UNIVERSITI PUTRA MALAYSIA

MEDIATING ROLE OF INFORMATION TECHNOLOGY RESOURCES IN NEW PRODUCT DEVELOPMENT PERFORMANCE AMONG IRANIAN BUSINESSES

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By

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Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

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Chairman: Associate professor. Tang Sai Hong, PhD

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The relationship between Information Technology (IT) and Business Performance (BP) is a recent and valuable research topic for both practitioners and students. To the best of the students' knowledge, little research has been performed to analyze the direct contribution of IT to BP, and the existing findings were inconclusive in supporting this contribution. Viewed from IT-enabled organizational capability perspective, current IT researchers tend to consider the firm's IT resources as complementary resources enhancing the value of other organizational capabilities and resources, which will further lead to the performance improvement. In fact, the study of the relationships between IT, organizational issues, and business performance is a cutting-edge research topic for IT scholars and practitioners and new IT enabled-organizational capabilities are being introduced continuously into the IT business value background. The purpose of this research is to examine how investment in different levels of IT resources can create IT competencies Cooperative Work Systems (CWS), Knowledge Management System (KMS) and Project and Resource Management System (PRMS), IT capabilities that farther create the higher order organizational capabilities of New Product Development (NPD) and Business Agility (BA). To examine the initial model, first a questionnaire-based survey was conducted and data was collected from Iranian business sectors. Then data analysis was performed by SEM technique (Structural Equation Modeling). Findings showed that investment in both technical and human IT resources and frequency of IT usage have positive effects on IT leveraging competence (in terms of CWS, KMS and PRMS). IT leveraging competence in turn converts the value of IT resources to organizational performance among Iranian companies by increasing NPD effectiveness and BA. Findings further demonstrated that the two higher order organizational capabilities of NPD effectiveness and BA are tangible to Iranian businesses, and their effective development can significantly enhance business performance in different dimensions.

Abstrak tesis dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains

PERANAN PENGANTARA SUMBER TEKNOLOGI MAKLUMAT DALAM PRESTASI PEMBANGUNAN PRODUK BAHARU DI KALANGAN PERNIAGAAN MASYARAKAT IRAN

Oleh

FAHIMEHSADAT GHORASHI NAJAFABADI

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Hubungan antara teknologi maklumat (IT) dan prestasi perniagaan (BP) adalah topik kajian hangat dan berharga kepada sarjana dan ahli perniagaan. Kajian ini menunjukkan bahawa hanya sedikit penyelidikan telah dijalankan untuk menyelidik sumbangan langsung IT terhadap BP, tetapi penemuan yang ada tidak dapat membuktikan sumbangan tersebut wujud. Daripada perspektif keupayaan organisasi berdaya-IT, sarjana IT –kini cenderung untuk menganggap sumber IT syarikat sebagai pelengkap untuk meningkatkan keupayaan dan sumber organisasi, dan membawa kepada peningkatan prestasi. Malahan, kajian hubungan antara IT, isu organisasi, dan prestasi syarikat adalah topik kajian hangat untuk sarjana IT dan ahli perniagaan dan keupayaan organisasi berdaya-IT baru terus diperkenalkan ke dalam arena nilai perniagaan IT. Objektif kajian ini adalah untuk menyilidik bagaimana pelaburan dalam tahap sumber IT yang berbeza boleh menghasilkan dayasaing IT dalam Sistem Kerja Bekerjasama (CWS), Sistem Pengurusan Pengetahuan (KMS), serta Sistem Pengurusan Projek dan Sumber (PRMS); yang merupakan keupayaan IT dan seterusnya menghasilkan keupayaan organisasi tahap tinggi dalam bentuk Pembangunan Produk Baru (NPD) serta Kelenturan Perniagaan (BA). Untuk memeriksa model pertama, soal selidik telah dijalankan dan data dikumpul - dari sektor perniagaan Iran. Kemudian analisis data dijalankan dengan teknik Permodelan Persamaan Berstruktur (SEM). Keputusan menunjukkan bahawa pelaburan dalam bentuk teknikal dan sumber manusia serta kekerapan penggunaan IT mempunyai kesan positif terhadap dayasaing penggunaan IT (dalam CWS, KMS, dan PRMS). Dayasaing penggunaan IT kemudian menukar nilai sumber IT kepada prestasi organisasi di kalangan syarikat Iran dengan meningkatkan kecekapan NPD dan meningkatkan BA. Keputusan seterusnya menunjukkan bahawa - dua keupayaan organisasi tahap tinggi iaitu kecekapan NPD dan BA dapat dikesan dalam syarikat Iran, dan jika dibangunkan secara berkesan dapat meningkatkan prestasi perniagaan secara ketara dalam dimensi yang berbeza.

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I certify that a Thesis Examination Committee has met on 26 December 2014 to conduct the final examination of Fahimehsadat Ghorashi Najafabadi on her thesis entitled "Mediating Role of Information Technology Resources in New Product Development Performance among Iranian Businesses" in accordance with the Universities and University Colleges Act 1971 and the Constitution of Universiti Putra Malaysia [P.U.(A)106] 15 march 1998. The committee recommends that the student be awarded the Master of Science.

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Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
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LIST OF ABBREVIATIONS

ATM	Automated Teller Machine
AVE	Average Variance Extracted
BA	Business Agility
BP	Business Performance
CA	Cronbach' Alpha
CAD	Computer Aided Design
CAM	Computer Aided Manufacturing
CEO	Chief Executive Officer
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CR	Composite Reliability
CVD	Chemical Vapor Deposition
CWS	Cooperation Work System
DBMS	Data Base Management System
DC	Data Communication
DF	Degree of Freedom
EDI	Electronic Data Interchange
ERP	Enterprise Resource Planning
GFI	Goodness-of-Fit Index
HIT	Hard Information Technology
IFI	Incremental Fit Index
IP	Internet Protocol
IS	Information System
IT	Information Technology

ITUF	Information Technology Usage Frequency
IDT	Innovation Diffusion Theory
KM	Knowledge Management
KMS	Knowledge Management System
LAN	Local Area Network
MC	Mass Customization
ML	Maximum Likelihood
MRP	Manufacturing Resource Planning
NA	Not Available
NFI	Normed Fit Index
NPD	New Product Development
PDMA	Product Development Management Association
PRMS	Project and Resource Management System
RBV	Resource Based View
R&D	Research & Development
RFI	Relative Fit Index
ROI	Return on Investment
RMSR	Root Mean Square Residual
RMSEA	Root Mean Square Error of Approximation
SCM	Supply Chain Management
SEM	Structural Equation Modeling
SIT	Soft Information Technology
TLT	Tucker-Lewis Index
UIS	User Information Satisfaction
VE	Virtual Enterprise

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The relationship between IT resources and business performance are recent and valuable research topic for both practitioners and scholars. In general, one of the most frequent obstacles to IT implementation and use for companies come to existence as businesses perceive IT does not deliver what is anticipated and/or they do not occasionally recognize what actually is achieved through investment in the use of IT (Melville, et al., 2004). Therefore, there is a great interest for managers and IT experts to know how and to what extend IT, emerging as a strategic differentiator, facilitates superior firm performance (Wu, et al., 2006; Liang, et al., 2010). To achieve this objective, many studies have offered different legitimate theories and methods to analyze the relationship between IT and firm performance, but the findings were mixed and inconclusive (Brynjolfsson, 1996; Caldeira, 2003; Tang & Ghobakhloo, 2013). One reason for this uncertainty is mostly due to the appearance of advanced new and complex IT applications, which has made it more sophisticated to identify and evaluate the benefits of IT investment that is mentioned as 'productively paradox' indicating a weak direct relationship between IT investment and business/firm productivity (Ghobakhloo, et al., 2011b). In the early 2000s, some IT scholars argued that this productively paradox may indeed be the consequence of the way we look at IT affecting firm performance (Bharadwaj, 2000). In IT productivity research context, the dominant theory base is the Resource-Based View (RBV) of the firm, which integrates the rationale of economics with a management perspective (Melville, et al., 2004). Consistent with RBV, it was observed that many of inconsistencies in justifying the relationship between IT resources controlled by firms and their financial or operational performance is attributable to the assumption of the direct relationship between IT and performance (Li, et al., 2009). These scholars proposed that the performance effect of IT may indeed go through some other factors (Bharadwaj, 2000; Wade & Hulland, 2004; Melville, et al., 2004). Accordingly, the idea of assuming the third constructs known as 'IT capability' or 'IT-enabled organizational capability', as the mediator between IT resources controlled by a firm and firm performance was introduced and employed extensively as the surrogate perspective to solve IT productivity paradox (Benitez-Amado, et al., 2010b; Benitez-Amado & Rita, 2012; Fink & Neumann, 2009; Jean & Sinkovics, 2010; Rai, et al., 2006; Ravichandran, 2009; Tang & Ghobakhloo, 2013). From this perspective, IT has an indirect, not a direct, impact on firm performance through IT-enabled capabilities. IT-enabled organizational capability perspective explains that a firm's IT resources per se do not enhance firm performance, yet they can increase critical organizational capabilities, or interact with other firm resources, to secure firm performance improvement (Bharadwaj, et al., 2007).

In these research NPD and AM are considered as higher order organizational capability that enhance the organizational performance by appling IT capabilities. These days, the new product development mechanism requiers to take advantage of IT capobilities to improve a firm's competitive advantage from unexpected alterations. Certainly all decision makers try to find how it could be possible to enhance the prosperity pace of firm NPD process. Managers should control method of performance for progression,

planning, evaluation, and master of essential competencies by the NPD efforts from the formation of novel concepts to the launching the new goods into the marketplaces.

From the other point of view, becouse of change in customers' demand, pressure of worldwide competition, market separation into smaller sections, infinite and fast changes in technical characteristic, and flexible manufacturing system the NPD team compel to present new products to the market as speedily as possible (Fekri, et al., 2009). The necessity for firms to response the clients demand, the stimulating conditions for perfect competition, growing level of turbulence of environment are rational reasons to be interest in the agility concept. Since of the uncertain and dynamic character of the NPD, using the agility dimensions in the NPD process is more beneficial. Agility construct is described as the skill of thriving and developing in unpredicted condition and continuous alteration driven by client designed goods and services (Inman, et al., 2011).

Considering NPD and AM as a tangible and vital process for companies, and drawing on the emerging IT-enabled organizational capabilities perspective, the scope of this research is to analyze how investments in different IT resources, Iranian firms can create capabilities in terms of IT leveraging competence in business agility and NPD effectiveness (Hulland, et al., 2007).

1.2 Problem statement

In spite of the significance of information technology for decision makers, there is ambiguity and discussion about how IT can improve the organizational performance. The literature review shows that investigations analyzing the relationship between organisational performance and information technology are divergent in how they conceptualize major ideas and their interrelationships (Melville, et al., 2004). Moreover, the poor association between financial performance and IT investment even causes investigators to challenge the impact of IT on performance (Ravichandran, 2009). Therefore for business performance dimension, it would be needed to understand an approach to use comparable and meaningful performance dimensions (Dowlatshahi & Cao, 2006).

Myriad researches carried out in field of using IT in industry reveal that IT barely deliver what is expected and many organizations do not distinguish what practical is obtained from IT investment (Ghobakhloo, et al., 2011c). The study also suggests that companies rarely allot all of the value they achieve by IT investment (Bresnahan, 1986; Hitt, 1996). CEOs (Chief Executive Officers) allocate part of company's investment on installing IT in order to reduce costs and increase the profit, but at the end they view IT would not bring about lower expenditures or more productivity and take IT into account as an inappropriate tool for business (Love, 2005). One important issue is that these days IT is not just an indispensable tool since nearly all companies have IT even by using computer to control absent and presence of employees. Yet, commercialization and utilization of IT become more widespread throughout the world and it has crucially became vital item

for daily operations of organisations so the utilisation of novel IT can be a cometitive factor among competiteis to create new business, various profits and opportunities. At the present time, all sizes of organizations are looking for methods to empower their competitive position and enhance their productivity. Most organisations are now investing a great amount of monetary resources in IT to reinforce their competitive positions . Considering large-scale application of IT among competitors, they have been exposed to several associated risks within the development and adoption of IT solutions (Ghobakhloo & Tang, 2013).

Then the most important matter is how IT should be applied to be dynamic in competitive situation. The existing IT-business value studies which draw on IT-enabled organizational capability perspective reveals that the direct relationship between IT and firm performance might be weak, therefore, finding some factors that could act as a mediator to deliver IT capability on business performance is highly necessary. Accordingly, it is suggested that the interrelationships conceptualization of IT resource → IT capability → IT-enabled higher order organizational capability → business performance can provide the most robust platform to analyze the business value of IT.

On the other hand, these days, the new product development mechanism requiers to take advantage of IT capabilities to improve a firm's competitive advantage from unexpected changes. Certainly all decision makers try to find how it could be possible to enhance the prosperity pace of firm NPD process. Managers should control method of performance for progression, planning, evaluation, and master of essential competencies by the NPD efforts from the formation of novel ideas to the launching the new goods into the marketplaces as speedily as possible (Fekri, et al., 2009).

For plenty of business organizations, the competitive era principally based on price, quality, and credibility is passing quickly. It is broadly agreed agility is prevalent competitive preference for a foremost enterprise. Agility is related to the capability to produce a broad range of high quality and low cost products not only with short lead times but also in changing lot sizes, which provide intensified value to individual clients through customization. It could be considerd that IT focuses is now on adaptability to alteration in the market condition and a proactive method of satisfying the customer demands and market (Yusuf, et al., 1999).

All these matters illustrate the important role of IT, NPD and BA for organizational performance (the topic that has recived littel attention to know among developing countries). On the ather hand, the uniqe economic structure and business situation of Iran that is highly depends on the oil and gas export cause some variouse difficulties in recent decades since several technological and economical sanctions have been imposed against Iran. These crucial situation leads CEOs to challenge to benefit their own potencial resources to keep their position among competences and increase organizational performance.

Albeit the importance of IT, NPD and AM as enabled resources have been regarded in various studies, there is a lack of evidence about a comprehensive and practical research model of these perspective, specialy among developing countries. This matter has been noted by some IT researcher and they suggested to pay more attention on this topic (Ghobakhloo, et al., 2011c; Fekri, et al., 2009).

All in all, as mentioned that the direct relationship between IT and business performance is problematic and the indirect relationship applied more beneficial, so according to indirect model(IT resource → IT capability → IT-enabled higher order organizational capability → business performance), and by considering NPD and BA as IT-enabled higher order organizational capability, the main problems are:

1. The lack of understanding about:
    - Does IT-enable perspective support IT investment in Iran as a developing country ?
    - Do IT-values investment support NPD effectiveness and BA and if yes how ?
    - Can NPD and BA transfer the effects of IT on business performance ?
2. The lack of guidline to improve performance by using IT.

1.3 Objectives

The author emphasizes the importance of using IT resources in terms of NPD effectiveness and BA for reaching high business performance. Therefore the objectives of this review would be:

1. To verify how IT-enable support IT investment in Iran as a developing country.
2. To verify how IT investment support NPD effectiveness and BA in Iran as a developing country.
3. To verify how NPD and BA can transfer IT investment to improve business performance.
4. To propose a comprehensive model of using IT to enhance business performance.

1.4 Significance of the Study

This research is unique among other studies about IT business value in its application of resource-based theory to analyze how IT effects on organizational performance through NPD and AM. This study enables the integration of research assessing both the efficiency

implications of IT application as well as its ability to confer a competitive advantage, heretofore separate research conversations. The study is also unique in analyzing the effects of KMS, CWMS and PRMS on both NPD and AM as mediators of organizational performance.

Exclusive characteristics of each organization and its specific situations of technological IT usage, cause that some practical approaches would not be functional but since this framework is carried out in all enterprises without considering the size of company and type of production, it could be applicable for all firms. This research may help to enhance the knowledge about IT utilization among CEOs as the main decision makers to understand how they should apply IT to have a dynamic situation among competitors and consequently rational rate of productivity by considering which factor could be necessary according to specifications of enterprise.

Organizations which have this data would benefit from a competitive advantage through their capability to plan and implement IT solution more effectively, and reacting more quickly response to challenging and shifting market situations due to better and more swift access to information . The findings of this research and resulted guidelines are significant for some reasons:

1. Developing IT resource based model through investigating and categorizing factors influencing IT value.

2. Investigating and interpreting key dimensions of IT capabilities that may improve through IT investing to enhance the organizational performance.

3. Investigating and interpreting key dimensions of IT enables higher order organizational capability that may improve through IT investing to enhance the organizational performance.

1.5 Thesis Organization

As demonstrated in Figure 1.1, the thesis is organized to five chapters. Introduction and background of IT is the subject of Chapter 1. An overview on information technology is carried out in this chapter. The thesis objectives, scopes and problem statement are also discussed in this chapter. The review of perior researches associated to the objectives and subject of the thesis is included in the second chapter with the title of literature review. This chapter includes privious studied models to conduct the initial model as well. Chapter 3 is methodology of research that includes hypothesis model and information about sample and procedure of data collection. Results is the topic of 4th chapter. In this chapter demographic and discriptic findings and also infinitial analysis are presented. Finally chapter 5 is conclusion that summerize of the main results of this study and future guidline is provided in this section.

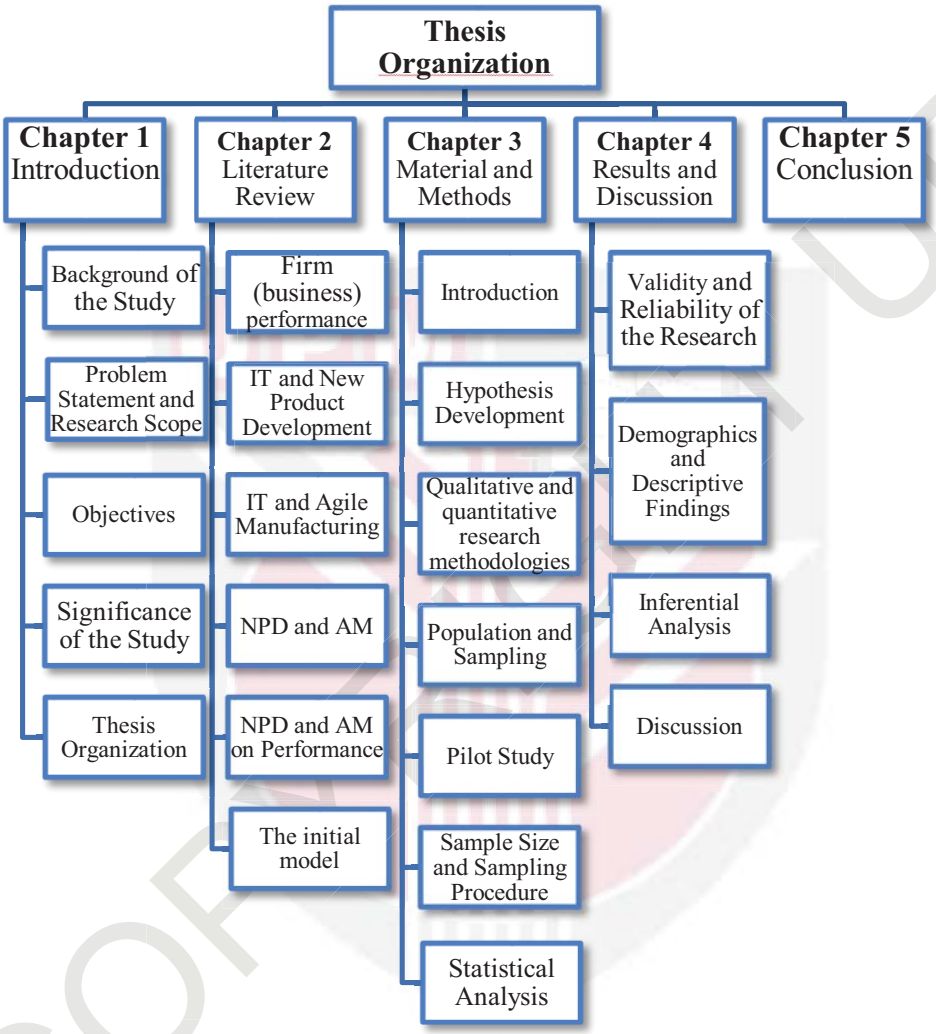

Figure 1.1: Schematic of the thesis organization.

REFERENCES

Alam, S., & Noor, M. (2009). ICT Adoption in Small and Medium Enterprises: an Empirical Evidence of Service Sectors in Malaysia. *International Journal of Business and Management*, 112-125.

Amit, R., & Schoemaker, P. (1993). Strategic assets and organizational rent. *Strategic Management Journal, 14*(1), 33–46.

Attaran, M. (2003). Information technology and business-process redesign. . *Business Process Management Journal, 9*(4), 440-458.

Badri, M., Davis, D., & Davis, D. (2000). Operations strategy, environmental uncertainty and performance: a path analytic model of industries in developing countries. *Omega, 28*(2), 155–173.

Banker, R., Bardhan, I., Hsihui, C., & Lin, S. (2006). Banker, R. D., Bardhan, I. R., Chang, H., & Lin, S. Plant information systems, manufacturing capabilities, and plant performance. *Mis Quarterly, 30*(2), 315-337.

Barczak, G., Griffin, A., & Kahn3, K. (2009). Perspective: trends and drivers of success in NPD practices: results of the 2003 PDMA best practices study. *Journal of Product Innovation Management, 26*(1), 3-23.

Bardhan, I. (2007). Toward a theory to study the use of collaborative product commerce for product development. *167-84*(2).

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99-120.

Benitez-Amado, J., & Rita M, W. (2012). Information technology, the organizational capability of proactive corporate environmental strategy and firm performance: a resource-based analysis. *European Journal of Information Systems, 21*(1), 664-679.

Benitez-Amado, J., Llorens-Montes, F., & Perez-Arostegui, M. (2010b). Information technology-enabled intrapreneurship culture and firm performance. *Industrial Management & Data Systems, 110*(4), 550-66.

Benitez-Amado, J., Perez-Arostegui, M., & Tamayo-Torres, J. (2010a). Information Technology-enabled Innovativeness and Green Capabilities. *Journal for Computer Information Systems, 51*(2), 87-96.

Bharadwaj, A. (2000). A Resource Based Perspective on Information Technology and Firm Performance :An Empirical Investigation. *MIS Quarterly, 24*(1), 169-196.

Bharadwaj, S., Bharadwaj, A., & Bendoly, E. (2007). The performance effects of complementarities between information systems, marketing, manufacturing, and supply chain processes. *Information Systems Research, 18*(4), 437-53.

Boar, B. (1997). Strategic thinking for information technology: How to build the IT organization for the information age. In N. J. New York.

Bradish, P., Metes, G. S., & Gundry, J. (1998). *Agile networking: competing through the Internet and Intranets.* New Jersey: Prentice Hall.

Bresnahan, T. F. (1986). Measuring the Spillovers from Technical Advance: Mainframe Computers in Financial Services,". *American Economic Review, 76*(4), 742-755.

Brown, S., & Bessant, J. (2003). The manufacturing strategy-capabilities links in mass customization and agile manufacturing: An exploratory study . *International Journal of Operations and Production Management, 23*(7-8), 707–730.

Bruque, S., & Moyano, J. (2007). Organisational determinants of information technology adoption and implementation in SMEs: The case of family and cooperative firms. *Technovation, 27*(5), 241-253.

Brynjolfsson, E. a. (1996). Paradox Lost? Firm-Level Evidence on the Returns to Information Systems Spending . *Management Science, 42*(4), 541-558.

Burn, J., & Barnett, M. (1992). Communicating for advantage in the virtual organization. *IEEE Transactions on Professional Communication, 42*(4), 215–222.

Byrne, B. (2013). Structural equation modeling with AMOS: Basic concepts, applications, and programming. Routledge.

Caldeira, M. M., & Ward J. M. (2002). Understanding the successful adoption and use of IS/IT in SMEs: An explanation from Portuguese manufacturing industries. *Information Systems Journal, 12*(2), 121-152.

Caldeira, M. M. (2003). Using resource-based theory to interpret the successful adoption and use of information systems and technology in manufacturing small and medium-sized enterprises. *European Journal of Information Systems, 12*(2), 127-141.

Carmines, E., & Zeller, R. (1979). *Reliability and Validity Assessment. :* . Beverly Hills: SAGE Publications, Inc.

Carr, A., & Meltzer, L. (2002). The relationship between information technology use and buyer-supplier relationships: An exploratory analysis of the buying firm's perspective. *IEEE Transactions on Engineering Management, 49*(3), 293-304.

Chamberlin, E. (1937). Monopolistic or imperfect competition? . *The Quarterly Journal of Economics, 4*, 557-580.

Chan, Y., Huff, S., & Copeland, D. (1998). Assessing realized information systems strategy. *Journal of Strategic Information Systems, 6*(4), 273–298.

Chan, Y., Huff, S., Copeland, D., & Barclay, D. (1997). Business strategic orientation, information systems strategic orientation and strategic alignment. *Information Systems Research, 8*(2), 125–150.

Chen, I. (2001). Planning for ERP systems: Analysis and future trend. *Business Process Management Journal, 7*(5), 374–386.

Chen, J.-S., & Tsou, H.-T. (2007). Information technology adoption for service innovation practices and competitive advantage: the case of financial firms. *Information Research, 12*(3), 314.

Cohe, S., & Mankin, D. (1999). Collaboration in the virtual organization. *Journal of Organizational Behavior, 6*, 105–120.

Cooper, R. (1999). Success factors of product. *Journal of Product Innovation Management, 16*(2), 115–133.

Cooper, L. (2003). A research agenda to reduce risk in new product development through knowledge management: a practitioner perspective. *Journal of Engineering and Technology Management, 20*(1-2), 117–140.

Coronado, A., Sarhadi, M., & Millar, C. (2002). Defining a framework for information systems requirements for agile manufacturing. *International Journal of Production Economics, 72*(1-2), 57–68.

Crawford, M., & Di Benedetto, A. (2003). *Crawford M, Di Benedetto A.* New York: McGraw-Hill.

D'avani, R. (1994). *Hyper competition: managing the dynamics.* New York: The Free Press.

Day, G. (1994). The capabilities of market-driven organizations. *The Journal of Marketing, 58*(4), 37-52.

Delone, W., & McLean, E. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems, 19*(4), 9-30.

DeLone, W., & McLean, E. (1992). Information Systems Success: The Quest for the Dependent Variable,. *Information Systems Research, 3*(1), 60-95.

Derazin, R., & Van de Ven, A. (1985). Alternative forms of fit in contingency theory. *Administrative Science Quarterly, 30*(4), 514–539.

Devaraj, S., & Kohli, R. (2003). Performance impacts of information technology: is actual usage the missing link? *Management Science, 49*(3), 273-289.

DeVOR, R., GRAVESb, R., & MILLSc, J. (1997). Agile manufacturing research: accomplishments and opportunities. *IIE Transactions, 29*(10), 813–823.

Dibrell, C., Davis, P., & Craig, J. (2008). Fueling innovation through information technology. *Journal of Small Business Management, 46*(2), 203-18.

Dierickx, I., & Cool, K. (1989). Asset Stock Accumulation and Sustainability of Competitive Advantage. *Management Science, 35*(12), 1504-1511 .

Dong, S., Xu, S., & Zhu, K. (2009). Research note-information technology in supply chains: the value of IT-enabled resources under competition. *Information Systems Research, 20*(1), 18-32.

Dowlatshahi, S., & Cao, Q. (2006). The relationships among virtual enterprise,information technology, and business performancein agile manufacturing: An industry perspective. *European Journal of Operational Research, 174*, 835–860.

Durmuşoğlu, S., & Barczak, G. (2011). The use of information technology tools in new product development phases: Analysis of effects on new product innovativeness, quality, and market performance. *Industrial Marketing Management, 40*(2), 321-30.

Elliott, Gill, & Nelson. (2001). How web-enabled tools can help optimize new product initiatives. *Visions Magazine, 25*(4), 13-17.

Fekri, R., Aliahmadi, A., & Fathian, M. (2009). Predicting a model for agile NPD process with fuzzycognitive map: the case of Iranian manufacturing enterprises. *41*(1240–1260).

Fink, L., & Neumann, S. (2009). Fink, L., & Neumann, S. Exploring the perceivedbusiness value of the flexibility enabled by information technology infrastructure. *Information & Management, 46*(2), 90-99.

Fornell, C., & Bookstein, F. (1982). Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. *Journal of marketing research, 19*(4), 440-452.

Fornell, C., & Larcker, D. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research, 18*(1), 39-50.

Fornell, C. (1982). A Second Generation of Multivariate Analysis: Methods. *NewYork: Praeger, 1*.

Frayret, J.-M., D'Amours, S., Montreuil, B., & Cloutier, L. (2001). A network approach to operate agile manufacturing systems. *International Journal of Production Economics, 74*(1-3), 239–259.

Frishammar, J., & Ylinenpaa, H. (2007). Managing Information In New Product Development: A Conceptual Review, Research Propositions And Tentative Model. *International Journal of Innovation Management, 11*(4), 441-67.

Fuller-Love, N. (2006). Management Development in Small Firms. *International Journal of Management Reviews, 8*(3), 175-190.

Ghobakhloo, M., & Tang, S. (2013). IT investments and product development effectiveness: Iranian SBs. *Emerald Group Publishing Limited, 113*(2), 265-267.

Ghobakhloo, M., Arias-Aranda, D., & Benitez-Amado, J. (2011a). Adoption of e-commerce applications in SMEs. *Industrial Management & Data Systems, 111*(8), 1238-69.

Ghobakhloo, M., Tang, S., & Sabouri, M. (2011b). Electronic commerce-enabled supply chain process integration and business value. *Journal of Systems and Information Technology, 13*(4), 344-68.

Ghobakhloo, M., Sabouri, M., Tang, S., & Zulkifli, N. (2011c). Information Technology Adoption in Small and Medium-sized Enterprises: An Appraisal of Two Decades Literature. *Interdisciplinary Journal of Research in Business, 1*(7), 53-80.

Goldman, S., Nagel, R., & Preiss, K. (1995). *Agile Competitors and Virtual Organizations.* New York: Van Nostrand Reinhold.

Green Jr, K., Medlin, B., & Whitten, D. (2004). Developing optimism to improve performance: an approach for the manufacturing sector. *Industrial Management & Data Systems, 104*(2), 106–114.

Gremillion, L. (1984). Organization size and information system use: An empirical study. *MANAGE. INFO. SYST, 1*(2), 4-17.

Hair, J., Hult, G., & Ringle, C. (2013). A primer on partial least squares structural equation modeling (PLS-SEM). *London: SAGE Publications Incorporated*.

Hair, J., Black, W., Babin, B., Anderson, R., & Tatham, R. (2006). *Multivariate Data Analysis.* Upper Saddle River, NJ: Prentice Hall.

Hair, J., Ringle, C., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. . *The Journal of Marketing Theory and Practice, 19*(2), 139-152.

Hall, R., Snell, A., & Foust, M. (1999). Item parceling strategies in SEM: Investigating the subtle effects of unmodeled secondary constructs. *Organizational Research Methods, 2*(3), 233-256.

Hauser, U. (1993). *Design and marketing of new products.* Upper Saddle River: Prentice Hall.

Hitt, L. a. (1996). Productivity, Business Profitability, and Consumer Surplus:Three Different Measures of Information Technology Value. *MIS Quarterly, 20*(2), 121-142.

Ho, R. (2006). *Handbook of univariate and multivariate data analysis and interpretation with SPSS.* New York: CRC Press.

Hollander, A., Denna, E., & Cherrington, J. (1999). *Accounting, information technology, and business solutions.* McGraw-Hill Higher Education.

Hsu, C., & Lin, J. (2008). Acceptance of blog usage: The roles of technology acceptance, social influence and knowledge sharing motivation., 45(1),. *Information & Management, 45*(1), 65-74.

Huang, C.-C., Lien, H.-H., Tu, S.-H., & Huang, C.-S. (2010). Quality of life in Taiwanese breast cancer survivors with breast-conserving therapy. *Journal of the Formosan Medical Association, 109*(7), 493-502.

Huanga, S.-M., Oua, C.-S., Chena, C.-M., & Linb, B. (2006). An empirical study of relationship between IT investment and firm performance: A resource-based perspective. *European Journal of Operational Research, 173*(3), 984-99.

Hulland, J., Wade, M., & Antia, K. (2007). The impact of capabilities and prior investments on online channel commitment and performance. *Journal of Management Information Systems, 23*(4), 109-142.

Inman, R., Sale, R., Green Jr, K., & Whitten, D. (2011). Agile manufacturing: Relation to JIT, operational performance and firm. *Journal of Operations Management, 29*, 343–355.

Jean, R.-J., & Sinkovics, R. (2010). Relationship learning and performance enhancement via advanced information technology: The case of Taiwanese dragon electronics firms. *International Marketing Review, 27*(2), 200 - 222.

Jitpaiboon, T., Dobrzykowski, D., Nathan, R., Ragu-Nathan, T., & Vonderembse, M. (2013). Unpacking IT use and integration for mass customisation: a service-

dominant logic view. *International Journal of Production Research, 51*(8), 2527-2547.

JRa, K. W., & Inman, R. A. (2005). Using a just-in-time selling strategy to strengthen supply chain linkages. *International Journal of Production Research, 43*(16), 3437–3453.

Kahn, K. (2004). *The PDMA Handbook of New Product Development.* New York: Wiley.

Karol, C., & Nelson, B. (2007). *New Product Development for Dummies.* For Dummies.

Kelley, K. (2009). *5 Benefits of Online and Email Surveys.* http://survey.cvent.com.

Kessler, E., & Chakrabarti, A. (1999). Speeding Up the Pace of New Product Development. *Prod Innov Manage, 16*(3), 231–247.

Khalil, O., & Wang, S. (2002). Information technology enabled meta-management for virtual organizations. *International Journal of International Journal of, 72*(1-2), 127–134.

King, W., & Rodriguez, J. (1981). Participative design of strategic decision support systems: an empirical assessment., 27(6),. *Management Science*, 717-726.

Knudsen, D. (2003). Aligning corporate strategy and e-procurement tools. *International Journal of Physical Distribution and Logistics Management, 33*(8), 720–734.

Kock, N. (2000). Benefits for virtual organizations from distributed groups. *Communications of the ACM, 43*(11), 107–112.

Kodish JL, G. D. (1995). Development and operation of an agile manufacturing consortium. *Fourth Annual Conference on Models Metrics & Pilots*.

Krejcie, R., & Morgan, D. (n.d.). (1970). Determining sample size for research. *Educational and psychological measurement, 30*, 607-610.

Lai, F., Li, D., Wang, Q., & Zhao, X. (2008). The information technology capability of third-party logistics providers: a resource-based view and empirical evidence from china. *Journal of Supply Chain Management, 44*(3), 22-38.

Langerak, F., Hultink, E., & Robben, H. (2004). The Impact of Market Orientation, Product Advantage, and Launch Proficiency on New Product Performance and Organizational Performance. *Journal of Product Innovation Management, 21*(2), 79-94.

Leonard-Barton, D. (1992). Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal, 13*(2), 111-25.

Li, J., Merenda, M., & Venkatachalam, A. (2009). Business Process Digitalization and New Product Development: An Empirical Study of Small and Medium-Sized Manufacturers. *International Journal of E-Business Research, 5*(1), 49-64.

Liang, T.-P., You, J.-J., & Liu, C.-C. (2010). A resource-based perspective on information technology and firm performance: a meta analysis. *Industrial Management & Data Systems, 110*(8), 1138-1158.

Love, P. E. (2005). The enigma of evaluation:benefits, costs and risks of IT in Australian small–medium-sized enterprises. . *Information andManagement, 42*(7), 947-964.

Mason-Jones, R., Naylor, B., & Towill, D. (2000). Lean, agile or leagile? Matching your supply chain to the marketplace. *International Journal of Production Research, 38*(17), 4061–4070.

Mata, J., Portugal, P., & Guimarães, P. (1995). The survival of new plants: Start-up conditions and post-entry evolution. *International Journal of Industrial Organization, 13*(4), 459–481.

McGrath, R., Macmillan, I., & Venkataraman, S. (1995). Defining and developing competence. *Strategic Management Journal, 16*(4), 251-275.

Melville, N., Kraemer, K., & Gurbaxani, V. (2004). Review: information technology and organizational performance: an integrative model of it business value. *MIS Quarterly, 28*(2), 283-322.

Mendenhall, W., & Ott. (1990). *Understanding Statistics.*

Milgrom, P., & Roberts, J. (1995). Complementarities and fit strategy, structure, and organizational change in manufacturing. *Journal of Accounting and Economics, 19*(2-3), 179-208.

Nambisan, S. (2003). "Information systems as a reference discipline for new product development. *MIS Quarterly, 27*(1), 1-18.

Nambisan, S. (2009). The role of information technology in product development:an introduction. *Information Technology and Product Development, 5*, 1-16.

Narasimhan, R., Swink, M., & Kim, S. (2006). Disentangling leanness and agility: An empirical investigation. *Journal of Operations Management, 24*(5), 440–457.

Nelson, R., & Winter, S. (1982). *An Evolutionary Theory of Economic Change.* Cambridge: Harvard University Press, Cambridge.

Nguyen, T. (2009). Information technology adoption in SMEs: an integrated framework. *International Journal of Entrepreneurial Behaviour & Research, 15*(2), 162-186.

Nunnally, J., & Bernstein, I. (1978). *Psychometric theory.* . New York: McGraw-Hill.

O'Brien, E., Harris, D., & Southern, M. (2009). IT-based knowledge management systems to support the design of product development processes. *Information Technology and Product Development, 2009*, 49-64.

Palaniswamy, R., & Frank, T. (2000). Enhancing manufacturing performance with ERP systems. *Information Systems Management, 17*(3), 43–55.

Pallant, J. (2005). *SPSS survival manual : a step by step guide to data analysis using SPSS for Windows (Version 12).* Buckingham: Open University Press.

Pavlou, P., & El Sawy, O. (2006). "From IT leveraging competence to competitive advantage in turbulent environments: the case of new product development. *Information Systems Research, 17*(3), 198-227.

Pawell, T., & Dent-Michallef, A. (1997). Information Technology as Competetitive Advantage: The Role of Human, Business and Technology Resource. *Strategic Management Journal, 18*(5), 375-405.

Penrose, E. (1959). The theory of the growth of the firm. *Oxford University Pres*.

Peteraf, M. (1993). The cornerstones of competitive advantage: a resource-based view. *Strategic Management Journal, 14*(3), 179-191.

Peters, A. (1999). New product design and development: a generic model. *The TQM Magazine, 11*(3), 172–184.

Petter, S., Straub, D., & Rai, A. (2007). Specifying formative constructs in information systems research. *MIS Quarterly, 31*(4), 623-656.

Priem, R., & Butler, J. (2001). Is the resource-based" view" a useful perspective for strategic management research? *Academy of Management Review, 26*(1), 22-40.

Rai, A., Lang, S., & Welker, R. (2002). Assessing the Validity of IS Success Models: An Empirical Test and Theoretical Analysis., 13(1),. *Information Systems Research, 13*(1), 50-69.

Rai, A., Patnayakuni, R., & Seth, N. (2006). Firm Performance Impacts of Digitally Enabled Supply Chain Integration Capabilities. *MIS Quarterly, 30*(2), 225-46.

Ravichandran, T. L. (2009). “Diversification and firm performance:exploring the moderating effects of information technology spending”, . *Journal of Management Information Systems=, 25*(4), 205-40.

Ravichandran, T., & Lertwongsatien, C. (2005). Effect of Information Systems Resources and Capabilities on Firm Performance: A Resource-Based Perspective. *Journal of Management Information Systems, 21*(4), 237 - 276.

Richard, O. (2000). Racial diversity, business strategy, and firm performance: A resource-based view. . *Academy of Management Journal, 43*(2), 164-177.

Ross, J., Beath, C., & Goodhue, D. (1996). Develop Long-Term Competitiveness Through IT Assets. *Sloan Management Review, 38*(1), 31-42.

Sabherwal, R., & Chan, Y. (2001). Alignment between business and IS strategies: A study of prospectors, analyzers, and defenders. *Information Systems Research, 12*(1).

Saleh, Ali, S., Ndubisi, & Oly, N. (2006). An Evaluation of SME Development inMalaysia. *International Review of Business Research Paper, 2*(1), 1-14.

Sambamurthy, V., Bharadwaj, A., & Grove, V. (2003). Shaping Agility through Digital Options: Reconceptualizing the Role of Information Technology in Contemporary Firms . *MIS Quarterly, 27*(2), 237-263.

Sanbarmurthy V, Z. W. (2004). *Steps toward strategic agility guiding corporate transformations.* Michigan: Michigan University.

Sarkis, J. (2001). Benchmarking for agility. *Benchmarking, 8*(2), 88 - 107.

Schroeder, R., Bates, K., & Junttila, M. (2002). A resource-based view of manufacturing strategy and the relationship to manufacturing performance. *Strategic Management Journal, 23*(2), 105-117.

Seyal, A., Rahman, M., & Rahim, M. (2002). Determinants of academic use of the Internet: a structural equation model. *Behaviour & Information Technology, 21*(1), 71-86.

Sharp, J., Irani, Z., & Desai, Z. (1999). Working towards agile manufacturing in the UK industry. *International Journal of Production Economics, 62*(1-2), 155–169.

Song, M., Berends, H., Van Der Bij, H., & Weggeman, M. (2007). The effect of IT and co-location on knowledge dissemination. *Journal of Product Innovation Management, 24*(1), 52-68.

Strader, T., & Shaw, M. (1998). Characteristics of electronic markets. *Decision Support Systems, 21*(3), 185–198.

Swink, M., & Song, M. (2007). Effects of marketing-manufacturing integration on new product development time and competitive advantage. *Journal of Operations Management, 25*(1), 203-17.

Tan, K., Chong, S., Lin, B., & Eze, U. (2009). Internet-based ICT adoption: evidence from Malaysian SMEs. *Industrial Management & Data Systems, 109*(2), 224-44.

Tang, S., & Ghobakhloo, M. (2013). IT investments and product development effectiveness: Iranian SBs. Industrial Management & Data Systems. *Industrial Management & Data Systems, 113*(2), 265-293.

Tanriverdi, H. (2005). Information technology relatedness, knowledge management capability, and performance of multibusiness firms. *MIS Quarterly, 29*(2), 311-334.

Tanriverdi, H. (2006). Performance effects of information technology synergies in multibusiness firms. *MIS Quarterly, 30*(1), 57-77.

Thong, J., & Yap, C. (1995). CEO characteristics, organizational characteristics and information technology adoption in small businesses. *Omega, 23*(4), 429-442.

Tippins, M., & Sohi, R. (2003). IT competency and firm performance: is organizational learning a missing link? *Strategic Management Journal, 24*(8), 745–761.

Tong, X., & Hawley, J. (2009). Measuring customer-based brand equity: empirical evidence from the sportswear market in China. *Journal of Product & Brand Management, 18*(4), 262-271.

Troy, L., Szymanski, D., & Varadarajan, P. (2001). Generating new product ideas: An initial investigation of the role of market information and organizational characteristics. *Journal of the Academy of Marketing Science, 29*(1), 89-101.

Tzokas, N., Hultink, E., & Hart, S. (2004). Navigating the new product development process. *Industrial Marketing Management, 33*(7), 619–626.

Vázquez-Bustelo, D., Avella, L., & Fernández, E. (2007). Agility drivers, enablers and outcomes: Empirical test of an integrated agile manufacturing model. *International Journal of Operations and Production Management, 27*(12), 1303–1332.

Venkatraman, N. (1989). Strategic orientation of business enterprises. *Management Science, 35*(8), 942–962.

Venkatraman, N., & Ramanujam, V. (1986). Measurement of business economic performance: An examination of method convergence. *Journal of Management, 13*(1), 109–122.

Wade, M., & Hulland, J. (2004). Review: the resource-based view and information systems research: review, extension, and suggestions for future research. *MIS Quarterly, 28*(1), 107-142 .

Ward, P., Duray, R., Leong, G., & Sum, C.-C. (1994). Business environment, operations strategy, and performance: An empirical study of Singapore manufacturers. *Journal of Operations Management, 13*(2), 99–115.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal, 5*(2), 171-80.

Wu, F., Yeniyurt, S., Cavusgil, S., & Kim, D. (2006). The impact of information technology on supply chain capabilities and firm performance: A resource-based view. *Industrial Marketing Management, 35*(4), 493-504.

Young, D., & Benamati, J. (2000). Differences in public Web sites: The current state of large US firms. *Journal of Electronic Commerce Research, 1*(3), 94-105.

Yusuf, Y. Y., & Adeleye, E. O. (2002). A comparative study of lean and agile manufacturing with a related survey of current practices in the UK. *Y. Y. Yusuf & E. O. Adeleye, 40*(17), 4545–4562.

Yusuf, Y., Sarhadi, M., & Gunasekaran, A. (1999). Agile manufacturing: The drivers, concepts and attributes. *62*(33-43).

Zhang Z, S. H. (2000). A methodology for achieving agility in manufacturing organisations: An introduction. *International Journal of Operations & Production Management, 20*(4), 496–512.

Zhu, K. (2004). The complementarity of information technology infrastructure and e-commerce capability: A resource-based assessment of their business value. *Journal of Management Information Systems, 21*(1), 167-202.