and reactor (Miles, Snow, Meyer, and Coleman 1978). The typology is referred to as the "Miles-Snow typology" and is extensively supported by empirical research. The literature describes the four organizational strategy types as follows:

A defender's strategy permits specialization in products and markets, thereby allowing a firm to achieve efficiency and excellent reputation in certain markets. In addition, the defender strategy enhances a company's ability to assess market needs, and it simplifies internal decision-making processes and planning activities, thus leading to efficiencies and speedy decision making by qualified experts (Das, Zhara, and Warkentin, 1991, p. 968).

Prospectors seek to achieve a favorable market position within a broad and dynamic business domain, which they maintain by seeing flexible technologies

and control systems. This flexibility enables prospectors to control their environments and sustain high levels of profitability. A prospector strategy provides opportunities for growth in new lucrative markets and allows these firms to utilize their financial and technological resources effectively. Further, prospectors are usually catalysts for change in their industries, which gives the advantages in establishing themselves as marketing or technological leaders (Das, Zhara, and Warkentin, 1991, p. 968).

Defenders and prospectors represent opposite ends of a continuum of business strategies, while analyzers lie between these two extremes. Analyzers have a hybrid domain with both stable and dynamic components. This duality in their domain is reflected in every facet of their organization and decision-making styles, requiring managers to approach the stable and dynamic elements of their domain differently. They typically adopt defender tactics within the spheres of their domain that are characterized by stability, and they tend to adopt prospector tactics in the areas characterized by dynamism (Das, Zhara, and Warkentin, 1991, p. 969).

A fourth organization type are called reactors. The Reactor exhibits a pattern of adjustment to its environment that is both inconsistent and unstable; this type lacks a set of response mechanisms which it can consistently put into effect when faced with changing environment. As a consequence, reactors exist in a state of almost perpetual instability (Miles and Snow, 1978). Reactors represent

a form of strategic failure because of their internal inconsistencies and the lack of conscious strategy (Das, Zhara, and Warkentin, 1991, p. 969).

The primary dimension underlying the typology is product-market profiles (Hambrick, 1980), which can provide mechanisms for effective adaptation to the environment (Das, Zhara, and Warkentin, 1991). Past studies have also shown that it is appropriate to use the Miles-Snow classification as a basis for linking IS planning and competitive strategy (Das, Zahra, and Warkentin, 1991). As modern enterprises are increasingly becoming information-based (Silk, 1991), business strategies must also be aligned with information strategies in order for organizations to leverage IT functionality and realize value from IT investments (Henderson, Thomas, and Venkatraman, 1992). Hence, business strategy, as defined in this thesis, is a comprehensive competitive plan for the firm, adapted to the environment, and directly affiliated with IT.

2.4 Business Performance

The business performance measures the contribution of the business and technology domains to the business objectives of the firm. The literature suggests that both the firm's external and internal environment affect financial performance (Das, Zhara, and Warkentin, 1991). The literature links business performance to the following factors: 1. The business strategy, which needs to be externally valid and accomplish competitive advantage in the marketplace (Henderson and Sifonis, 1988); 2. The effectiveness of the alignment between the firm's competitive strategy and the technologies deployed (Schroeder,

Congden, and Gopinath, 1995), or as otherwise described as effective deployment of IT (Sethi and King, 1994; Sethi, Hwang, and Pegels, 1993; Smith and McKeen, 1993); and 3. Internal operational effectiveness, which can be supported by norms, rules, and culture that preserve a certain desired behaviors, mental maps, and shared values and beliefs (Ferioli and Migliarese, 1996).

As businesses invest time, money, and future technology, they look for payoff (Smith and McKeen, 1993), and the quality of the firm's investments can be effectively evaluated in terms of growth and profitability (Venkatraman, 1989). Business performance is defined in this thesis as the measures of growth and profitability of the firm through its business endeavors and deployment of organizational and technology resources.

3.0 THEORETICAL BACKGROUND TO THE RESEARCH MODEL

The theoretical framework of the study of infrastructure alignment and business performance is the Contingency Theory, which is a subset of organizational Theory (Bergeron and Raymond, 1995).

3.1 Contingency Theory

Contingency theory has been the basis for a substantial amount of research concerning organization technology interface (Venkatraman and Camillus, 1984; Boynton and Zmud, 1987; Lederer and Mendelow, 1987; Premkumar and King, 1994; Brown and Magill, 1994). Contingency theory, which is an open systems model, argues that a firm's survival is dependent on its ability to adapt successfully to a changing environment (Boyd, 1991). Initially, the theory emanated from research on organizational structure designs involving large-scale empirical studies. Two conciusions were primarily drawn: 1. "There is no one best way to organize"; and 2. "Any way of organizing is not equally effective" (Galbraith, 1973, p. 2).

Nowadays, firms often change their forms or even reconsider and revise their strategic orientations in the pursuit of efficiency and effectiveness. Information technology is extensively perceived as an enabler to the firm, especially during business process redesign (Grover and Kettinger, 1995), and consequently, businesses have increasingly become more information-based. However, complexities arise due to the diversity and interdependencies inherent in man-

machine interactions. Since contingency theory "attempts to understand the interrelationships within and among organizational subsystems and emphasizes the multivariate nature of organizations" (Premkumar and King, 1994, p. 76), a contingent perspective in this thesis can provide the underlying theoretical base for understanding the integration of the firm's organization with the technology. Moreover, contingency theory can provide the base to search for the "characteristics of the organizational contexts which appear to make a difference" (Galbraith, 1973, p. 2), such as implicated in the firm's infrastructures and strategic orientation, and verify their impact on business performance.

The emerging contingent approach in the field of IS suggests that there is no single best way to achieve the necessary fit among organizational factors and IS. The contingency theory has been previously described in the literature as a theory that only demonstrates interrelationships and does not generally explain specific forms and interactions between the contingency variables (Schoonover, 1981).

Nevertheless, the theory has several important underlying assumptions: 1. *Fit.* The better the "fit" among contingency variables the better the performance of the firm. The contingency approach suggests that a "fit" between organizational variables, such as strategy, environment, structure, and the design and use of IS positively impacts IS performance. Furthermore, the theory suggests that there is an assumed "fit" between IS performance and organizational performance; 2.

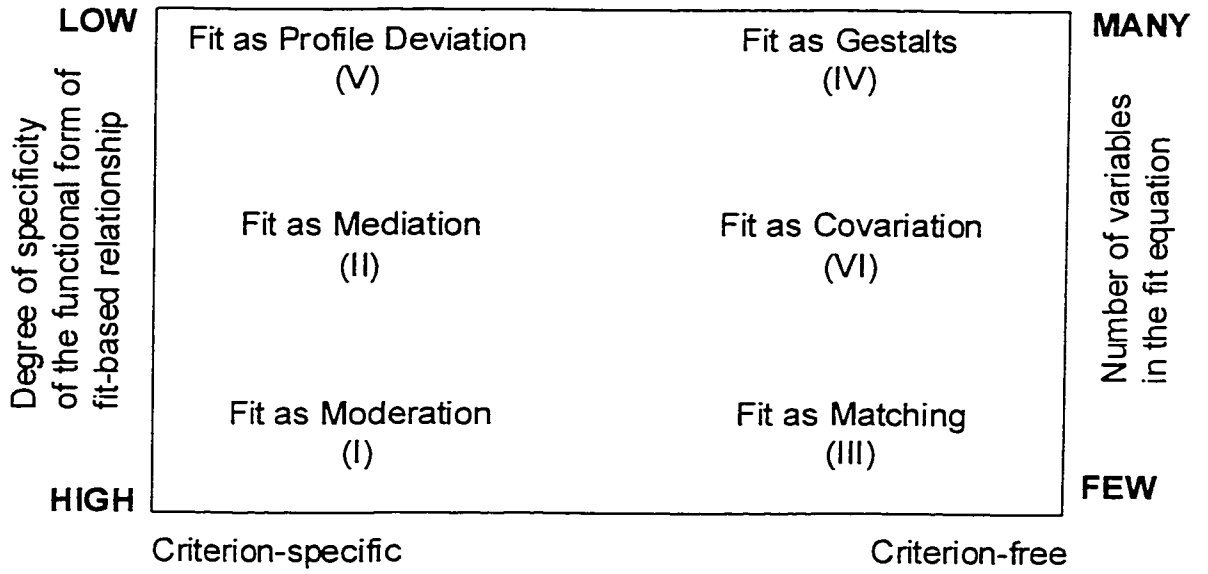
Performance. Performance is usually defined by financial measures such as return on investment (ROI), profit, or net worth; 3. *Equilibrium*. An organization with "fit" is at equilibrium, and organizational performance is the result of that equilibrium (Weill and Olson, 1989).

3.2 The Concept of Fit

The fit among contingent variables in organizational settings has been widely researched in the IS literature (e.g., Tavakolian, 1989; Das and Warkentin, 1991; Earl, 1993; Premkumar and King, 1994; Doukidis, Lybereas, and Galliers, 1996; Reich and Benbasat, 1996). The concept of fit was initially studied in the strategy literature, and relationships were postulated with phrases and words such as *matched with*, *contingent upon*, *consistent with*, *fit*, *congruence*, *alignment*, and *coalignment* (Venkatraman, 1989).

Precise guidelines for translating these verbal statements to the analytical level are provided in a conceptual framework that identifies six distinct perspectives of fit within two decision-related dimensions (Venkatraman, 1989). The two decision-related dimensions are: 1. Degree of specificity of the functional form of fit-based relationship; and 2. Choice of anchoring the specification of fit-based relationships. Refer to Figure 4 for the classificatory framework.

Figure 4. Conceptual Framework of Fit



The first decision-dimension, degree of specificity, indicates the level of precision in the functional form of fit. A high level of this dimension indicates that a functional form of the relationship between the underlying variables can be specified. When two variables are involved, it is possible to be more precise. For example, the fit between strategy and managerial characteristics can be explored in terms of interactive effects.

The second decision-dimension, choice of anchoring the specification, can either anchor the concept, and tests, to fit to a particular criterion (e.g., effectiveness), or adopt a criterion-free specification which has a universal applicability.

The moderation perspective of fit has been widely used in previous organizational research and is generally based on a Contingent underlying Theory (Venkatraman, 1989). Fit as moderation was used in previous research to study cases where the relationship between two variables predicted a third variable, a moderator, which suggested that an interaction exists between the first two variables (Chan, Huff, Copeland and Barclay, 1996).

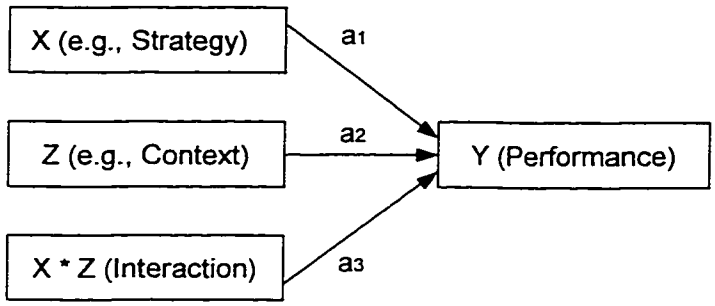
A formal representation of Z is a moderator if the relationship between two variables (for example X and Y) is a function of the level of Z. The following is a mathematical representation:

$$Y = f(X, Z, X * Z)$$

where, for example, Y = performance, X = strategy, and Z = the contextual variable that fits with strategy for performance improvement; hence X * Z shows the joint effect of X and Z. It is recommended that two variables should be incorporated in the Moderation perspective of fit.

Figure 5 shows a schematic representation of the Moderation perspective of fit using the same variables as demonstrated above.

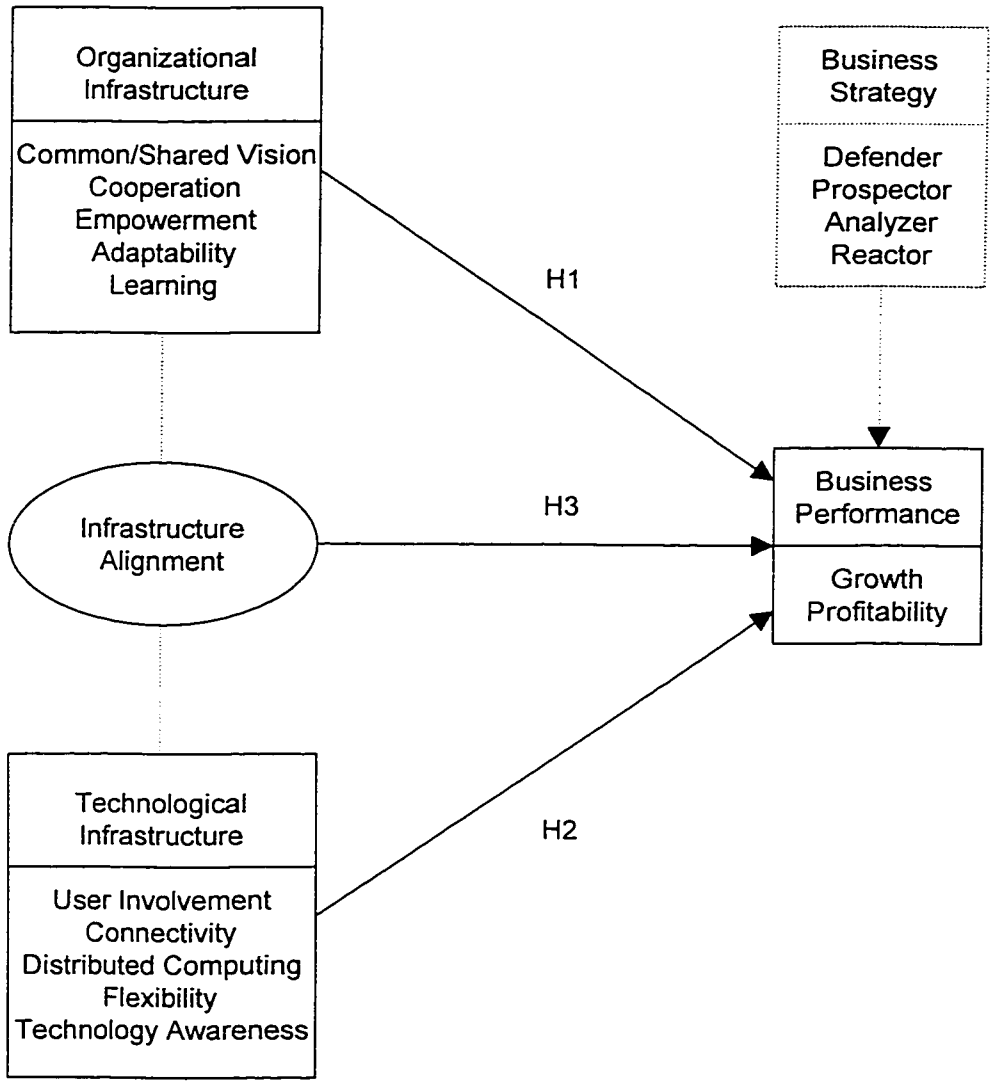
Figure 5. A Schematic Representation of Fit as Moderation



4.0 RESEARCH MODEL

Figure 6 illustrates the completed model of Organizational/Technological Infrastructure Alignment.

Figure 6. Organizational / Technological Infrastructure Alignment Model



The proposed research model is a schematic representation of the principal question: Can organizations enhance their business performance by aligning the technological domain with the organizational domain of the enterprise? The independent variables in the model are Organizational Infrastructure, Technological Infrastructure, and Business Strategy. The dependent variable is Business Performance.

The model suggests that the organizational and technological domains of the enterprise and their alignment impact the business performance of the firm. The organizational and technological characteristics listed in the model are the recommended building blocks of strong and effective infrastructures that enable organizations to strategically manage their processes and technological and human resource capabilities.

To complement the internal alignment of the firm's infrastructures, the Business Strategy variable is shown in the model as impacting business performance. The Strategic Alignment Model shown earlier in Figure 2 summarizes four alignment perspectives, addressing both the internal and external domain of the firm. Business Strategy, as described in this thesis, comprises both the organizational strategy and technological strategy and is adapted to the environment. The external domain of the enterprise has a direct impact on the firm's internal operations. Consequently, the variable Business Strategy, which

reflects both the organizational and technological strategies is included in the model and provides the external link to the environment.

4.1 Hypotheses

Hypothesis 1: Firms with sophisticated organizational infrastructures experience high business performance.

The organizational infrastructure provides the structures, processes, and the skills, which are the mechanisms required to pursue the business strategy of the firm. A high utilization of the organizational infrastructure themes presented in Table 3 give rise to sophisticated and innovative organizational infrastructural characteristics. It is expected that firms with sophisticated organizational infrastructures make efficient and effective use of their organizational resources, which leads to high business performance.

Hypothesis 2: Firms with sophisticated technological infrastructures experience high business performance.

The technological infrastructure provides the technological components, processes, and services for building business applications for the firm. A high utilization of the technological themes presented in Table 3 give rise to sophisticated and innovative technological infrastructural characteristics. It is expected that firms with sophisticated technological infrastructures make efficient

and effective use of their technological resources, which leads to high business performance.

Hypothesis 3: Firms that display a high functional integration between their organizational and technological infrastructures achieve high business performance.

An alignment between the organizational/technological infrastructures brings about functional integration of the organization and IT. As it has been mentioned previously, the technological infrastructure is interrelated with organizational factors, and an operational-level link between the infrastructures will ensure internal coherence between the organizational requirements on one hand and the delivery capability of the information technology on the other hand. An alignment between the organizational and IT domains of the firm is expected to lead to a superior organizational performance, which later translates into high business performance.

5.0 METHODOLOGY

No one research method can maximize generalizability, manipulation of research variables, and context realism (Teng, Cheon and Grover,1995). From amongst the three possible research strategies, experimental, correlational, and case studies, the correlational research was selected to test the hypotheses and the relationships that exist between the variables in the Organizational/Technological Infrastructure Alignment Model.

5.1 Operationalization

The variables presented in the proposed model are inherently complex in nature. They cannot be directly observed, thus they cannot be measured with complete accuracy. In such cases where measures are complex and unobservable (latent), the literature highly recommends the use of multi-item scales, where two or more items are developed as alternate indicators of the same underlying construct. During the data analysis, a composite score is calculated and used as an estimate of the corresponding construct. Such measures raise the correlation with the attribute being measured and reduce measurement error (Segars,1997).

To test the model, measurement scales were generated from relevant IS, management, psychology, and sociology literature. Where possible, pretested existing scales were adopted from previous empirical research. Table 4 outlines the research variables with their corresponding references.

Table 4. Research Model Variables

VARIABLE	Number of Items	REFERENCE
Business Performance	8	Venkatraman (1989)
Business Strategy	4	Tavakolian (1987)
Organizational Infrastructure Characteristics	42	
Common/Shared Vision	6	Kravchuk and Schack (1996) (3 items) Boynton, Zmud and Jacobs (1994) (1 item) Mayer and Shoorman (1992) (1 item) Henderson,Thomas and Venkatraman (1992) (1 item)
Cooperation	7	Pinto, Pinto and Prescott (1993) (3 items) Zaheer and Venkatraman (1994) (2 items) Jones and James (1979) (2 items)
Empowerment	10	Bartunek, Pennie, Foster-Fishman and Key (1996) (6 items) Boynton, Zmud and Jacobs (1994) (4 items)
Adaptability	9	Lai and Guynes (1994)
Learning	10	Agarwal, Krudys and Tanniru (1997)
Technological Infrastructure Characteristics	40	
User Involvement in IS	7	Hartwick and Barki (1994) (6 items) Torkzadh and Doll (1993) (1 item)
Connectivity	8	Premkumar and Ramamurthy (1995) (3 items) Sethi and Carraher (1993) (2 items) Kraemer and Danziger (1993) (1 item) Ferioli and Migliarese (1996) (1 item) Debanne (1997) (1 item)
Distributed Computing	4	Sethi and Carraher (1993) (1 item) Kraemer and Danziger (1993) (3 items)
Flexibility	11	Chau and Tam (1997) (4 items) Duncan (1995) (7 items)
Technology Awareness	10	Lai and Guynes (1994) (4 items) Croteau (1998) (6 items)

In situations where scales were not available, statements or definitions of the variables were used which contained various dimensions or components. During the development of the measurement scales, a step was undertaken to ensure that the selection of the items always corresponded with the variable of interest. A 5-point Likert-type scale was selected. For some questions, inverted scales were use.

The measurement items selected to test the proposed model were compiled into a questionnaire (refer to Appendix A). The questionnaire was pre-tested on three academics and two business executives, and items were evaluated for ambiguity and construction flaws. After the careful analysis and proof-reading, the questionnaire was revised where appropriate. Some of the items were dropped and the questionnaire was rearranged to present better sequencing and flow.

5.2 Survey

The survey research method was chosen as being appropriate for this study. Today, IT is emerging as a critical component in business strategies, and interest and investment in IT is growing at an accelerated pace. The interest in IT is not limited or restricted to specific industry sectors. The benefits of IT, some of which are efficiency, speed, precision and dependability, can be realized in all industry sectors. The focus of this survey is on a cross-section of industry

characteristics, to enhance the generalizability and external validity of the research findings.

Hypotheses are defined at the organizational level. Data collected from the questionnaires will be used to test the Organizational/Technological Infrastructure Alignment Model presented in Figure 6. The infrastructure alignment will be tested using the concept of fit as Moderation (Venkatraman, 1989). The joint effect of the organizational and technological infrastructures will be explored in terms of interaction.

The data to test the research model was drawn from medium to large-sized private Canadian organizations with 250 employees or more. Large organizations were sampled because they have a reasonable level of experience with formalized IS planning and maintain mature IT infrastructures, consequently they are more amenable to the content presented in the survey instrument. Organizations in the private sector were selected because they are sales and profit oriented. In general, private organizations seek growth and profitability, which are the measures included in the definition of business performance presented in this thesis.

Data were collected on a sample of large-sized firms appearing in 1996-1997 Scott's Selectory Database, a computerized mailing list of the Canadian Southam Business Information and Communications Group Inc. One thousand

Canadian organizations were randomly selected from the Database. A survey package was mailed to each organization in the survey population, addressed to the CEO or to the president of the firm. The package contained three items: the questionnaire, a cover letter, and a postage-paid return envelope. To ensure that the respondents understood the motive of the research, a brief definition of the study was provided in the cover letter together with the objective of the research. A statement in the cover letter also assured the respondents that their participation in the survey would be anonymous and a request was made that they return the survey package within one week of receiving it. One month after the initial mailing of the survey package follow–up reminder cards were sent to the same survey population. Refer to Appendix A for a sample of the completed questionnaire and the cover letter.

6.0 RESULTS

The results of the study will be described in two sections. The first section will illustrate the profiles of the respondents who participated in the research. The second section will present a statistical analysis of the data.

6.1 Description of Respondents

The questionnaire, distributed to 1,000 individuals, consisted of ninety-four items and measured twelve constructs: Business Performance, Business Strategy, Organizational Infrastructure Characteristics (Common/Shared Vision, Cooperation, Empowerment, Adaptability, Learning), and Technological Infrastructure Characteristics (User Involvement in Information Systems, Connectivity, Distributed Computing, Flexibility, Technological Awareness). One hundred and four completed questionnaires were returned, providing a response rate of 11%. All the responses were checked for completeness, and it was established that the respondents preferred to skip over the questions that they did not feel comfortable answering rather than provide indiscriminate answers. In these cases, the missing scores were substituted with the calculated item means.

From tabulating the data, it was determined that the responses to the Business Strategy construct were not sufficient to be used in the data analysis. Of the survey population (104 respondents), 91 (88%) had selected a business strategy type. The business strategy type selections, however, were not evenly

distributed. The defender business strategy type had 18 responses (20%), the prospector business strategy type had 42 responses (46%), and the analyzer business strategy type had 31 responses (34%). None of the respondents who provided a business strategy type selection had chosen the reactor type. The decision to exclude the business strategy data from the analysis was based on the uneven response distribution and the low number of responses (below 30) to the defender business strategy type. The Business Strategy construct was subsequently dropped from the statistical analysis. Hence, the study's main concentration, considering the data, is the impact of the firm's infrastructures, and their alignment, on business performance.

To help control response bias, items with reverse scoring were included in the questionnaire. The following are the questionnaire's reverse scored item measures: construct Empowerment – item 15; construct Adaptability – item 31; construct Learning – items 37 and 38; construct Connectivity – item 13; and construct Flexibility – item 30. An overall examination of the returned questionnaires did not show evidence of extremity response bias, which is a tendency by the respondents to use the end points of rating scales.

Since the questionnaire items were borrowed from previous related empirical studies, it was determined that they had adequate reliability and validity. Consequently, the items were viewed as appropriate to be applied in this study.

The first part of the result presentation is a descriptive statistical analysis of the respondents' background information compiled from the last page of the questionnaire. The data assembled from the eight items that surveyed the respondents' background information were categorized and visually displayed in form of pie charts and histograms. The following are the frequencies reported by the respondents.

The majority of the respondents of the survey (48%) held the titles of President/Chairman/Ceo (refer to Figure 7). The titles of Vice President/General Manager were held by 29% of the respondents while other titles, such as Chief Officer, Director, Controller, Systems Analyst/Technical Support, Controller, and Supervisor were held from between 1% to 7% of the respondents.

Figure 7. Title of Respondent

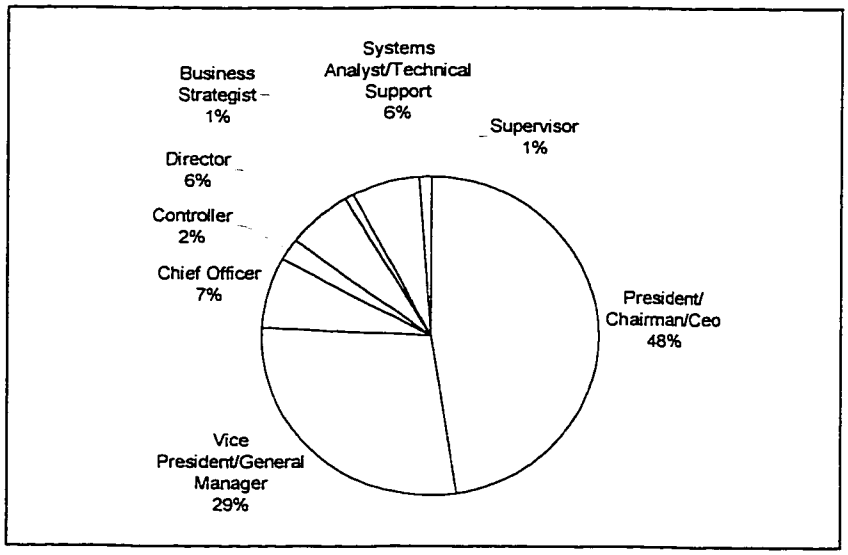


Figure 8. Number of Years in Current Position

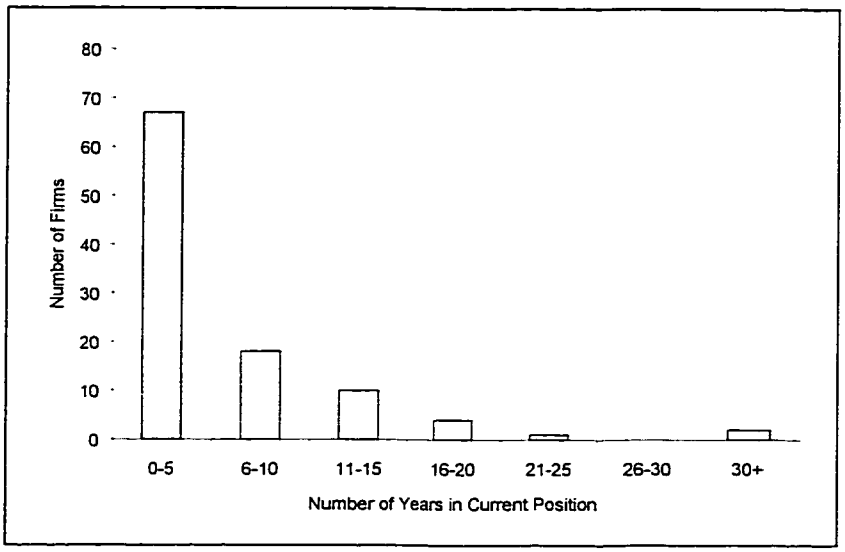
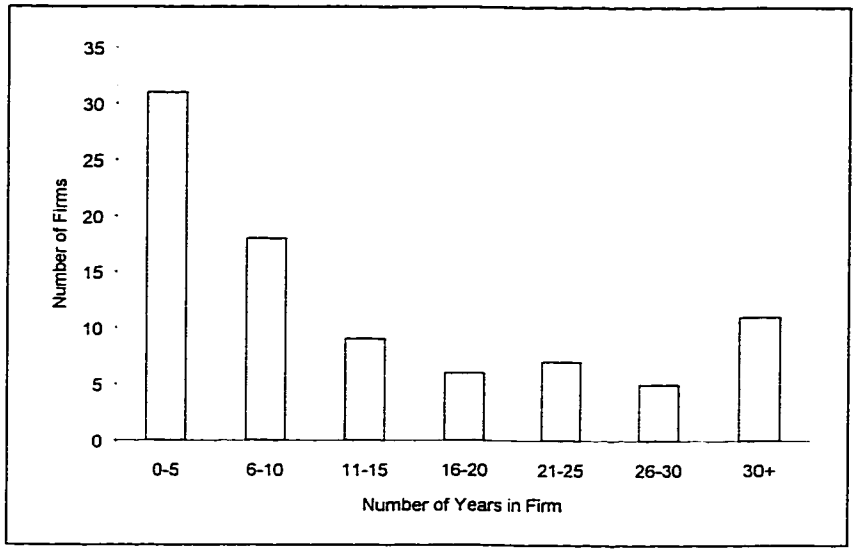


Figure 8 displays a frequency histogram of the number of years that the respondents held their current titles. Most of the respondents (66%) held their current title for five years or under, 18% of the respondents held their current title for between six and ten years, and 10% of the respondents held their title for between eleven and fifteen years.

The total number of years that the respondents worked for the firm is displayed in Figure 9.

Figure 9. Number of Years in Firm



Of all the respondents who provided this information, 36% worked in the firm for five years or under, 21% have worked in the firm for a time duration between six to ten years, 10% have worked in the firm for a duration between eleven and fifteen years, and 13% have been with the firm for over thirty years. As seen by these frequencies, most of the respondents have held their current title for a short time duration, under six years. Newly-hired company directors usually bring in novel, creative ideas as to the direction of the firms. Perchance these respondents have been instrumental in reorganizing or restructuring their enterprises, and consequently introduced new information technologies to their organizations. Furthermore, they may have supported and/or encouraged the

above-mentioned organizational infrastructure themes amongst the organizational members in a quest to raise productivity. It is therefore likely that the responses on the questionnaire's organizational and technological infrasructure characteristics support the hypotheses mentioned earlier.

The total number of employees in the sampled firms are shown in Figure 10. A few of the sampled firms reported to have below 250 employees. Two firms reported to have 200 employees and one firm reported to have 160 employees. As these firms had adequately responded to the items on the questionnaire, it was decided to include their data in the research to increase the response rate of the survey. Moreover, the inclusion of the data was not expected to bias the results because of the current organizational trend to downsize with respect to manpower but upsize with respect to technology. Of all the participant firms, 31% report to have between 251 and 500 employees, 33% report to have over 2000 employees, and 13% report to have between 751 and 1000 employees. The mean of the total number of employees is 5,372 and the median is 950.

Figure 11 shows the total employees working in the IS department. Most of the firms (60%) employ twenty-five IS employees or under and 12% employ over 200 IS employees. The mean of the number of IS employees is 108 and the median is 15.

Figure 10. Total Employees in Firm

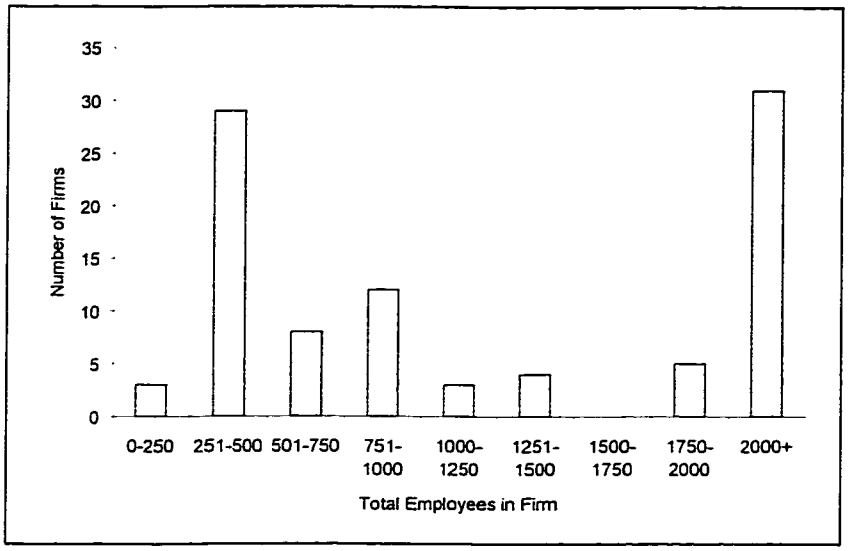
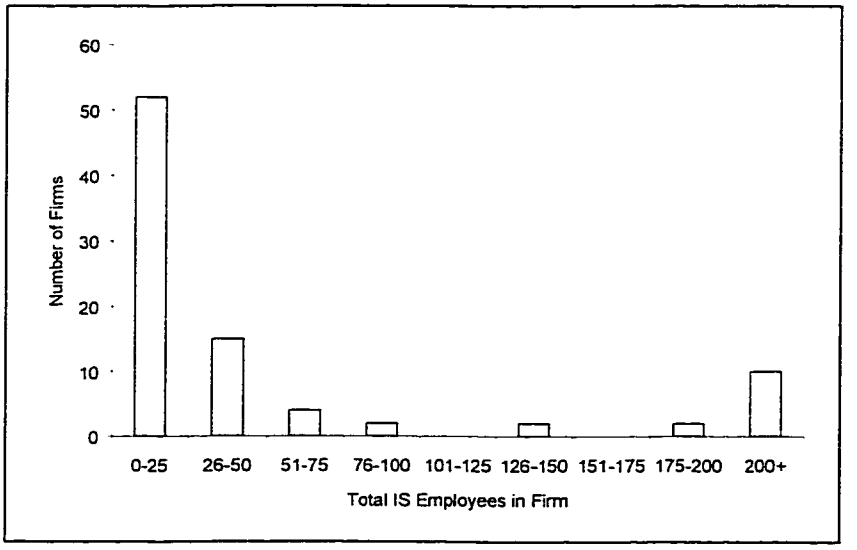


Figure 11. Total IS Employees in Firm



The sampled firms' total revenues and budget allocated to IS are shown in Figure 12 and Figure 13 respectively. The respondents reported that the total yearly revenues of 49% of the firms were one hundred million dollars (Canadian) or less. Additionally, 16% of the firms reported to have yearly revenues of over one billion dollars (Canadian). The mean of the total yearly revenues is 1.5 billion dollars (Canadian) and the median is 100 million dollars (Canadian).

Figure 12. Total Revenues of Firm

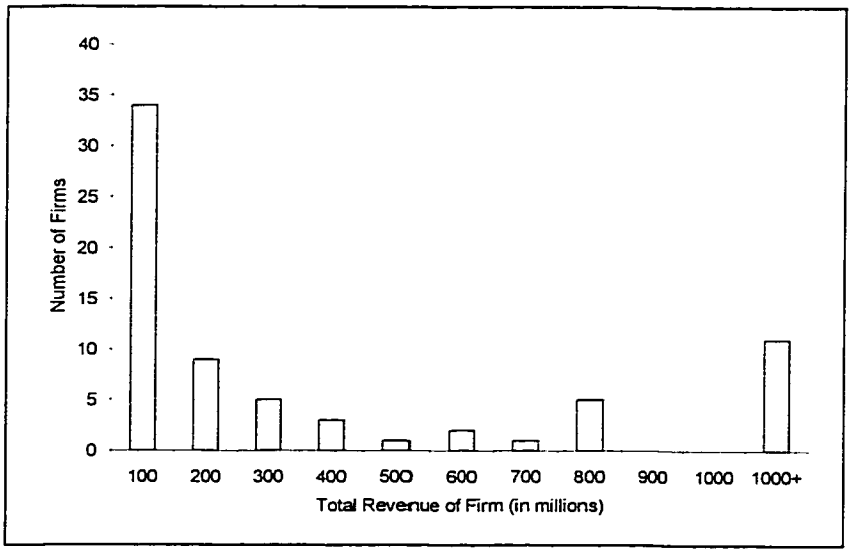
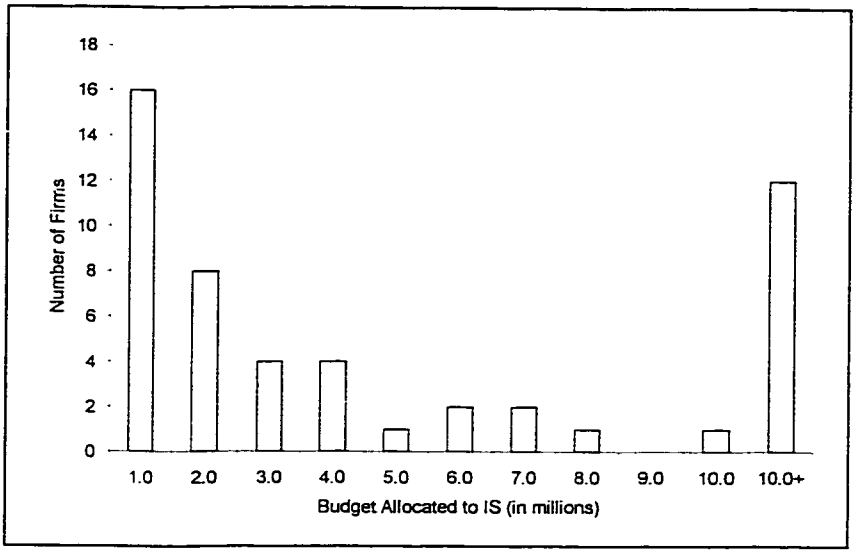


Figure 13. Firm's Budget Allocated to IS

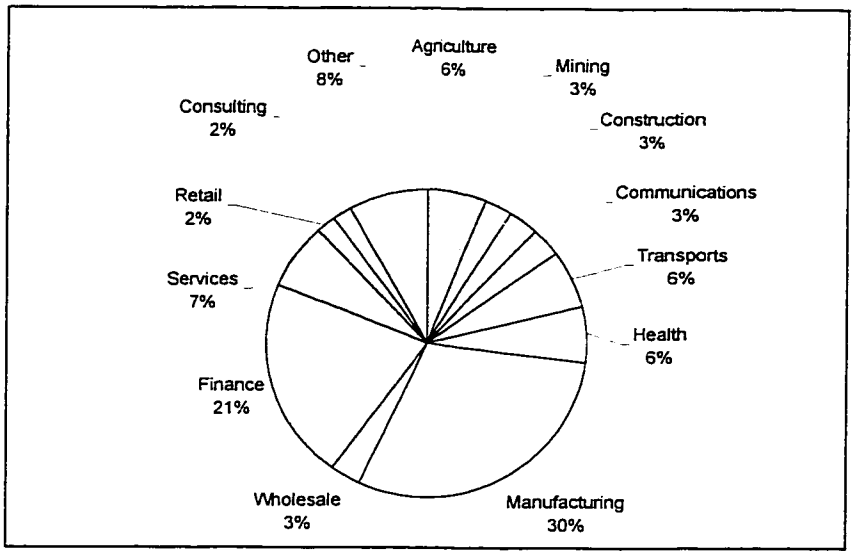


The respondents also indicated that 31% of the firms allocated a budget of one million dollars (Canadian) or less to IS, 16% of the firms allocated a budget of between one and two million dollars (Canadian) to IS, and 24% of the firms allocated a budget of over ten million dollars (Canadian) to the IS department. The mean of the budget allocated to IS is 43.5 million dollars (Canadian) and the median of the budget allocated to IS is 2 million dollars (Canadian). These figures support the high interest and investment in IT to reinforce and extend the company's position.

The sampled firms' primary industries are displayed in Figure 14. The respondents reported that 30% of the firms were from the manufacturing industry and 21% of the firms were from the finance industry. The respondents also indicated that 8% of the firms were from industry categories not listed in the

questionnaire, such as petroleum, consulting, beverage, television, law, and printing.

Figure 14. Firms Primary Industry



6.2 Reliability of Construct Measures

The first step in data analysis is to establish sound and reliable measures before they can be used to test the hypotheses. An analysis of the reliability of the scale items in the questionnaire was conducted and items were dropped from the set of items because they lowered the reliability of the scale. Table 5 reports the results of the final analysis and provides the reliability coefficients after item deletion.

Table 5. Reliability Analysis Results of Item Measures

Variable Name	Cronbach's Alpha Coefficient (α) After Item Deletion
Business Performance (dependent variable)	0.89 8 items (8 items before deletion)
Organizational Infrastructure Characteristics:	0.86 37 items (42 items before deletion)
Common/Shared Vision	0.89 6 items
Cooperation	0.81 7 items
Empowerment	0.82 10 items
Adaptability	0.81 6 items
Learning	0.86 8 items
Technological Infrastructure Characteristics:	0.76 35 items (40 items before deletion)
User Involvement in Information Systems	0.76 7 items
Connectivity	0.76 7 items
Distributed Computing	0.81 3 items
Flexibility	0.73 8 items
Technology Awareness	0.83 10 items

After the final analysis, the reliability coefficients of the independent variables range between 0.73 and 0.89. The reliability coefficient of the dependent variable is 0.89. The correlation coefficients of the item measures, after item deletions, are acceptable. They are all above 0.70, which is the minimum level that indicates consistency among items. Refer to Table 6 for the final item measures after the reliability analysis.

Table 6. Item Measures after Analysis

Business Performance
1. The sales growth position relative to our principal competitor is:
2. My satisfaction with sales growth rate is:
3. The return on corporate investment position relative to our principal competition is:
4. My satisfaction with the return on corporate investment is:
5. My satisfaction with return on sales is:
6. The market share gains relative to our principal competitors are:
7. The net profit position relative to our principal competitor is:
8. The financial liquidity position relative to our principal competitor is:
Common / Shared Vision
1. The company mission is clear and coherent.
2. The company objectives are clear and coherent.
3. The company strategy is clear and coherent.
4. There is a strong feeling in the organization that a common purpose exists.
5. I find that my values and the organizational values are very similar.
6. The strategic decision process is participative.
Cooperation
1. All individuals are committed to the same project goals.
2. For most problems that arise, there are rules and procedures for dealing with them.
3. Individuals establish their own rules and procedures to facilitate the work's progress.
4. There is a cooperative effort among individuals to carry out difficult tasks.
5. There is an open communication among individuals, and the atmosphere is characterized by friendly relations.
6. There is a high level of mutual trust.
7. Individuals actively work together as partners
Empowerment
1. Decision making tends to occur in a decentralized manner.
2. Operating rules and standard procedures play important roles in how decisions are handled.
3. Ideas tend to flow horizontally as well as vertically.
4. Decision-making responsibilities are pushed down to the lowest possible level.
5. Individuals are capable to direct and take charge of their own work.
6. There are opportunities to select options and make choices at work.
7. The individuals' knowledge base in this organization has increased.
8. Individuals have been given or taught the skills that are needed to arm themselves.
9. Individuals participate equally in organizational activities.
10. There are opportunities for personal development, such as growth in self-worth or self-efficacy.
Adaptability
1. Promotions are based on merit.
2. I can act as my own boss in most matters.
3. Most jobs have something different happening from day to day.
4. People are encouraged to make their own decisions.
5. People are encouraged to use their own judgment in handling everyday situations.
6. People like it here because of the variety in work they do.

Table 6. Item Measures after Analysis (continued)

Learning
1. Creativity is encouraged.
2. My ability to function creatively is respected by the leadership.
3. Around here people are allowed to solve the same problems in many different ways.
4. This organization can be described as flexible and continually adapting to change.
5. The reward system here encourages innovation.
6. Assistance in developing new ideas is readily available.
7. There are adequate resources available to enable innovation in this organization.
8. There is adequate time available to pursue creative ideas here.
User Involvement in Information Systems
1. I am currently a heavy user of the information system.
2. I use the information system frequently.
3. I consider the information system to be important.
4. I consider the information system to be essential to the organization.
5. The information system means a lot to me.
6. The information system is of concern to me.
7. The information system is easy to use
Connectivity
1. A good telecommunication infrastructure is available.
2. Information system applications are integrated and encompass different functional areas.
3. Database oriented applications are regularly used in daily operations.
4. Information systems improves internal meetings and discussions.
5. Information systems provide better coordination among functional areas in firms.
6. There is information systems support for lateral mechanisms of coordination and communications (e.g., GDSS, WorkFlow Management Systems).
7. I frequently access my e-mail and "surf" the world-wide-web.
Distributed Computing
1. The information systems have made it easier to get needed information.
2. The information systems save time in looking for information.
3. The information systems have improved the process and content of decision making.
Flexibility
1. There are a lot of choices for hardware.
2. There are a lot of choices for software.
3. Flexibility in the technological infrastructure is encourage.
4. Today's user interfaces commonly provide invisible access to platforms.
5. Current corporate rules and standards for hardware and operating systems support future platform compatibility and standardized platform gateways.
6. Current corporate standards adequately address vendor choices for operating systems and protocol selection and use.
7. Our firm has formally and sufficiently identified data to be shared across business units.
8. Our firm has adequately identified sharable business process components

Table 6. Item Measures after Analysis (continued)

Technology Awareness
1. The members of the information systems department design and implement applications that reduce the organization's operating expenses.
2. The members of the information systems department participate in corporate organizational meetings.
3. The members of the information systems department read technological journals on a regular basis.
4. The members of the information systems department attend information systems Conferences.
5. The members of the information systems department learn continuously about new technologies and their applications.
6. Continuos learning about ways to integrate new technologies is encouraged by our firm.
7. New information technology is important to achieving the organization's goal.
8. The company promotes the use of new information technology.
9. There is an informal network to keep up with new information technology.
10. There are formal procedures for evaluating new technologies.
Business Strategy
A short description of the four business strategy types are provided. Respondents are asked to select only one of the business strategy type.

6.3 Descriptive Statistics of the Constructs

Table 7 provides descriptive statistical information and the distribution of the item measure scores after the final analysis.

Table 7. Descriptive Statistics of Item Measures

Variable Name	Mean	Standard Deviation	Minimum	Maximum
Business Performance	3.42	0.61	2.25	4.75
Common/Shared Vision	3.87	0.65	2.00	5.00
Cooperation	3.51	0.57	2.00	4.86
Empowerment	3.58	0.49	2.00	4.80
Adaptability	3.87	0.55	2.17	5.00
Learning	3.54	0.60	2.00	4.88
User Involvement in IS	3.95	0.53	2.29	5.00
Connectivity	3.72	0.55	2.33	4.83
Distributed Computing	3.94	0.55	2.00	5.00
Flexibility	3.33	0.51	1.91	4.63
Technology Awareness	3.75	0.47	2.30	4.90

Refer to table 7 for the means, standard deviations, minimum and maximum measures of the constructs. Business Performance is the dependent variable and the infrastructural characteristics are the independent variables in this study.

6.4 Hypotheses

The Organizational/Technological Infrastructure Alignment model introduced earlier presents three hypotheses. The first and second hypotheses link organizational and technological infrastructure with business performance. The third hypothesis coaligns organizational and technological infrastructures with business performance.

6.4.1 Hypothesis 1

The first hypothesis states that firms with sophisticated organizational infrastructures experience high business performance. Two tests were conducted to test the first Hypothesis. The first analysis examined the relationship between the firm's overall organizational profile and business performance. The Pearson Correlation test was used to test the correlations between the overall means of the Organizational Infrastructure Characteristics and the means of Business Performance. The overall means of the Infrastructure Characteristics are obtained by computing the average scores of the responses on the Organizational Infrastructure survey items. Consequently, the average scores represent the overall Organizational Infrastructure profile of the firm.

The second test examined the bivariate relationships between organizational infrastructure characteristics and business performance. The Pearson Correlation test was used to test the correlations between the means of each of

the Organizational Infrastructure Characteristics and the means of Business Performance. Table 8 present the results of the 1-tailed correlation tests.

Table 8. Organizational Infrastructure – Business Performance Correlation Tests

Organizational Infrastructure Characteristics	**Correlation Scores**
Organizational Profile	.429** .000
Common/Shared Vision	.361** .000
Cooperation	.225** .004
Empowerment	.387** .000
Adaptability	.270** .003
Learning	.449** .000

** Correlation is significant at the 0.01 level (1-tailed)

The correlations of both tests, the overall profile and bivariate models, are statistically significant since all the tests report P-values less than the 0.01 level. The overall results suggest that there is a relationship between the firm's organizational infrastructure characteristics and business performance. The first Hypothesis is therefore confirmed. Consequently, it can be stated that firms with sophisticated organizational infrastructures experience high business performance.

6.4.2 Hypothesis 2

The second Hypothesis states that firms with sophisticated technological infrastructures experience high business performance. Two tests were conducted to test the second Hypothesis. The first analysis examined the relationship between the firm's overall technological profile and business performance. The Pearson Correlation test was used to test the correlations between the overall means of the Technological Infrastructure Characteristics and the means of Business Performance. The overall means of the Infrastructure Characteristics are obtained by computing the average scores of the responses on the Technological Infrastructure survey items. Consequently, the average scores represent the overall Technological Infrastructure profile of the firm.

The second test examined the bivariate relationships between technological infrastructure characteristics and business performance. The Pearson Correlation test was used to test the correlations between the means of each of the Technological Infrastructure Characteristics and the means of Business Performance. Table 9 presents the results of the 1-tailed correlation tests.

Table 9. Technological Infrastructure – Business Performance Correlation Tests

Technological Infrastructure Characteristics	Correlation Scores
Technological Profile	.343** .000
User Involvement in IS	.197* .022
Connectivity	.229** .010
Distributed Computing	.286** .002
Flexibility	.275** .002
Technology Awareness	.247** .006

** Correlation is significant at the 0.01 level (1-tailed)
* Correlation is significant at the 0.05 level (1-tailed)

The correlations of both tests, the overall profile and bivariate models, are statistically significant. The calculated P-values are below the 0.01 level for all the tests with the exception for the correlation test between User Involvement of Information and Business Performance, which the result indicate the P-value to be below the 0.05 level. The overall results of the tests suggest that there is a relationship between the firm's technological Infrastructure characteristics and business performance. The second Hypothesis is therefore confirmed. Consequently, it can be stated that firms with sophisticated technological infrastructures experience high business performance.

6.4.3 Hypothesis 3

The third hypothesis states that firms that display a high functional integration between the organizational and technological infrastructures achieve high business performance. The literature reports that the concepts of organizational and technological infrastructures are fundamentally relational, and it is recommended that respective design issues should be jointly addressed. The integration of people and technology in the business environment entails flexible, interactive planning to ensure more effective links between the variables involved in the IS planning process (Das, Zhara, and Warkentin, 1991).

The functional integration or fit between the infrastructures can be measured using the Moderation perspective of fit (Venkatraman, 1989). The Moderation perspective of fit suggests that the interaction between the infrastructures, which are the predictor variables, creates a moderator variable, and together they predict the business performance, which is the criterion variable. The Moderation perspective of fit has been used in previous research that examined the strategic alignment between business strategy and IS strategy. The results of the research indicate that the interaction model of alignment is a useful and effective weighted measure that explores the fit between the Business and IS domains of firms (Chan, Huff, Copeland and Barclay, 1996).

The testing of the first and second hypotheses was based on a model that specifies direct effects of the organizational and technological characteristics on

business performance. To separate the interaction effects from the main effects, Multiple Regression Analysis (MRA) is the suggested method of measuring fit as Moderation (Venkatraman, 1989). To determine the relationship between the infrastructures alignment and business performance, multiple regression analysis was conducted on the product of both infrastructures, organizational infrastructure and technological infrastructure, the independent variables, and business performance, the dependent variable. Table 10 presents information on the distribution of the infrastructure alignment scores.

Table 10. Descriptive Information on Infrastructure Alignment

Corresponding Infrastructures Alignment Measures	Mean	Standard Deviation	Minimum	Maximum
Organizational Profile * Technological Profile	13.80	2.64	6.94	21.61
Common/Shared Vision * User Involvement in IS	15.35	3.65	7.14	25.00
Cooperation * Connectivity	13.13	3.15	5.67	22.67
Empowerment * Distributed Computing	14.15	3.09	6.40	24.00
Adaptability * Flexibility	12.92	2.92	6.23	18.73
Learning * Technology Awareness	13.33	3.71	5.95	20.48

Two tests were subsequently conducted to test the third Hypothesis. The first test examined the relationship between the product of the overall organizational profile and technological profile, and business performance. Multiple regression

analysis was conducted on the product of the overall means of the Organizational Infrastructure Characteristics and Technological Infrastructure Characteristics, and the means of Business Performance.

The second test examined the bivariate relationships between the product of the organizational and technological infrastructure characteristics, and business performance. Multiple regression analysis was conducted on the product of the means of each of the Organizational Infrastructure Characteristics and Technological Infrastructure Characteristics, and the means of Business Performance. Table 11 presents the standardized values of the variables and the results of the multiple regression analysis.

Table 11. Infrastructure Alignment – Business Performance Multiple Regression Analysis

Standardized Value	F	Sig.	T	Sig.
Organization Profile * Technology profile	9.305	.000	-0.173	.863
Common / Shared Vision * User Involvement in IS	6.163	.001	1.230	.222
Cooperation * Connectivity	3.863	.012	0.598	.551
Empowerment * Distributed Computing	8.061	.000	-0.059	.953
Adaptability * Flexibility	5.256	.002	1.363	.176
Learning * Technology Awareness	11.821	.000	-2.358	.020 *

Dependent variable: standardized business performance
*p < 0.050

The significance of the F-values, shown in Table 11, are all below the 0.05 level. These main results indicate that the products of the Organizational Infrastructure Characteristics and the Technological Infrastructure Characteristics, and Business Performance are related when measured together. The results suggest that, overall, there is a relationship between both infrastructures and business performance. These results confirm the correlation test findings of the first two Hypotheses, namely that both the Organizational and Technological Infrastructures impact Business Performance.

The t-values, also shown in Table 11, are associated specifically with the interaction effects of the product of the infrastructures and business

performance. The significance of the t-values are all above the 0.05 level. The only exception is for the product of the corresponding Learning/Technology Infrastructure Characteristics, and Business Performance, where the significance is indicated to be .020. The negative t-value of –2.358 for the same corresponding infrastructure characteristics indicates that their alignment does not contribute to business performance. The general high values of the results suggest that there is no clear relationship between the product of the infrastructures and business performance.

The overall results of the analysis don't indicate that there is a relationship between the alignment of the firm's Organizational and Technological Infrastructure Characteristics and Business Performance. The results cannot show clearly that the interaction between the Organizational and Technological Infrastructures impacts the Business Performance of firms.

7.0 DISCUSSION

Today, IT investments comprise a large percentage of organizational resources. Consequently, interest in organization-wide IT planning has increased. The Strategic Alignment Model, shown in Figure 2, proposes that IT planning must be addressed on the same level of importance as organizational planning. The model provides a continuous, holistic framework for integrated IT and business planning and provides alignment mechanisms by which to integrate the technological domain with the organizational domain.

The focus of this study was on the two lower quadrants of the Strategic Alignment Model. The research presented examined the internal fit between the organizational and technological infrastructures and determined how their alignment impacted business performance.

The alignment of the infrastructures was operationalized in terms of emerging organizational goals which corresponded with technology characteristics. This perspective of infrastructures presents a view that the infrastructure characteristics that impact the business performance of firms involve both people and technology as added value resources.

The first two Hypotheses were confirmed. The correlation test results of the first two Hypotheses were found to be significant for both, the higher-order systems model that examined the organization/technology profiles and the bivariate

model that examined the infrastructural characteristics. The results indicate that both the organizational infrastructure and the technological infrastructure impact organizations in terms of business performance. Hence, the research findings confirm and support the theoretical underpinning of the Strategic Alignment Model, namely that both infrastructures must be addressed during the planning process.

The research findings suggest that business performance increases for firms with both sophisticated organizational infrastructures and sophisticated technological infrastructures. The term 'sophisticated' implies a high level utilization of organizational/technological characteristics listed in the Research Model displayed in Figure 6.

The results indicate that firms with sophisticated organizational infrastructures have high impact on business performance. Firms with sophisticated organizational infrastructures display high utilization of the following organizational infrastructure characteristics: Common/Shared Vision, Cooperation, Empowerment, Adaptability, and Learning. An explanation as to the high impact on business performance may be that these characteristics create value to organizations in terms of strategic business issues. Having a common/shared vision make possible the articulation of the firm's strategic objectives. Organizational cooperation encourages participation in the firm's strategic directions. Individual empowerment assigns accountabilities to the

appropriate organizational orientation. Organizational adaptability is in response to organizational change and addresses such issues as novel opportunities and threats. Organizational learning is value-based and demonstrates long-term interests in the business.

The above-mentioned organizational characteristics provide organizations with organizational configurations and internal arrangements that are profit-oriented and support the organization's chosen position in the market. A high utilization of the organizational characteristics illustrate a fit between the firm's business strategy and the organizational infrastructure. The research results confirm this premise, namely that sophisticated organizational infrastructures lead to an achieved business fit that positively impacts business performance.

The research results also indicate that firms with sophisticated technological infrastructures have high impact on business performance. Sophisticated technological infrastructures have a high utilization of the technological infrastructure characteristics: User Involvement in IS, Connectivity, Distributed Computing, Flexibility, and Technology Awareness. An explanation as to the high impact on business performance may be that these characteristics create value to organizations in terms of strategic IT issues. User involvement in information systems facilitates the strategic use of IT. Organizational connectivity comprises designs of IS architectures that are linked to IT strategies. Distributed computing delivers relevant information for organizational decision-

making. IT flexibility creates business-driven IT. Technology awareness helps to deploy IT effectively and profitably to meet strategic IT and business objectives.

The above-mentioned technological characteristics provide organizations with technological configurations, IT work processes and shared services that address IT strategic goals and sustain business applications. A high utilization of the technological characteristics illustrate a fit between the firm's IT strategy and the technological infrastructure. The research results confirm this premise, namely that sophisticated technological infrastructures lead to an achieved IT fit that positively impacts business performance.

The research findings did not confirm the third Hypothesis. The premise that high interaction between the infrastructures impacts business performance was not validated. The results cannot suggest that business performance increases when both the organizational domain and technological domain are aligned. The results related to the third Hypothesis indicate that only the alignment between the product of the corresponding infrastructural characteristics Learning and Technology Awareness is linked to the dependent variable, Business Performance. The alignment of Learning and Technology Awareness and its link to Business Performance is shown to be reverse in nature, given the negative t-value score (-2.358). This score indicates that the higher the interaction between Learning and Technology Awareness the lower is Business Performance. The definition of both constructs Learning and Technology Awareness comprise the

concept of an openness and responsiveness to change and innovation. The results cannot clearly show that the alignment between the organizational factors and technological factors that support change and innovation in terms of newly learned behaviors increases business performance.

The alignments of the other four corresponding infrastructure characteristics did not show clear impact on business performance. The concept of Infrastructure alignment implies that there is an operational level link between the infrastructures through internal coherence between the organizational requirements on one hand and the delivery capability on the other. The only observed interaction, between Learning and Technology Awareness, is close to the managerial aspect of IT. The lack of interaction of the other corresponding characteristics may indicate that the two domains are too distant from one another to truly interact.

This study focused on the concept of fit in IS strategy research. The functional linkage between the organizational and technological infrastructures was operationalized in terms of their interaction. In this study, the fit between the infrastructures was conceptualized in the same manner as previous research conceptualized the fit between business strategy and IT strategy (Chan, Huff, Copeland and Barclay, 1996). Hence, this study complemented previous research to present a continuous, integrated, conceptual view of the Strategic Alignment Model.

The theoretical underpinning of the research model is the Contingency Theory, which is an open systems model and promotes for firms to organize based on individual needs. The theory suggests that the better the fit among the contingent variables, the better the performance of the firm. Although the research findings suggest that a high level of use of the organizational and technological infrastructural characteristics outlined in the model may lead to high business performance, organizations may wish to adopt to their firms characteristics that are suitable to them operationally and financially. The literature indicates that flexible, interactive strategic planning may be more beneficial to firms rather than rigid, formal strategic planning (Hufnagel, 1987; Neumann, 1994). The literature also suggests that IS planners should take into account past experiences, intuition, and informal information flows during the planning process (Neumann, 1994). Organizations, when selecting their firm's infrastructural characteristics should be aware of their own capacities and capabilities and not build unfitting infrastructures to their business operations.

7.1 Contribution

This study contributes to the current research in two ways: (1) it provides empirical findings regarding the functional linkage between organizational and technological infrastructures, and partially confirming the validity of the Strategic Alignment Model (Henderson, Thomas, and Venkatraman, 1992) which has been extensively researched in terms of business/IT strategies; and (2) it explores the strategic alignment of organization and technology and provides

subjective measures of business performance, which is a valuable contribution to the current research.

The study provides contribution to practitioners in two ways: (1) it highlights and provides organizational and technological themes of interests to contemporary Canadian organizations currently undergoing reorganization and/or restructuring in an effort to become more efficient, effective, and innovative; and (2) it links operational organizational and technological factors to business performance of firms, thus providing some mechanisms for implementation and an investment direction for scarce resources that may improve or increase business performance, which is a main objective of businesses.

7.2 Limitations

One limitation of the research is a low response rate, which may have affected the results of the study. The low response rate of 11% was presumably due to the time period of the survey which was during the month of June, a month when company personnel are usually absent due to vacations. A larger sample size would have given more statistical power to the results and more confidence could have been obtained regarding the results.

A second limitation of the research relates to the variable Business Strategy. The original model under study comprised the construct Business Strategy and the intention was to investigate the relationship between business strategy types,

namely prospector, defender, analyzer, and reactor, infrastructure alignment profiles, and business performance. The responses on the business strategy section of the questionnaire were not sufficient to accurately test the data. The construct was subsequently dropped from the analysis, however it remained part of the research model as an indicator of the firm's external link to the environment.

A third limitation of the research involves some of the technological infrastructure question items on the survey instrument and the sampling distribution. The majority of the respondents were high-ranking personnel from the strategic/management area who did not have much technical background. It was crucial for the study to have a sample of respondents who were knowledgeable about the firm's business performance and strategic orientation. However, it is conceivable that these respondents had some difficulties in answering the technical questions about the technological infrastructure and response bias could have issued for specific measures resulting in some form of measurement error.

7.3 Future Research Considerations

In recent years researchers and strategists are working toward a better integration of human potential and machine capabilities in the business enterprise. Increasingly, organizational design decisions are introduced from a perspective that generally views people and technology equally important as contributors to the firm in terms of added value.

Future considerations for research include the examination of the organizational and technological infrastructures, and their interaction, in more depth. Measuring the fit between the organizational and technological infrastructures is not a simple task. Six approaches to measure fit are proposed by Venkatraman (1989). The research results in this study can be verified by using one or more of the five other perspectives of fit.

Another study consideration is the extent to which high-level executives formulate IT investment decisions for their firms. Company directors customarily make organizational investment decisions but often rely on professional IT personnel or consultants to direct the IT investment decisions. A future study can examine the frequency that company directors make IT investment decisions. Further analysis on the topic can explore how these IT investment decisions are aligned with organizational investment decisions and compare this alignment with IT investment decisions formulated by people other than the company directors.

7.4 Conclusion

In conclusion, this study has tried to asses the impact of organizational and technological infrastructures, and their alignment, on business performance. The study explored the fit between the firm's operational business and IT domains as functional integration between the firm's infrastructures. The study's findings cannot clearly suggest that the functional integration between the infrastructures, measured in terms of interaction, impacts the business performance of firms.

The study, however, confirms that organizations can enhance their business performance by addressing issues related to both the organizational domain and the technological domain of the enterprise. The Hypotheses that stated that both organizational and technological infrastructures impact the business performance of firms were confirmed. The study also presented infrastructural characteristics that may assist organizations to build strong and effective infrastructures.

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9.0 Appendix A

June 13, 1998

Name
Title
Company
Address
City (Province)
Postal Code

Object: Impact on Business Performance by the Organizational and Technological Infrastructures

Name,

We would like to determine the Characteristics of Organizational and Technological Infrastructures that best support business strategies, thus contributing to better performance. We strongly value your views on this topic. To make best use of your valuable time, we have carefully developed a short questionnaire on *Organizational and Technological Infrastructure Characteristics* that will take you about twenty five minutes to complete.

The questionnaire is aimed at individuals who are familiar with the managerial aspects as well as with the technological characteristics of their organizations. Your name and company were given to us by Southam's Scott's Directories Group. All the information will be kept confidential and no results will allow the identification of the respondents nor the participant firms. If you have any comments or questions, please feel free to contact us.

It would be very much appreciated if the questionnaire could be returned within a week in the attached postage-paid envelope. We will be glad to mail an Executive Summary of the results of this study if you provide us with a business card in the return envelope. We thank you in advance for your precious cooperation and we look forward to receiving your answers.

Best regards,

Simona Solomon
M.Sc. (Administration) Student

BUSINESS PERFORMANCE

Using the following scale, please indicate **how you perceive your actual business performance**. Please circle the number that best represents your opinion.

Very Low	*Low*	*Medium*	*High*	*Very High*
1	*2*	*3*	*4*	*5*

1.	The sales growth position relative to our principal competitor is:	1	2	3	4	5
2.	My satisfaction with sales growth rate is:	1	2	3	4	5
3.	The return on corporate investment position relative to our principal competition is:	1	2	3	4	5
4.	My satisfaction with the return on corporate investment is:	1	2	3	4	5
5.	My satisfaction with return on sales is:	1	2	3	4	5
6.	The market share gains relative to our principal competitors are:	1	2	3	4	5
7.	The net profit position relative to our principal competitor is:	1	2	3	4	5
8.	The financial liquidity position relative to our principal competitor is:	1	2	3	4	5

ORGANIZATIONAL INFRASTRUCTURE CHARACTERISTICS

Using the following scale, please indicate **how you perceive your organizational infrastructure characteristics**. Please circle the number that best represents your opinion.

Highly Disagree	*Disagree*	*Neutral*	*Agree*	*Highly Agree*
1	*2*	*3*	*4*	*5*

I. COMMON / SHARED VISION

1.	The company mission is clear and coherent.	1	2	3	4	5
2.	The company objectives are clear and coherent.	1	2	3	4	5
3.	The company strategy is clear and coherent.	1	2	3	4	5
4.	There is a strong feeling in the organization that a common purpose exists.	1	2	3	4	5
5.	I find that my values and the organizational values are very similar.	1	2	3	4	5
6.	The strategic decision process is participative.	1	2	3	4	5

Highly Disagree 1	*Disagree* 2	*Neutral* 3	*Agree* 4	*Highly Agree* 5

II. COOPERATION

7.	All individuals are committed to the same project goals.	1	2	3	4	5
8.	For most problems that arise, there are rules and procedures for dealing with them.	1	2	3	4	5
9.	Individuals establish their own rules and procedures to facilitate the work's progress.	1	2	3	4	5
10.	There is a cooperative effort among individuals to carry out difficult tasks.	1	2	3	4	5
11.	There is an open communication among individuals, and the atmosphere is characterized by friendly relations.	1	2	3	4	5
12.	There is a high level of mutual trust.	1	2	3	4	5
13.	Individuals actively work together as partners.	1	2	3	4	5

III. EMPOWERMENT

14.	Decision making tends to occur in a decentralized manner.	1	2	3	4	5
15.	Operating rules and standard procedures play important roles in how decisions are handled.	1	2	3	4	5
16.	Ideas tend to flow horizontally as well as vertically.	1	2	3	4	5
17.	Decision-making responsibilities are pushed down to the lowest possible level.	1	2	3	4	5
18.	Individuals are capable to direct and take charge of their own work.	1	2	3	4	5
19.	There are opportunities to select options and make choices at work.	1	2	3	4	5
20.	The individuals' knowledge base in this organization has increased.	1	2	3	4	5
21.	Individuals have been given or taught the skills that are needed to arm themselves.	1	2	3	4	5
22.	Individuals participate equally in organizational activities.	1	2	3	4	5
23.	There are opportunities for personal development, such as growth in self-worth or self-efficacy.	1	2	3	4	5

Highly Disagree 1	*Disagree* 2	*Neutral* 3	*Agree* 4	*Highly Agree* 5

IV. ADAPTABILITY

24. Promotions are based on merits.	1	2	3	4	5
25. I can act as my own boss in most matters.	1	2	3	4	5
26. Most jobs have something different happening from day to day.	1	2	3	4	5
27. People are encouraged to make their own decisions.	1	2	3	4	5
28. People are encouraged to use their own judgment in handling everyday situations.	1	2	3	4	5
29. People like it here because of the variety in work they can do.	1	2	3	4	5
30. The work group has a manual of rules and procedures to follow.	1	2	3	4	5
31. Jobs are monotonous.	1	2	3	4	5
32. There are systematic procedures for promotions.	1	2	3	4	5

V. LEARNING

33. Creativity is encouraged.	1	2	3	4	5
34. My ability to function creatively is respected by the leadership.	1	2	3	4	5
35. Around here people are allowed to solve the same problems in many different ways.	1	2	3	4	5
36. This organization can be described as flexible and continually adapting to change.	1	2	3	4	5
37. The best way to get along in this department is to think the way the rest of the group does.	1	2	3	4	5
38. This place seems to be more concerned with the *status quo* than with change.	1	2	3	4	5
39. The reward system here encourages innovation.	1	2	3	4	5
40. Assistance in developing new ideas is readily available.	1	2	3	4	5
41. There are adequate resources available to enable innovation in this organization.	1	2	3	4	5
42. There is adequate time available to pursue creative ideas here.	1	2	3	4	5

TECHNOLOGICAL INFRASTRUCTURE CHARACTERISTICS

Using the following scale, please indicate **how you perceive your technological infrastructure characteristics**. Please circle the number that best represents your opinion.

Highly Disagree	*Disagree*	*Neutral*	*Agree*	*Highly Agree*
1	*2*	*3*	*4*	*5*

I. USER INVOLVEMENT IN INFORMATION SYSTEMS

1. I am currently a heavy user of the information system.	1	2	3	4	5
2. I use the information system frequently.	1	2	3	4	5
3. I consider the information system to be important.	1	2	3	4	5
4. I consider the information system to be essential to the organization.	1	2	3	4	5
5. The information system means a lot to me.	1	2	3	4	5
6. The information system is of concern to me.	1	2	3	4	5
7. The information system is easy to use.	1	2	3	4	5

II. CONNECTIVITY

8. A good telecommunication infrastructure is available.	1	2	3	4	5
9. Information system applications are integrated and encompass different functional areas.	1	2	3	4	5
10. Database oriented applications are regularly used in daily operations.	1	2	3	4	5
11. Information systems improves internal meetings and discussions.	1	2	3	4	5
12. Information systems provides better coordination among functional areas in firms.	1	2	3	4	5
13. There are difficulties in accessing computer-based data gathered or held by other members / departments / groups.	1	2	3	4	5
14. There is information systems support for lateral mechanisms of coordination and communication (e.g., GDSS, WorkFlow Management Systems).	1	2	3	4	5
15. I frequently access my e-mail and "surf" the world-wide-web.	1	2	3	4	5

Highly Disagree 1	*Disagree* 2	*Neutral* 3	*Agree* 4	*Highly Agree* 5

III. DISTRIBUTED COMPUTING

16. Computing services are offered primarily from an installation located in the manager's department rather than from a central installation.	1	2	3	4	5
17. The information systems have made it easier to get needed information.	1	2	3	4	5
18. The information systems save time in looking for information.	1	2	3	4	5
19 The information systems have improved the process and content of decision making.	1	2	3	4	5

IV. FLEXIBILITY

20. The information technology infrastructure is constrained by proprietary systems.	1	2	3	4	5
21. There are a lot of choices for hardware.	1	2	3	4	5
22. There are a lot of choices for software.	1	2	3	4	5
23. Flexibility in the technological infrastructure is encouraged.	1	2	3	4	5
24. Today's user interfaces commonly provide invisible access to platforms.	1	2	3	4	5
25. In our major systems, data rules and relations are not hardcoded into applications.	1	2	3	4	5
26. Current corporate rules and standards for hardware and operating systems support future platform compatibility and standardized platform gateways.	1	2	3	4	5
27. Current corporate standards adequately address vendor choices for operating systems and protocol selection and use.	1	2	3	4	5
28. Our firm has formally and sufficiently identified data to be shared across business unites.	1	2	3	4	5
29. Our firm has adequately identified sharable business process components.	1	2	3	4	5
30. The complexity of current applications software seriously restrict our ability to develop systems of single-process reusable modules.	1	2	3	4	5

Highly Disagree 1	*Disagree* 2	*Neutral* 3	*Agree* 4	*Highly Agree* 5

V. TECHNOLOGY AWARENESS

31. The members of the information systems department design and implement applications that reduce the organization's operating expenses.	1	2	3	4	5
32. The members of the information systems department participate in corporate organizational meetings.	1	2	3	4	5
33. The members of the information systems department read technological journals on a regular basis.	1	2	3	4	5
34. The members of the information systems department attend information systems conferences.	1	2	3	4	5
35. The members of the information systems department learn continuously about new technologies and their applications.	1	2	3	4	5
36. Continuous learning about ways to integrate new technologies is encouraged by our firm.	1	2	3	4	5
37. New information technology is important to achieving the organization's goal .	1	2	3	4	5
38. The company promotes the use of new information technology.	1	2	3	4	5
39. There is an informal network to keep up with new information technology.	1	2	3	4	5
40. There are formal procedures for evaluating new technologies.	1	2	3	4	5

BUSINESS STRATEGY

Please check of the following types of product-market strategies which is closest to the product-market strategy of your corporation.

( ) Type 1:

An organization with this type of strategy attempts to locate and maintain a secure niche in a relatively stable product or service area. The organization tends to offer a more limited range of products or services than its competitors, and it tries to protect its domain by offering higher quality, superior service, lower prices, and so forth. Often an organization with this type of strategy is not at the forefronts of developments in the industry – it tends to ignore industry changes that have no direct influence on current areas of operation and instead concentrates on doing the best job possible in a limited area.

( ) Type 2:

An organization with this type of strategy typically operates within a broad product–market domain that undergoes periodic redefinition. The organization values being "first -in" in new product and market areas even if some of these efforts prove not to be highly reputable. The organization responds rapidly to early signals concerning areas of opportunity, and these responses often lead to a new round of competitive action. However, an organization with this type of strategy may not maintain market strength in all of the areas it enters.

( ) Type 3:

An organization with this type of strategy attempts to maintain a stable, limited line of products or services, while at the same time moving out quickly to follow a carefully selected set of the more promising new developments in the industry. The organization is seldom "first–in" with new products or services. However, by carefully monitoring the actions of major competitors in areas compatible with its stable product–market base, the organization can frequently be "second–in" with a more cost–efficient product or service.

( ) Type 4:

An organization with this type of strategy does not appear to have a consistent product–market orientation. The organization is usually not as aggressive in maintaining established products and markets as some of its competitors, nor is it willing to take as many risks as other competitors. Rather, the organization responds in those areas where it is forced to by environmental pressures.

PLEASE PROVIDE SOME BACKGROUND INFORMATION FOR OUR ANALYSIS

1. What is your title? _____

2. How long have you held this position? _____ /year(s)

3. How long have you been working for this firm? _____ /year(s)

4. How many employees work in this firm? _____

5. How many employees work in the information systems department? _____

6. What is the budget allowed to the information systems department? _____

7. What are the firm's total revenues? _____

8. What is your primary industry?

- ☐ Agriculture, forests and fisheries
- ☐ Mining
- ☐ Construction
- ☐ Communications
- ☐ Transports
- ☐ Health
- ☐ Manufacturing
- ☐ Wholesale
- ☐ Retail Trade
- ☐ Finance, Insurance, Real Estate
- ☐ Services
- ☐ Other: _____

Please return this questionnaire by using the attached postage-paid envelope or by faxing it to Simona Solomon.

Thank you for your precious cooperation!

If you wish to obtain a summary of the results of this survey, please enclose your business card in the return envelope. If you have any comments or questions, please feel free to contact us.

Simona Solomon
M.Sc. (Admin.) Student

Department of Decision Sciences and MIS
Concordia University
1455, de Maisonneuve Blvd. W,
Montreal, Quebec
H3G 1M8