An Evaluation of Perceived Risks and Benefits that Influence the Adoption of a Technological Innovation.
The Case of IIOs in SMEs Greek Firms

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Abstract: *InterOrganizational Systems are these information systems that link enterprises (customers and suppliers) and facilitate corporate buying. Last decades the Internet has grown rapidly offering new opportunities for cost reduction, service improvements and increased profits. Furthermore it gives significant competitive advantage changing the balance of power between suppliers and customers. Especially the use of internet as a basic technology for conducting business to business transactions has dramatically changed the nature and capabilities of InterOrganizational Systems. In this paper, the main objective is to explore the influence of perceived benefits and risks for the adoption of internet based InterOrganizational Systems. Considering IOS as a technological innovation it is investigated whether the usage extent of these systems is positively associated with the perceived benefits while simultaneously is negatively associated with perceived risks. Data for the study were gathered through a survey of Greek firms, using a questionnaire. The results support the hypotheses that the extent of use of Internet – based IOS is positively influenced by the perceived benefits and negatively influenced by the perceived risks. The results of the study have significant implications for both management and academic communities.*

Keywords: *Internet based InterOrganizational Systems; Perceived Benefits; Perceived Risks;*

Paper type: *Research paper;*

1. INTRODUCTION

Modern firms face an increasingly competitive environment and as a result technological investments and innovation represent very important challenges to managers. Information Technology investments on equipment and software across all business functions represent a large and stable share of firm spending (Cha 2009) because these technologies are considered an instrument for achieving cost savings and increased competitiveness (Laage – Hellman and Gadde, 1996). Within this

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context many firms invest in InterOrganizational Systems in order to automate transactions among them. Furthermore, last decade one of the most important issues that face modern firms is the integration of internet technology in their daily activities as the rapid growth in the use of the Internet and World Wide Web (WWW) can change the way firms buy or sell to each other. However, the decision to adopt these new innovative technologies is very difficult as the implementation of these systems has both advantages and risks for firms (Davila *et al.* 2003). Therefore the main research question in this study is: To what extent do these perceived characteristics influence the adoption and use of internet based IOS from potential adopters (firms)?

The paper is organised as follows. First the key issues that are of great interest in this study are defined. As a result of a literature review the main advantages and disadvantages of InterOrganizational Systems (IOS) are summarized. Moreover the basic technologies (categories) of IOS are presented with the purpose to illuminate the differences and similarities among them. Thereafter, the objectives of this study and the research hypotheses are specified. Data for the study were gathered through a mail survey of 2.147 Greek firms and 178 responses were received. However only 170 firms were considered adequate for analysis due to incomplete answers. The results of the study provide support for the main research hypotheses. Finally the main conclusions are presented and a discussion of the results follows.

2. INTERORGANIZATIONAL SYSTEMS

2.1. Definition

Electronic commerce (e-commerce) is the process of conducting business transactions electronically and can be defined as the purchase or sale of products or services on-line. In order to be successful e-commerce has to be implemented in an electronic business (e-business) environment which is a broad term that encompasses e-commerce transactions as well as the complex synergy of business processes, applications and organizational structure (Kalakota and Robinson 1999). Despite the fact that business and academic community initially emphasized Business – to – Consumer (B2C) commerce, last years a main type of electronic commerce that is generating a lot of interest is Business – to – Business (B2B) commerce. B2B refers to the transactions that occur electronically between organizations (firms) and includes a variety of applications (e.g. online wholesaling, corporate purchasing) and networking technologies designed to automate transactions and integrate business processes between these firms (Turban *et al.* 2006). B2B is conducted in a broad informal marketplace where buyers and sellers meet each other in order to interchange products, services, information. These marketplaces are implemented using information systems that cross organizational boundaries and link one or more firms to their business partners (suppliers or/ and customers). In literature these systems that are shared by two or more organizations are named InterOrganizational Systems (IOS) and their strategic value to businesses has been widely recognized

worldwide (Turban *et al.* 2006). They usually link one or more firms to their customers and/or suppliers by using Information Technology and significantly contribute to enhanced productivity and flexibility, more powerful collaboration and greater competitiveness of these organizations (Kaufman, 1966; Chismar and Meier, 1992; Wilson and Vlosky, 1998). Using these systems firms can achieve automation of transactions and inter-business processes. Hence firms avoid - to a great extent - errors related to transactions and human intervention and as a result manage to reduce the cost of transactions after adopting and using Internet based IOS.

Many researchers have mentioned the benefits of IOS. Information Technology offers new competitive opportunities that allow companies to change the basis of competition (McFarlan 1984). Thus Cash and Konsynski (1985) note that InterOrganizational Systems have the strength to change the balance of power between buyers and suppliers, providing strategic benefits to the organizations that use them (either sellers or buyers). Thereafter, researchers present some methods in order to aid managers in deciding whether they should participate in an IOS solution or not.

However while most of the literature refer to the benefits that accrue for firms from the adoption and use of IOS, many researchers recognize the potential for conflict in these systems (Kumar and Dissel 1996, Wilson and Vlosky 1998).

2.2. Internet's Role

Last decade the use of the internet has played a critical role in the new age of electronic collaboration as an intermediary for business to business electronic commerce. Internet is a major distribution channel for goods and services that has the strength to change the market and industry structure (Drucker 2002). The use of the internet to facilitate commerce among firms provides many benefits: reduction of transaction costs, greater access to buyers and sellers, new improved services, more product information and more available services both to sellers and to buyers (Kaplan and Shawney 2000, Wise and Morrison 2000). However, it must be noted that despite the fact that most electronic commerce transactions are done over the internet, electronic commerce can also be conducted on private networks, LAN, etc. Internet and web - based technologies facilitate system development and the deployment of IOS by automating corporate procurement (e.g. electronic marketplaces). As a result these technologies give many benefits both to suppliers (e.g. lower selling costs, lower transaction costs) and to buyers (e.g. easier access to price and product information) (Porter 2001). Moreover, this increased automation provides opportunities for firms to work increasingly closely with their business partners for the supply of products and information. Considering the differences in information and networking technologies that are used in order to link firms with their suppliers or customers electronically, some major electronic commerce categories arise. Albrecht *et al.* (2005) propose five main electronic commerce technology platforms (e-business architectures), Electronic Data Interchange,

Electronic Marketplaces, Electronic Procurement Software, Web Services and World Wide Web. However the common attribute of these different technologies is that all of them are implemented using internet technology. As a result they all have approximately the same capabilities, strengths and weaknesses. This fact allows us for the purpose of this research to group these technology platforms into the same category of Internet based InterOrganizational Systems (IIOS) (Lee 1998, Dai and Kauffman 2002, Soliman and Janz 2004).

Firms can use IIOS in order to process successfully purchasing orders (reducing order-cycle time), to provide improved service to their customers, to create an improved communication channel with vendors, to optimize transportation of raw materials or products, to improve inventory management and to manage purchasing (Lancioni *et al.* 2000, Lancioni *et al.* 2003). Especially the internet presents a cost – effective transmission medium for business to business transactions (Bakos 1991, Lancioni *et al.* 2000). According to Soliman and Janz (2004) IIOS demand lower expenses giving the chance to smaller firms to invest in these technologies. Furthermore web technologies make the integration of these systems an easier process (due to low demand for technical components) and this characteristic increases the ability of firms to change and adapt their systems according to requirements of management. These benefits make easier the cooperation between firms and help them to maintain and build relationships raising the level of trust between organizations (Roberts and MacKay, 1998).

Nevertheless, many factors related to information technology infrastructure of firms (the extent to which organizations use relevant information or networking technologies) present major barriers to the extended use of these systems. In order to fully exploit the aforementioned benefits, IIOS have to be integrated with information systems and infrastructure of separate organizations that connect. Moreover most of businesses seem wary of internet for conducting business on a large scale. The main reason for this is the insecurity of the internet as a medium for exchanging information between partners (Ratnasingham 1998). Many attacks in the past have taken advantage of basic vulnerabilities in the Internet's infrastructure and have caused great damage in firms (Bhimani 1996). As a result executives have lost their confidence in using the internet as a "vehicle" for electronic commerce transactions (Bequai 1996). Additionally, other researchers have mentioned that special types of IIOS (e.g. electronic marketplaces) don't always assure lower price for buyers or that they don't provide benefits for sellers (Ba and Pavlou 2002, Wise and Morrison 2000).

3. IIOS AND TECHNOLOGICAL INNOVATION

3.1. Adoption of Internet based IOS

Recently, many researchers have studied the adoption of various types of IIOS. Kendal *et al.* (2001) utilizing the five attributes of innovation explained by Rogers, explored the influence of them on the willingness of 58 small and medium - sized

enterprises (SMEs) to adopt. They proved that among these attributes only relative advantage, compatibility and trialability appear significant. Moreover Eastin (2002) in a survey of 274 users investigated the significance of six attributes in the adoption processes and concluded that each of them influence in a different extent the adoption processes. However it must be noted that although this research provides us useful information related to the adoption processes, it refers to adoption at the individual and not at the organizational level. Davila *et al.* (2003) examined the adoption of e-procurement technologies. The researchers identified two types of companies, these that move aggressively to adopt e-procurement technologies and these that adopt a more conservative strategy towards these systems. Thereafter the authors present the main perceived benefits and risks of adopting these technologies and compare the risk perceptions of companies following different adoption strategies. They compare the differences in risks perceptions between conservative adopters and aggressive adopters and conclude that usually conservative adopters perceive risks to be more significant. Patterson *et al.* (2003) developed a model of the main factors influencing the adoption of supply chain technology and conducted a survey in order to test the model. As a result researchers provided a better understanding of these technologies as well as significant insights into the relationship between various factors and the adoption of supply chain systems. Additionally, Soliman and Janz (2004) in a survey of 87 US companies, reported that the main factors that significantly affect the adoption of Internet-based IOS are 'pressures felt from trading partners, pressures felt from competitors, establishing costs, network reliability, data security, scalability, complexity, support from top management, and trust between trading partners'. Furthermore the researchers argue that there are similarities as well as differences between Internet based IOS and EDI. Also, Lin and Lee (2005) gathered data through a survey of 202 Information Systems executives in Taiwan and investigated the influence of organizational learning factors and knowledge management processes on e-business systems adoption. They found that these factors are closely related to the level of e-business system adoption. A more recent survey by Rao *et al.* (2007) examined the impact of perceived benefits, risks and e-business infrastructure on the adoption of Electronic Marketplaces. In particular, researchers found that usage extent of Electronic Marketplaces (a special type of internet based InterOrganizational Systems) is influenced from the perceived benefits and risks of these systems. Additionally they proved that this relationship was moderated by the e-business readiness of firms (buyers).

3.2. Technological Innovation

According to Drucker (1985) innovation is 'the specific function of entrepreneurship… It is the means by which the entrepreneur either creates new wealth-producing resources or endows existing resources with enhanced potential for creating wealth'. Technological innovation has become very important to the competitiveness of modern firms as it leads to reduced costs, improved production

processes, higher quality of products. Many other researchers have defined technological innovation (i.e. Zaltman *et al.* 1973, Rogers 2003). Regardless of the differences, the common element of all the definitions is that the product (or idea, process, object, etc.) is new or is considered new from the potential adopter (whether this adopter is a firm or a person). Another characteristic of an innovation is that it creates the need for change in the organization (or person). However this change has to create value for the potential adopters in order the adoption to be successful. In literature two types of innovations are referred: the *administrative* and *technological* innovations. This distinction implies differences in the adoption decision processes and doesn't mean that these two innovations serve different business functions (Kimberly and Evanisko 1981). Furthermore there are many theoretical frameworks that investigate the antecedents and drivers tailored to the intention to adopt technological innovation. These frameworks - e.g. Diffusion of Innovations (Rogers 1983) or the Theory of Reasoned Action (Ajzen and Fishbein 1975), the Technology Acceptance Model (Davis *et al.* 1989) **–** 'have received widespread validation for many technological innovations where individual autonomy is permitted to adopt or reject an innovation' (Gallivan 2001). However many researchers have questioned these frameworks when generalising findings of individual adoption to the organisational level. They consider that such conceptual frameworks don't take into account the whole set of dimensions related to adoption and implementation of innovations within organizations, especially when adoption decisions are made at the organizational level rather than at the individual level (Molla and Licker 2005).

However, Gatignon and Robertson (1989) presented a model for the study of technological diffusion at the organizational level considering four set of factors explaining the adoption or rejection decisions of a technological innovation. Based on this conceptual framework and the research of Kwon and Zmud (1987), in this study it is suggested that the factors affecting the adoption of technological innovation from an organization can be classified into four main categories. These categories include factors related to:

- the person that decides to adopt the innovation,
- the structure of an organization,
- the environment of an organization,
- the characteristics of innovation itself.

4.   OBJECTIVES OF THE STUDY. RESEARCH HYPOTHESES

The different dimensions of the main categories of factors related to the adoption of a technological innovation at the organizational level have been examined thoroughly in many studies. Nevertheless, the main conclusion that is drawn from the presentation of the aforementioned research efforts related to the adoption of various types of IIOS is that the category of characteristics of innovations has the most significant impact on the adoption decisions of these systems. The characteristics of

technological innovations influence or determine the adoption decisions in the organizations as well as the subsequent use of these innovations (Tornatzky and Klein 1982, Ettlie and Vellenga 1979, Fliegel and Kivlin 1966). Tornatzky and Klein (1982) suggest three main categories of innovation characteristics that are related to the adoption decisions: compatibility, complexity and relative advantage. According to Kwon and Zmud (1987) 'relative advantage reflects the degree to which an innovation is perceived as providing greater organizational benefits than either other innovations or the status quo'. The perceptions of managers (potential adopters) related to the characteristics of a technological innovation influence their evaluation of this innovation as well as the final intention and decision of adoption (Ostlund 1974). Furthermore, another dimension of perceived innovation attributes is that of perceived risks associated with the innovation. The adoption decision should be made on the basis that the perceived benefits of adoption exceed the perceived risks (Robinson 1990, Frambach and Schillewaert 2002).

In this paper the main interest is in studying the perceived characteristics of IIOS and their influence on the degree of use of these systems. The importance of characteristics of innovation to the adoption behavior of InterOrganizational Systems has been mentioned and proved in the aforementioned research literature (Davila *et al.* 2003, Rao *et al.* 2007). Although these studies have provided significant insights into the adoption of special types of IOS, in this study the main objective is to find whether the extent of use of IIOS is determined by the characteristics of these innovations. Additionally, it is suggested that there are differences - related to the extent that determine the degree of use of IIOS - between the factors that describe each dimension (benefits or risks). These research objectives have received little empirical attention in previous studies and as a result the main research hypotheses in this paper are:

> *H1: The extent of use of IIOS is positively associated with perceived benefits and negatively associated with perceived risks.*
>
> *H2: The extent of use of IIOS is determined from perceived benefits and risks of these systems.*

5. SURVEY METHODOLOGY

5.1. Introduction

In this study the communication method of data collection was used, which is based on the questioning of respondents (firms). The data collection instrument that was used was the questionnaire (Kinnear and Taylor, 1996). Also for reasons of low cost and ease of implementation, we used a mail survey (Dilman, 1991) that was performed in order to collect the necessary data. A questionnaire with a cover letter indicating the purpose of the study was mailed to commercial and industrial Greek firms. These firms were collected from the ICAP's Directory 2007, according to the following two criteria: (1) sales revenues, (2) number of employees. The final list contained 2147 firms and the data were collected during the last quarter of 2007. Fifty

three mailings were returned due to incorrect addresses of the respondents, whereas 178 completed questionnaires were finally received. Eight of these questionnaires could not be used, as respondents did not provide answers to more than fifteen per cent of the questions asked in the questionnaires (Sekaran 2003) and in some other cases, all the demographic variables were not provided. Therefore, for data analysis only 170 completed questionnaires were found useful, representing a response rate of 8.1%.

5.2. Questionnaire Development

In order to measure the perceived benefits and risks, the measurement scales that were developed by Rao *et al.* were used (Rao *et al.* 2007), because these scales were constructed based on Churchill's (1979) guidelines for developing reliable and valid measures. Thus these scales were considered adequate for the needs of this research that to great extent follows the basic guidelines that are determined by Churchill (1995). All variables were measured with five-point interval scales. In all of the above items, the respondents were asked to answer the questions on a five point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). Thereafter, the questionnaire was pretested in a small pilot survey involving a number of firms similar (firms that fulfil the aforementioned two criteria) to those interviewed in the main (large scale) survey, in order to test how it performs under actual conditions of data collection (Kinnear and Taylor 1996). As a result of this step some minor changes and modifications related to the sequence and difficulties of the questions were made. Furthermore some questions were eliminated due to difficulties that faced the respondents in understanding and answering the questions.

In order to assess the reliability of the measures, reliability coefficient Cronbach Alpha was computed, which is the most commonly accepted test for assessing the reliability of a measurement scale with multi-point items. Additionally Alpha is the first measure one calculates for the purpose to assess the quality of the instrument (Peter, 1979). Thus, the items measuring each of the constructs (F1, F2, F3, F4) were analyzed for the reliability and the results are shown in Table 1. A value of Cronbach Alpha that approaches 0,70 or is greater than this threshold is considered appropriate for the analysis (Nunnally and Bernstein 1994) and as a result, all the measures of this study are considered appropriate for the analysis because the minimum value for alpha is 0,725.

Table 1
Cronbach Alpha

	Cronbach Alpha
F1	0,784
F2	0,725
F3	0,823
F4	0,756

The next step was to compute validity. There are many types of validity, however the technique of factor analysis plays an important role in order to assess whether the measures are valid or not. According to Nunnally (Nunnally and Bernstein 1994) factor analysis is important to content validity in suggesting how to revise instruments. A factor analysis was conducted both to assess the construct validity of the measures and to determine the factors that will be used in testing the hypotheses. Especially principal components analysis was used as the extraction technique, with varimax rotation. It is suggested that in order to assess the fit between the items and their construct for the sample size of this research (170 respondents), all of the primary factor loadings should be greater than 0.5 (Hair *et al.*, 1998).

Table 2
Factor Loadings and Reliability Data for Scales

Items	F1 Alpha = 0,784	F2 Alpha= 0,725	F3 Alpha= 0,823	F4 Alpha= 0,756
Lower cost of products	0,737			
Lower transactional fees	0,813			
Paying at true market price	0,740			
Increased price transparency	0,737			
Improved searching of product information	0,635			
Shortening of order to delivery time		0,783		
Improving logistics management		0,737		
Improving inventory management		0,763		
Better collaboration with suppliers		0,676		
High cost of implementation			0,788	
High business process restructuring cost			0,869	
High cost of integration with Information Systems (IS)			0,812	
Great difficulties of integration with IS			0,701	
Long period of time of integration with IS			0,664	
Uncertainty related to verification of suppliers' identity				0,704
Uncertainty related to the security and integrity of transactions				0,860
Uncetainty related to missing of confidential information				0,817
Uncertainty related to the settlement of problems happening during transactions				0,654

In this research (as it is shown in Table 2), all factor loadings are equal to or greater than 0.64, which demonstrates a good match between each factor and related items. As a result, the conclusion is that a strong internal structure exists inside the constructs, a fact that is an essential precondition in order to assure content validity of the measures. The other type of validity is construct validity but the process of establishing this type of validity is not a simple one. However, most researchers agree

that establishing construct validity involves the process of assessment of convergent and discriminant validity (Churchill and Brown, 2007). Convergent validity assures that a measure is highly correlated with other measures of the same construct, while the discriminant validity requires the lack of correlation among different measures (of other constructs). The multitrait–multimethod approach was used to test discriminant and convergent validity using Pearson's correlation coefficient. The results of this process (Table 3) suggest that the within-measure correlations are consistently significant, indicating convergent validity, and greater than the between-measures correlations, indicating discriminant validity. Additionally the sign of the associations (positive or negative) confirms the aforementioned conclusions.

Table 3
Convergent and Divergent Validity Analysis

	F1	*F2*	*F3*	*F4*
F1	1	0,615**	-0,176*	-0,247**
F2	0,615**	1	-0,027	-0,044
F3	-0,176*	-0,027	1	0,294**
F4	-0,247**	-0,044	0,294**	1

**.Correlation is significant at the 0.01 level (2-tailed), *.Correlation is significant at the 0.05 level (2-tailed)

Furthermore a Confirmatory Factor Analysis was performed in order to validate measurement scales. As it is indicated in Table 4 the fit measures that were used were near or above the thresholds (Hair et al 1998) presenting a satisfactory fit for the model.

Table 4
Results of Confirmatory Factor Analysis

	Number of Items	X^2	*df*	*GFI*	*NFI*	*CFI*
F1	5	40,95*	5	0,91	0,88	0,89
F2	4	7,54**	2	0,98	0,95	0,96
F3	5	33,34*	5	0,93	0,92	0,93
F4	4	5,71**	2	0,98	0,97	0,98

*$p<0,01$ **$p>0,01$

6. STUDY FINDINGS

6.1. Sample Characteristics and Data Collection

The characteristics of firms that were surveyed are presented in Table 5. In particular most of the respondents (67,2%) were from the service sector whereas the rest (32,8%) were from the manufacturing sector. Furthermore only 54,7% of the respondents have an independent purchasing department. The number of employees of most organizations is below 100. The conclusion we draw from these data is that most of the firms that took part in the survey were small and medium sized. This is partially explained by the fact that the majority of firms in Greece are of small and medium

size. Additionally because Internet based IOS don't demand large investments are probably very attractive to small firms. Hence, the generalization of findings is limited as it is probable that the results are differentiated in large organizations.

6.2. Results

Results presented in Table 6 show that the majority of respondents (52,9%) don't use some type of internet-based IOS for purchasing whereas 28,6% of firms make rather little use of these systems (percentage of procurement budget lower than 15%). However 18,9% of firms use IIOS in great extent (more than 15% of the total procurement budget). Additionally in Table 7 the correlations (using Spearman's rho) between the main factors influencing the adoption of IIOS are shown (Hypothesis 1).

Table 5
Sample Characteristics

Characteristics		Percentage
Industry Profile	Service Sector	67,2%
	Manufacturing Sector	32,8%
Size of firms		
• **Number of employees**		
	0-99	86,4%
	More than 100	13,5%
• **Purchasing Department**	Yes	54,7%
	No	45,3%
• **Annual Sales (€)**		
0,5 - 1 million		6,5%
1 – 5 million		40,5%
5 – 10 million		24,8%
10 – 20 million		14,4%
More than 20 million		13,7%
Procurement Budget (€)		
Less than 1 million		21,1%
1 – 5 million		42,8%
5 – 10 million		15,8%
10 – 20 million		8,6%
More than 20 million		11,8%

Table 6
Usage per cent of Internet based IOS

Percentage of purchasing through internet-based IOS	Frequency	Percentage	Cumulative Percentage
1. 0%	90	52,9	52,9
2. Lower than 5%	35	20,6	73,5
3. From 5% to 15%	13	7,6	81,2
4. From 15% to 25%	11	6,5	87,6
5. From 25% to 40%	4	2,4	90,0
6. More than 40%	17	10,0	100,0
Total	170	100,0	

Table 7
Spearman's Correlations between Factors

	F1	F2	F3	F4
Extent of Use of IIOS	,207	,053	-,180	-,335
	(,007)	(,498)	(,019)	(,000)

In this study a Logistic Regression was performed with a dichotomous dependent variable. The technique of Logistic Regression informs researchers how well the set of independent variables predicts or explains the dependent (categorical) variable (Palant 2005). Considering the extent of use of Internet based IOS the firms that were researched have been classified into two groups. The first group includes those firms that the percentage of use of Internet based IOS for purchasing products is less than 15% (categories 1,2,3 of Table 6), while the second group includes those firms that the percentage of use of Internet based IOS is greater than 15% of the total purchasing budget (categories 4,5,6 of Table 6). Hence, the first group encompasses 138 firms (including those firms that don't use Internet based IOS) while the second group encompasses 32 firms. The first group was coded using value '1' – High Use of IIOS whereas the second was described using value '0' – Low Use of IIOS.

Table 8
Results of Logistic Regression

Variables	Beta	St. Error	Wald	df	Sig	Exp(B)	95% C. I. Low	High
Trust Problems (F4)	-0,971	0,265	13,398	1	,000	0,379	0,225	0,637
Market improvement (F1)	0,492	0,242	4,139	1	,042	1,635	1,018	2,627
Constant	-1,823	0,260	49,138	1	,000	0,161		
Omnibus Tests of Model Coefficients	p<0,000							
Hosmer-Lemeshow GFI	Chi-Square = 3,897, df = 8, sig. = 0,866							
Cox and Snell R square	0,145							
Nagelkerke R square	0,235							
Percent correctly classified	83,6							

Analysing the data of Table 8 we note that the Omnibus Tests of Model Coefficients gives us the indication that the model constructed for the purposes of this research performs well because the value p is less than .05 (for this set of results we need a highly significant value). Another Goodness of Fit test is Hosmer-Lemeshow Test and in order to support the model a value (significance value) greater than .05 is needed. In this model the chi-square value for this test is 3,897 with a significance level of 0,866 which is larger than .05. As a result this Test also supports the model. The Cox & Snell R square (0,145) and the Nagelkerke R square (0,235) values provide an indication of the amount of variation in the dependent variable explained by the

model (pseudo R square statistics). In this model the two values suggest that between 14,5% and 23,5% of the variability is explained by this set of variables. The column "Beta" gives us information about the contribution of each of the independent variables. In this model the variable measuring Market Improvement shows a positive B value (it is a factor that increase the likelihood of high IOS use) while the variable measuring Trust Problems has a negative B value (it means that it is a factor that decrease the likelihood of high IOS use). Furthermore, the last column displays the confidence interval (CI) for each of the odds ratios Exp (B). This CI is the range of values that we can be 95% confident encompasses the true values of odds ratios. Finally the model correctly classified 83,6 per cent of cases overall.

$$p(X) = \frac{e^{-1,823-0,971F_4+0,492F_1}}{1+e^{-1,823-0,971F_4+0,492F_1}} \tag{1}$$

Using the equation (1) we can predict the odds of high use of Internet – based IOS (variable X) when we know the perceptions related to factors F1 (Market Improvement) and F2 (Trust Problems). The positive sign for F1 means that the variable is positively related to High Use of Internet based IOS, while the negative sign of F2 indicates that if the value of this variable increases the likelihood of High Use of IIOS decreases.

7. CONCLUSIONS

In the aforementioned theory in this study was suggested that a main dimension related to the extent of use of Internet – based InterOrganizational Systems is their perceived characteristics i.e. the perceived benefits and risks. Thus, the first objective in this paper was to identify whether these benefits (related to improvement of market and to interfirm collaboration) and risks (related to trust and investment barriers) were associated to the usage extent of these systems in a way consistent with theory and previous research. Specifically, the results indicated that these benefits that are summarized by factor F1 (Lower cost of products, Lower transactional fees, Paying at true market price, Increased price transparency, Improved searching of product information) in great extent are positively associated with the usage extent of Internet based IOS. On the contrary benefits summarized by factor F2 (Shortening of order to delivery time, Improving logistics management, Improving inventory management, Better collaboration with suppliers) were not found to be significant positively associated associated with IOS usage. Furthermore factor F3 (High cost of implementation, High business process restructuring cost, High cost of integration with IS, Great difficulties of integration with IS, Long period of time of integration with IS) was negatively associated with usage extent while F4 (Uncertainty related to verification of suppliers' identity, Uncertainty related to the security and integrity of transactions, Uncetainty related to missing of confidential information, Uncertainty related to the settlement of problems happening during transactions) presented a strong negative association with usage extent. These findings are consistent with

previous research. Rao *et al.* (2007) reached similar conclusions for electronic marketplaces, a special type of Internet based IOS. Furthermore Davila et al (2003) have mentioned the contribution of perceived benefits or risks to adoption or rejection of e- procurement systems respectively. However in this research it is proved that these relationships hold for the broader category of IIOS. In addition a comparison of the main benefits is achieved, as we can conclude which benefits or risks influence more or less (negatively or positively) the extent of use of IIOS.

8.   IMPLICATIONS OF THIS STUDY AND FUTURE RESEARCH

The findings of this paper are subject to a number of limitations. A limitation of this study is that the extent of use of IIOS was measured only for the purchasing of products. Although this is the main function that is of great interest during the use of such systems, it is not correct to draw general conclusions as regards other business applications of IIOS. Thus we cannot generalize the results of this study to other applications like the provision of improved service to customers, the improvement of communication channel with vendors, the optimization of transportation of raw materials, the improvement of inventory management (Lancioni et al 2000). Furthermore because of the fact that most of Greek firms are small and medium sized, the sample for the present study consisted of small firms and this fact doesn't ensure that the research findings can be generalized to the wider population of firms. However the results can still offer important guidelines for replicating the study over a sample of large firms.Despite these limitations, this study has important implications. The findings of this study are useful for both managers and researchers. Results provide the first empirical evidence of the relationship between internet – based InterOrganizational Systems (a category that includes many others) and special types of expected benefits and risks. Specifically, this study gives insight into a total of four dimensions of perceived characteristics and presents the association of each of them with the extent of use of IIOS. Understanding the underlying relationship between these structures and the extent of use of IIOS helps managers identify where they should focus their attention before taking an adoption decision. In particular this study suggests that managers should carefully consider the benefits related to market improvement as these benefits seem to influence positively the usage of IIOS. Despite the aforementioned influence both researchers and managers must not ignore the association between the other dimension of benefits (interfirm collaboration) and the extent of use of IIOS. Instead of looking at the expected benefits in order to decide whether to adopt or not an IIOS managers have to examine the perceived risks related to these systems. Thus researchers should pay careful attention to trust barriers and those risks related to security issues. Meanwhile, companies that develop software should take into consideration the concerns of managers related to these security issues, as this seems to be a factor that strongly influences the extent of use of these systems. However, the relationship between perceived characteristics and the use of internet based IOS needs further

investigation. More specifically, future research should consider incorporating other important variables related to perceived benefits and risks from contingency theory that are likely to influence the level of use of Internet based IOS. Thus future studies can explore in depth different dimensions of risks and benefits and especially such constructs that are relevant to modern internet technology solutions that focus on solving the trust problems that appear during the transactions via Internet. This is important, because in the present study the scales didn't measure such issues that were found to influence negatively the use of these systems. Hence, new scales have to be developed to measure these dimensions more appropriately. Finally future research should generalize the results to large firms.

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