

An Empirical Study on the Advantages of EDI Implementation in Korean Companies

Byung-Gon Kim

*Department of Digital Business Administration
Namseoul University, Cheonan 330-707, Choongnam, Korea
Tel: +82-41-580-2137, E-mail: bgkim@nsu.ac.kr*

Jong-Uk Kim

*School of Management
Yeungnam University, Kyungsan 712-749, Kyongbuk, Korea
Tel: +82-53-810-2749, E-mail: jukim@ynuucc.yeungnam.ac.kr*

Soon-Chang Park

*Department of Information Systems
Taegu Science College, Taegu 702-723, Taegu, Korea
Tel: +82-53-320-1199, scpark@wmail.taegu-c.ac.kr*

I. INTRODUCTION

Due to innovative advancement in telecommunications technologies, the business environments are moving fast toward those of information societies. The telecommunications of previous years have been utilized for internal usages, but those in current years have widely extended even to usages for Interorganizational Information System (IOIS) beyond its internal uses.

EDI, a subsidiary form of IOIS which permits interorganizational electronical exchanges of transaction documents through the telecommunications networks between and among computers, is expected to bring forth various innovative results with improved efficiency and productivity through the improvement and simplification of transaction processes. And it became needed and significant to review studies with practical values and necessity. The results by many scientists that the EDI system, a

major telecommunications technology to the improvement of organizational efficiency and performance, provide advantages to the businesses.

EDI has come to revolutionize in recent years the way in which businesses conduct their trading activities. Based on the establishment of trading partner relationships, EDI systems have come to signify a speedy, efficient, and accurate means of electronically exchanging business transactions. Ranging from the manner in which purchases are made to payments are remitted, they can contribute to reducing paperwork, decreasing human error, increasing accuracy, and improving productivity (Arunachalam, 1995).

The major objectives of research is to identify factors influencing in the advantages of EDI implementation by Korean business entities. Business which already implementation of EDI system in their organizations were subjected to the

survey. The aim of this study is therefore to answer the two following questions:

1. What are the advantages achieved through the implementation of EDI systems ?
2. What are the influencing factors for the advantages of EDI systems implementation ?

II. LITERATURE REVIEW

2.1 Previous Studies on EDI Advantages

Organizations are realizing that to increase their efficiency and profitability they must implement EDI (Bakos, 1985). EDI responds to a need for a more rapid and accurate exchange of information between firms (Kimberley, 1991). As Rockart and Short (1989) write : "Competitive pressures are now forcing almost all major firms to become global in scope, to decrease time to market, and to redouble their efforts to manage risk, service and cost on a truly international scale."

Increased speed was the benefit most often mentioned (Ragsdale and Gilbert, 1990; Spence, 1991). Speed included a reduction in transaction time and in cycle time. In the words of Holland et al. (1992), EDI links remove the constraints on volume and speed of information flows between separate organizations. The elimination of duplicated data entry was also high on the list (Ives, Olson, & Baroudi 1983; Emmelhainz, 1993). Cost reduction was also considered an important benefit (Gifkin and Hitchcock, 1988; Belitos, 1988).

Cost reductions were seen in terms of

labour costs and a reduction in the administration of paperwork. Quicker and better access to information (Sokol, 1989; Farhoomand and Drury, 1996) was reported as a benefit because information was more readily available to provide to the customer, which in turn led to improved customer service (Emmelhainz, 1993; Farhoomand and Drury, 1996). This more efficient access to information was also reported to improve trading partner relationships due to the fact that companies could now share information regarding not only stock and orders but about production schedules (Emmelhainz, 1990).

Dearing (1990) categorizes the benefits of EDI into three classes : direct, indirect, and strategic. The direct benefits of EDI include time needed to exchange information is greatly reduced, less rekeying and fewer errors, and reduced personal costs. Indirect benefits include lower inventory levels, enhanced materials, fixed asset, and cash management. Strategic benefits include developing closer ties with customers or suppliers through the sharing of information, market share expansion through increased responsiveness, and new businesses made possible by EDI.

The advantages of EDI, the dependent variable, include various types of operational, managerial, and strategic benefits that can be derived from EDI use. These advantages relate to improvements in information quality, transaction speed, administrative costs, competitive advantage, and operations management (Banker and Kauffman, 1988; Bytheway and Braganza, 1992; O'Callaghan et al., 1992; Bergeron and Raymond, 1992, 1997). Bergeron and Raymond (1992) confirmed empirically the content of this

construct and the hierarchy of advantages accrued from EDI.

A list of the potential benefits of EDI compiled from Hansen and Hill(1989) are briefly presented below: (1) Improves data accuracy (2) Eliminates manual sorting, matching, filing, mailing (3) Provides quick response and access to information (4) Reduced inventory cost, manufacturing cost, administrative cost (5) Augments cycle time reduction programs (6) Improves scheduling accuracy (7) Improved productivity

Scala and McGrath(1993) reported advantages and disadvantages of electronic data interchange. Their findings top ten advantages are as follows: (1) EDI improves the accuracy of information and reduces errors. (2) EDI reduces data reentry. (3) EDI speeds the transmission of information between organization. (4) EDI reduces inventory and inventory carrying costs. (5) EDI enhances our relationship with customers and suppliers. (6) EDI complements and enhances our company's marketing effort. (7) EDI improves productivity. (8) EDI reduces the paper flow between organizations. (9) EDI standardizes programs and procedures. (10) EDI allows for the reduction in personal.

2.2 Previous Studies on IOS and EDI Implementation

According to a recent study which reviewed research trends in EDI systems released lately, foreign studies on EDI until 1998 counted about 60 issued on major academic journals, and doctoral theses on EDI and IOIS, bestowed in the Northern American universities, counted about 38. About 10 papers were released in MIS

related academic journals published in Korea excluding several doctoral theses in Korean universities.

It's very rare to find studies done in Korea which have direct relationship, this research has focused on 3 theses published in international journals and 4 doctoral theses by Korean researchers, which have direct relationship with the purpose of this thesis, as subjects of previous research relevant to the thesis. Among these 7 papers, one paper is doctoral thesis on the adoption and implementation of IOIS, 3 other papers issued on international journals are about the implementation of EDI systems, the remaining 3 papers are doctoral theses on the adoption and implementation of EDI. All of 7 theses are can be classified into two categories; theses on innovation diffusion theories and on the implementation of information systems.

III. RESEARCH MODEL AND HYPOTHESES

3.1 Research Model

This research developed a research model based on various theories of innovation diffusion, implementation of information systems, implementation of inter-organizational information systems(Grover, 1990), and other studies on the implementation of EDI systems(Hwang, 1991; Kym, 1991; Bergeron & Raymond, 1992; McGowan, 1994). Previous studies discussed up until now mostly have adopted innovation characteristics, organizational characteristics, environmental characteristics

Table 1. Research Variables

Categories	Variables	Source
Organizational Characteristics	<ul style="list-style-type: none"> • Size • Decentralization • Formalization • Management Risk Position 	Grover(1990), Hwang(1991) McGowan(1994),Kim & Park(1996) Choe et al.(1997)
Technical Characteristics	<ul style="list-style-type: none"> • Technical Expertise • EDI Standards • Technical Compatability • Technical Support of Vendors 	Grover(1990), Hwang(1991) Premkumar et al.(1994) McGowan(1994),Kim & Park(1996)
Managerial Characteristics	<ul style="list-style-type: none"> • Education and Training • User Involvement • Top Management Support • Control Procedures 	Carter et al.(1987) Grover(1990), Hwang(1991) Kym(1991), McGowan(1994) Bergeron & Raymond(1992, 1997) Kim & Park(1996) Choe et al.(1997)
Environmental Characteristics	<ul style="list-style-type: none"> • Participation by Trading Partners • Information Intensity • Industry Cooperation • Industry Concentration 	Grover(1990), Hwang(1991) McGowan(1994),Kim & Park(1996) Bergeron & Raymond(1992, 1997)
EDI Advantages	<ul style="list-style-type: none"> • Time Reduction • Data Accuracy • Business Level Improvement • Cost Down • Competitive Advantage 	Ives, Olson, & Baroudi(1983) Banker and Kauffman, 1988 Hansen & Hill(1989) Bakos(1985), Emmelhainz(1990) Bytheway and Braganza, 1992 O'Callaghan et al., 1992, Bergeron & Raymond, 1992, 1997

as research variables(Grover & Goslar, 1993; Premkumar et al., 1994; McGowan, 1994). And factors, which affect the implementation of EDI systems, were classified into two; technical issues and organizational or managerial issues(Emmelhainz, 1993).

But this study, after reviewing all the variables studied previously, intends to classify organizational characteristics into structural, managerial characteristics, and technical characteristics is classified into another category, in addition to environmental characteristics. All the variables, therefore, adopted in the study can

be classified into 4 different categories.

The rationale of classifying variables into 4 different categories is as follow. Most studies done in foreign countries did not classified organizational and managerial characteristics into distinct variables and so considered one factor group in their study designs. But, in this study, organizational and managerial characteristics are classified as two distinct separate characteristics. Because the managerial environment, under which Korean companies are operating, are different from that of foreign businesses in such aspects as forms of organizational

structure, types of management, institutions and cultures. For example, even though Hyundai Group and LG Group both have adopted division system, they are quite different from each other in their management forms and styles.

And most previous studies did not classified technical characteristics as a distinct factor and merged and studied this factors into innovative, organizational, environmental researcher's experience, it's necessary for technical characteristics to be distinguished from other characteristics. Because factors related to technical characteristics are characteristics categories.

But, according to controlled not by managerial staffs, but by technical staffs in the organizations.

The backbone of this study are managerial and technical characteristics. Because most Korea big businesses used to classify managerial and technical positions in their job distinction. Moreover they classify managerial and technical positions distinctive even in the classifications of works in operations management or computer related jobs. Accordingly, managerial and technical characteristics in the implementation of EDI systems are considered to be closely inter-related. Emmelhainz(1993) considered

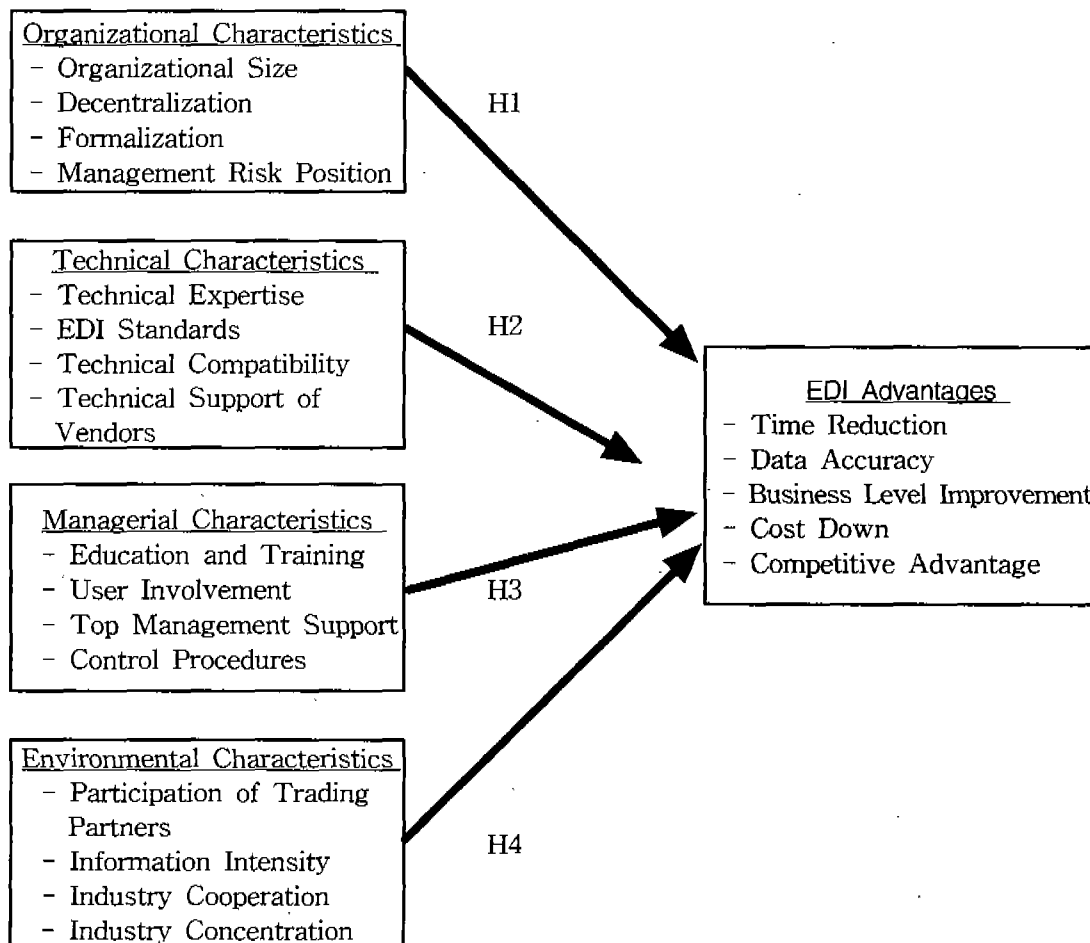


Figure 1. Research Model

standardization of EDI, EDI hardware, EDI software, and networks as technical characteristics. Walton(1994) adopted in his study of total costs in implementing EDI the level of data integration, the level of data sharing within the organization, and the level of changes in the process of business as technical variables. Theoretical background and model derived from review of previous research are found in <Table 1> and <Figure 1>.

3.2 Research Hypotheses

1) Organizational Characteristics

Hypothesis 1.1 : There is a positive relationship between the larger size of the organization and the advantages obtained from EDI.

Hypothesis 1.2 : There is a positive relationship between the level decentralization of the organization and the advantages obtained from EDI.

Hypothesis 1.3 : There is a positive relationship between the more formalized organizations and the advantages obtained from EDI.

Hypothesis 1.4 : There is a positive relationship between the level of ability of the top management and the advantages obtained from EDI.

2) Technical Characteristics

Hypothesis 2.1 : There is a positive relationship between the existence of EDI standardization or higher level of compatibility with EDI standardization of transaction counter parts and the advantages obtained from EDI.

Hypothesis 2.2 : There is a positive

relationship between the level of compatibility of previous information systems with EDI systems and the advantages obtained from EDI.

Hypothesis 2.3 : There is a positive relationship between the level of technical supports from EDI vendors in the process of EDI systems implementation and the advantages obtained from EDI.

Hypothesis 2.4 : There is a positive relationship between the level of expertise of IS specialists and the advantages obtained from EDI.

3) Managerial Characteristics

Hypothesis 3.1 : There is a positive relationship between the level of user education and training and the advantages obtained from EDI.

Hypothesis 3.2 : There is a positive relationship between the level of involvement of users in the establishment process and the advantages obtained from EDI.

Hypothesis 3.3 : There is a positive relationship between the level of supports from top management and the advantages obtained from EDI.

Hypothesis 3.4 : There is a positive relationship between the level of control procedures and the advantages obtained from EDI.

4) Environmental Characteristics

Hypothesis 4.1 : There is a positive relationship between the level participation by trading partners and related institutions during establishment and the advantages obtained from EDI.

Hypothesis 4.2 : There is a positive relationship between the level of information

Table 2. Operationalizations of Variables

Variables	Operationalizations
Organizational Size	The size of a company in the industry
Decentralization	The level of participation in decision making process and the level of decision making by its members
Formalization	The level of autonomy, control, and the existence of regulations on work process
Management Risk Position	Managers tendency to accept changes in organizational structure and new technologies, and to invest in the adoption of new information technologies
Technical Expertise	Level of knowledge owned by IS staffs on EDI technologies Number of technical experts in the organization
EDI Standards	Level of EDI standard compatibility with transaction partners
Technical Compatibility	Level of EDI compatibility with S/W, H/W environment Level of EDI compatibility with communications and information resources in the organization
Technical Supports by EDI Vendors	Technical supports by EDI vendors in adopting and implementing EDI
Training and Education	Level of formal and lasting EDI training and education, Level of pertinence of EDI training and educational structure and contents
User Involvement	Extent of user participation during EDI establishment, existence of user feedback
Top Management Support	Level of interests and consideration by top management on EDI Efficient communications on EDI establishment
Control Procedures	Existence of staffs charged with control Existence of records and backup files on transactions and their authorization
Participation by Trading Partners	Level of participation and advisement from partners in the establishment stage
Information Intensity	Substitutability of suppliers, information requirement on goods and services, Level of inter-dependence between company and customer
Industry Cooperation	The extent companies accomplish their shared objectives, Whether there are EDI standards in an industry
Industry Concentration	Level of price competition in an industry Level of quality competition for their goods and services in an industry

owned by companies in a industry and the advantages obtained from EDI.

Hypothesis 4.3 : There is a positive relationship between the competition level among companies in an industry and the advantages obtained from EDI.

Hypothesis 4.4 : There is a positive relationship between the level of cooperation in an industry and the advantages obtained

from EDI.

3.3 Operationalization of Variables

Because it's not possible to measure variables only through conceptual definitions, it's reasonable to operationalize and measure variables based on developed survey questions. Operationalization of variables are

Table 3. Measurements of Independent Variables

Factors	Measurement Variables
Organizational Size	1. size of firm in an industry
Decentralization	1. level of participation by lower level of managers in decision making 2. level of delegated power to process before authorization from superiors 3. level of power to decide by employee himself 4. number of participation in decision making when adopting new policy
Formalization	1. level of power to organize in his discretion what employee wants to do 2. level of employee's power to process his work in his own way 3. level of regular checks or monitors on regulation violation 4. existence of regulations applied when regular works are processed
Management Risk Position	1. level of acceptance of changes by top management in organizational structure, labor, and technologies 2. level of acceptance by top management of H/W, S/W, and other technologies not acceptable to the organization 3. level of top management intention to invest in applications software, N/W technologies
Technical Expertise	1. level of knowledge of IS staffs on EDI related technologies 2. Number of technical experts
EDI Standards	1. level of technical relevance of EDI standards with those of transaction partners
Technical Compatibility	1. level of compatibility of EDI with previous S/W environment 2. level of compatibility of EDI with organization's work processing environment 3. level of compatibility of EDI with network infrastructure 4. level of compatibility of EDI with information resources
Technical Support by EDI Vendors	1. level of support by EDI vendors 2. level of technical support by EDI vendors in the establishment of EDI
Training and Education	1. level of formalized training and education on EDI 2. level of sufficient and lasting training and education on EDI 3. relevance of contents and structure of training and education with EDI requirements
User Involvement	1. level of user participation in all stages of EDI establishment 2. level of advisement by users during EDI establishment 3. existence of formalized feedback systems
Top Management Support	1. level of interest by top management on EDI 2. level of the extent CEO considers EDI as important 3. existence of communications of CEO for EDI support
Control Procedures	1. distinction of transaction and control works 2. documentation of transactions before transmission 3. existence of records of authorization by transaction partners 4. existence of backup files on transaction
Participation by Trading Partners	1. level of participation by transaction partners in all stages of EDI establishment 2. level of advisement by transaction partners in all stages of EDI establishment
Information Intensity	1. level of information customers own when making purchases 2. supplier substitutability 3. level of information on products and services by other companies in the industry 4. level of dependence on information by company and customer
Industry Cooperation	1. existence of shared objectives shared by companies 2. existence of developed industry standards
Industry Concentration	1. level of price competition 2. level of competition for quality

one based on literature reviews. Operationalizations of 16 independent

d variables and 3 dependent variables are summarized in Table 2.

3.4 Measurement of Variables

This thesis empirically investigates, based on responses collected through survey questionnaires, which factors are affecting the successful implementation of EDI systems in Korean companies. Independent variables include organization's structural, technical, managerial, and environmental characteristics, all of which are expected to have correlations with successful implementation.

And dependent variables, the level of implementation of EDI systems, are measured using three such factors as the levels of usage, integration with previous systems, and applicability of EDI systems. More specific variables are summarized in Table 3 and Table 4.

IV. DATA ANALYSIS AND RESULTS

4.1 Data Collection Method

The sampling universe consisted of 520 Korean enterprises. A questionnaire was mailed to the individual responsible for EDI in each enterprise. A cover letter addressed to the EDI manager was included, assuring confidentiality and explaining the objectives of the study with instructions on how to answer the questionnaire. A pre-addressed return envelope and the

Table 4. Dependent Variables

Research Factors	Measurement Items
EDI Advantages	<ol style="list-style-type: none"> 1. Reduces cost of data entry 2. Improves data accuracy 3. Eliminate manual reconciliation 4. Eliminates manual sorting, matching, filing, mailing 5. Reduces costs of envelopes, paper storage, data entry facilities 6. Improved productivity 7. Decreases administrative cost 8. Provides quick response and access to information 9. Simplifies processing for order entry 10. Reduced inventory cost 11. Improves customer service 12. Reduces manpower 13. Increased sales 14. Decreases manufacturing cost 15. Augments inventory and cycle time reduction programs 16. Improved trading partner relations 17. Increased ability to compete 18. Improves scheduling accuracy through improved communication with suppliers

Table 5. Classified Return Rates of Survey Questionnaires

Industry	Total Sample	No. of Retrieved	No. of Excluded	Rate of Return (%)
Trade	150	46	8	30.7
Textile and Clothing	110	43	2	39.1
Electric and Electronic	90	45	3	50.0
Machinery and Metal	40	18	1	45.0
Beverages and Foods	35	17	0	48.6
Bubber and Paper	25	17	0	68.0
Petroleum and Chemical	30	16	0	53.3
Others	40	15	1	37.5
Total	520	217	15	41.73

possibility to receive a summary of the results of the study were meant to increase the response rate.

The questionnaire was pre-tested through direct interviews with EDI managers of ten enterprises. In its final form, the questionnaire was mailed to the member-firms of the Korea Trade Network (KTNET) and the DACOM-EDI network, which had kindly provided its membership list. The questionnaire was addressed to the EDI managers when the mailing list provided this information. Otherwise, the questionnaire was sent to the members listed asking them to direct it to the EDI manager if they did not hold the position themselves. To maximize the response rate, a recall letter was sent one week after the initial mailing. A

total of 217 responses were obtained, of which 202 were retained for the purposes of the study, for a response rate of 42%.

15 of them were discarded because some contained too many unanswered items, and some answered unsincerely. And questionnaires from companies with less than 1 year experience in EDI operations were excluded from the analysis. Classified return rates are summarized in Table 5.

4.2 Validity and Reliability

(1) Validity Tests

(a) Factor Analysis on Organizational Characteristics

Factor analysis was set up to produce

Table 6. Results of Factor Analysis on Organizational Characteristics

Items	Decentralization	Formalization	Management Risk
DECEN-1	0.737	0.254	-0.051
DECEN-2	0.750	0.292	0.085
DECEN-3	0.820	0.171	-0.055
DECEN-4	0.816	0.033	0.068
FORMA-1	0.361	0.685	0.228
FORMA-2	0.176	0.866	0.144
FORMA-3	0.168	0.858	-0.125
MANAG-1	0.017	-0.114	0.831
MANAG-2	0.080	0.284	0.657
Eigenvalue	4.075	1.398	1.155
Variance Explained	37.0	12.7	10.5
Cummulative Percent of Variation(%)	37.0	49.8	60.3

factors above eigen values 1. The results of factor analysis on organizational characteristics are summarized in Table 6.

As we can see in the Table, 3 factors are resulted, which implies that variables are valid. Variables in formalization were originally 4 items, but alpha coefficients of 2

variables were too low(alpha = 0.2651) and excluded form the analysis. As a result, since all factor loadings were above 0.6, all variables were considered to be important in the analysis. Among 3 factors, the validity of decentralization factor was especially high.

Table 7. Factor Analysis on Technical Characteristics

Items	Technical Compatibility	Technical Support	Technical Expertise
COMPA-1	0.836	0.140	-0.046
COMPA-2	0.889	0.088	-0.017
COMPA-3	0.748	0.165	0.113
COMPA-4	0.709	-0.032	0.476
SUPPO-1	0.137	0.890	0.091
SUPPO-2	0.130	0.845	0.278
EXPER-1	0.207	0.325	0.627
EXPER-2	-0.121	0.083	0.887
Eigenvalue	3.163	1.702	1.136
Variance Explained	35.1	18.9	12.6
Cummulative Percent of Variation(%)	35.1	54.1	66.7

Table 8. Factor Analysis on Managerial Characteristics

Items	Education and Training	Top Management Support	User Involvement	Control Procedures
EDUCA-1	0.798	0.143	0.052	0.209
EDUCA-2	0.766	0.314	-0.005	0.139
EDUCA-3	0.765	0.240	0.161	-0.027
TOPMG-1	0.298	0.862	0.099	-0.028
TOPMG-2	0.232	0.859	0.021	0.103
INVOL-1	0.126	-0.004	0.842	0.060
INVOL-2	0.155	0.085	0.736	0.081
PROCE-1	0.122	0.022	-0.078	0.919
PROCE-2	0.121	0.120	0.255	0.736
Eigenvalue	5.080	1.811	1.228	1.019
Variance Explained	39.1	13.9	9.4	7.8
Cumulative Percent of Variation(%)	39.1	53.0	62.5	70.3

(b) Factor Analysis on Technical Characteristics

The results of factor analysis on technical characteristics are summarized in Table 7. The results show that 3 factor solutions and technical expertise is excluded from analysis because of low reliability($\alpha=0.409$). So the validity of variables are verified. All factor loadings are above 0.6, which implies all variables in the analysis are important. Among all variables, technical compatibility is the most powerful explanatory factor.

(c) Factor Analysis of Managerial Variables

4 factors included in the managerial characteristics are summarized in Table 8. The validity and variability of variables are confirmed from the analysis. 1 variable in user involvement and top management factors respectively are excluded and 2

items in EDI control procedures are excluded. And all factor were loaded high, above 0.7. Education and training factor in managerial characteristics was loaded highest.

(d) Factor Analysis of Environmental Variables

The results of factor analysis on 4 environmental characteristics are summarized in Table 9. It's suggested from the analysis that 4 factor solutions were valid. It's because all reliable variables after test-retest examinations were adopted. And all variables the validity of industry cooperation was too low and excluded in the analysis. Factor loadings were high(above 0.6) enough for analysis. The validity of participation variables from trading partners were rated highest.

Table 9. Factor Analysis on Environmental Variables

Items	Participation by Partners	Information Intensity	Concentration	Cooperation
PARTI-1	0.837	0.173	0.087	0.140
PARTI-2	0.878	0.114	0.106	0.073
INFOR-1	0.203	0.703	0.271	-0.036
INFOR-2	-0.025	0.649	0.048	0.377
INFOR-3	0.268	0.708	-0.274	0.014
CONCE-1	-0.005	-0.021	0.893	0.026
CONCE-2	0.256	0.120	0.756	0.024
COOPE-1	0.240	-0.263	-0.072	0.614
COOPE-2	-0.243	0.401	0.232	0.673
Eigenvalue	2.916	1.391	1.221	1.047
Variance Explained	29.2	13.9	12.2	10.5
Cumulative Percent of Variation(%)	29.2	43.1	55.3	65.8

(e) Factor Analysis of Dependent Variables

Table 10. Factor Analysis on Dependent Variables

Items	Competitive Advantage	Time Reduce	Accuracy Advancement	Cost Down	Business Level Up
COMAD-1	0.823	0.021	0.262	0.048	0.205
COMAD-2	0.818	0.040	0.140	0.060	0.313
COMAD-3	0.799	0.314	0.107	0.166	-0.059
COMAD-4	0.733	0.325	0.047	0.316	-0.014
TIMRE-1	0.169	0.785	0.153	0.191	0.266
TIMRE-2	0.115	0.757	0.173	0.351	0.123
TIMRE-3	0.147	0.681	0.363	0.146	0.201
ACCAD-1	-0.013	0.260	0.783	0.082	0.108
ACCAD-2	0.365	0.113	0.658	0.323	0.065
ACCAD-3	0.344	0.267	0.634	0.215	0.154
COSDO-1	0.196	0.309	0.187	0.765	0.195
COSDO-2	0.128	0.264	0.165	0.736	0.226
COSDO-3	0.392	0.029	0.297	0.590	0.360
BUSLE-1	0.057	0.324	0.093	0.288	0.728
BUSLE-2	0.120	0.473	0.097	0.300	0.648
BUSLE-3	0.446	0.135	0.332	0.206	0.538
Eigenvalue	3.491	2.772	2.351	2.113	2.073
Variance Explained	19.392	15.399	13.063	11.739	11.518
Cumulative Percent of Variation(%)	19.392	34.791	47.854	59.594	71.111

(2) Reliability Test

The reliability of 16 independent variables used in this analysis was tested using SPSSWIN, a well-known statistical package, and is summarized in Table 11. To summarize it, first, among 16 independent variables, 2 variables, technical expertise (alpha = 0.409) and industry cooperation (alpha = 0.048), were revealed as irrelevant. Second, since the reliability of 2 formalization variables of organizational characteristics was too low (alpha = 0.391), two among 4 were excluded, which subsequently resulted in reliability of 0.620 (α). Third, it's revealed the reliability of 14 variables except 2 irrelevant variables showed was over 0.6.

4.3 Correlation Analysis

The level of correlation among variables were investigated in this analysis using independent variables adopted in the realization of EDI systems. 16 variables, which were shown as valid and reliable, were adopted to investigate correlation and multicollinearity, and whether regression analysis are meaningful.

The result of correlation analysis is summarized in Table 12. The upper numbers represent correlation coefficients and the lower numbers the level of significance. To interpret, The analysis shows that correlation coefficients between education and training, user involvement are

Table 11. Reliability Tests of Independent Variables

Categories	Variables	No. of Variables	Reliability Coefficient (Cronbach's Alpha)
Organizational Structural Characteristics	Decentralization	4	0.838
	Formalization	4 (2 items excluded)	0.620
	Management Risk Position	3	0.801
Technical Characteristics	Technical Expertise	2	0.409
	Technical Compatability	4	0.779
	Technical Support of Vendors	2	0.766
Managerial Characteristics	Education and Training	3	0.819
	User Involvement	3	0.670
	Top Management Support	3	0.699
	Control Procedures	4	0.612
Environmental Characteristics	Participation by Trading Partners	2	0.769
	Information Intensity	4	0.636
	Industry Cooperation	2	0.048
	Industry Concentration	2	0.697
EDI Advantages	Competitive Advantage	4	0.874
	Time Reduction	3	0.835
	Data Accuracy	3	0.756
	Cost Down	3	0.779
	Business Level Improvement	3	0.775

significant with correlation coefficient 0.40-0.60 and the remaining variables are not closely correlated, coefficients below 0.40. The regression analysis shows that

admissible error values are above 0.5 and VIF values were also below 2.00. Accordingly, it's shown that multicollinearity does not exist among independent variables.

Table 12. Correlations among Independent Variables

Variables	ORG1	ORG2	ORG4	ENV2	ENV3	ORG3	MAN1	MAN3	TEC3	ENV1	MAN2	TEC2	MAN4
Size(ORG1)	1.00 .00												
Decentral.(ORG2)	.018 .402	1.00 .00											
Risk(ORG4)	.120 .044	.451 .000	1.00 .00										
Information(ENV2)	.134 .028	.257 .000	.316 .000	1.00 .00									
Competition(ENV3)	.112 .057	.185 .004	.160 .012	.280 .000	1.00 .00								
Formalization(ORG3)	.074 .149	.445 .000	.349 .000	.137 .026	.073 .151	1.00 .00							
Education(MAN1)	.212 .001	.148 .018	.310 .000	.311 .000	.091 .098	.168 .009	1.00 .00						
Top Support(MAN3)	.096 .088	.228 .001	.557 .000	.316 .000	.058 .207	.191 .003	.546 .000	1.00 .00					
Tech. Support(TEC3)	.112 .057	.129 .033	.299 .000	.164 .010	.094 .091	.172 .007	.460 .000	.368 .000	1.00 .00				
Parter. Invol.(ENV1)	.178 .006	.126 .037	.222 .001	.237 .000	.189 .004	.203 .002	.408 .000	.292 .000	.484 .000	1.00 .00			
User Invol.(MAN2)	.173 .007	.126 .037	.347 .000	.357 .000	.199 .002	.163 .010	.561 .000	.466 .000	.443 .000	.325 .000	1.00 .00		
Compatibility(TEC2)	.098 .083	.112 .056	.228 .001	.125 .038	-.107 .065	-.007 .463	.211 .001	.236 .000	.295 .000	.155 .014	.119 .046	1.00 .00	
Control(MAN4)	-.067 .173	.168 .008	.178 .006	.113 .055	.124 .040	.124 .040	.219 .001	.167 .009	.227 .001	.212 .001	.249 .000	.203 .002	1.00 .00

Table 13. Analysis Summary of All Variables

Variables	Time	Accuracy	Level	Cost	Compete	Hypotheses
Size				0.158***		H1.1: partly accepted
Decentralization					0.165**	H1.2: partly accepted
Formalization	0.173***		0.170***	0.195***		H1.3: partly accepted
Management Risk						H1.4: rejected
EDI Standards		0.243***				H2.1: partly accepted
Technical Compatibility	0.384***	0.195***		0.358***		H2.2: partly accepted
Technical Support from Vendors	0.130**			-0.157**		H2.3: partly accepted
Education and Training	0.167***	0.145**	0.356***	0.179**	0.263***	H3.1: accepted
User Involvement				0.147**		H3.2: partly accepted
Support from Top Management	-0.131**		-0.183***			H3.3: partly accepted
Control Procedures						H3.4: rejected
Participation from Trading Partners	0.165***	0.141**	0.212***	0.131**	0.301***	H4.1: accepted
Information Intensity						H4.2: rejected
Industry Concentration						H4.3: rejected

Note : 1) ** : $p < 0.05$, *** : $p < 0.01$

2) Values of each cell is regression coefficients

V. CONCLUSIONS

With the rapid proliferation of Electronic Data Interchange(EDI) systems and Electronic Commerces(EC) in recent years, there has been a growing need for understanding various issues surrounding the adoption, implementation, diffusion, and advantages of such systems.

This paper is implemented on the basis of a judgement that Korea businesses can

improve some of their structural problems of high costs by successfully adopting and implementing EDI system in their organizations. And it's also realized that more studies on the related subjects will benefits and be valuable for various applications.

The purpose of this research was to identify influencing factors of EDI systems implementation and the advantages corporate organizations could obtain by using this

technology.

The influencing factors found empirically in a field study of 202 Korean companies are the organizational characteristics, technical characteristics, managerial characteristics, and environmental characteristics in the firm.

REFERENCES

1. Anthony, R. N., *Planning and Control Systems : A Framework for Analysis*, Harvard University Press, Cambridge, 1965.
2. Bakos, J. Y., "Information Links and Electronic Marketplace : The Role of Interorganizational Information Systems in Vertical Markets", *Journal of Management Information Systems*, Vol. 8, No. 2, Fall 1991. pp. 31-15.
3. Bergeron, F. and Raymond, L., "The Advantages of Electronic Data Interchange", *Database*, Vol. 23, Number 4, Fall 1992, pp. 19-31.
4. Carter, J. R., Monczka, R. M., Clauson, K. S. and Zelinski, T. P., Education and Training for Successful EDI Implementation, *Journal of Purchasing and Materials Management*, Vol. 23, No. 2, Summer 1987.
5. Dearing, B., "The Strategic Benefits of EDI.", the *Journal of Business Strategy*, Volume 11, Number 1, 1990, pp. 4-6.
6. Earl, M. J., Information Systems Strategy Formulation, in Boland, R. J. and Hirschheim, R., *Critical Issues in Information Systems Research*, John Wiley & Sons, London, 1987.
7. Emmelhainz, Margaret A., "Strategic Issues of EDI Implementation", *Journal of Business Logistics*, Vol. 9, No. 2, 1988, pp. 55-70.
8. Grover, V., Factors Influencing Adoption and Implementation of Customer Based Inter-organizational Systems, Unpublished Ph. D. Dissertation, University of Pittsburgh, 1990.
9. Hansen, J. V. and Hill, N. C., "Control and Audit of Electronic Data Interchange", *MIS Quarterly*, Vol. 13, No. 4, December, 1989, pp. 403-413.
10. McGowan, Matthew K., *The Extent of Electronic Data Interchange Implementation : An Innovation Diffusion Theory Perspective*, Unpublished Ph. D. Dissertation, Kent State University, 1994.