



**UNIVERSITI PUTRA MALAYSIA**

***MEDIATING ROLE OF LEAN MANUFACTURING PRACTICE FOR  
INFORMATION TECHNOLOGY RESOURCES AND PERFORMANCE  
IMPROVEMENT OF MANUFACTURING FIRMS***

**MORTEZA GHOBAKHLOO**

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**By**

**MORTEZA GHOBAKHLOO**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in  
Fulfillment of the Requirements for the Degree of  
Doctor of Philosophy**

**July 2015**

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment  
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**July 2015**

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The computer-based Information Technology (IT) is a major technological innovation that has been vastly adopted by organizations to achieve performance improvement. Understanding how performance of firms, at the organizational level of analysis, is affected by IT and relative systems is an important and cutting-edge research topic. Recent IT business value scholars drew on the resource-based view of the firm and proposed that IT has an indirect, not a direct, impact on business performance through IT-enabled capabilities. The present study draws on the so-called IT-enabled capabilities perspective to study the relationships between IT, lean manufacturing and business performance improvement to shed more light into relationship between IT and business performance improvement among manufacturing firms. Therefore, the present study mainly aims to examine whether the application of current IT and different principles of lean manufacturing are interdependent and complementary or they are mutually exclusive. Using a questionnaire-based survey, the study collected from 131 leading Iranian and 125 Malaysian manufacturers to test the proposed research model of lean manufacturing sustainability using Partial Least Square-Structural Equation Modeling (PLS-SEM). The study also benefits from a two years longitudinal case study to assess the applicability of proposed model. Finding shows that lean manufacturing and IT are mutually interdependent and value of IT resources can be effectively transformed into business performance improvement for manufacturers through the higher levels of lean manufacturing sustainability. In effect, IT-enabled lean manufacturing sustainability accounted for 41.3% of variance in business performance improvement. Advanced manufacturing technology competency is a valuable intermediate capability which links IT investments into lean manufacturing sustainability. Findings also show that IT resource is one of the minimum requirements of lean manufacturing for surveyed business, and the value of IT investment is truly transformed to valuable capability when IT investments and resources offer competent administrative advanced manufacturing technologies for effective management of all production processes.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia Sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**PERANAN PENGANTARA OLEH SISTEM PEMBUATAN LEAN UNTUK SUMBER TEKNOLOGI MAKLUMAT DAN PENINGKATAN PRESTASI DI DALAM SYARIKAT PEMBUATAN**

Oleh

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Teknologi Maklumat berasaskan komputer (IT) adalah satu inovasi teknologi utama yang telah banyak digunakan oleh organisasi untuk mencapai peningkatan prestasi. Selain itu, dalam memahami tahap prestasi firma di peringkat analisis organisasi, tahap pengaruh IT dan sistem relatif adalah suatu topik penyelidikan penting dan canggih. Baru-baru ini, penilaian perniagaan IT daripada para cendekiawan telah menarik pandangan berasaskan sumber firma dan mencadangkan IT secara langsung dan tidak langsung mempengaruhi prestasi perniagaan melalui kebolehan IT. Kajian ini membentangi tentang IT yang mempunyai keupayaan perspektif untuk mengkaji hubungan antara teknologi maklumat, pembuatan *Lean* dan peningkatan prestasi perniagaan yang dapat memberi lebih sumbangan ke dalam nilai perniagaan IT di kalangan firma-firma pembuatan. Oleh itu, kajian ini terutamanya bertujuan untuk mengkaji sama ada penggunaan IT semasa dan prinsip-prinsip yang berbeza adalah saling bergantung dan merupakan sesuatu penambahan dalam sistem pembuatan *Lean*. Dengan menggunakan kajian berdasarkan soal selidik, kajian yang dikumpul dari 131 pengilang terkemuka Iran dan 125 pengilang Malaysia untuk menguji model penyelidikan yang dicadangkan kemampanan pembuatan *Lean*, dengan menggunakan Separa *Least Square*-Pemodelan Persamaan Berstruktur (PLS-SEM). Kajian ini juga memberi manfaat dengan memulakan kajian dua tahun kes longitudinal untuk mengakses kesesuaian cadangan model. Keputusan menunjukkan bahawa pembuatan *Lean* dan IT saling bergantung dan nilai sumber teknologi adalah berkesan dan boleh berubah menjadi peningkatan prestasi perniagaan bagi pengeluar melalui tahap yang lebih tinggi untuk kemampanan pembuatan *Lean*. Sebagai kesimpulan, IT telah menyumbang 41.3% dalam kemampanan pembuatan *Lean* daripada varians dalam peningkatan prestasi perniagaan. Kemajuan kecekapan teknologi pembuatan adalah keupayaan pengantara berharga yang menghubungkan pelaburan IT kepada kemampanan pengeluaran *Lean*. Dapatan kajian juga menunjukkan bahawa sumber IT adalah salah satu keperluan minimum kemampanan pembuatan *Lean* untuk perniagaan yang dikaji, dan nilai pelaburan IT adalah benar-benar berharga kepada pelaburan dalam prestasi produktiviti apabila mempunyai IT dan sumber yang cekap. Ia juga menawarkan pentadbiran teknologi pembuatan termaju untuk pengurusan yang berkesan kepada semua proses pengeluaran.

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I certify that a Thesis Examination Committee has met on (July 1, 2015) to conduct the final examination of (Morteza Ghobakhloo) on his thesis entitled "Mediating Role of Lean Manufacturing Practice for Information Technology Resources and Performance Improvement of Manufacturing Firms" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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## LIST OF ABBREVIATIONS

AMT	Advanced Manufacturing Technology
AUT	Automation
AVE	Average Variance Extracted
BS	Business Size
CAD	Computer Aided Design
CAM	Computer Aided Manufacturing
CB-SEM	Covariance-Based Structural Equation Modeling
CEO	Chief Executive Officer
CI	Customer Integration
CM	Cellular Manufacturing
CMMS	Computerized Maintenance Management System
CUI	Continuous Improvement
D&M	DeLone and McLean
DF	Degree of Freedom
EDI	Electronic Data Interchange
ERP	Enterprise Resource planning
FMEA	Failure Mode and Effects Analysis
FMM	Federation of Malaysian Manufacturers
FMS	Flexible Manufacturing System
FP	Financial Performance
HITI	Human IT Investment
HRM	Human Resource Management
IGRF	International Graduate Research Fellowship
IS	Information System
IT	Information Technology
ITUB	IT Usage Behavior
ITUF	IT Usage Frequency
JIT	Just in Time
KKCO	Kavian Kar Company
LAN	Local Area Network
LM	Lean Manufacturing
MBS	Maintenance Breakdown Severity
MFT	Multifunctional Team
MP	Marketing Performance
MRPI	Material Requirements Planning
MRPII	Manufacturing Resource Planning
MTBF	Mean Time Between Failure
MTTR	Mean Time To Repair
NPD	New Product Development
OEE	Overall Equipment Effectiveness
PI	Product Innovation
PLS	Partial Least Squares
PLS-MGA	Partial Least Squares Multi Group Analysis
PLS-SEM	Partial Least Square-Structural Equation Modeling
PPC	Production Planning and Control
QM	Quality Management
RBV	Resource-Based View
SEM	Structural Equation Modeling

SI	Supplier Integration
SMED	Single-minute Exchange of Die
SPC	Statistical Process Control
SRM	Supplier Relationship Management
SS	Six Sigma
STDV	Standard Deviation
SU	Setup Time Reduction
TITI	Technological IT Investment
TPM	Total Productive Maintenance
TPS	Toyota Production System
TQM	Total Quality Management
VIF	Variance Inflation Factor
VSM	Value Stream Mapping
WR	Waste Reduction



# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

Organizations implement and use different initiatives to improve their operations capabilities and the long-term profitability. The computer-based Information Technology (IT) is a major technological innovation during this century that has been vastly adopted by organizations to achieve these purposes. Regarding IT as a tool, organizations nowadays make an intensive use of it to win global business competition and possess sustainable competitive advantage through developing efficiency, profitability, product and service quality and product variety. Organizations also invest in IT with the hope of improving employees' skills at the individual level.

Understanding how performance of firms, at the organizational level of analysis, is affected by IT and relative systems is an important and cutting-edge research topic (Benitez-Amado and Walczuch, 2012), as it allows managers and practitioners to better evaluate the value of IT resources controlled by firms (Liang et al., 2010). More importantly, organizations in both developed and developing countries need to be able to assess the value of IT investment because one of the most frequent obstacles to the effective and frequent use of IT among organizations arises when (Thong and Yap, 1995; Walczuch et al., 2000):

1. They perceive that IT cannot deliver what is anticipated;
2. They are unable to assess the actual benefits that have been delivered to them by the use of IT.

Therefore, there is a great interest for managers and IT experts to know how and to what extent recent advanced IT tools, emerging as a strategic differentiator, affect business (firm) performance (Liang et al., 2010).

Prior IT and operation management scholars have used different legitimate theories and methods to study the relationship between IT and firm performance. Resource-Based View (RBV) is the well-established and powerful theory which has been used widely by IT business value scholars to study the relationship between IT and business performance (Benitez-Amado et al., 2010a; Liang et al., 2010; Melville et al., 2014). RBV has received such an interest by previous scholars that was called the key perspective guiding researchers into the determinants of organizational performance by Crook et al. (2008). IT business value literature also identifies the RBV as the dominant theory for studying the business value of IT resources among organizations (Melville et al., 2004). The early studies that drew on RBV tried to directly link IT resources to business performance improvement among organizations. These early studies assumed that higher investment in IT and possessing IT resources alone provide organizations with performance improvement. Although many IT scholars attempted to analyze the direct contribution of IT to business performance

improvement, however, their findings were mixed and inconclusive (Brynjolfsson and Hitt, 1998; Caldeira and Ward, 2002; Lucas, 1999). Brynjolfsson (1993) first popularized the notion of 'IT productivity paradox' and argued that while impressive IT success stories exist, so do equally major IT failure cases. This productivity paradox highlighting the weak direct relationship between IT resource/investment and business performance improvement was climaxed by the assertion of Carr (2003) in his article "IT Doesn't Matter". Carr (2003) argued that recent ITs cannot be regarded as a source of competitive advantage and productivity because they are ubiquitous and inexpensive, thus available to all firms.

In the early 2000s, few IT scholars started to argue that 'IT productively paradox' can be indeed the consequence of the way IT is assumed to enhance business performance (Li and Ye, 1999; Santhanam and Hartono, 2003). These scholars drew on RBV and proposed that majority of the inconsistencies in justifying the relationship between IT resources controlled by firms and their performance improvements (regarding different metrics) should be attributed to the assumption of the direct relationship between IT and business performance (Bharadwaj, 2000; Powell and Dent-Micallef, 1997). These scholars proposed that the performance effect of IT may indeed go through some other factors (Bharadwaj, 2000; Melville et al., 2004; Rai et al., 2006; Wade and Hulland, 2004). Accordingly, they introduced the idea of assuming the third construct branded as 'IT-enabled capability', as the mediator between IT resources controlled by a firm and business performance. This perspective proposes that IT has an indirect, not a direct, impact on business performance through IT-enabled capabilities. 'IT-enabled capability perspective', for the first time, enlightened us that a firm's IT resources, per se, do not improve business performance. IT in effect can augment critical organizational capabilities, or interact with other firm resources, to secure business performance improvement (Bharadwaj et al., 2007; Tian et al., 2010). This perspective revolutionized the way IT scholars viewed the business value of IT. More recent scholars employed the IT-enabled capability perspective extensively as the surrogate perspective to solve IT productivity paradox (Benitez-Amado et al., 2010a, b; Benitez-Amado and Walczuch, 2012; Jitpaiboon et al., 2013; Ravichandran et al., 2009).

IT business value scholars introduced some IT-enabled capabilities that can transform the value of IT resources into business performance improvement. For example recent scholars revealed that firms can use their IT resources to create invaluable organizational capabilities such as 'IT-enabled mass-customization' (Jitpaiboon et al., 2013) and 'proactive corporate environmental strategy' (Benitez-Amado and Walczuch, 2012) that significantly improve business performance. Despite recent efforts to understand the mechanism by which IT interacts with organizational issues and consequently creates performance improvement, this research background is in its infancy, and the understanding of these relationships are still limited (Benitez-Amado and Walczuch, 2012). In effect, the research on the relationships between IT, organizational issues, and business performance is a cutting-edge research topic for IT scholars and practitioners and new IT-enabled capabilities are being identified and introduced continuously into the IT business value background (Jin et al., 2014; Im and Rai, 2014; Pang et al., 2014).

The IT business value literature suggests that almost all prior studies that drew on IT-enabled organizational capability perspective have been carried out in developed countries. These studies mainly focused on huge and overpowering firms which are

characterized with billion dollars annual sale and best management practices. Yet it is rational to propose that researchers can also benefit from IT-enabled capability perspective to study the business value of IT investment within firms in developing countries. It is therefore interesting to find out how IT investments by firms in developing countries are rationalized as studied via the lens of IT-enabled capability perspective. Inspired by prior studies on firms in developed countries, the present study proposes that in justifying IT investment and use, scholars and practitioners should look for capabilities that are tangible and understandable to firms, particularly manufacturing ones, in developing countries which can be easily and promptly formed through IT resources.

The present study, for the first time, proposes that manufacturing firms can effectively use their IT resources to achieve effectiveness in their Lean Manufacturing (LM) practices, and consequently improve their performance. Considering LM as a tangible and vital process for Iranian and Malaysian manufacturing firms, and drawing on the emerging IT-enabled capabilities perspective, the scope of this study is to analyze how investments in IT at different levels by Iranian and Malaysian manufacturing firms, and organization wide use of IT tools, can create LM capability in terms of 'IT-enabled Advanced Manufacturing Technology (AMT) competency' and IT-enabled LM sustainability. The study further assesses how LM capability can improve the performance of Iranian and Malaysian manufacturing firms, in terms of different financial and non-financial metrics.

## **1.2 Problem Statement**

First and foremost, there is a lack of understanding on how businesses in developing countries can achieve performance improvement by embedding and complementing their IT resources into other organizational resources and capabilities given almost all research that drew on the IT-enabled capability perspective focused on firms in developed countries. Accordingly, there is a limited understanding on the mechanism by which firms, particularly manufacturing ones, in developing countries can develop and subsequently benefit from IT-enabled capabilities and transform the value of IT resources controlled to performance improvement. Since little to no studies, by far, have tried to look for IT-enabled capabilities that are tangible and understandable to firms in developing countries, this particular lack of understanding can be costly to manufacturing firms of developing countries in terms of ineffective IT investment strategies.

Secondly, IT-business value studies have not yet investigated the interaction between IT resources controlled by firms and implementation or success of LM. Although the application of IT and LM are nowadays a common practice for firms, even among developing countries, there is not enough practical evidence to decide whether the application of IT and LM are interrelated, they complement each other or they are independent approaches. Consistently, the review of literature also did not reveal any empirical evidence from Iranian or Malaysian firms showing that LM can lead to improved business performance. These discussions, collectively, inform us that there is a significant lack of knowledge on whether IT can support true implementation of LM or they contradict each other, particularly among Iranian and Malaysian manufacturing



firms. More importantly, it is not yet clear whether IT and LM, alone, or together as complementary approaches, can improve business performance of firms in developing countries. Since a deep understanding of interrelationships between IT, LM (in its true nature) and business performance is lacking, manufacturers, Iranian and Malaysian ones in particular, may not be able to effectively plan their long-term business strategies and future investment scheme.

Thirdly, it cannot be expected all manufacturing firms to fully implement all the practices of LM. The journey to leanness can start with implementation of one or two practice(s) of LM that suit(s) a manufacturing firm the most. The question here is how manufacturers can know which LM practices will suit them the most. For example, one manufacturing firm may mainly value the improvement of marketing performance whereas another manufacturing firm may mainly seek for reduction of waste. So, manufacturers need to know, from reports of empirical studies or even the anecdotal evidences, that which performance dimension is affected the most by a particular LM practices. Unfortunately, such knowledge is significantly lacking, particularly for Iranian and Malaysian manufacturers. This knowledge gap imposes more risk on implementation of LM for manufacturing firms. This risk can be more imminent to Iranian and Malaysian manufacturers because firms in developing countries are more limited in their financial resources, thus are more susceptible to failure because of inefficient decision making for their implementation of LM.

The fourth gap concerns the existing theoretical inconsistency in defining and conceptualizing IT resource. The review of prior IT value studies suggests that RBV has been deficient, to some extent, in providing a comprehensive approach to thinking about IT resources, which has considerably limited the comparability of prior studies (Melville et al., 2004; Taher, 2012). To the best of the researcher's knowledge, no study has tried to conceptualize IT resource multifaceted as being consisted of both perceptual IT measures (such as IT behavior) and metric IT measures (such as level of IT investment). Scholars and practitioners therefore may not know how and whether the synergies between these two different aspects of IT resource can better account for improvement of business performance among manufacturing firms. This theoretical gap can principally lead to a key practical gap, particularly for manufacturers that are already engaged with LM. Since IT resources are interdependent and there are relatively complex interrelationship among different aspects of IT resources, manufacturing firms may not be aware of the mechanism by which IT resources can interact with each other to better support LM practices. This issue in turn may limit manufacturers in devising effective IT development strategies that can directly or indirectly support LM and business performance.

Consistent with theoretical and practical gaps explained above, following research problems are highlighted:

1. Lack of understanding on how manufacturing firms in developing countries can improve their business performance through the use of IT resources;
2. Nonexistence of effective guidelines for manufacturers in developing countries (particularly Iranian and Malaysian ones) to assist them with forming valuable IT-enabled organizational capabilities to transform their IT resources into business performance improvement.

3. Lack of theoretical and empirical justifications to decide whether 'IT-enabled capability perspective' can be practical in justifying IT investment decisions among manufacturers in developing countries.
4. Lack of empirical evidence to decide whether the application of IT and LM (in its true form) is interdependent and complimentary or these two approaches are mutually exclusive.
5. Lack of understanding on how cross-synergies between different practices of LM can better improve business performance;
6. Lack of understanding on how different dimensions of business performance are affected by each of the LM practices;
7. Lack of understanding on how different dimensions of business performance are affected by each type of IT resources;
8. Lack of empirical evidence to decide whether the interaction between IT resources and LM can provide superior business performance improvement.
9. Lack of comprehensive measurement instrument for measuring IT resource, sustainability of LM and businesses performance improvement among IT business value context and particularly for manufactures in developing countries.
10. The non-existence of a reliable research model that can effectively explain the mechanism by which manufacturing firms, Iranian and Malaysian in particular, can use their IT resources to develop the IT-enabled capability of 'LM sustainability' to improve their business performance.

### 1.3 Research Questions

By reaching the end of the present study, and keeping in mind the existing theoretical and practical gaps in the context of IT business value for manufacturing firms, particularly in developing countries, the present study aims to answer the following research questions.

1. How manufacturing firms in developing countries can improve their business performance through the use IT resources?
2. How 'IT-enabled capability perspective' can be practical in justifying IT investment decisions among manufacturers in developing countries?
3. Is the application of IT and LM (in its true form) interdependent and complimentary?
4. How cross-synergies between different practices of LM can better improve business performance?
5. How different dimensions of business performance are affected by each of the LM practices?
6. How different dimensions of business performance are affected by each type of IT resources?
7. How interaction between IT resources and LM can provide superior business performance improvement?

## 1.4 Objectives of the Study

The present study intends to address the following key research aim:

- ❖ To determine how LM practice can mediate the relationship between IT resources and business performance improvement.

The study proposes that assessing the mediating role of IT-enabled capability can help manufacturing firms in developing countries to better use their IT resources and achieve higher level of performance improvement. To achieve this purpose, the present study introduces and conceptualize the construct of ‘AMT competency’ as an IT capability and the construct of ‘LM sustainability’ as an IT-enabled higher-order organizational capability and further determine how manufacturing firms in Iran and Malaysia can effectively use their IT resources to develop these two invaluable constructs and thus achieve superior performance improvement. Consistently, the present study holds following three key research objectives:

1. To develop a RBV-based model of ‘IT-enabled LM sustainability’ and to test whether this model out performs existing models in the literature in term of better explaining the role of IT in enhancing business performance;
2. To determine how well IT resources controlled by manufacturing firms can significantly improve different dimensions of business performance, with and without interaction with IT-enabled capabilities;
3. To provide manufacturing firms in developing countries with practical guideline on approaches to effectively form valuable IT-enabled capabilities and transform value of existing IT resources to the performance gain.

## 1.5 Significant of the Study

The present study sheds more light on the relationship between IT resources controlled by firms and business performance improvement, particularly with the presence of the impact of LM. Since both IT and LM are ever-changing dynamic approaches, an empirical study of the relationship between recent IT and LM, particularly among contemporary firms can always add valuable insights to the IT business value background.

The present research can make an important contribution to this research discipline by introducing two brand new IT-enabled capabilities: the IT capability of ‘AMT competency’ and the IT-enabled higher-order organizational capability of ‘LM sustainability’. This contribution can be more valuable to manufacturers because majority of previously introduced IT-enabled capabilities such as proactive corporate environmental strategy (Benitez-Amado and Walczuch, 2012) are management-oriented capabilities whereas the two new IT-enabled capabilities introduced in this study are highly manufacturing-oriented capabilities.



It was noticed that majority of previous IT business value studies performed survey and used cross-sectional data to introduce IT-enabled capabilities and measure the performance improvement of businesses surveyed. This observation is consistent with Nevo and Wade (2011) notion arguing that the reliance on cross-sectional data alone is a limitation for existing RBV-based business value studies. Nevo and Wade (2011) warned that reliance on cross-sectional data in RBV-based business value studies "while providing breadth, lack depth. Although the study uses the cross-sectional data from a survey of 256 Iranian and Malaysian manufacturers to test the proposed research model, however, the study also performs and reposts a 24 months longitudinal case study to more precisely exemplify the way manufacturers can leverage their IT resources to support the development of IT capabilities and improvement of business performance.

The conceptualization of LM construct in the present study is a direct answer to the calls from Hofer et al. (2012), Inman et al. (2011) and Khanchanapong et al. (2014) recommending that the complementarity between different practices of LM should be recognized the individual effects should be compared with the complementarity effects. The present study is the first to answer to this research call and make a comparison among impacts of individual LM practices and different performance dimensions, as well as a comparison between individual impacts of each LM practice with the synergistic impact.

It was previously highlighted that several categorization of IT resources have been introduced by prior IT value studies. The present study is among the first to hold a holistic perspective in conceptualizing IT resource. The study in effect assesses the effect of both human and non-human IT resources, including two different types of IT investment metrics on LM and business performance. The present study will demonstrate the diversity in performance effect of different IT resources, which can assist manufacturers with better IT investment decisions. By doing so, the present study addresses the suggestion from Ong and Chen (2014) that in general, IT resources can be "divided into different types, for examples, IT infrastructure, IT technical and managerial knowledge, and IT integration ... we can further understand which types of IT are more relevant to firm value. Then, firms can adjust their allocation strategy of resources to create more IT-enabled value."

### **1.6 Scope of the Study**

This study aims to determine how manufacturing firms in developing countries can form valuable capabilities with the use of IT resources, and thus, improve their performance. The data for this study come from both Iranian and Malaysian manufacturing firms. Because the study is concerned with sustainability of LM, the potential respondents come from Iranian and Malaysian manufacturers that have already been engaged in any form of LM activities. The study relies on the questionnaire-based survey to collect data that is used to test the research model of study proposed. The study also performs a longitudinal in-depth case study in a manufacturing firm to complement the findings of the cross-sectional survey. This research will be financially and logistically supported by the *Enterprise of Iran Industrial Cities* and the *Ministry of Industry, Mine and Trade* since the objectives of

this study is in line with the supportive policies of Iran government aimed for promoting manufacturing sector in Iran. The present study is also funded and supported by an *International Graduate Research Fellowship (IGRF)* from Universiti Putra Malaysia (Ref No: UPM/SPS/GS30834).

For the data analysis, the study first uses typical descriptive statistics such as frequencies to analyze the demographics of participating firms. For the descriptive statistics, IBMSPSS (V. 20.0.0) is used. The proposed research mode of the study is however tested using Structural Equation Modeling (SEM). The study uses the Partial Least Squares (PLS) method because PLS-SEM is the most appropriate SEM technique in this study given the presence of both formative and reflective constructs (Petter et al., 2007). The study therefore uses SmartPLS version: 2.0.M3 (Ringle et al., 2005) to perform the PLS-SEM analysis. To perform the PLS-SEM, and following the standard procedure within the IT and operation management literature (Chin, 2010; Hair et al., 2013; Petter et al., 2007; Shah and Goldstein, 2006), the validity and reliability of the measurement instrument and the data collected are first evaluated using and the structural model is further tested via the test of the structural equation model.

## **1.7 Organization of the Thesis**

This thesis is organized by six chapters. The first chapter presents an overview of IT business value background and existing theoretical and practical gaps in this particular context and among Iranian and Malaysian manufacturers. This chapter further introduces the research aims and objectives of the study and then highlights the way this study can contribute to the research and practice. This chapter ends by describing the scope of the study.

Chapter two commences by offering the definition of key terms, reviews the IT business value background and scrutinizes the so-called 'IT productivity paradox'. This chapter further discusses about the IT-enabled capability perspective and reviews the progression done within this research discipline. After reviewing the history and application of LM, this chapter ends with introducing the research model of the study and related hypotheses.

In chapter three, steps that have been taken all throughout this study to fulfill the research objectives are thoroughly discussed. After proposing the overview of the research method in the form of a decision model, detailed explanations about the measurement instrument (questionnaire) development and data collection process are supplied. At the end of this chapter, the process of performing PLS-SEM is comprehensively discussed.

Chapter four presents the demographics of the study, the results of PLS-SEM and the test of hypotheses, and the in-depth case study done. In chapter five, the present study offers the discussion on results of statistical tests and the case study. Last but not least, chapter six discusses the theoretical contribution and practical implications of the study. The limitation of the study and the future research directions are also deliberated at the end of this chapter.

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