JITTA

JOURNAL OF INFORMATION TECHNOLOGY THEORY AND APPLICATION

A STUDY ON THE ROLE OF INFORMATION SYSTEMS IN ORGANIZATIONAL GROWTH: A LONGITUDINAL CASE STUDY

JAEMIN HAN, Korean University
  Email: jaemin@korea.ac.kr

JONGSOO YOON, SAS Korea
  Email: jongsoo@kangnam.ac.kr

YOOJEONGKIM, Digitmate Co. Ltd.
  Email: yjkim@nca.or.kr

ABSTRACT

The purpose of this paper is to present an integrated framework which can explain how the role of information systems evolves in organizations. To develop the framework, two critical dimensions, each of which is classified further into three categories, are selected to explain the role of information systems in organizational growth: the purpose of information processing, the scope of information processing. As these are considered to be major dimensions underpinning much research regarding the role of information systems in organizations, the framework proposed in this paper could serve to integrate much existing research, while stimulating future research aimed at verifying its applicability.

INTRODUCTION

Numerous studies show that information technology(IT) has already become a strategic necessity in the organization; indeed many have used IT as a means of coping with the changing environment in flexible and effective ways.

Significant advances in computers, telecommunications, data access and storage devices, graphics equipment, and software have created opportunities for substantial and sustainable competitive advantage.

Much research in the role of IS in organizations has been to identify variables that will provide consistent and valid

predictions of their value. This effort has led to the investigation of ancillary issues, such as the relationships between utilization of IS and organizational factors such as: task characteristics(Alloway & Quillard, 1983; Cooper, 1985; Daft & Lengel, 1986; Daft & Macintosh, 1978; Davis & Olson, 1985; Ghani, 1992; Gorry & Scott Morton, 1971; Ito & Peterson, 1986; Macintosh & Daft, 1987; Tushman & Nadler, 1978; Zigurs & Buckland, 1998); the nature of environment in which the organization must do business(Chenhall & Morris, 1986; Daft & Lengel, 1984; Daft & Macintosh, 1981; Ewusi-Mensah, 1981; Galbraith, 1973; Gordon & Miller, 1976; Gordon & Narayanan, 1984; Gul & Chia, 1994); the nature of organizational strategy(Bakos & Treacy, 1986; Broadbent & Weill, 1993; Camillus & Lederer, 1985; Das, Zahra & Warkentin, 1991; Ein-Dor & Segev, 1978; Ives & Learmonth, 1984; King, 1978; McFarlan & McKenney, 1983; Parsons, 1983; Porter & Miller, 1985; Premkumar & King, 1973; Rockart & Scott Morton, 1984; Vitale, Ives & Beath, 1986); the characteristics of organizational structure(Chenhall & Morris, 1986; Dearden, 1967; Gordon & Narayanan, 1984; Leavitt & Whisler, 1958; Lee & Leifer, 1992; Leifer, 1988; Robey, 1981; Tavakolian, 1989); and management innovation(Allen, 1970; Davidson, 1993; Ginzberg, 1992; Teng, Grover & Fiedler, 1994; Venkatraman, 1994).

While these various studies have been fruitful, there is no generally accepted theory. That is, the work was performed in a limited and static context. It seems therefore desirable to develop an integrated framework that can explain the role of IS in organizations systematically and comprehensively, especially during organizational growth. In this sense, the paper presents a framework developed based on an in-depth case study and literature review, and discusses its applicability and validity.

The first portion of this paper provides a review of past researches that explain implicitly or explicitly the role of IS in organizations. The second portion presents an integrated framework for explaining the role of IS in organizational growth. The third portion describes an empirical examination of the framework resulting from a case study on Hyundai Motor Company(HMC). Finally, the implications for research and practice are identified in the fourth portion.

ORGANIZATIONAL GROWTH AND ROLE OF INFORMATION SYSTEMS

Organizational Growth

Contemporary literature contains at least three broad points of view on organizational change(Hannan & Freeman, 1984; Singh, House & Tucker, 1986): population ecology theory(Freeman & Hannan, 1983; Hannan & Freeman, 1977; McKelvey, 1982); rational adaptation theory including contingency theory(Lawrence & Lorsch, 1967; Thompson, 1967), resource dependence theory(Pfeffer & Salancik, 1978), institutional theory(DiMaggio & Powell, 1983; Meyer & Rowan, 1977), and marxist theory(Burawoy, 1979; Edwards, 1979); random transformation theory based on a set of historically sequenced stages(Chandler, 1962; Greiner, 1972; Lippitt & Schmidt, 1967; Miller & Friesen, 1984; Pfeffer & Salancik, 1978; Quinn & Cameron, 1983; Rowe, Mason & Dickel, 1982; Scott, 1973) and on a non-deterministic pattern of organizational change(Mintzberg, 1979; Tushman & Romaneli, 1985).

Each of the three perspectives on organizational change described above can contribute to understanding how organizations evolve. The third, among the three perspectives, is considered to be pertinent to explain the long-term developmental process of organizations in terms of organizational change of strategy, structure, major managerial concerns, crises leading to evolution and revolution, and technological capabilities(Quinn & Cameron, 1983).

From the strategy and structure point of view, Chandler(1962), Franco(1974), Scott(1973), and Stopford and Wells(1972) proposed that organizations would develop by experiencing different stages, and suggested that business strategy and organizational structure would differ according to organizational life cycles.

Lippitt and Schmidt(1967) suggested that corporations progress through different stages of development from the perspective of

major managerial concerns. Their models specify major managerial concerns that change as the organization progresses from stage to stage.

Greiner(1972) and Rowe, Mason and Dickel(1982) maintained that growing organizations move through distinguishable phases of development, each of which contains a relatively calm period of growth that ends with a management crisis.

Abernathy and Utterback(1978), and Kim(1997) presented developmental process of organizations in terms of technological capabilities. Abernathy and Utterback(1978) postulated that industries and firms in advanced countries develop along a technological trajectory made up of three stages: fluid, transition, and specific. Kim(1997) presented that the course of technology development in catching-up countries has been different from that of advanced countries: acquisition, assimilation, improvement, and generation.

Miller and Friesen(1984) disclosed the five common stages of organizational development in which each stage would manifest integral complementarities among variables of environment, strategy, structure, and decision making methods. Quinn and Cameron(1983) discussed the relationships between developmental stages of organization and organizational effectiveness, and proposed an integrated summary model of organizational life cycles.

Taken together, key indicators such as strategic goal, organizational structure, leadership, managerial concerns, and technological capabilities were used to distinguish organizational growth stage. Therefore, this paper used a surrogate indicator, key products that can reflect relatively both strategic change and level of technological capability, to distinguish HMC's growth stage.

Role of Information Systems

Previous research has discussed the role of IS in organizations related to task uncertainty(Daft & Lengel, 1986; Daft & Macintosh, 1978; Ghani, 1992; Macintosh & Daft, 1987; Specht, 1986; Tushman & Nadler, 1978; Zigurs & Buckland, 1998), mechanism for control and coordination(Alter, 1991; Daft & Lengel, 1986; Galbraith, 1973), nature of decision making(Alloway & Quillard, 1983; Cooper, 1985; Davis & Olson, 1985; Gorry & Scott Morton, 1971; Yadav, 1985; Zigurs & Buckland, 1998), nature of organizational strategy(Bakos & Treacy, 1986; Broadbent & Weill, 1993; Das, Zahra & Warkentin, 1991; Ein-Dor & Segev, 1978; Ives & Learmonth, 1984; King, 1978; McFarlan & McKenney, 1983; Parsons, 1983; Porter & Miller, 1985; Rockart & Scott Morton, 1984), characteristics of organizational structure(Chenhall & Morris, 1986; Lee & Leifer, 1992; Leifer, 1988; Tavakolian, 1989), and management innovation (Davidson, 1993; Ginzberg, 1992; Teng, Grover & Fiedler, 1994; Venkatraman, 1994). However, those researches did not propose the specified dimensions that explain how IS evolves in organizational growth systematically, even though those works explained the evolution of IS in organization implicitly or partially. To overcome these limitations, this paper reviews the past works centered on the purpose and scope of information processing. Because it is considered that these two aspects could explain the role of IS in organizational growth comprehensively.

Purpose of Information Processing

Many researches suggested that information processing requirements and information processing capacities are associated with task uncertainty, mechanism for control and coordination, nature of decision making, and level of management activities(Alloway & Quillard, 1983; Cooper, 1985; Daft & Lengel, 1986; Daft & Macintosh, 1978; Davis & Olson, 1985; Gordon, Larker & Tuggle, 1978; Gorry & Scott Morton, 1971; Specht, 1986; Zmud, 1983). A generally accepted view in these researches is that the information processing requirements are different by their degree of task uncertainty, nature of decision making, and level of management activities. In this sense, information processing requirements which vary dependent on those organizational factors have great implications for explaining the role of IS in organizations.

Gorry & Scott Morton(1971) proposed that the attributes of information(e.g., accuracy, source, aggregation level, currency) vary depending on the level of managerial activities(Anthony, 1965), and relative degree of structure in the decision making(Simon, 1960). Daft & Macintosh(1978) emphasized that IS should be designed to provide appropriate amount and quality of information according to the task characteristics such as task variety and analyzability.

Gordon, Larcker & Tuggle(1978) insisted that internal, historical, periodical, and detailed information is required for routine and repetitive tasks while external, future, aggregated, and integrated information is needed for complex and difficult work. Zmud(1983) described IS encompassing Transaction Processing Systems(TPS), Information Reporting Systems(IRS), and Decision Support Systems(DSS).

Davis & Olson(1985) also said that TPS is for automating the fundamental and routine processes to support operations, and that IS is to support a wide range of organizational functions and management processes. Daft and Lengel(1986) insisted that as the frequency of unexpected events increase, the need for more varied information processing increases, and less analyzable tasks require richer information in order that users may clarify ambiguities and define problems(Ito & Peterson, 1986; Rice, 1992; Goodhue, Wybo & Kirsch, 1992). Specht(1986) found that strategic decision makers need much more sophisticated information while managerial decision makers require exceptional information which is very easily accessible.

Based on the above researches(see Table 1), it can be said that organizational information processing requirements have been influenced by task uncertainty, mechanism for control and coordination, level of management activities, and nature of decision making, even though there are a few differences among researchers' view on required information processing characteristics. That is, from the purpose of information processing point of view, IS in organizations have a tendency to be utilized for processing a high volume of data in order to support operational activities, structured decision making, and routine tasks. IS also tend to be used to provide a variety of high quality information to improve the quality of managerial activities, semi or unstructured decision making, and complex tasks.

Table 1. researches on the purpose of information processing

Researchers(year)	IS or information variables	Related variables	Characteristics of information processing
Alloway and Quillard(1983)	-Types of computer based information systems (Transaction Processing System, Managerial Support System)	-level of management activities	High volume of data, a variety of information, high quality of Information
Chenhall and Morris(1986)	-information characteristics (scope, timeliness, aggregation, integration)	-environmental uncertainty -organizational structure (decentralization) -organizational interdependence	High quality of information
Cooper(1985)	-characteristics of IT (response time, focus of decision making)	-problem complexity (homogeneity, predictability, knowledge)	High volume of data, a variety of information, high quality of Information
Daft and Lengel(1986)	-information processing requirements (the amount of information processing, a variety of computing tool, rich media)	-technology (routine, nonroutine, craft, engineering) -interdepartmental relation (interdependence, differentiation)	A variety of information
Daft and Macintosh(1978)	-information characteristics (the amount of information, the quality of information)	-task characteristics (analyzability, variety)	High volume of data, high quality of information

Table 1. researches on the purpose of information processing (Continued)

Davis and Olson(1985)	-information processing requirements (the amount of information) -the quality of information (usefulness of information)	-task uncertainty -the number of department in which decision is made -interdependence between subunits	High volume of data, a variety of information, high quality of Information
Ghani(1992)	-IT characteristics (PC use, mainframe use, diversity of use)	-task characteristics (analyzability, variety)	A variety of information
Goodhue, Wybo and Kirsch(1992)	-degree of data integration (full data integration, partial data integration)	-interdependence among subunits, complex or nonroutine subunit tasks, external environmental uncertainty	A variety information, high quality of information
Gordon, Larcker and Tuggle(1978)	-characteristics of information (format, level of summary, sources, type, timeliness)	-phase of decision making	A variety of information, high quality of information
Gordon and Narayanan(1984)	-information characteristics (internal/external, qualitative/quantitative, prior/posterior)	-environmental uncertainty -flexibility of organizational structure	High volume of data, a variety of information
Gorry and Scott Morton(1971)	-information characteristics (source, scope, level of aggregation, time horizon, currency, accuracy, frequency of use) -types of information systems (Structured Decision System, Decision Support System)	-levels of management activities -relative degree of structure in the decision being made	High volume of data, a variety of information, high quality of information
Ito and Peterson(1986)	-information processing requirements	-task difficulty -inter-unit interdependence	A variety of information, high quality of information
Mia and Chenhall(1994)	-scope of information in management accounting systems	-task uncertainty -functional differentiation	A variety of information, high quality of information
Specht(1986)	-information requirements (data quality, data manipulation)	-job complexity, job level, the purpose of decision making	A variety information, high quality of information
Tushman and Nadler(1978)	-information processing requirements, capacities of information processing	-subunit task characteristics (task complexity, task interdependence) -subunit task environment -inter-unit task interdependence -mechanism for coordination and control	A variety of information, high quality of information
Yadav(1985)	Characteristics of IT (structural nature, structure of presentation of information, attributes of information)	-organizational characteristics (goal, strategy, functional differentiation and integration, task characteristics, etc.)	A variety of information
Zmud(1983)	-types of information systems (TPS, IRS, DSS)	-level of management activities	High volume of data, a variety of information, high quality of information

Scope of Information Processing

A number of authors have suggested that information processing capabilities vary widely according to their scope in which IT has been employed(Alter, 1991; Bakos & Treacy, 1986; Boynton, 1993; Cash & Konsynski, 1985; Clemons, 1986; Davidson, 1993; Lee & Leifer, 1992; Porter & Miller, 1985; Rockart & Scott Morton, 1984; Venkatraman, 1994; Zigurs & Buckland,

1998). In this sense, it is considered that information processing capabilities which vary dependent on various organizational factors have large implications in identifying the role of IT in organizations.

Rockart & Scott Morton(1984) identified three types of opportunities that current and emerging IT could help organizations gain competitive advantages: improving each value adding function, facilitating interactions with customers and suppliers, and creating a new business through services or products. Porter and Miller(1985) showed how and why IT is changing the way companies operate internally as well as altering the relationships among companies and suppliers, customers, and rivals. These researchers present implicitly that IS can play a pivotal role in facilitating information flow within and across organizations.

Cash & Konsynski(1985) emphasized that the role of inter-organizational systems(IOS) in linking and integrating value activities and value chain bring about changes in various areas such as business process, the skills of employees, staff requirements, organizational structure, and business strategy. Bakos and Treacy(1986) also suggested a normative model by distinguishing three levels at which IT impacts on corporate strategy. In relation to internal strategy, they emphasize the role of IS in improving operational efficiency and functional effectiveness. In relation to competitive strategy, much emphasis is placed on the role of IS in enhancing comparative efficiency and effectiveness within an organization, and in exploiting inter-organizational synergies.

Clemons(1986) emphasized that IT would play a different role for achieving sustainable competitive advantage according to the technological advances in IT and strategic orientation(internal vs. external), naturally affecting the scope in which IT is utilized in terms of internal and external. Alter(1991) explained that the role of IT is very different compared to the extent in which IT imposes structure and the level of coordination IT provides. It is said that the wider the level of coordination, the more important the role of IT in supporting integration.

Lee & Leifer(1992) suggested IS boundaries as an important effector on IS structure along with hardware distribution, planning decision authority, focus of application development, and database location. It is said that IS boundaries should be considered to understand intra- and inter-organizational IS structures. Boynton(1993) explained the role of IT in facilitating horizontal, cross-functional, or cross-organizational flow of information for applying learning, knowledge, and experience differently to changing product requirements. It implies that IS could play a central role in linking and integrating business processes inside and outside an organization.

From the perspective of IT-enabled Business Process Reengineering(BPR), Davidson(1993) and Venkatraman(1994) emphasized that IT plays various roles in the organizational transformation. They explained that the different role of IT is required dependent on the scope in which IT is utilized in terms of automation, linkage, and integration. The wider the scope, the more important the role of integration provided by IT. Zigurs and Buckland(1998) insisted that Group Decision Support Systems(GDSS) should have the capabilities of supporting communications among co-workers, structuring processes, and processing a variety of information. It presents implicitly that GDSS can be utilized for increasing efficiencies in intra- or inter-organizational processes.

Based on the research just reviewed(see Table 2), key indications can be summarized that the scope in which IS is utilized has an effect on the organizational processing capabilities. That is, it is considered that the role of IS in organizations is different according to the scope of organizational activities in which IS must be employed. In specific, from the scope of information processing point of view, internal utilization of IS is mainly for automating the operation of individual business processes and linking inter-related operational activities to increase efficiency in operational coordination. External

utilization of IS is primarily to link and integrate the inter-related activities across many organizations in order to facilitate cooperative operations with external entities such as suppliers, customers, intermediaries, and competitors.

Table 2 researches on the scope of information processing

Researchers(year)	IS or information variables	Related variables	Characteristics of information processing
Alter(1991)	-types of IS (TPS, MIS, OAS, DSS, ES, EIS)	-level of coordination -extent in which IT impose structure	Inter-process, inter-organization
Bakos and Treacy(1986)	-characteristics of IT (the functional components of a system-storage, processing, and communication * the performance characteristics – capacity, quality, and unit cost)	-industry structure -corporate strategy -business strategy	Intra-process, inter-process, inter-organization
Boon Siong Neo(1991)	-role of IT (integration/coordination, configuration, responsiveness)	-structure of multi national company -strategy of multi national company	Intra-process, Inter-process, inter-organization
Boynton(1993)	-IT characteristics (ability to use information, information processing capability)	-the capability of decision making	Inter-process, Inter-organization
Cash and Konsynski (1985)	-role of inter-organizational systems (electronic links)	-industry level -organization level -business level	Inter-process, Inter-organization
Clemons(1986)	-IT characteristics (internally focused applications, externally focused applications)	-sustainable competitive advantage	Inter-process, Inter – organization
Davidson(1993)	-role of IT (automation, integration)	-business processes within and across organizational boundaries	Intra-process, Inter-process, inter-organization
Fedorowicz and Konsynski(1992)	-role of organization supporting systems (results reporting information systems, organization-wide systems, spanning systems, transformational systems)	-business process -decision process	Intra-process, Inter-process, Inter-organization
Lee and Leifer(1992)	-five dimensions of IS structure (system boundaries, hardware distribution, locus of application development, database location, and planning decision authority)	-organizational technology (predictability, analyzability, type of independence) -environmental uncertainty -organizational structure	Inter-process, Inter-organization
Parsons(1983)	-role of IT (automation, integration)	-industry structure -corporate strategy -business strategy	Intra-process, Inter-process, Inter-organization
Porter and Miller(1985)	-role of IT (automation, integration)	-industry level -corporate level -business level	Intra-process, Inter-process, Inter-organization
Venkatraman(1994)	-role of IT (automation, integration)	-business processes within and across organizational boundaries	Intra-process, Inter-process, Inter-organization
Zigurs and Buckland(1998)	-role of GDSS (supporting communications among co-workers, structuring processes, processing a variety of information)	-nature of cooperative works	Inter-process, Inter-organization

AN INTEGRATED FRAMEWORK

In this paper, several times of interviews with HMC's IS managers and an extensive review of past researches were performed in parallel to identify the research dimensions that can explain how IS evolves in organizations, Consequently, the purpose and scope of information processing were selected as the research dimensions(see Table 3). The properties that show how the purpose of information processing changes over time were categorized into three parts('processing high volumes of data', 'processing a variety of information', and 'processing a high quality of information'). The properties that show how the scope of information processing expands over time were classified into three parts('intra-process', 'inter-process', and 'inter-organization').

As Figure 1 shows, the combination of these two dimensions can help provide an insight into how the role of IS evolves systematically and comprehensively in organizations. The first dimension is expected to explain of how IS evolves to meet changing information processing requirements in organizational growth. The second dimension is useful to expound the role of IS that differed dependent on the scope in which IT is to be deployed.

The specific explanations of each cell in the framework are as follows.

Cell 1: IS plays a major role in processing high volume of data required for transactions of daily operations within an individual process, improving efficiency in day-to-day operation and operational control.

Cell 2: IS plays an important role in transferring high volume data needed for linking inter-related operational activities within an organization, increasing efficiency in massive data flow between processes and improving efficiency in operational coordination.

Cell 3: IS plays a pivotal role in exchanging high volume of data demanded for linking inter-related operational activities across organizations, improving efficiency in high volume data transfer between organizations.

Cell 4: IS plays a central role in processing a variety of data or information required for supporting a number of various daily operations and controlling operational activities within individual process, improving efficiency in linkage among operational activities and operational control in processes.

Table 3 research dimensions and conceptual definition

Research dimensions		Conceptual definition
Purpose of information processing	Processing high volumes of data	In the case of utilizing IS to process high volume of data generated from structured and routine daily operations.
	Processing a variety of information	In the case of utilizing IS to allow users to process a variety of information to meet their varied views and variant information requirements
	Processing a high quality of information	In the case of utilizing IS to process immediately high quality of information so as to sophisticate varied tasks and to improve the quality of decision making
Scope of information processing	Intra-process	In the case that IS is applied to some operational activities within individual process in isolate
	Inter-process	In the case that IS is deployed to facilitate interactions among processes within an organization
	Inter-organization	In the case that IS is employed to facilitate interactions across organizations

Purpose of information processing

	Processing high volumes of data	Processing a variety of information	Processing a high quality of information
Intra-process	Cell 1	Cell 4	Cell 7
Inter-process	Cell 2	Cell 5	Cell 8
Inter-organization	Cell 3	Cell 6	Cell 9

(Scope of information processing)

Figure 1. A framework for analyzing the role of IS in organizational growth

Cell 5: IS plays a critical role in processing a variety of data or information needed for linking various inter-related operational activities between processes and supporting managerial control within an organization, improving efficiency in operational coordination and managerial control in an organization.

Cell 6: IS plays an important role in transferring a variety of data or information demanded for linking inter-related operational activities across organizations, improving efficiency in operational coordination and operational control beyond the boundaries of an organization.

Cell 7: IS plays a vital role in processing high quality data or information required for integrating various operational activities and enhancing the quality of decision making within individual process, enhancing quality of operational activities and streamlining of decision making process for operational and managerial control in a process.

Cell 8: IS plays a central role in processing high quality data or information needed for integrating various operational activities and enhancing the quality of decision making within an organization, streamlining organization-wide operational activities and adding sophistication to the decision making process for operational and managerial control in an organization.

Cell 9: IS plays a pivotal role in transferring high quality data or information demanded for integrating inter-related

operational activities and streamlining the decision making process across organizations, supporting operational integration across many organizations and enhancing the quality of cooperative decision-making processes beyond the boundaries of an organization.

RESEARCH METHODOLOGY

An in-depth case study on HMC, which is a leader in Korean automotive industry, was performed to analyze how IS evolves based on the framework presented in this paper. The procedures of this case study can be summarized as follows.

Step 1.

In 1996, an analysis was done to compare the pattern of growth of Hyundai, Daewoo, and KIA. A variety of chronicles of Korean automotive industry and company records were used in the analysis.

Step 2.

Subsequently, the details on IS of HMC developed over the past 30 years and contextual factors such as strategic goals, resources, and performance were investigated. Again, raw data were obtained from HMC's well documented history books(1987, 1992, 1997), company records, plant tours, and interviews with executives in IS, manufacturing, marketing, accounting, human resources, and R&D.

Step 3.

In-depth interviews with IS seniors and executives were done over 10-times to identify the backgrounds, purposes, and features of 356 IS applications which were introduced or developed over the past 30 years in HMC.

Step 4.

Using the framework and collected data, IS developed over the past 30 years was analyzed in the developmental process of HMC. And, the case writeup covering 1967 to 1998 was completed in 1998. It was

thoroughly reviewed by IS seniors and executives of HMC.

ROLE OF INFORMATION SYSTEMS IN HMC'S GROWTH

Overview of Hyundai Motor Company

HMC was founded in 1967, and though it was a follower in the Korean automotive market at that time, it has, by now, achieved a position as the leader through the application of technology and development of new models. HMC has also successfully gained international competitive advantage due to outstanding performance, quality, and safety, as well as its high value-for-money rating. In this epochal developmental process of HMC, key factors are shown in the Table 4(Hyundai Motor Company, 1987; 1992; 1997).

As Table 4 shows, HMC has grown through four stages of development. Each can be characterized by key product that reflected the strategic orientation and the level of technological capabilities.

STAGE 1: MANUAL-ORIENTED INFORMATION PROCESSING (1967-1975)

HMC was a part of the Korean automotive industry from its earliest times. The Korean automotive industry was characterized by low demand, a small number of suppliers, and moderate competition among Shinjin, Kia, and Asia at that time. HMC entered the domestic market in 1968 by introducing *Cortina* as its first model, and struggled to survive while developing the *New-Cortina* in 1972.

To accomplish the goal of surviving in the domestic market, HMC concentrated its capabilities on establishing production facilities for assembling imported parts from Ford, and on sales channels distributed in large cities such as Seoul and Pusan.

Table 4 key models of cars and resources in HMC

Stage Element	Stage1 (1967?1975)	Stage2 (1976?1984)	Stage3 (1985?1993)	Stage4 (1994?1998)
Key models of Cars(year)	*Cortina('68-'71) *Ford 20M('69-'73) *New-Cortina('71-'76)	*Pony('75-'82) *Mark4('77-'80) *Granada('78-'82) *Mark5('80-'83) *Pony2('82-'90) *New-Granada('82-'86) *Stella('83-'92)	*Excel('85-'89) *Presto('85-'89) *Grandeur('86-'92) *Sonata('88-'93) *New-Excel('89-'94) *Scoupe('90-'95) *Elantra('90-'95) *Sonata2('93-'96) *New-Grandeur('92-Now)	*Accent('94-Now) *Avante('95-Now) *Marcia('95-'97) *Sonata3('96-Now) *Tiburon('96-Now) *Dynasty('96-Now) *New-Marcia('97-Now) *Atoz('97-Now)
Total production Capacity per year\ Number of cars Produced(year)	*16,000\ 12,000('68) *93,500\ 56,000('75)	*93,500\ 56,000('76) *137,500\ 100,000('79)	*337,500\ 300,000('85) *637,500\ 600,000('87) *737,500\ 600,000('88) *977,500\ 840,000('90) *1,077,500\ 840,000('92)	*1,077,500\ 840,000 ('94) *1,177,500\ 840,000 ('95) *1,477,500\ 1,140,000('96)
Total sales Volume(unit)\ The number of Cars exported (year)	*-\ 0('68) *7,820\ 0('69) *4,062\ 0('72) *7,312\ 0('75)	*19,057\ 631('76) *38,615\ 4,523('77) *90,747\ 14,493('79) *70,954\ 15,199('81) *138,463\ 48,186('84)	*230,653\ 118,583 ('85) *423,500\ 297,964 ('86) *597,582\ 403,419 ('87) *603,673\ 213,639 ('89) *767,487\ 254,108 ('91) *967,177\ 337,363 ('93)	*1,115,871\ 354,643 ('94) *1,201,174\ 404,813 ('95) *-\ 565,235('97)
Total employees\ R&D employees (year)	*590\ -?'68) *2,970\ -?'69) *1,851\ -?'72) *2,953\ -?'75)	*4,187\-('76) *12,676\-?'79) *9,118\-('80) *12,490\98('84)	*17,596\200('85) *29,083\339('87) *38,623\512('90) *41,311\649('92)	*44,158\816('94) *47,174\1,309('96) *46,683\1,169('97)

Consistent increase in production and sales during this period required more efficient data processing: HMC did not made aggressive efforts to utilize IT for managing business more efficiently. This stage can be regarded as a kind of 'pre-genesis age' from the IS point of view: That is, the first stage can be characterized by manual-oriented information processing from the information processing point of view.

STAGE 2: AUTOMATION-ORIENTED IS ROLE (1976-1984)

HMC set a more ambitious goal of sustaining competitive advantage as the leader in the Korean market and entering the foreign markets. To accomplish these goals, HMC focused its capabilities on developing its own model that can meet the needs of foreign and domestic customers. HMC successfully introduced *Pony* into domestic sub-compact market in 1975 and *Stella* into compact markets in 1983, respectively.

To be a more cost-effective manufacturer, HMC enlarged its manufacturing plant in 1979, expanding the total production capacity up to 133,500 units a year. In addition, HMC established nationwide distribution channels in Korea and a few branch offices abroad such as in Europe, Middle East, and Africa.

The fast growth of HMC, however, was accompanied with operational management problems. HMC had been expanding markets(from domestic to foreign), production facilities, products(sub-compact, compact, large-sized) and other capabilities, increasing

the amount of data to be processed and complexity of organizational activities tremendously. Thus, it has become almost impossible to manually process routine activities in such processes as inventory, assembling, sales, and payroll.

HMC began to apply IT first to more or less well-formed routine activities to solve inefficiencies such as low productivity, and inaccuracy and delay in high volume data processing. IS applications introduced or developed can be mapped on the framework as Table 5.

The IS applications to be noted are payroll system, Bill of Material(BOM) system, Assembly Line Control(ALC) system, and production management system.

Payroll system developed in 1979 enabled the payroll of 7,000 employees to be calculated more accurately and rapidly. Thus, the number of employees needed for processing payroll decreased to 2 from previously 20.

The computerization of BOM in 1976 made it possible to reduce the complexity of BOM management caused by ever-increasing types of models, and to provide more accurate data on production parts related to activities such as production planning, marketing, purchasing, and inventory.

ALC system was installed to collect massive data about how much work has been done and how much material has been used on key points of assembly line such as press and painting.

Production management system developed to support operational planning and control on finished cars and commercial vehicles in 1978 and 1981, respectively. It improved efficiency in overall production scheduling, planning, and control management at the operational level.

IS in this period was intentionally developed to process high volume data of daily operations within individual process, improving the efficiency in day-to-day operation and operational control. The major role of IS can be regarded as 'processing high volumes of data' of daily operations in 'intra-process', as seen in Table 5.

Table 5 classification of IT applications in the second stage

Purpose / Scope	Processing high volumes of data	Processing a variety of information	Processing a high quality of information
Intra-process	-human resource management (1) -finance/accounting management (5) -inventory management (3) -installment management (1)	-repair management (1) -CAE/CAT (2)	
Inter-process	-process management (2) -production management (2)	-inventory management (1) -production management (1)	
Inter-organization			

* the number in the () is the number of applications developed

STAGE 3: LINKAGE-ORIENTED IS ROLE (1985-1993)

HMC entered the era of mass production by opening three additional manufacturing plants in Ulsan in 1985, 1990, and 1992, respectively. Then, HMC's total production capacity soared to more than a million units a year. Reaching to the capacity of economy of scale, HMC oriented its strategic target to the U.S. market with *Excel* and *Sonata*. In the Korean market, HMC reinforced its position as the leader with much more variety of models such as *Scoupe*, *Elantra*, and *Grandeur*. In the foreign markets, including U.S., it continued pursuing growth in sub-compact and compact markets with *Excel* and *Sonata*.

HMC prospered in all areas of resources: the steep growth in production and sales, diversified markets including foreign markets, more variety of models, and more advanced technologies developed in-house. However, this kind of prosperity accelerated increasing complexities and volume of data and information to be processed for business processes and management. Efficient and effective coordination among processes and overall control spanning from purchasing to after-service was raised as critical issues.

Some examples related to the information processing are as follows : the data flow between processes was delayed, causing the inefficiency in operational coordination; the feedback information for linking 'plan-do-see' activities was not provided immediately; it was impossible for managers to quickly acquire managerial information because it was difficult to collect, compare, and aggregate data from various sources; there were much difficulty in the communications between role occupants across functions, and in the interactions with related companies such as contractors, suppliers, and so on.

To solve these problems, HMC initiated more heavy investment in IS infrastructure, purposely for providing a variety of data and/or information with regard to various business processes, and for facilitating communications between co-workers. Based on the framework, IS applications developed in this period can be categorized as Table 6.

IS applications in the third stage were characterized by standardization and integration of data. For instance, database and data communication network were introduced in some processes, creating a formalized and standardized language which facilitated high volumes of data flow across processes and thus made it possible to produce more aggregated data for managerial activities.

Local Area Network(LAN) for departmental or group work accelerated sharing information resources such as hardware, software, and data. Furthermore, data could be transferred and shared through Value Added Network(VAN) between HMC and its cooperators or foreign branches.

In the third stage, IS applications such as accounting management system, BOM system, ALC system, human resource management system, marketing management system, and inventory management system were upgraded for the changing processes.

Cost accounting concept was firstly introduced in the accounting management system in 1988. More advanced accounting made it possible to estimate cost for each product specification, which helps managers make better decisions.

Another big change was made in the BOM system in 1993: the top-down data structure of 'part to product' was changed to the structure of 'product to part'. The previous data structure was a heritage of imported material management, and was appropriate when HMC had purchased parts and assembled them. But, as HMC started producing its own products and more various products, the 'from part to product' material management could be no longer appropriate. By restructuring BOM, a bill of materials could be generated more easily and accurately.

ALC system was redesigned to automate the collection process of production data across the entire assembly line, contributing to make production management more flexible and reliable, and speeding up the response time to various customer needs.

Table 6 classification of IT applications in the third stage

Purpose / Scope	Processing high volumes of data	Processing a variety of information	Processing a high quality of information
Intra-process	-human resource management (7) -inventory management (5) -production management (2) -press management (1) -finance/accounting management (1) -installment management (3)	-human resource management (1) -cost accounting management (2) -inventory management (2) -production management (1) -quality management (5) -plant maintenance (2) -repair management (1) -CAE/CAT (14)	
Inter-process	-inventory management (2) -OA (1) -office documents management (1) -process management (9) -production management (1) -press management (3) -parts production management (1) -finance/accounting management (1) -domestic sales management (3) -foreign sales management (3)	-human resource management (2) -cost accounting management (2) -inventory management (3) -production management (5) -press management (2) -parts production management (1) -installment management (2) -domestic sales management (1) -foreign sales management (1) -repair management (2)	
Inter-organization	-inventory management (1) -production management (1)	-human resource management (1) -inventory management (2) -installment management (1) -domestic sales management (1) -foreign sales management (1) -repair management (1)	

* the number in the () is the number of applications developed

Human resource management system was modified with redesigning business processes. Together with linking processes previously separated, the redesigned human resource management helps managers evaluate employee's performance better.

Paper work in sales had been done manually before 1985, causing frequent errors, delivery delays and lack of sharing with related processes such as production. A new sales support system replaced most of the paper work, and also automated data transfer online between sales and related processes including production.

It is observed that information processing requirements in this period go beyond massive data processing and within the boundary of single process. IS expanded its role into supporting more than one process and/or processing more variety of information. Rather than massive data processing, data flows and sharing among processes became a more prominent issue since it became more critical to success to plan better and coordinate across processes more efficiently and effectively.

STAGE 4: INTEGRATION-ORIENTED IS ROLE (1994-1998)

HMC's long time efforts to have it's own engine technology payed off with Alpha, Beta-engines successfully developed and commercialized in 1994 and 1995. HMC also completed the construction of their fifth and sixth manufacturing plants to increase total production capacity a year in 1994 and 1995. Furthermore, HMC built foreign manufacturing plants and branches in many countries such as Turkey, India, Indonesia, and Malaysia to cover a wide range of world markets. HMC's sophisticated production and technological capabilities enabled HMC to be able to offer a wide variety of lines, with many choices of body style. HMC became an automobile manufacturer with a full line-up of quality equipment and service.

There have been more fluctuations in environmental situations, requiring HMC to have more and better information processed to get adjusted to them continuously. HMC realized that it had to change itself from a high-growth pep rally kind of organization to a more dynamic and stable organization. As a way of transforming to a more flexible and well-integrated organization, HMC made an aggressive effort to streamline processes. IS applications are also required to support organizational transformation, integrating processes within it and linking it with the environment. IS applications developed in this period can be classified as Table 7.

Table 7 classification of IT applications in the fourth stage

Purpose / Scope	Processing high volumes of data	Processing a variety of information	Processing a high quality of information
Intra-process	-human resource management (2) -office documents management (2) -inventory management (7) -finance/accounting management (1) -domestic sales management (1) -foreign sales management (1) -quality management (1)	-cost accounting management (5) -plant maintenance (2) -quality management (5) -production management (1) -press management (1) -plant maintenance (2) -domestic sales management (2) -foreign sales management (2) -CAE/CAT (9)	-human resource management (1) -cost accounting management (4) -process management (1) -press management (1) -inventory management (2)
Inter-process	-human resource management (1) -office documents management (2) -inventory management (4) -process management (9) -production management (1) -press management (5) -finance/accounting management (2) -foreign sales management (1)	-cost accounting management (1) -office automation (2) -inventory management (6) -quality management (1) -production management (4) -press management (3) -parts production management (1) -parts molding and cutting management (1) -domestic sales management (3) -foreign sales management (3) -repair management (1)	
Inter-organization	-inventory management (1) -finance/accounting management (1) -installment management (1) -repair management (2)	-office automation (3) -inventory management (1) -production management (1) -domestic sales management (1) -foreign sales management (1) -repair management (1)	

* the number in the () is the number of applications developed.

The characteristics of IS applications are to improve the quality of information and to integrate business processes. By developing or redeveloping IS applications, processes have been integrated in such functions as production, human resource, cost accounting, purchasing, pre-delivery inspection, inventory, and ALC.

Production management system was refined in 1994 to integrate different divisions of cars and commercial vehicles, and also production planning and operational control process. In addition, as production management system got linked to sales management system, it got easier to forecast demand, to balance the master production schedule and to confirm delivery date.

Human resource management process was reengineered in 1996. Data resources were standardized and integrated into relational database that had been managed in either VSAM or hierarchical structure. Together with the reengineered processes, relational database could allow well structured and flexible data access capability. Data consistency and reduction in data redundancy were removed.

Cost accounting system was redesigned to integrate the related processes in production, sales, logistics, purchasing, and so on. More comprehensive and accurate cost data could be calculated and fed back to management process.

EDI was incorporated to facilitate information sharing across related entities such as contractors, affiliated companies, suppliers, customers, and so on. EDI had been rapidly diffused into those organizations and helped them reduce paper work, process data more accurately and quickly, and thus increase the overall productivity in the data transfer among the organizations.

The basic philosophy of the IS applications above is to streamline business processes and to improve management capability, and thus enable HMC to respond more flexibly to rapidly changing environment. IS in this stage expanded its role into processing high quality information required for managerial decision making. Processes within the organization and between organizations were integrated and better coordinated by the IS applications.

THE EVOLUTION OF THE ROLE OF IS IN HMC: THE SUMMARY

In summary, it is found that IS in HMC have been changing in its role along with the organizational growth.

In the second stage, the work overload occurred in the operational activities due to the rapid growth in production related activities, causing inefficiencies in tasks such as production, ALC, and accounting. IS applications were developed to provide massive data processing capabilities for operational activities consisting of production related processes that were a major bottleneck in organizational growth. The role of IS in this period had been limited to processing high volumes of data within individual processes.

In the third stage, new organizational activities were brought into the organization and current activities were getting more complicated due to the expansion of production facility, target markets, and variety of models. The sharp increase in complexity and quantity in every function required a new role for IS: better communication vertically and horizontally for control and coordination, linking activities among processes, and processing more variety of information.

In the fourth stage, the role of IS was expanded into inter-organizational data and information processing and high-quality information processing. This kind of change in its role was initiated by the management requirements for integrating processes within the organization and among organizations to be more competitive.
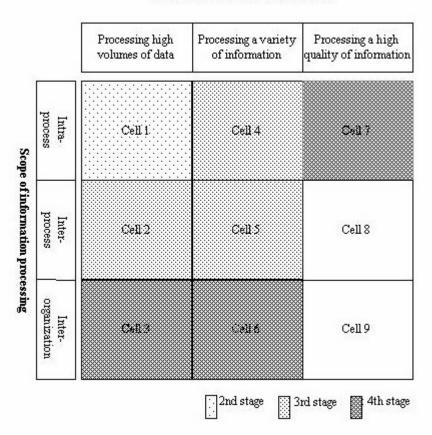
Even though no systems to belong to cell 8 and 9 was developed at the moment of this research, new systems such as ERP, DW, and CALS were planned to be built, which can be classified as the systems for cell 8 and 9. Those systems are expected to streamline and integrate the operational activities, and to enhance the quality of cooperative decision making processes drastically within HMC and across related organizations.

The changing role of IS in the growth stage of HMC can be delineated as in Figure 2. That is, the purpose of information processing has been changed from 'processing high volumes of data' to 'processing a variety of information', and further to 'processing high quality information'. The scope of information processing has been expanded from 'intra-process' to 'inter-processes', and further to 'inter-organizations'. In consequence, IS have played a different role in supporting organizational activities in the developmental process of HMC over the past 30 years.

CONCLUSIONS

There has been much research on how IT can be utilized to improve efficiency and effectiveness in organizations from various points of view. However, it seems that much of the past work discussed the role of IS in a limited and static context. In particular, few researches present the changing role of IS in organizational developmental stages systematically and comprehensively.

To overcome these limitations, this paper presented an integrated framework that can explain how IS evolves in organizational growth. The framework with the purpose and scope of information processing was developed based on the priori interviews with IS managers of HMC and extensive review on the past researches discussed the role of IS in organizations. In-depth case study was done on a Korean car manufacturing firm to verify the applicability of the framework.

Figure 2 the changing role of IS in the growth of HMC.

On the basis of the case analysis, the role of IS to be important has differed in terms of the purpose and scope of information processing as the organization grows. That is, the purpose of information processing has been changed from 'processing high volumes of data' to 'processing a variety of information' and further to 'processing high quality information', and its scope has been expanded from 'intra-process' to 'inter-process' and further to 'inter-organization'.

Considering the findings, a possible evolution of IS that can be generally applied to many organizations is characterized as follows.

Firstly, at the initial stage of organizational growth, data can be processed manually because there are a small number of tasks coupled loosely with each other and the transaction volumes are relatively low.

Secondly, when the work overload occurs that causes the inefficiency in data processing, IS begins to be mainly applied to well-structured tasks within individual processes for processing high volumes data of daily operations by automating those tasks.

Thirdly, when there is the demand for linking and coordinating varied tasks to facilitate massive data flow and communication, IS plays an important role in processing a variety of data or information, improving the efficiency in operational coordination and managerial control within and across organizations.

Finally, when there is the demand for integrating business processes to cope with rapidly changing environment, IS plays a pivotal role in processing high quality of data or information, integrating inter-related operational activities and adding sophistication to the decision making process for operational and managerial control within and across organizations.

The implications of this paper are identified as follows.

First of all, this paper proposed an integrated framework for analyzing the evolution of IS in organizational growth. This study also verified the applicability of the framework by in-depth case study on a Korean car manufacturing firm. It is believed that the framework can serve to integrate previous researches while stimulating future research with regard to the role of IS in organizations from the longitudinal point of view.

Secondly, the evolution of IS in organizations can be explained systematically using the framework presented in this paper. That is, it is expected that IS managers in organizations can identify the role IS plays in their organizations up to the present, and can determine the role IS should perform to meet the changing organizational information requirements in the future.

The limitation of this research is that this study was performed on only one company in Korean automotive industry. Therefore, it is required that more empirical studies should be done on various industries and companies to reinforce the changing role of IS in organizational growth based on the framework identified in this paper.

ACKNOWLEDGEMENTS:

REFERENCES

Abernathy, W.J. (1978). & Utterback, J.M. Patterns of Industrial Innovation. *Technology Review*, June-July , 80, 40-70.

Allen, J.I. (1970). Communication Networks in R&D Laboratories. *R&D Management*, Oct, 14-21.

Alloway, R.M. & Quillard, J.A. (1983). User Manager's Systems Needs. *MIS Quarterly*, June, 27-41.

Alter, S. (1991). *Information Systems: A Management Perspective*. Addison-Wesley Publishing Co.

Anthony, R.N. (1965). *Planning and Control Systems: A Framework for Analysis*. Harvard University Press, Cambridge, MA.

Bakos, J.Y. & Treacy, M.E. (1986). Information Technology and Corporate Strategy: A Research Perspective. *MIS Quarterly*, June, 107-119.

Boon, S.N. (1991). Information Technology and Global Competition: A Framework for Analysis. *Information and Management*, 20, 151-160.

Boynton, A.C. (1993). Achieving Dynamic Stability through Information Technology. *California Management Review*, Winter, 58-77.

Broadbent, M. & Weill, P. (1993). Improving Business and Information Strategy Alignment: Learning from the Banking Industry. *IBM*, No.1.

Burawoy, M. (1979). *Manufacturing Consent: Changes in the Labor Process Under Monopoly Capitalism*. Chicago: University of Chicago Press.

Camillus, J.C. & Lederer, A.L. (1985). Corporate Strategy and the Design of Computerized Information Systems. *Sloan Management Review*, Spring, 35-42.

Cash, J.I. & Konsynski, B.R. (1985). IS Redraws Competitive Boundaries. *Harvard Business Review*, March-April, 63(2), 134-142.

Chandler, Jr.A. (1962). *Strategy and Structure*. MIT Press, Cambridge.

Chenhall, R.H. & Morris, D. (1986). The Impact of Structure, Environment, and Interdependence on the Perceived Usefulness of Management Accounting Systems. *The Accounting Review*, January, LXI(1), 16-35.

Clemons, E.K. (1986). Information Systems for Sustainable Competitive Advantage. *Information and Management*, 11, 131-136.

Cooper, R.B. (1985). Identifying Appropriate MIS/DSS Support: A Cost Analysis Approach. *Proceedings of the 6th International Conference on Information Systems*, December, 89-104.

Daft, R.L. & Lengel, R.H. (1986). Organizational Information Requirement, Media Richness and Structural Design. *Management Science*, May, 32, 554-571.

Daft, R.L. & Macintosh, N.B. (1978). A New Approach to the Design and Use of Management Information. *California Management Review*, 21, 82-92.

Daft, R.L. & Macintosh, N.B. (1981). A Tentative Exploration into the Amount and Equivocality of Information Processing in Organizational Work Units. *Administrative Science Quarterly*, 26, 207-224.

Das, S.R., Zahra, S.A. & Warkentin, M.E. (1991). Integrating the Content and Process of Strategic MIS Planning with Competitive Strategy. *Decision Science*, 22(1), 953-984.

Davidson, W.H. (1993). Beyond reengineering: The three Phases of Business Transformation. *IBM Systems Journal*, 32(1), 65-79.

Davis, G.B. & Olson, M.H. (1985). *Management Information Systems* (2nd Ed.). McGraw-Hill, NY.

Dearden, J. (1967). Computers: No Impact on Divisional Control. *Harvard Business Review*, Jan.-Feb., 99-104.

DiMaggio, P.J. & Powell, W.W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review*, 48, 147-160.

Edwards, R. (1979). *Contested Terrain: The Transformation of the Work Place in the Twentieth Century*. New York: Basic Books.

Ein-Dor, P. & Segev, E. (1978). Organizational Context and the Success of Management Information Systems. *Management Science*, 24(10), 1064-1077.

Ewusi-Mensah, E. (1981). The External Organizational Environment and its Impact on Management Information Systems. *Accounting, Organization and Society*, 6(4), 301-316.

Franco, L. (1974). The Move toward a Multi-Divisional Structure in European Organizations. *Administrative Science Quarterly*, 19, 493-506.

Freeman. J. & Hannan, M.T. (1983). Niche Width and the Dynamics of Organizational Populations. *American Journal of Sociology*, 88, 1116-1145.

Galbraith, J.R. (1973). *Designing Complex Organization*. Addison-Wesley Publishing Co., Reading, MA.

Ghani, J.A. (1992). Task Uncertainty and the Use of Computer Technology. *Information and Management*, 22, 69-76.

Ginzberg, M.J. (1992). Information Technology and Reengineering. *Proceedings of KMIS*, June, 18-30.

Goodhue, D.L., Wybo, M.D. & Kirsch, L.J. (1992). The Impact of Data Integration on the Costs and Benefits of Information Systems. *MIS Quarterly*, 16(3), 293-311.

Gordon, L.A., Larcker, D.F. & Tuggle, F.D. (1978). Strategic Decision Processes and the Design of Accounting Information Systems: Conceptual Linkages. *Accounting, Organization and Society*, 3(3-4), 203-213.

Gordon, L.A. & Miller, D. (1976). A Contingency Framework for the Design of Accounting and Information Systems. *Accounting, Organization and Society*, 1(1), 56-69.

Gordon, L.A. & Narayanan, V.K. (1984). Management Accounting Systems, Perceived Environmental Uncertainty and Organizational Structure: An Empirical Investigation.

Accounting, Organization and Society, 9(1), 33-47.

Gorry, G.A. & Scott Morton, M.S. (1971). A Framework for Management Information Systems. *Sloan Management Review*, Fall , 13(1), 55-70.

Greiner, L. (1972). Evolution and Revolution as Organizations Grow. *Harvard Business Review*, Jul.-Aug., 37-46.

Gul, F.A. & Chia, Y.M. (1994). The Effects of Management Accounting Systems, Perceived Environment Uncertainty and Decentralization on Managerial Performance: A Test of Three-Way Interaction. *Accounting, Organization and Society*, 19(4-5), 413-426.

Hannan, M.T. & Freeman, J. (1984). Structural Inertia and Organizational Change. *American Sociological Review*, April, 49, 149-164.

Hannan, M.T. & Freeman, J. (1977). The Population Ecology of Organizations. *American Journal of Sociology*, 82, 929-964.

Hyundai Motor Company (1987). *Hyundai Jadongcha Sa(The History of Hyundai Motor)*. Seoul: Hyundai Motor Company.

Hyundai Motor Company (1992). *Hyundai Jadongcha Sa(The History of Hyundai Motor)*. Seoul: Hyundai Motor Company.

Hyundai Motor Company (1997). *Hyundai Jadongcha Sa(The History of Hyundai Motor)*. Seoul: Hyundai Motor Company.

Ito, J.K. & Peterson, R.B. (1986). Effects of Task Difficulty and Interunit Interdependence on Information Processing Systems. *Academy of Management Journal*, 29(1), 139-149.

Ives, B. & Learmonth, G.P. (1984). The Information System as a Competitive Weapon. *Communications of the ACM*, 27(12), 1193-1201.

Kim, L.S. (1997). *Imitation to Innovation*. Harvard Business School Press.

King, W.R. (1978). Strategic Planning for Management Information Systems. *MIS Quarterly*, 2(1), 27-37.

Lawrence, P.R. & Lorsch, J.W. (1967). *Organization and Environment: Managing Differentiation and Integration*. Harvard University Press, Cambridge, Mass.

Leavitt, H.J. & Whisler, T.L. (1958). Management in the 1980's, *Harvard Business Review*. Nov.-Dec., 41-48.

Lee, S.R. & Leifer, R.P. (1992). Framework for Linking the Structure of IS with Organizational Requirements for Information Sharing. *Journal of Management Information Systems*, Spring , 18(4), 27-44.

Leifer, R. (1988). Matching Computer-based Information Systems with Organizational Structures. *MIS Quarterly*, March, 63-73.

Lippitt, G.L. & Schmidt, W.H. (1967). Crises in a Developing Organization. *Harvard Business Review*, 45, 102-112.

Macintosh, N.B. & Daft, R.L. (1987). Management Control and Departmental Interdependencies: An Empirical Study. *Accounting, Organization and Society*, 12(1), 49-61.

McFarlan, F.W. & McKenney, J.L. (1983). *Corporate Information Systems Management*. Richard D. Irawin Inc., Homewood(USA).

McKelvey, B. (1982). *Organizational Systematics*. Berkeley: University of California Press.

Meyer, J.W. & Rowan, B. (1977). Institutionalized Organizations: Formal Structure as Myth and Ceremony. *American Journal of Sociology*, 83, 340-363.

Mia, L. & Chenhall, R.H. (1994). The Usefulness of Management Accounting Systems, Functional Differentiation and Managerial Effectiveness. *Accounting Organizations and Society*, 19(1), 1-13.

Miller, D. & Friesen, P.H. (1984). A Longitudinal Study of the Corporate Life Cycle. *Management Science*, October, 30(10), 1161-1183.

Mintzberg, H. (1979). *The Structuring of Organizations*. Englewood Cliffs, NJ: Prentice-Hall.

Parsons, G.L. (1983). Information Technology: A New Competitive Weapon. *Sloan Management Review*, Fall, 25(1), 3-14.

Pfeffer, J. & Salancik, G. (1978). *The External Control of Organizations: A Resource Dependence Perspective*. NY: Harper & Row.

Porter, M.E. & Miller, V.E. (1985). *Competitive Advantage*. The Free Press, New York.

Premkumar, G. & King, W.R. (1973). MIS Project Management: Myths, Opinions and Reality. *California Management Review*, Spring, 15(3), 147-156.

Quinn, R.E. & Cameron, K. (1983). Organizational Life Cycles and Shifting Criteria of Effectiveness: Some Preliminary Evidence. *Management Science*, January, 29(1), 33-51.

Rice, R. (1992). Task Analyzability, Use of New Media, and Effectiveness: A Multi-Site Exploration of Media Richness. *Organization Science*, November, 3(4), 475-500.

Robey, D. (1981). Computer Information Systems and Organizational Structure. *Communications of the ACM*, 24(10), 679-687.

Rockart, J.F. & Scott Morton, M.S. (1984). Implications of Changes in Information Technology for Corporate Strategy. *Interfaces*, Jan.-Feb., 1, 84-95.

Rowe, A.J., Mason, R.O. & Dickel, K. (1982). *Strategic Management and Business Policy*. MA: Addison-Wesley.

Scott, B.R. (1973). The Industrial State: Old Myths and New Realities. *Harvard Business Review*, Mar.-Apr., 133-148.

Simon, H. (1960). The Corporation: Will It Be Managed by Machine?, in Melvin L. Anshen & George L.Bach(Ed.). *Management and Corporation*, NY: McGraw-Hill Co., 17-55.

Singh, J.V., House, R.J. & Tucker, D.J. (1986). Organizational Change and Organizational Mortality. *Administrative Science Quarterly*, 31, 587-611.

Specht, P.H. (1986). Job Characteristics as Indicants of CBIS Data Requirements. *MIS Quarterly*, September, 10(3), 251-270.

Stopford, J. & Wells, L. (1972). *Managing the Multinational Enterprise*. London: Longmans.

Tavakolian, H. (1989). Linking the Information Technology Structure with Organizational Competitive Strategy. *MIS Quarterly*, 13(1), 23-47.

Teng, J.T.C., Grover, V. & Fiedler, K.D. (1994). Business Process Reengineering: Charting a Strategic Path for the Information Age. *California Management Review*, Spring, 36(3), 9-31.

Thompson, J.D. (1967). *Organization in Action*. McGraw-Hill, NY.

Tushman, M.L. & Nadler, D.A. (1978). Information Processing as an Integrating Concept in Organization Design. *Academy of Management Review*, 3(3), 613-624.

Tushman, M.L. & Romaneli, E. (1985). Organizational Evolution: A Metamorphosis Model of Convergence and Reorientation. *Research in Organizational Behavior*, 7, 171-222.

Venkatraman, N. (1994). IT-Enabled Business Transfomation: From Automation to Business Scope Redefinition. *Sloan Management Review*, Winter, 35(2), 73-87.

Vitale, R.R., Ives, B. & Beath, C.M. (1986). Linking Information Technology and Corporate Strategy: An Organizational View. *Proceedings of the Seventh International Conference on Information Systems*, December, 265-276.

Yadav, S.B. (1985). Classifying and Organization to Identify its Information Requirements: A Comprehensive Framework. *Journal of Management Information Systems*, 2(1), 39-60.

Zigurs, I. & Buckland, B.K. (1998). A Theory of Task/Technology Fit and Group Support Systems Effectiveness. *MIS Quarterly*, September, 313-334.

Zmud, R.W. (1983). *Information Systems in Organization*. Scott, Foreman and Company, Palo Alto, CA.

AUTHORS

Jaemin Han is a professor in the School of Business Administration at Korea University. He received his Ph.D from the University of Iowa. His current interests include strategic use of information systems, applications of artificial intelligence in business, expert systems, and technology analysis and forecasting of telecommunications industry.

Jongsoo Yoon is a senior consultant in the Division of Data Warehouse & Business Intelligence (DW/BI) at SAS Korea. He received his Ph.D from the Korea University. His current research interests include use of information technology in business, strategic information systems planning, analysis of telecommunications strategy, and process innovation.

Yoojeong Kim is a director of Strategic Planning Division at the Digitmate CO. LTD, which is doing a variety of businesses in wired and wireless internet business in Korea. She received her Ph.D from the Korea University. Her current research interests include electronic commerce, use of information technology in business, process innovation, and analysis of telecommunications strategy and technology.