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## RISK MITIGATION AND RISK ABSORPTION IN IOS: A PROPOSED INVESTIGATIVE STUDY

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### Abstract

*This study examines the risk consequences of participation in inter-organisational information systems (IOS). The research aims to identify the risk mitigation and risk absorption impacts of IOS participation and evaluate the extent to which these impacts affect participation decisions. Prior research has called for a greater understanding of risks associated with IS. This paper presents a synthesis of the research on IS risk and illustrates that, to date, this call has been addressed primarily by one-dimensional studies. The paper highlights the changing context of inter-firm trade illustrating its increased reliance on networked collaboration. What remains uncertain is the nature and consequences of risk within this context. The paper presents a framework that will form the basis of the proposed research into the risk mitigation and risk absorption consequences of IOS participation.*

*Keywords: IOS, Risk Mitigation, Risk Absorption, Collaboration.*

## **1 INTRODUCTION**

Driven by an increasingly competitive business environment and technological innovations the prevalence and use of inter-organisational information systems (IOS) is increasing dramatically. This growth is also being driven by larger organisations seeking supply chain efficiencies. These firms are now attempting, given the changing economics of IOS, to connect more small suppliers to their inter-organisational supply chain management systems. While existing research provides useful insight into IOS benefits it rarely assesses the risk consequences associated with the proposed benefits. Further, this research provides evidence that the benefits of IOS participation are often unevenly distributed among participants. With some participants being subject to strategic manipulation by more powerful firms. However, this work lacks a comprehensive analysis of risk posturing between firms with scant treatment of the risk mitigation and risk absorption implications of IOS. As such there is insufficient understanding of the risk consequences of IOS participation.

## **2 LITERATURE REVIEW**

Risk and uncertainty in various forms have always been prevalent on the management agenda (Luehrman 1998; Oldfield & Santomero 1997). Previous research (Adams 1995; IFAC 1999) presents risk as composed of three distinct, but interrelated, dimensions - uncertainty, hazard and opportunity. Within inter-firm trade, firms have traditionally attempted to mitigate risks by engaging in vertical integration or by introducing contractual obligations into market relationships.

Technological innovations of the 1980's and early 1990's enabled a new modus operandi of coordination among firms that relies more on close-knit networks and value-added partnerships with small numbers of participants than on market relationships (Bakos & Brynjolfsson 1993). Larson (1992) highlighted the proliferation of these networked organisational forms that do not fit into the market-hierarchy framework as proposed by Coase (1952). This non-vertically integrated and non-market relationship environment has been referred to as the 'move to the middle' (Clemons et al. 1993). This middle is characterised by co-operative relationships, mutual gain and collaborative information sharing (Powell 1990).

More recent technological innovations have led to proliferation of exchange technologies and structures often termed 'e-Business networks'. Current inter-firm co-ordination techniques and structures are becoming synonymous with use of some form of IOS (Buzzell & Ortmeyer 1995). Within the collaborative 'middle', these systems are designed to support automation of exchange processes, better visibility of the processes, and sharing of databases and applications (Grover et al. 2002).

However, IOS engender a risk paradox, in that mitigating identified risks may involve increased exposure to new risks. One justification for IOS adoption is to smooth links in the supply chain, eliminating supply uncertainties and reducing risk (Kumar & Van Dissel 1996) by achieving cost reductions, increased productivity (Barrett & Konsynski 1982), shortened lead times (Cunningham & Tynan 1993) and reduced inventory levels (Johnston & Vitale 1988). The reality, however, is somewhat different and while some success has been achieved in reducing uncertainty, IOS introduces a variety of new risks. Primary among these are the risks associated with the use of specific technologies (Barua & Lee 1997) including multiple standards and process reengineering, the risks associated with changes in the position of firms in the value chain, and risks from loss of bargaining power (Clemons et al. 1993). While many of these risks exist for non-technology enabled relationships the introduction of information systems has the potential to exacerbate these risk and hence, the strategic benefits of IOS participation are still unclear (Chatfield & Yetton 2000). In addition firms must also evaluate the risks of not joining an IOS (Barua & Lee 1997). Thus, understanding the risk

consequences of new ‘middle’ is critical if firms are to avoid becoming victims of strategic manipulation (Bakos 1988).

Currently, there is a significant body of literature and research on IS risk. However, synthesising this literature (Table 1) demonstrates that, when the primary area of concern is risk, it rarely addresses risk in the IOS context. Further, the risk areas tend to be confined to project implementation, development and management risks as opposed to strategic risk implications. Kemerer and Sosa (1991) do include an IOS focus in their research in Strategic Information Systems. Their research advocates using a systems development framework to identify risk. However, their work is one-dimensional and focuses solely on development risks. Vitale (1986) takes a more strategic view of risk and focuses on the risks associated with information systems success. Highlighting the increasing ability of IS to alter industry structure, introduce barriers to entry and increase switching costs. Vitale argues that these effects can ultimately, although unintentionally, have negative consequences for the firm. He stresses the importance of an increased understanding of the risks associated with IS and suggests evaluating the current impact of IS and the future competitive importance of IS to the industry as initial steps towards understanding IS risks.

Area	Primary Focus on IOS	Degree of Focus on IOS	Author
IS Development & Implementation	No	None	(Alter & Ginsburg 1978)
	No	Some	(Kemerer & Sosa 1991)
	No	None	(Wilcocks & Margetts 1994)
General IS Risk Management	No	None	(Kelly Rainer et al. 1991)
	No	None	(Charette 1996)
Systems Reengineering	No	None	(Clemons et al. 1995)
Failure & Abandonment	No	None	(Ewusi-Mensah & Przasnyski 1994)
Outsourcing	No	None	(Lacity et al. 1995)
	No	None	(Willcocks et al. 1999)
IS Security	No	None	(Straub & Welke 1998)
Risk Associated with Success	No	Some	(Vitale 1986)

Table 1 Indicative Synthesis of IS Risk Literature

There is a growing body of IOS literature. Table 2 summarises the IOS literature that includes some aspects of risk.

	Primary Focus	Risk Focus	Author
IOS Literature	Sustainable Collaboration	Risks of Conflict	(Kumar & Van Dissel 1996)
	Economics of Coordination	Transaction Risk	(Clemons & Row 1992)
	Economic Activity	Risk Mitigation (Partial)	(Clemons et al. 1993)
	Trust	Opportunistic Behaviour	(Pavlou 2002b)
	Optimal Number of Suppliers	Opportunistic Behaviour	(Bakos & Brynjolfsson 1993)
	Information Sharing	Uncertainty	(Borman 1994)

Table 2 Indicative Synthesis of IOS Risk Literature

Kumar and Van Dissel (1996) posit that without adequate management, IT enabled collaboration can degenerate into conflict. Their study identifies risks of conflict and presents conflict risk management

strategies based on IOS typologies. Clemons and Row (1992) employ a transactions cost economics approach to analyse IOS structures. They argue that IT can reduce inter-firm coordination costs and hence transaction risk which they define as the cost associated with the exposure to being exploited in the relationship. However, this argument has not been empirically tested. Clemons et al (1993) build on the previous work arguing that a move to the middle will be brought about by the impact of IT on coordination cost and transaction risk. Pavlou (2002b) explores the role of trust as a mechanism for mitigating uncertainty in online B2B marketplaces. Bakos and Brynjolfsson (1993) investigate the optimal number of suppliers in IOS exchanges and highlight the potential for opportunistic behaviour, a transaction risk, as a result of over reliance on key suppliers. Finally, Borman (1994) argues that the reduction of uncertainty, through increased communication, can serve to reduce the consequences of asset specificity.

Cumulatively tables 1 and 2 highlight the dearth of research on risk in the IOS field by illustrating that there is insufficient comprehensive multi-dimensional research on IOS risk. IOS research that has focused on risk has primarily done so in a one-dimensional fashion and none of the current research on IOS risk addressed the strategic impacts of IOS participation on business risk. One such strategic impact is the degree of risk mitigation and risk absorption associated with IOS participation. This research proposes to investigate the risk absorption and risk mitigation properties of IOS.

### **3 UNDERSTANDING IOS PARTICIPATION RISKS**

Inter-firm trade has always been subject to risk and uncertainty. Firms attempt to manage this uncertainty by engaging in vertical integration or contractual market based agreements. Vertical integration provides a high degree of control but at a high coordination cost while market interactions offer low coordination costs at the expense of control. Driven by these limitations and enabled by technological innovations a new middle has emerged. This middle is characterised by a network enabled collaborative relationships between firms.

More recent technological innovations have impacted each of the three inter-firm trading structures. Enterprise collaboration systems have dramatically altered the economics of vertical integration. Business-to-business e-Commerce systems provide networked capabilities to market based interactions. Within the middle an increased array of networking technologies have become available to support collaboration. Given these innovations the middle has persisted as a trading structure as evidenced by the increased literature on networked collaboration, for example see (Borman 1994; Grover et al. 2002; Kumar & Van Dissel 1996; Buzzell & Ortmeyer 1995; Pavlou 2002a).

However, while a central motivation towards the adoption of vertical integration or market interactions was the control risk and uncertainty, it is unclear what as to what risks and uncertainties are present in the new structure of the middle.

The literature synthesis presented earlier provides an initial basis for understanding risk in IOS by explicitly identifying some of the risks associated with IOS participation. The discussion on the emergence of the new 'middle' aids understanding of the problem by providing a context within which new trading relationships can be evaluated. However, neither provides insight into potential risk mitigation or risk absorption capabilities of IOS within the networked collaborative structure. Hence, further research is required to investigate the risk consequences of IOS participation. The contribution of this research is to evaluate the emerging, collaborative-networked structure of inter-firm trade through the traditional literature on risk. Identifying the risk mitigation and absorption consequences of participation in this new form of inter-firm trade. To date no such analysis has been done.

## 4 RESEARCH OBJECTIVES

This research provides an exploratory study of the relationship between IOS participation and risk. The research objective is:

*to examine the risk consequences of participation in Inter-Organisational Information Systems (IOS)*

Specifically, the research seeks to identify the risk mitigation and risk absorption impacts of IOS participation, evaluate the extent by which these impacts differ for small and large participants and to assess the impact risk has on participation decisions. That is:

RQ1: to what extent does IOS participation mitigate risk?

RQ2: to what extent does IOS participation absorb risk?

RQ3: what impact does organisational size have on risk mitigation and risk absorption?

RQ4: what role do managers' perceptions of IOS participation risks play in participation decisions?

## 5 CONCEPTUAL FRAMEWORK

As previously defined, risk is composed of three dimensions: uncertainty, hazard and opportunity. Pure risk mitigation is conceptualised as reduced hazard, increased opportunity and reduced uncertainty, while pure risk absorption is conceptualised as increased hazard, reduced opportunity and increased uncertainty.

Figure 1 presents an indicative version of the conceptual framework to be use in the study to assess the risk consequences for organisations participating in IOS. This framework identifies the generic risk categories of IOS participation as technical, operational and strategic. Indicative risk elements are then classified within these generic groups before being analysed under the dimensions of risk. Uncertainty, will be operationalised by utilising the four measures of uncertainty: a clear enough future, alternative futures, a range of futures and true ambiguity as identified by Courtney et al (2000). Hazard will be operationalised by the number of responses available to counter act the potential downside effects. Opportunity will be operationalised by the number of positive alternative outcomes identifiable.

Generic IOS Risk	Indicative Risk Element	Risk Dimension 1: Uncertainty	Risk Dimension 2: Hazard	Risk Dimension 3: Opportunity
Technical	Technology			
	Design			
Operational	Degree of Integration			
	Financial			
Strategic	Dependency			
	Flexibility			

Figure 1 Conceptual Framework

## 6 PROPOSED RESEARCH APPROACH AND RESEARCH METHODS

This project is exploratory with the intent of building upon and expanding existing theory of technology enabled supply chain relationships. The theory building aspect of this research and the absence of a priori principles places it within the inductive research tradition. In addition, as one of the main goals of the research is to yield a greater understanding of human thought and action the research is hermeneutic in nature and thus lies firmly within the interpretative tradition. Orlikowski & Baroudi (1991) illustrated that positivist research has traditionally been the dominant research paradigm in IS research. However, they posit that this dominance has been unnecessarily restrictive and that much is to be gained from the use of other research perspectives in the IS domain. Since then the interpretative approach has emerged as an important strand of IS research and has gained a wide acceptance in the IS domain (Klein & Myers 1999; Walsham 1995; Lee 1999).

While the research methodology is interpretative this does not necessarily restrict the choice of research methods to methods traditionally associated with interpretive research. Mingers (2001) argues that a richer understanding of the research topic can be gained by combining several research methods. He develops the work of Lyytinen and Klein (1985) who argued for a coming together of the hermeneutic and empirical-analytic traditions in IS research. Consequently the proposed research methods for data collection are questionnaire surveys and case study analysis. Such plurality of research method is useful for triangulation and has gained acceptance in the IS domain (Mingers 2001; Palvia et al. 2003). The completed framework will form the basis for a questionnaire survey instrument. The survey will be cross sectional but targeted at firms known to be participating in some form of IOS. The mailing list will be compiled from members of the Electronic Commerce Association and other available sources. It is expected that the number of companies that will fit the research profile will be in the region of 100-300. This may necessitate the use of a purposive, non-probabilistic sample. The survey findings will be cross-validated by utilising case based research methods on a selected number of cases. It is anticipated that preliminary survey results will be available for presentation at the conference.

### References

- Adams, J. (1995). Risk. UCL Press Limited, London.
- Alter, S. and M. Ginsburg (1978). Managing Uncertainty in MIS Implementation. Sloan Management Review. Fall, 23-31.
- Bakos, J. Y. (1988). Strategic Implications of Interorganizational Systems. In Workshop in Information Technology and Business Strategy, Brussels, Belgium, June, pp. 1-12
- Bakos, J. Y. and E. Brynjolfsson (1993). Information Technology, Incentives, and the Optimal Number of Suppliers. Journal of Management Information Systems. 10(2), 37-53.
- Barrett, S. and B. Konsynski (1982). Inter-Organization Information Sharing Systems. MIS Quarterly. 6(4), 93-104.
- Barua, A. and B. Lee (1997). An economic analysis of the introduction of an electronic data interchange system. Information Systems Research. 8(4), 398-422.
- Borman, M. (1994). Common knowledge, interorganizational networks and the future for the organization of production. Journal of Information Technology. 9, 203-212.
- Buzzell, R. D. and G. Ortmeyer (1995). Channel Partnerships Streamline Distribution. Sloan Management Review. 36(3), 85-96.
- Charette, R. N. (1996). The mechanics of managing IT risk. Journal of Information Technology. 11(4), 373-378.
- Chatfield, A. T. and P. Yetton (2000). Strategic Payoff from EDI as a Function of EDI Embeddedness. Journal of Management Information Systems. 16(4), 195-224.

- Clemons, E. and M. Row (1992). Informational Technology and Industrial Cooperation: the Changing Economics of Coordination and Ownership. *Journal of Management Information Systems*. 9(2), 9-28.
- Clemons, E., M. Thatcher and M. Row (1995). Identifying Sources of Reengineering Failure: A Study of the Behavioral Factors Contributing to Reengineering Risks. *Journal of Management Information Systems*. 12(2), 9-36.
- Clemons, E. K., S. P. Reddi and M. C. Row (1993). The Impact of Information Technology on the Organization of Economic Activity: The "Move to the Middle" Hypothesis. *Journal of Management Information Systems*. 10(2), 9-35.
- Coase, R. H. (1952). The Nature of the Firm. In *Reading in Price Theory* (Stigler, G. J. and K. E. Boulding Eds.), pp. 386-405. Richard D. Irwin, Homewood, IL.
- Courtney, H. G., J. Kirkland and S. P. Viguierie (2000). Strategy under uncertainty. *The McKinsey Quarterly*. 2000(Number 3).
- Cunningham, C. and C. Tynan (1993). Electronic Trading, Inter-organizational Systems and the Nature of Buyer-Seller Relationships: The Need for a Network Perspective. *International Journal of Information Management*. 13, 3-28.
- Ewusi-Mensah, K. and Z. H. Przasnyski (1994). Factors Contributing to the Abandonment of Information-Systems Development-Projects. *Journal of Information Technology*. 9(3), 185-201.
- Grover, V., J. T. C. Teng and K. D. Fiedler (2002). Investigating the Role of Information Technology in Building Buyer-Supplier Relationships. *Journal of the Association of Information Systems*. 3, 217-245.
- IFAC (1999). Enhancing Shareholder Wealth by Better Managing Business Risk, pp. 1-49. International Federation of Accountants and PricewaterhouseCooper, New York.
- Johnston, H. R. and M. R. Vitale (1988). Creating Competitive Advantage With Interorganizational Information Systems. *MIS Quarterly*. 12(2), 153-165.
- Kelly Rainer, R., C. A. Snyder and H. H. Carr (1991). Risk Analysis for Information Technology. *Journal of Management Information Systems*. 8(1), 129-147.
- Kemerer, C. F. and G. L. Sosa (1991). Systems-Development Risks in Strategic Information-Systems. *Information and Software Technology*. 33(3), 212-223.
- Klein, H. and M. Myers (1999). A Set of Principles for Conducting and Evaluating Interpretative Field Studies in Information Systems. *MIS Quarterly*. 23(1), 67-94.
- Kumar, K. and H. G. Van Dissel (1996). Sustainable Collaboration: Managing Conflict and Cooperation in Interorganizational Systems. *MIS Quarterly*. 20(3), 279-300.
- Lacity, M. C., L. P. Willcocks and D. F. Feeny (1995). IT Outsourcing: Maximize Flexibility and Control. *Harvard Business Review*. 73(3), 84-93.
- Larson, A. (1992). Network Dyads in Entrepreneurial Settings - a Study of the Governance of Exchange Relationships. *Administrative Science Quarterly*. 37(1), 76-104.
- Lee, A. S. (1999). Rigor and Relevance in MIS Research: Beyond the Approach of Positivism Alone. *MIS Quarterly*. 23(1), 29-34.
- Luehrman, T. A. (1998). Strategy as a Portfolio of Real Options. *Harvard Business Review*. 76(5), 89-99.
- Lyytinen, K. and H. Klein (1985). The critical theory of Jurgen Habermas as a basis for a theory of information systems. In *Research Methods in Information Systems* (Mumford, E. et al. Eds.), pp. 219-236. Elsevier, Amsterdam, The Netherlands.
- Mingers, J. (2001). Combining IS Research Methods: Towards a Pluralist Methodology. *Information Systems Research*. 12(3), 240-259.
- Oldfield, G. S. and A. M. Santomero (1997). Risk Management in Financial Institutions. *Sloan Management Review*. 38(3), 33-46.
- Orlikowski, W. J. and J. J. Baroudi (1991). Studying Information Technology in Organizations: Research Approaches and Assumptions. *Information Systems Research*. 2(1), 1-28.
- Palvia, P., E. Mao, A. F. Salam and K. S. Soliman (2003). Management Information Systems Research: What's there in a methodology? *Communications of the Association for Information Systems*. 11, 289-309.

- Pavlou, P. A. (2002a). Coordination of Task Interdependencies in Collaborative Supply Chains: Interorganisational IT-Enabled Coordination Capabilities. In Eighth Americas Conference on Information Systems, pp. 2312-2316
- Pavlou, P. A. (2002b). Institution-based trust in interorganizational exchange relationships: the role of online B2B marketplaces on trust formation. *The Journal of Strategic Information Systems*. 11(3-4), 215-243.
- Powell, W. W. (1990). Neither Market nor Hierarchy: Network Forms of Organization. In *Research in Organizational Behaviour*, (Straw, B. M. and L. L. Cummings Eds.), pp. 295-336. JAI Press, Greenwich, Conn.
- Straub, D. W. and R. J. Welke (1998). Coping with systems risk: Security planning models for management decision making. *Mis Quarterly*. 22(4), 441-469.
- Vitale, M. (1986). The Growing Risks of Information Systems Success. *MIS Quarterly*. December, 327-334.
- Walsham, G. (1995). The Emergence of Interpretivism in IS Research. *Information Systems Research*. 6(4), 376-394.
- Wilcocks, L. and H. Margetts (1994). Risk Assessment and Information Systems. *European Journal of Information Systems*. 3(2), 127-138.
- Willcocks, L. P., M. C. Lacity and T. Kern (1999). Risk mitigation in IT outsourcing strategy revisited: longitudinal case research at LISA. *Journal of Strategic Information Systems*. 8(3), 285-314.