OPERATIONAL AND BEHAVIOURAL DIMENSIONS OF E-SUPPLY CHAINS AMONG MALAYSIAN'S SMES

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Keywords: e-Supply chain, systems engineering, e-Business adoption, network organisation, structural equation modelling, SMEs.

Abstract: This paper reviews the available literature to identify theoretical and empirical gaps regarding e-Supply chain adoption among small and medium sized enterprises (SMEs). We argue that a generic e-Supply chain framework should employ appropriate *operational* and *behavioural* perspectives. We propose that e-Supply chain operation can succeed only when integrated with an efficient supply chain network and a strategic plan committed to e-Business. Survey data from 208 Malaysian SMEs are collected and Structural Equation Modelling (SEM) is employed to apply the proposed framework. More specifically, a set of three empirical models are examined to evaluate the validity and impact of *supply chain strategy, e-Business adoption, and the interaction of these constructs* on *business performance*. Our review suggests that much of the existing e-Supply chain adoption and implementation literature is not firmly grounded in theory. We have suggested that the systems engineering tradition of focusing on the interactions of technology, organizational structure, and personnel provides a useful framework for understanding the business performance of e-Business. The technology-organisational and people (TOP) dimensions are based on sound systems engineering principles that are widely recognised and accepted for improving manufacturing organisation. We suggest that these principles are equally valid for the e-Business oriented and virtual organisations. These expectations are supported by our empirical results. We find that measures based on the TOP conceptual scheme provide reliable and valid scales that are equally applicable to both e-Business and non-e-Business firms.

1 INTRODUCTION

Recent years have witnessed the worldwide adoption of e-Business for achieving cost savings, improving customer service, and promoting innovation, and taking advantage of new business opportunities (Wagner *et al.*, 2003). Despite the burst of the dot-com bubble, companies are continuing to adopt e-Business operations. Martinsons and Martinsons (2002) suggest that the fear of lagging behind in adopting the Internet technology has rushed many firms to blindly engage in e-Business initiatives. As a consequence, many have done so without deriving much benefit. Despite huge investments in e-Business initiatives, academics and practitioners are questioning the value proposition of e-Business investments (Zhu *et al.,* 2003).

Studies indicate that technology diffusion among knowledge intensive SMEs have been difficult (see for example, McCole and Ramsey; 2005; Ramsey *et al.,* 2005). Chapman *et al.* (2000) argue that SMEs are lagging behind their larger counterparts in the use of the Internet. Other studies have found that SMEs are only half as likely to be using e-mail; for micro companies the figure is even smaller (Chapman *et al.,* 2000). Poon and Swatman (1997) suggest that cost is the largest barrier for SMEs restricting the adoption of new technology. A recent report by *Spectrum* (2001) also supports the view that SMEs need to catch up with their larger

Hooi Keoy K., Zairi M. and Hafeez K. (2008).
OPERATIONAL AND BEHAVIOURAL DIMENSIONS OF E-SUPPLY CHAINS AMONG MALAYSIAN'S SMES.
In *Proceedings of the International Conference on e-Business*, pages 362-369
DOI: 10.5220/0001906703620369

counterparts in adopting ICTs in the automotive components sector. The main issues identified include the excessive cost of e-technology and skill deficiencies in e-Business implementation.

This paper provides a critical review of the available e-Business literature to identify theoretical and empirical gaps. Based on our literature review, we identify *operational* and *behavioural* perspectives that form the basis of a theoretical framework for understanding e-Supply chain adoption and success. We show that these perspectives relate to the well established "systems engineering" principles of *technology, organisation*, and *people*.

2 E-SUPPLY CHAIN: LITERATURE REVIEW

Operations management academics have always highlighted the strategic importance of operations, and its role in corporate success. The consideration of operation strategy is relatively as important in e-Business operations as in operating in traditional environments. However, evidence from the literature suggests that many companies have adopted e-Business without thinking through their strategic, operational and behavioural impacts (Marshall and Mackay, 2002; Gunasekaran *et al.,* 2002; Dutta and Biren, 2001), which subsequently led to e-Business failure. This section considers the impact the Internet has on operational, and behavioural management perspectives and whether new strategic thinking is required in response to the powerful external forces that are re-shaping industry. This section also aims to sustain the significance of these perspectives by providing supporting evidence from the existing e-Business literature.

2.1 Operational Perspective

e-Business is important for the supply chain literature because of the increasing need to integrate activities and information flows and to optimise the processes not only at the single company level, but also at the level of inter-company processes (Landford, 2004; Lattimore, 2001; Stevens, 1989). The importance and role of web-based technologies to support company operations (e-Supply chain) is widely acknowledged by both practitioners and academics (Sanders and Premus, 2005; Porter, 2001; Skjoett-Larsen, 2000).

There has been extensive research investigating the impact of organisational factors on innovation and technology adoption (Fjermestad, 2003; Grandon and Pearson, 2004). The factors influencing Internet technology adoption within supply chain strategy can be classified in several ways such as internal and external environments, firm and individual conditions, and domestic and international involvement (Moini and Tesar, 2005; Lewis and Cockrill, 2002). The perceptions of management toward IT adoption are examined in many studies (Taylor and Murphy, 2004). .

2.2 Behavioral Perspective

Technological sophistication of an organisation is considered an important factor for businesses' e-Business adoption and implementation. There has been extensive research outlining important determinants of organisational factors on e-Business adoption (Tornatzky and Fleischer, 1990). The majority of organisational factors addressed involve such organisational characteristics as size, industry type and business scope (Zhu *et al.,* 2004, 2006). However, there is a lack of study addressing the relationship between information orientation / asymmetry and technological innovation / integration on e-Business adoption (Hsieh *et al.,* 2006).

From the behavioural perspective, Damodaran and Olpher (2000) have identified knowledge transfer, knowledge integration, and practical application of knowledge as the main elements for developing "external" capabilities. According to a study conducted by Caloghirou *et al.* (2004), the readiness, and openness towards knowledge sharing among business partnerships are important factors in improving business performance and encouraging the adoption of e-Business. Establishing knowledge management mechanisms and advantage knowledge assets is essential for successful technological and organisational innovation (Bong *et al.,* 2004).

2.3 Performance Measurement

Marshall *et al*. (1999) define performance measurement as "… the development of indicators and collection of data to describe, report on and analyse performance". Neely *et al*. (1995) see performance measurement as "the process of quantifying the efficiency and effectiveness of action". Sanders and Premus (2005) argue that performance measurement is a complex issue that incorporates economics, management, and

accounting disciplines. Zhu *et al.* (2004) have stressed that an appropriate measurement system is essential to support a wide range of performance measures. Using Kaplan and Norton's (2004) balance score card concepts, we have identified tangible and intangible performance measures to evaluate performance improvements (Hafeez *et al.* 2007). Based on the relevant literature (Eikebrokk and Olsen, 2005) we identify three domains of measures to examine the perceived benefits of e-Business adoption: Financial, Operational efficiency and Coordination. Within each domain, it is useful to categorise specific indicators under "operational", and "behavioural" perspectives.

2.4 System Engineering Concept

Systems engineering may be defined as the science of analysing the behaviour of a system (or organisation) by studying the technology, policies and management procedures (or organizational structure) and the behaviour and attitudes of the people who make up of the organisation (Forrester, 1961; Parnaby, 1981; Towill, 1993). Many past and current management initiatives such as Total Quality Management (TQM) (Hafeez *et al.* 2006, supply chain management (Hafeez, *et al.* 1996), business process re-engineering (BPR) (Hammer and Champy, 1994) are based on systems engineering principles. Systems engineering distinguishes technology (T) and/or organisation (O) and/or people (P) dimensions (or TOP dimensions in short). Systems engineering emphasizes the inter-connectedness of these dimensions, and suggests that change in one is very likely to have implications requiring changes in others.

e-Business operation might best be understood from the perspective of supply chain management. We would particularly draw attention towards Stevens' (1989) supply chain management integration framework based on systems engineering principles. Stevens' (1989) model also provides a consistent empirical support, which provides a good base for comparisons. Stevens (1989) has differentiated contributory factors for supply chain integration into the 'hard' issues (such as technology) and the 'soft' (e.g. relations, attitudes, etc). Numerous studies suggest that many companies have not yet fully realised the technological integration of the available office technologies and software tools such as Material Resource Planning (MRP), Distribution Resource Planning (DRP), and Enterprise Resource Planning (ERP). Stevens, as early as 1989, advocated that in order to achieve full integration (from a baseline to external; companies needed to focus on people dimensions internally as well as externally. This study argued the applicability of Stevens' (1989) integration framework in today's business environment where companies want to move from a traditional business to e-Business. Therefore, the identified dimensions, namely technology, organisation, and people (TOP) are well suited for studying the success of e-Supply chain adoption.

Table 1: Incorporation of technology, organisation and people dimensions within each identified factor.

	Variables examined
"Operational Perspective" Supply Chain Strategy	Investments for supply chain system Integration of operating and planning database Standardised and customised information Information sharing and distribution
	Organisational structure Standardised supply chain practices and operations Integration of individual operations channel Time based logistics solutions
	Roles and responsibilities Developing and maintaining relationships Risk and rewards
"Behavioural Perspective" E-Business Adoption	Technological innovation and integration Information orientation and asymmetry Adoptability of technology infrastructures
	Organisational learning factors Organisational support and value Organisational knowledge management
	Internal and external collaboration Performance measurement Readiness mindset of adoption

Following the critique from the literature and gaps identified, it can be seen that the context of operational and behavioural management are still fit to investigate the success factor of e-Business adoption. Through a careful content analysis, elements have been identified which in the present author's view contribute to e-Business research. They can be generally categorised under the well-

established operations research dimensions of technology, organisation and people (see Table 1).

3 THEORETICAL FRAMEWORK

We have argued that a successful e-Supply chain company needs to take into account "operational" and "behavioural" issues. The overarching theoretical framework is summarized in Figure 1, and includes *supply chain strategy* and *e-Business adoption* constructs.

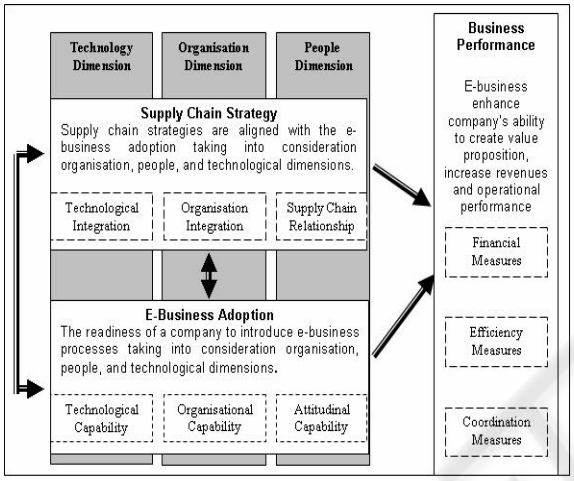

Figure 1: A conceptual framework for e-Supply chain adoption.

Figure 1 illustrates that within each of these constructs are embedded the three systems engineering principles: "technology", "organisation," and "people" (or TOP). The framework illustrates that these constructs are inter-related, and therefore any change in one factor will have ramifications for others. We hypothesize that developments in each dimension (TOP) of each domain (supply chain strategy and e-Business adoption) are necessary for satisfactory *business performance* (BP).

Hypothesis H1: Supply chain strategy (SCS) is a significant determinant of business performance (BP)

Hypothesis H2 E-Business adoption (EBA) is a significant determinant of business performance (BP)

Hypothesis H3 Business performance (BP) is directly related to the level of mutual dependency (and alignment) between supply chain strategies (SCS) and e-Business adoption (EBA)

In the sections that follow, we will illustrate the utility of our approach by applying it to understanding variation in the business success of Malaysian SMEs.

3.1 Sample Selection

We also describe the results obtained of an empirical study applying these concepts to data collected from 208 Malaysian SMEs. Using confirmatory factor analysis techniques (i.e. structural equation modelling or SEM), we show the effects of operational, and behavioural adjustments to e-Business on business success. Malaysia has been developing its information highway capacity since late 1990s. This is realised by the investment of RM 40 Billion (approximately £ 5.9 billion) to establish Multimedia Development Corporation (MDC). The Multi-media Super Corridor (MSC) is one of the key initiatives of MDC (Low *et al.,* 2000).

We have selected six industrial sectors that had previously been identified as the leading sectors in e-Business adoption (UNCTAD, 2001; Daniel *et al.,* 2002; Daniel, 2003). These include "Manufacturing", "Services", "Information Technology", "Finance, Insurance, and Real Estate", "Wholesale and Retail Trade", and "Others" (agriculture, communication, utility services). Equal sample sizes (fifty) of firms were selected for each sector. There are unequal numbers of SMEs in these six sectors in Malaysia. Stratified sampling with probabilities not proportional to stratum size (Dawson, 1998) was used to enable comparisons between sectors. While such an approach could restrict the generalisation of the results, it allows for a focus on the issues in industries where e-Business is rapidly becoming institutionalised. Three hundred questionnaires were emailed across these six industries. Overall, 208 respondents returned the questionnaire for a response rate of 69.3%. Sample sizes and response rates are reported in Table 2

Table 2: Survey sample characteristics (n= 208).

Sample industries	Respondents
Manufacturing	30
Services	28
IT	43
Finance, Insurance and Real Estate	35
Wholesale and Retails Trade	32
Others	40
Total Respondent	208
Response Rate (%)	69.3%

3.2 Structural Equation Models

We have employed Structural Equation Modelling (SEM) to test the applicability of our conceptual framework. SEM is a multivariate statistical technique that allows for the simultaneous analysis of the first-order and second-order measurement factors. In our analysis, the first-order factors consist of multi-item measures technological, organizational, and personnel/attitudinal dimensions of each of the basic constructs of supply chain strategy, and e-Business adoption. Supply chain strategy, and e-Business adoption constructs are second-order factors composed of the first-order ones. The dependent measure of business performance is also conceptualized as a "factor of factors" including financial, efficiency, and coordination factors, each of which is composed of multiple items.

The final model provides excellent fit to the data: χ^2 of 588.80, *df* = 393 with 72 parameters; χ^2/df = 1.50; CFI = 0.96; GFI = 0.85; RMSEA = 0.04; TLI = 0.95). This model fit indices fall in an acceptable range (> 0.90) and the RMSEA was less than 0.05. This structural model was nested within the first order model; in that it had been generated by imposing restrictions on, the parameters of the first order model (Figure 2).

Table 3 and Table 4 indicate the hypotheses results for the Malaysian sample. The path coefficients of interest in this model were generated between the independent factors (ξ, exogenous) of e-Business constructs and the dependent factor of *business performance* (η, endogenous). Interestingly, the results suggested that *e-Business adoption* (H2; γ = 0.53; *c.r.* = 4.97) was the strongest stronger predictor of *business performance* followed by the *supply chain strategy* construct (H1; γ = 0.26; *c.r.* = 2.70). The correlational paths are also of key interest when running this model. Results suggested between correlation between *supply chain strategy* and *e-Business adoption* had strong *phi* value of ϕ = 0.70 at significant value of *t* >1.96. The strong correlation was between supply chain strategy and e-Business adoption which confirmed that companies in Malaysia regardless of which sectors they belongs to still treated both of these factors as a important driver for improvement of business performance by treating equally important and they complement each other when a strategy had been formulated.

Table 3: Regression weights for hypotheses H1 to H6 for the Malaysian sample (n = 208).

Hypotheses				Standardised Weight	Standard Error (SE) (*c.r.*)
Paths Coefficients					
H1	BP	←	SCS	0.26	0.09 (2.70)
H2	BP	←	EBA	0.53	0.12 (4.97)
Factor Correlations					
H3	SCS	←→	EBA	0.70	0.06 (6.51)

Table 4: Second factor loadings for sub-hypotheses for the Malaysian sample (n = 208).

2nd Factor Loadings (Sub-hypotheses)				Standardised Weight	Standard Error (SE) (*c.r.*)
H1a	TIn	←	SCS	0.97	0.70 (10.50)
H1b	OIn	←	SCS	0.96	(Fixed) (Fixed)
H1c	SCR	←	SCS	0.67	0.08 (8.68)
H2a	TC	←	EBA	0.94	0.10 (7.96)
H2b	OC	←	EBA	0.84	(Fixed) (Fixed)
H2c	AC	←	EBA	0.65	0.10 (7.01)
FM		←	BP	0.94	(Fixed) (Fixed)
CM		←	BP	0.96	0.07 (14.66)
EM		←	BP	0.90	0.07 (10.50)

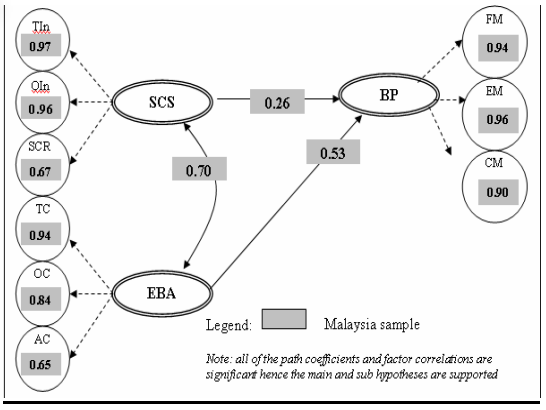

Figure 2: Standardised estimates for main and sub-hypotheses for Malaysian (n = 208) sample.

4 DISCUSSION

The theoretical model confirms that successful e-Supply chain requires *supply chain strategy*, and *e-*

Business adoption, which have mutual dependency regardless of geographic and economic differences. For the Malaysian sample (in the context of a developing country), the formation of *e-Business adoption* is dependent on the implementation of *supply chain strategy*. This is a critical factor for the Malaysian e-Business development as most of the businesses operate in a larger geographical area.

One explanation of greater relevance of supply chain strategy in the Malaysian sample could be that some of the Malaysian sample surveyed function as a role of contractors to core nations, and may be more focused on primary products. Their success depends on being able to assemble resources and to deliver products on time. The success for the companies operating in core nations may depend more critically on finding new markets for the products. Such an explanation may be viewed as speculation, but the key results are broadly consistent with this sort of a "world systems" view. Results also suggest that the operational differences in managing a global trade and distribution chain are more prominent than any cultural differences in explaining the (limited) differences in the surveyed samples.

The results suggested that companies must pay attention to their technological, organisational, and human capabilities for improving e-Business performance. These capabilities are critical when firms are planning or at the very initial stage of e-Business adoption, where most processes are at low integration levels and are full of manual work (Hsin and Shaw, 2005). Companies that intend to venture into e-Business need to acknowledge and identify barriers caused by "organisation" dimensions by offering training and knowledge for system integration, standards development, and process automation as well as to overcome possible IT resistance.

Where some previous studies have identified *supply chain strategy* as key dimensions (Wickramatillake *et al*., 2007; Koh *et al.,* 2006), our model extends this by measuring the impact of technological, organisational and people related issues with *e-Business adoption* in order to become a successful e-Business firm. Both e-Businesses and conventional businesses use information technology. Our results suggest, however, that technology plays a much more critical role in the business performance of enterprises that have fully adopted the e-Supply chain model. In non-adopting businesses, the use of technology is positively related to business performance, but only modestly so; and, technology use is not integrated with supply chain strategy. In e-Businesses, the use of technology is a stronger determinant of business performance than supply chain strategy. Furthermore, in e-Supply chain, technology use is strongly articulated with business and supply chain strategies.

Adopting enterprises are not without business performance problems. Our results suggest that for e-Business organisations to be successful, *supply chain management* need to be given a higher level of strategic importance (Koh *et al.,* 2007). We would argue that successful business collaboration is the result of human interactions, which can be supported by IT, but not to be replaced by IT. This is particularly important in the e-Business context where the traditional business model is usually developed on the backbone of technological infrastructure, and "people" related issues can be easily buried under the overwhelming emphasis on technological details. Technology is not the most critical factor in improving supply chains. To improve in this area, SMEs must consider relevant *attitudinal* issues as identified by Steven (1989) to allow for e-technology to be accepted and diffused in the e-Supply chain.

5 CONCLUSIONS

Our literature review suggests that the existing e-Supply chain and implementation studies lack theoretical underpinning. This situation is more acute for SMEs as the limited numbers of e-Supply chain models found in the literature are not tested empirically. Systems engineering principles, which focus on the interaction of *technology, organisation,* and *people* (TOP), provide a useful conceptual scheme for understanding the business performance of both e-Supply chain firms and others.

We have introduced a structural equation modelling approach, and used it to examine the sources of good business performance for companies adopting e-Supply chain. The multi-item constructs of *e-Business adoption and supply chain strategy* relate differently to business performance. The measures developed here, and the empirical results can be used as a benchmarking tool for the SMEs who wish to embark on e-Supply chain adoption journey. The study also provides some useful directions for new economy cyber-entrepreneurs, guiding them to give due consideration towards appropriate operational and behavioural factors when considering e-Supply chain adoption.

It would be an added value to expand findings obtained from the quantitative study by conducting qualitative investigations in a case study format. As stated by Patton (1987), "case studies are useful where one needs to understand some particular problems in great depth and identify rich information that can be learned from few exemplars of the phenomenon in question". The future research could be conducted as a complementary study, to further assess and test the applicably of the e-Supply chain factors of e-Business adoption and to identify and investigate any potential benefits, obstacles or emerging themes associate with it. Several organisations (minimum three organisations from each industry) that expressed their interests and met the criteria from both samples could be contacted for face-to-face interview. It is hoped that this combination of quantitative and qualitative study will further support and verify the applicability and robustness of the proposed conceptual model.

REFERENCES

Bong, S.H., Lee, J. and Gil, Y. (2004). Effective team processes for technology internalization with special emphasis on knowledge management: successful late starter, Samsung case. International Journal of Technology Management. Vol. 27, No. 1, pp. 16-39.

Cagliano, R., Caniato, F. and Spina, G. (2005). Reconsidering E-Business Strategy and the Impact on Supply Chains. International Journal of Operations & Production Management. Vol. 25, No. 12, pp. 1328-1332.

Damodaran, L. and Olpher, W. (2000). Barriers and facilitators to the use of knowledge management systems. Behaviour and Information Technology. Vol. 19, No. 6, pp. 405-413.

Dawson, T.E. (1998). Structural equation modelling versus ordinary least squares canonical analysis: some heuristic comparisons. San Diego: American Education Research Association.

Dutta, S. and Biren, B. (2001). Business Transformation on the Internet: Results from the 2000 Study. European Management Journal. Vol. 19, No. 5, pp. 449-462.

Eikebrokk, T.R. and Olsen, D.H. (2005). Co-opetition and e-Business success in SMEs: An empirical investigation of European SMEs. Proceedings of the 38th Annual Hawaii International Conference on System Sciences (HICSS'05).Hawaii, pp. 234-267.

Fjermestad, J. (2003). Electronic customer relationship management: revisiting the general principles of usability and resistance – an integrative implementation framework. Business Process Management Journal. Vol. 9, No. 5, pp. 572-591.

Forrester, J.W. (1961) Industrial Dynamics, T. Press, Cambridge, MA and John Wiley & Sons, New York.

Grandon, E. and Pearson, J.M. (2003). Strategic Value and Adoption of Electronic Commerce: An Empirical Study of Chilean Small and Medium Businesses. Journal of Global Information Technology Management. Vol. 6, No. 3, pp. 22-43.

Gunasekaran, A., Marri, H.B., McGaughey, R.E. and Nebhwani, M.D. (2002). E-commerce and its impact on operations management. International Journal of Production Economics. Vol. 75, No. 1, pp. 185-197.

Hafeez, K. Abdelmeguid, H. and Malak, N.M. (2006). A Framework for TQM to Achieve Business Excellence. Total Quality Management, 17(9), pp. 1213-1229.

Hafeez, K., Griffiths, M., Griffiths, M. and Naim, M.M. (1996). Systems Design of a Two-echelon Steel Industry Supply Chain. Int. J. Production Economics, Vol. 45, pp. 121-130.

Hafeez, K., Zhang, Y.B. and Malak, N.M. (2007). Outsourcing Non-core Assets and competences of a Firm using Analytic Hierarch Process. Computer and Operations Research (C&OR).(in Press August/September issue); reference 10-1016/j.cor.2006.

Hammer, M. and Champy, J. (1993). Business Process Reengineering. London: Nicholas Brealey.

Hsieh, C.T., Lai, F. and Shi, W. (2006). Information orientation and its impacts on information asymmetry and e-Business adoption: Evidence from China's international trading industry. Industrial Management & Data Systems. Vol. 106, No. 6, pp. 825 – 840.

Hsin, L.C. and Shaw, M.J. (2005). A Roadmap to Adopting Emerging Technology in E-Business - An Empirical Study. Working Papers. Bureau of Economic and Business Research, University of Illinois at Urbana.

Kaplan, R.S. and Norton, D.P. (2004). Measuring the Strategic Readiness of Intangible Assets. Harvard Business Review. Vol. 82, No. 2, p 52 - 67.

Koh, S.C.L. and Tan, K.H., 2006, Translating knowledge of supply chain uncertainty into business strategy and actions, Journal of Manufacturing Technology Management, 17, 4, pp. 472-485

Koh, S.C.L., Gunasekaran, A. and Rajkumar, D., 2007, ERPII: The involvement, benefits and impediments of collaborative information sharing, International Journal of Production Economics.

Lanford, A. (2004).The Current Practice of Organization Development within the Firm: A Survey of Large Industrial corporations. Group and Organization Studies. No. 17, pp.117–134.

Lattimore, O. (2001). Electronic Commerce Tools that Address Supply Chain Performance. Logistics Spectrum. Vol. 35, No. 4, pp. 11-12.

Lewis, R. and Cockrill, A. (2002). Going global – remaining local: the impact of e-commerce on small retail firms in Wales. International Journal of Information Management. Vol. 22, No. 3, pp. 195-209.

Low L.T., Mazlina, M. and Yang, W.K. (2000). Electronic Commerce in Malaysia. Akauntan Nasional. Vol. 34, No. 5, pp. 48-51.

Marshall, M., Wray, L., Epstein, P. and Grifel, S. (1999). 21st century community focus: better results by linking citizens, government and performance measurement. Public Management. Vol. 81 No. 10, pp. 12-19.

Marshall, P. and Mackay, J. (2002). An emergent framework to support visioning and strategy formulation for EC. INFOR Journal. Vol. 40, No. 1, pp. 3–22.

Martinsons, M.G. and Martinsons, V. (2002). Rethinking the Value of IT, Again. Communications of the ACM. Vol. 45, No. 7, pp. 25–26.

McCole, P. and Ramsey, E. (2005). A Profile of Adopters and Non-adopters of eCommerce in SME Professional Service Firms. Australasian Marketing Journal. Vol. 13, No.1, pp. 36-48.

Neely, A., Gregory, M. and Platts, K. (1995). Performance measurement system design – a literature review and research agenda. International Journal of Operations & Production Management. Vol. 15 No. 4, pp. 80-116.

Parnaby, J. (1981). Concept of a Manufacturing System. In: Systems Behaviour, 3rd Edn. (Paul Chapman, London). pp. 131-141.

Patton, M. Q. (1987) How to Use Qualitative Methods in Evaluation. California: Sage Publications, Inc.

Poon, S. and Swatman, P.M.C. (1997). Determinants of Small Business Internet Usage: A Multi-method Investigation of Perceived benefits, Tenth International Bled Electronic Commerce Conference, Bled, Slovenia, pp. 465-483.

Porter, M.E. (2001). Strategy and the Internet. Harvard Business Review. Vol. 79, No. 3, pp. 63-78.

Ramsey, E., Bell, P.J. and McCole, P. (2005). Internet-Based Business Among Knowledge Intensive Business Services: Some Irish Regional Evidence. Service Industries Journal (Special Issue - Services in the Regions). Vol. 25, No. 4, pp. 525-545.

Sanders, N.R. and Premus, R. (2005). Modeling the relationship between Firm IT capability, collaboration and performance. Journal of Business Logistics. Vol. 26, No. 1, pp. 1-23.

Skjoett-Larsen, T. (2000). European logistics beyond 2000. International Journal of Physical Distribution & Logistics Management. Vol. 30, No. 5, pp. 377-387.

Stevens, G.C. (1989). Integrating the Supply Chain. International Journal of Physical Distribution and Materials Management. Vol. 19, No. 8, pp. 3-8.

Taylor, M. and Murphy, A. (2004). SMEs and E-Business. Small Business and Enterprise Development. Vol, 11, No. 3, pp. 280-289.

Tornatzky, L. G. and Fleischer, M. (1990). The Processes of Technological Innovation. Lexington: Lexington Books.

Towill, D.R. (1993). System dynamics- background, methodology and applications. 1. Background and methodology, Computing & Control Engineering Journal; 4(5). pp. 201-208, ISSN: 0956-3385.

UNCTAD (2001). E-Finance and Small and Medium-size Enterprises (SMEs) in Developing and Transition Economies. UNCTAD Expert Meeting. Improving Competitiveness of SMEs in Developing Countries: Role of Finance Including E-Finance to Enhance Enterprise Development.

Wagner, B.A., Fillis, I. and Johansson, U. (2003). E-Business and E-Supply Strategy in Small and Medium Sized Businesses (SMEs). Supply Chain Management: An International Journal. Vol. 8, No. 4, pp. 343-354.

Wickramatillake, C.D., Koh, S.C.L., Gunasekaran, A. and Arunachalam, S., 2007, Measuring performance within supply chain, Supply Chain Management: An International Journal, 12, 1, pp. 52-59.

Zhu, K., Ken, K., Sean, X. and Jason, D. (2004). Information Technology Payoff in E-Business Environments: An International Perspective on Value Creation of E-Business in the Financial Services Industry. Journal of Management Information Systems. Vol. 21, No. 1, pp. 17-54.

Zhu, K., Kraemer, K.L. and Xu, S. (2003). E-Business adoption by European firms: A cross country assessment of the facilitators and inhibitors. European Journal of Information Systems. Vol. 12, No. 4, pp. 251–268.

Zhu, K., Kraemer, K.L. and Xu, S. and Vijay G. (2006). Migration to Open-Standard Interorganizational Systems: Network Effects, Switching Costs, and Path Dependency. MIS Quarterly. Vol. 30 (Special Issue), pp. 515-539.