ORGANIZATIONAL CITIZENSHIP BEHAVIOURS, MANAGERIAL TIES AND ORGANIZATIONAL CULTURE: IMPACT ON OPEN INNOVATION

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FACULTY OF BUSINESS AND ACCOUNTANCY
UNIVERSITY OF MALAYA
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ABSTRACT

Success in the Open Innovation paradigm offers great benefits to firms and supplants their reliance on expensive internal R&D. Many firms have succeeded in the Open Innovation paradigm but failures have also been reported. Being a new area of research, not much is known about the factors affecting Open Innovation. In view of this, the current research was conducted with the aim to study the effects of Organizational Citizenship Behaviours, Organizational Culture and Managerial Ties (predictor variables) on Open Innovation (criterion variable) and to study the moderating role of Regimes of Appropriability on these relationships. Cross-sectional data were collected using the survey method from 339 middle and top managers working in manufacturing firms in the four high-tech industries in Malaysia. A two-stage sampling procedure involving stratified sampling and convenience sampling techniques was used. Hierarchical multiple regression was employed to test the hypothesized relationships. The results reveal that Organizational Citizenship Behaviors predicts Open Innovation positively and significantly. In addition, *Highly Integrative Culture* was found to relate positively to In-bound Open Innovation while *Hierarchy Culture* related negatively. No evidence of a significant relationship between Organizational Culture and Out-bound Open Innovation was found. Managerial Ties with government officials and with universities and/or other research centers were found to facilitate In-bound Open Innovation while Managerial Ties with managers at other firms did not significantly affect In-bound Open Innovation. Besides, no statistically significant relationship was found between Managerial Ties and Out-bound Open Innovation. In addition, Regimes of Appropriability was not found to moderate strongly the relationships between the predictor and the outcome variables. The study makes many theoretical and managerial contributions which, along with the limitations of this research and future research directions, are highlighted in this thesis.

ABSTRAK

Kejayaan dalam paradigma Inovasi Terbuka memberikan banyak manfaat kepada firma dan menggantikan ketergantungan firma pada Penyelidikan dan Pembangunan dalaman firma. Banyak firma menempah kejayaan dalam paradigma Inovasi Terbuka, namun ada juga firma yang gagal dalam pendekatan ini. Oleh kerana ia merupakan bidang kajian yang baru, tidak banyak yang diketahui tentang faktor-faktor yang mempengaruhi Inovasi Terbuka. Memandangkan kekurangan ini, kajian ini bertujuan mengkaji kesan Kelakuan Warganegara Berorganisasi (Organizational Citizenship Behaviours), Kebudayaan Organisasi (Organizational Culture) dan Hubungan Pengurus (Managerial Ties) pada Inovasi Terbuka dan juga mengkaji pengaruh moderasi "Regimes of Appropriability" pada ketiga-tiga variable Inovasi Terbuka. Data daripada kajian keratan lintang telah dikumpul dengan menggunakan kaedah tinjauan 339 pengurus atasan dan menengah dalam firma pembuatan empat industri teknologi tinggi di Malaysia. Satu kaedah persampelan dua peringkat iaitu pensampelan berstrata dan pensampelan mudah telah digunakan. Regresi Berganda Berhirarki digunakan untuk menguji hubungan yang dihipotesiskan. Keputusan kajian menunjukkan Kelakuan Warganegara Berorganisasi meramalkan Inovasi Terbuka secara positif dan secara signifikan. Selain daripada itu, Budaya Berintegrasi Tinggi didapati mempunyai hubungan yang positif terhadap Inovasi Dalaman manakala Budaya Berhiraki mempunyai hubungan yang negatif. Tiada bukti yang menunjukkan hubungan signifikan di antara Kebudayaan Organisasi dan Inovasi Luaran. Hubungan Pengurus dengan pegawai kerajaan dan universiti dan/atau pusat-pusat penyelidikan didapati memudahkan Inovasi Dalaman manakala Hubungan Managerial dengan pengurus di firma lain tidak memberi kesan yang signifikan kepada Inovasi Dalaman. Selain daripada itu, tiada hubungan signifikan secara statistic didapati di antara Hubungan Pengurus dan Inovasi Luaran. Selain daripada itu, "Regimes of Appropriability" didapati tidak memoderasikan dengan kuat hubungan di antara pemboleh ubah tak bersandar (Kelakuan Warganegara Berorganisasi, Kebudayaan Organisasi dan Hubungan Pengurus) dan pembolehubah bersandar (Innovasi Terbuka). Banyak implikasi teori pengurusan berserta dengan keterbatasan dan panduan bagi penyelidikan yang akan datang dinyatakan dalam tesis ini.

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DEDICATION

To

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who – en route to school a zillion times – impressed upon me the virtues of education, lovingly tucked my shirt in, adjusted the annoying necktie and with a peck on the cheek, inspired me to navigate this world's wilderness.

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CHAPTER ONE

INTRODUCTION

1.0 Brief Summary

This study firstly examines the effects of Organizational Citizenship Behaviours (OCB), Managerial Ties and Organizational Culture on Open Innovation. Secondly, this study investigates the moderating role of Regimes of Appropriability on these relationships. In this study, there are three predictor variables (OCB, Managerial Ties and Organizational Culture), one criterion variable (Open Innovation) and one moderating variable (Regimes of Appropriability). Of the predictor variables, OCB consists of three dimensions; Managerial Ties consists of three types; Organizational Culture also has three types, while the criterion variable, Open Innovation has two dimensions.

1.1 Overview of the Study

Innovation has been the main driver of many firms' growth and sustainability for a long time now; so much so that it has been considered as a "strategic asset" that helps in gaining and maintaining competitive advantage and defending against competition. Long-term competitiveness requires that companies enhance their innovative capabilities to improve their products and processes. It is thus one of the means of ensuring an organization's long-term survival Mirza and Giroud (2004).

For years, firms relied on the Closed Innovation model to be competitive and to bring new product and services to the market (Chesbrough, 2006). While this model of innovation, also called the traditional/closed model of innovation led to myriad innovations, it involved a very limited interaction with the external environment (Lichtenthaler, 2008). In the case of this Closed Innovation model, the assumption was

that the innovation processes need to be controlled by the firm. Lucent Technologies, for instance, pursued the Closed Innovation model, investing and relying heavily on its internal R&D to stay competitive without interacting much with any external source of knowledge and learning (Chesbrough, 2003b).

In the present times, however, due to rapid technological changes taking place and other factors of globalization, sticking to this traditional Closed Innovation model can lead to loss of competitive advantage for a firm. On the other hand, embracing an Open Innovation model can result in important strategic innovations providing firms with competitive advantage (Chesbrough, 2003b). Due to this and many other reasons firms are shifting from the Closed Innovation model to the Open Innovation model.

In the Open Innovation model, as the boundaries become porous, there is more interaction between partner firms that results in greater technology acquisition and exploitation (Chesbrough, 2006). Consequently there is a greater amount of resources and expertise at hand than expected in the Closed Innovation model. This has many benefits, one of which is faster innovations. Besides, as a result of collaborative efforts of the partnering firms, a heady mix of talent and expertise from people working together in new ways often stimulates innovation. This has further been made easier by the advent of information technology that has enabled better coordination of alliance partner value chains and greater integration as demanded by the new global market forces (Shaw, 2000). For instance, in contrast to the example of Lucent Technologies highlighted above, Cisco Systems is a successful example of a company that embraced Open Innovation and relied heavily on external knowledge retention by forming alliances thereby adopting an external knowledge strategy (Chesbrough, 2003b).

However, while Open Innovation may offer many benefits to a firm, adopting this model does not seem to be easy as several challenges come in the way of the Open

Innovation process. The Open Innovation process starts with identifying the knowledge sources and then exploiting them. This stage can usually be accompanied by a lack of resources either because the project is still new or because the output of the project is not trusted. Or, sometimes managers may not be able to foreknow all uncertainties or fully anticipate the roles that they may want or need the employees to discharge (Katz & Kahn, 1978; Organ, 1988). In their now widely-cited book Open Innovation*: Researching a new paradigm,* West, Vanhaverbeke and Chesbrough (2006a, pp. 285-309) underline that innovation is a result of efforts of one or more individuals. In the Closed Innovation paradigm, such efforts are made within the firm by employees. Similarly, in the Open Innovation model, West et al. (2006a) state that such individuals "certainly" play a crucial role by being productive and using some combination of intrinsic and extrinsic motivations.

In this backdrop, this study intends to examine the factors that are expected to affect Open Innovation. **Firstly**, therefore, this study examines the impact of Organizational Citizenship Behaviours (OCB) on Open Innovation. OCB shown by the employees may play a crucial role in the success of Open Innovation projects. Positive employee voluntary behaviours like acting cooperatively, being a team player, giving ideas about improving the product, and encouraging a positive climate, which Organ (1988) termed as OCB are shown by the activities that are aimed towards other employees in the office or in the organization. These activities can include helping co-workers, being conscientious toward the work environment, communicating new and critical information, actively taking part in decision processes and discussions, and not complaining about minor issues (Yen, Li, & Niehoff, 2008). OCB performed by the employees of a firm exceed the minimum job requirements as anticipated by the employer and advance the well-being of the co-workers, the organization or the work groups. At the same time, organizations rely on the employees' practice of OCB to

encourage a positive work atmosphere, to assist other employees with any problems, be more tolerable of any inconveniences, and protect resources of the firm (Witt, 1991). Organ (1988) argues that in the aggregate OCB have a major beneficial impact on organizational operations and effectiveness. OCB may also enhance the ability of an organization to adjust to environmental changes (Podsakoff & MacKenzie, 1997). Since embarking on the Open Innovation paradigm involves adapting to new external environment changes and conditions, OCB as suggested by Podsakoff and MacKenzie (1997) may also be able to facilitate Open Innovation.

Secondly, this study examines the relationship between Managerial Ties and Open Innovation. Resource dependence theory suggests that managerial ties with groups and individuals outside the organization can act as a substitute in lowering the firms' dependence on critical resource (Pfeffer & Salancik, 2003). Moreover, the social network theory argues that managerial ties can provide informational and control benefits to organizations, and may even benefit competition (Burt, 1997b). Against this backdrop, Open Innovation relies on identification of proper and compatible knowledge sources and later their exploitation to create value. This leads to several impediments in the way of the Open Innovation process. Open Innovation involves reliance on inter-organizational relationships to internalize external ideas from different innovation sources (In-bound Open Innovation) and sell the ideas that are developed within the firm but may not be in sync with the firm's current business model (Out-bound Open Innovation). Therefore, a firm needs to establish relations with different partners which could be universities and research institutions, suppliers, users and other firms (Chesbrough, 2006; Chesbrough, Vanhaverbeke, & West, 2006; Emden, Calantone, & Droge, 2006; Perkmann & Walsh, 2007; Von Hippel, 2005). Such firms look for new ideas and technologies by increasing the search breadth (the number of innovation sources they depend upon for creating innovation) and the search depth (the

degree/depth to which firms utilize their external knowledge sources) of their innovation networks (Laursen & Salter, 2006).

Developing such relationships however may not be easy and a firm may face several challenges. For instance, how would firms identify appropriate knowledge sources? How would firms explore and choose the right firm partners collaborating with whom will create value for the firm (West, Vanhaverbeke, & Chesbrough, 2006b)? How would firms interact with the potential knowledge sources and how would the process of Open Innovation start? In addition, given the diversity of partners in the Open Innovation model, the activities of acquisition, assimilation, transformation and exploitation (Zahra & George, 2002) become all the more complex. This is where the role of Managerial Ties becomes paramount. Well-networked managers can help a firm identify and exploit proper sources of knowledge and use them to the advantage of the firm, thus facilitating the process of Open Innovation. The role of Managerial Ties is not to be underestimated as Managerial Ties, particularly in transition economies, have been found to even help firms enhance and gain competitive advantage over their competitors (Li & Zhou, 2010; Thorelli, 1986).

Thirdly, this study examines the relationship between Organizational Culture and Open Innovation. According to Carbone, Contreras, and Hernandez (2010), the introduction of the Open Innovation paradigm in an enterprise requires not just a modification of the corporate process of innovation but also a cultural change. Lichtenthaler (2011) further mentions that Open Innovation processes involve foreign partners, and this adds an international dimension to it; and leads to cultural issues which deserve further analysis. Currently, there are hardly any empirical studies about the relationship between Organizational Culture and Open Innovation. This seems to be due to the fact that Open Innovation is a rather new research area and there clearly is a need for further

theoretical and empirical research (Lichtenthaler, 2011). One of the most prolific authors on Open Innovation (Scopus, 2011), Lichtenthaler (2011) particularly highlights the link between Organizational Culture and Open Innovation as a 'fruitful avenue' for investigation. Pool (2000) suggested that Organizational Culture allows an organization to address ever-changing problems of adaptation to the external environment and the internal integration of organization resources, personnel and policies to support external adaptation. Therefore, besides helping to predict the success of Open Innovation initiatives in many ways, an understanding of what type of Organizational Culture relates positively to Open Innovation can also give insights into the degree of openness a firm should practice (Lichtenthaler, 2011).

Fourthly, this study intends to examine the moderating role of Regimes of Appropriability on the relationships between OCB, Managerial Ties and Organizational Culture and Open Innovation. OCB, Managerial Ties and Organizational Culture alone may not be able to lead to success in the Open Innovation paradigm. A firm's favorable internal resources and conditions may not always be enough to lead it to successful Open Innovation. The success of a firm in general is contingent upon its understanding of the external environment to survive volatile times (Yeo, 2005). Before creating any kind of innovation, it is important for a firm to measure its potential benefits and check whether it can appropriate the results of its innovative activities. Securing results of any innovation is paramount for the firms that invest in such innovation activities as it allows them the fruits of their innovations (González-Álvarez & Nieto-Antolín, 2007). Therefore, Regimes of Appropriability, sometimes also called Appropriability Regimes, become an important moderating factor in the relationships between OCB, Managerial Ties Organizational Culture and Open Innovation. Appropriability, as Atkins (1998) defines is "the ability of different stakeholders to retain for themselves the financial benefits that arise through the exploitation of an innovation". If the firm that creates

innovation is the main beneficiary of the innovation, the situation is called ‘strong appropriability regime’, and if the creator of innovation gains less than other stakeholders, it is referred to as ‘weak appropriability regime’.

The role of appropriability in Open Innovation outcomes remains not only hazy but contradictory also. According to the conventional view, strong appropriability regimes create increased willingness among innovators to offer internal innovations for others to use thereby enhancing Open Innovation outcomes (Chesbrough, 2003a). However, in contrast to this, Laursen and Salter (2005) found through a large-scale survey that Open Innovation provides better results in moderate regimes of appropriability. Adding to the difference in results, Fabrizio (2006) reported a negative relationship between high appropriability and aspects of Open Innovation. Hence no clear role of the appropriability regimes is established in the literature. Nevertheless, reconnoitring the Regimes of Appropriability of the industry and establishing their role in the Open Innovation paradigm can help determine ex ante the benefits of potential Open Innovations. Since the relationship between appropriability and Open Innovation does not seem to be a simple linear causal relationship, responding to the call for further research by West et al. (2006b), this study aims to identify the moderating effects of Regimes of Appropriability between the predictor variables of this study and Open Innovation.

The remainder of this chapter takes the following structure. The following section 1.2 discusses the problem statement. Section 1.3 elaborates on the scope of this study and Section 1.4 discusses Open Innovation in relation to Malaysia. This is followed by presentation of research objective in section 1.5. In section 1.6, research questions are discussed. Research hypotheses are examined in section 1.7. This is followed by a brief

discussion on the theoretical framework of this study in section 1.8. Lastly in section 1.9, the contributions of this research are highlighted briefly.

1.2 Problem Statement

Success in the Open Innovation paradigm offers great benefits to firms and supplants their reliance on expensive internal R&D. Many firms have succeeded in the Open Innovation paradigm but failures have also been reported. Several factors influence the success of Open Innovation. These range from internal to external factors. The role of many of these factors remains hazy. The role of four such factors, Organizational Citizenship Behaviours, Managerial Ties, Organizational Culture (internal factors) and Regimes of Appropriability (external factor) in facilitating Open Innovation ranges from being inconclusive to doubtful to contradictory and even unstudied as is shown by many studies. This not only affects the outcomes of Open Innovation but also adds to uncertainty regarding the value-creation of Open Innovation which jeopardizes the earning potential. An understanding of how these variables operate in creating successful Open Innovation can rule out many failures related to the adoption of Open Innovation.

1.3 Scope of the Study

The scope of this study is limited to manufacturing firms in Malaysia. Specifically, the theoretical framework developed in this study will be tested in the high-tech sector in Malaysia which consists of four industries namely Aerospace industry, Computers and Office Machinery industry, Electronics and Communications industry, and Pharmaceuticals industry (OECD, 1997). The chances of Open Innovation being practiced in these industries are expected to be higher than in, say, medium- or low-tech industries (van de Vrande, de Jong, Vanhaverbeke, & de Rochemont, 2009). To the best

of this researcher's knowledge, no previous study explores Open Innovation in the high-tech sector in Malaysia.

1.4 Open Innovation and Malaysia

Open Innovation is a recent area of research in the field of management that aims at improving the innovation processes of enterprises, based on the collaborative creation and development of ideas and products (Carbone et al., 2010). Globally many industry leaders, such as Nestle, 3M, GE, Goodyear, Xerox, and BP are already successful leading practitioners of Open Innovation (Evan, 2009). At the same time, a large number of researchers have taken interest in this evolving theme in Management which is evidenced by the increasing number of papers appearing on the topic of Open Innovation. Open Innovation has therefore caught the interest of practitioners as well as researchers (Lichtenthaler & Lichtenthaler, 2010; Savitskaya, Salmi, & Torkkeli, 2010).

The idea of Open Innovation as we know it today emerged in the West. Therefore most of the research on this theme has been conducted in the West. Given the recency of the Open Innovation theme, the practice of Open Innovation in the Western context is fairly documented while in the Asian context, not much is known about it (Lindegaard, 2012). Of late however, Open Innovation research, providing evidence of practice of Open Innovation, has started to trickle in from the Asian countries (cf. Abulrub & Lee, 2012; Lee, Park, Yoon, & Park, 2010). Due to the impact Open Innovation can have on an organization at the micro level or on a country at the macro level, Open Innovation requires extensive empirical investigation, testing and development (De Jong, Vanhaverbeke, & de Vrande, 2007) not only in the West but in the East as well.

As of now, not much is known about Open Innovation adoption in Malaysia. However, recognizing the benefits of Open Innovation, a top Malaysian executive, Dr Roger

Wyse, Co-chairman/director of the Malaysian Life Sciences Capital Fund (MLSCF) exhorted Malaysian companies to adopt the Open Innovation model to create more investment opportunities and stimulate economic growth of the country by leveraging internal and external sources of ideas (Bernama, October 25, 2011). The executive spoke of Open Innovation in these words:

> "Open Innovation is a necessary paradigm for companies to remain competitive and for countries to make the leap to the next phase of economic development. Sole reliance on organic innovation is too slow and costly. Malaysian firms must identify, adapt and integrate global innovation in sectors where Malaysia has a sustainable competitive market advantage" (Bernama, October 25, 2011).

In addition, according to Lindegaard (2012), Malaysia is the most promising country for Open Innovation in Asia – surpassing even fully-developed countries like Singapore, South Korea and Japan – due to its potential to become the Open Innovation hub in Asia (Lindegaard, 2012). Malaysia has an increasingly high number of knowledge workers, the English fluency is high, the infrastructure, logistics as well as IT, is well-developed and there seems to be a balanced understanding of Western and Asian business practices making it a nice place to mix business and pleasure (Lindegaard, 2012).

1.5 Research Objectives

This study aims:

- To examine the effects of different dimensions of Organizational Citizenship Behaviors on Open Innovation.
- To examine the effects of different types of Managerial Ties on Open Innovation.

- To examine the effect of different types of Organizational Cultures on Open Innovation.
- To investigate the moderating effect of Regimes of Appropriability on the relations between OCB, Managerial Ties and Organizational Culture, and Open Innovation.

1.6 Research Questions

Following are the research questions of this study:

- What is the nature of the relationship between the different dimensions of Organizational Citizenship Behaviors and Open Innovation?
- What is the nature of the relationship between the different types of Managerial Ties and Open Innovation?
- What is the nature of the relationship between the different types of Organizational Cultures and Open Innovation?
- What is the moderating role of Regimes of Appropriability on the relations between the predictors and criterion variables of this study?

1.7 Research Framework

The research framework in this study consists of three predictor variables, one criterion variable and a moderating variable. The three predictor variables are: Organizational Citizenship Behaviour, Managerial Ties and Organizational Culture. Open Innovation is the criterion variable in this study while Regimes of Appropriability is the moderating variable. The first predictor variable in this study, Organizational Citizenship Behaviour has three dimensions: a) Altruism, b) Conscientiousness and, c) Sportsmanship. The second predictor variable in this study, Managerial Ties has three types: a) Ties with officials, b) Ties with managers and, c) Ties with R&D centers. The third predictor

variable in this study, Organizational Culture, has five dimensions namely: a) Employee Development, b) Harmony, c) Customer Orientation, d) Social Responsibility and, e) Innovation. Based on the most interpretable results of cluster analysis performed on these five dimensions of Organizational Culture, three types of Organizational Cultures are formed, which are: *Highly Integrative Culture*, *Moderately Integrative Culture* and *Hierarchy Culture*. Creating these three Organizational Culture types is in line with a previous seminal study by Tsui, Wang, and Xin (2006). The only criterion variable in this study, Open Innovation has two dimensions: In-bound Open Innovation and Out-bound Open Innovation. This study also has a moderating variable: Regimes of Appropriability. The research framework is shown below diagrammatically:

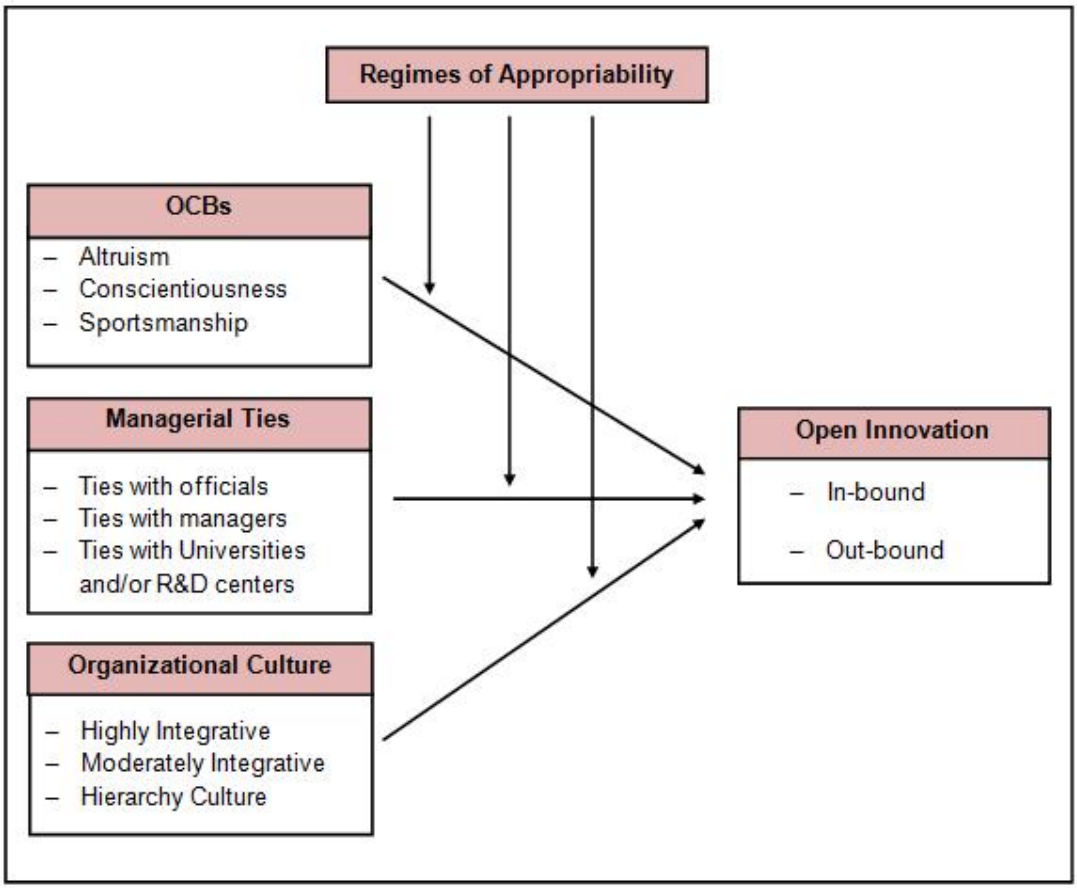

Figure 1.1: Research framework of the study

1.8 Contribution of the Study

This study is expected to make several theoretical and practical contributions. This study explores the factors that affect Open Innovation in Malaysia. The effects of these factors have not been examined before empirically. Firstly, thus, this study will contribute to the theory by exploring how the dimensions of the first factor, Organizational Citizenship Behaviours, operate when it comes to facilitating Open Innovation. An examination of Organizational Citizenship Behaviours in relation to Open Innovation will provide guidelines to firms about which dimensions of Organizational Citizenship Behaviours affect Open Innovation positively.

Secondly, this study is expected to explore whether or not having different types of Managerial Ties with different parties is useful for Open Innovation. The practical contribution of this would be an understanding of what type of Managerial Ties to cultivate and which ones to avoid in order to facilitate Open Innovation.

Thirdly, this study contributes by examining what types of Organizational Cultures encourage Open Innovation and what types are detrimental to it. A direct consequence of understanding this is that it would help practitioners nurture the Organizational Culture types in their organizations that are found to affect Open Innovation positively. This can also help firms predict, based on their Organizational Culture, whether they should embark on an Open Innovation journey or whether they should ensure first that their Organizational Culture is conducive for the Open Innovation model.

In addition, the choice of the instrument used in this study to measure Organizational Culture is a contribution to the theory of Organizational Culture. This study uses – and validates in the Malaysian context – the instrument developed by Tsui et al. (2006) to capture Organizational Culture dimensions of the firms operating in the high-tech

industry in Malaysia which, to the best of this researcher's knowledge, has never been used in the Malaysian context.

Moreover, this study is theoretically expected to clarify the role of Regimes of Appropriability with respect to Open Innovation. Currently, there seems to be a lot of confusion in the literature as to whether Regimes of Appropriability has any moderating effect on Open Innovation; the results of this study are also expected to remove this confusion, at least in the Malaysian context.

1.9 Chapterization

This thesis consists of six chapters.

In **Chapter One**, background of this study, problem statement, scope of the study, research context, research objectives, research questions, research framework and contributions of this study are presented.

In **Chapter Two**, a review of literature is given. This chapter reviews literature related to the three predictor variables, one outcome variable and one moderating variable of this study. The literature review of all the variables is presented in a thematic manner. Hypotheses are also developed in this chapter. In addition, in the last section of the chapter, the theoretical underpinning of this study is explained.

In **Chapter Three**, the methodology that was used to conduct this study is presented. This chapter provides discussion of the philosophical underpinning of this study, discusses the research design, the research approach, sample, target population, sampling method, sampling constraints, sampling frame and procedures, and sample size. In addition, this chapter also discusses the questionnaire design, provides the operational definitions and measurement of the variables of interest, assesses the

questionnaire validity and checks its reliability through a pilot test. The chapter ends by giving a brief overview of the main data analysis techniques used in this study.

In **Chapter Four**, the exercise of data analysis is presented and the findings of this study are presented. This chapter deals with the coding of the data, reverse scoring of negatively-worded items, and missing values. The chapter then presents descriptive statistics, giving a summary of the demographic profile of the respondents and the firms that participated in this study. Next in this chapter, the multivariate assumptions are tested which is followed by presentation of the results of the tests for non-response bias and common method bias. The chapter then moves on to show that the scales used have sound psychometric properties. This is followed by a presentation of the results of exploratory factor analysis, confirmatory factor analysis, cluster analysis and hierarchical multiple regression.

In **Chapter Five**, a discussion of the findings of this research is provided. This chapter states, explains, discusses, relates and put into proper perspective the findings of this study.

In **Chapter Six**, a summary of this thesis, theoretical contributions and managerial implications, limitations, future research direction and conlusions of this study are provided.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews the literature related to the variables of interest in this study. The literature review of all the variables is presented in a thematic manner. Section 2.1 discusses the literature on Open Innovation, the only criterion variable of this study. Section 2.2 presents a discussion of literature review on the first predictor variable, Organizational Citizenship Behaviours. Section 2.3 highlights relevant literature on the second predictor variable in this study, Managerial Ties. Section 2.4 reviews the relevant literature on the third predictor variable of this study, Organizational Culture. In section 2.5, the literature on the only moderator in this study, Regimes of Appropriability is discussed. Lastly, in section 2.6 the theoretical underpinning of this study is explained.

2.1 Open Innovation

2.1.1 Definition of Open Innovation

The term Open Innovation was introduced and popularized by Henry Chesbrough, a Professor at the University of California, Berkeley. Chesbrough defined Open Innovation as:

> "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively" (Chesbrough et al., 2006).

Since Chesbrough's introductory work on Open Innovation, this paradigm has emerged as an alternative model of innovation that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology. The Open Innovation process provides for projects to be initiated from internal or external sources. Similarly, new technology can come in at different stages. Besides traditional sales channels, projects can go to the market in different ways, such as through out-licensing or spin-off ventures (Chesbrough, 2003a).

In one of his definitive articles, Chesbrough (2003b) lists the principles that distinguish closed innovation from Open Innovation. According to Chesbrough, firms in the closed innovation model assume that: a) the clever employees in the field work with them, b) discovering, developing and shipping by the firm ensures profits, c) if the firm discovers it themselves, it can get it to the market first, d) the firm will win only if it commercializes the innovation, e) the firm will win if the most and the best deals in the industry are created by it, f) the firm should control the intellectual property so that the competitors are not able to exploit the protected intellectual property. On the other hand, firms operating in the Open Innovation paradigm assume that: a) all the sharp and smart people do not work inside the firm and thus there is a need to use and exploit external knowledge sources, b) external research and development can create value for the firm, c) research can be profitable to the firm even if it did not originate inside the firm, d) a strong business model has more significance than bringing products to the market first, e) internal and external ideas are necessary to win and, f) a firm can benefit from their own IP while it should also benefit from the IP of other firms whenever necessary (Chesbrough, 2003b).

Chesbrough et al. (2006) consider the Open Innovation model as the opposite of the traditional, vertically integrated model wherein internal research and development (R&D) efforts of a firm lead to products developed internally and distributed thereafter. Besides many disadvantages of the closed innovation model, its one limitation is that monolithic organizations that carry out business in isolation develop fragmented linkages and poor interfaces (Govindarajan & Trimble, 2005).

However, Open Innovation explicitly considers the business model as the fountain head of value creation and value capture, helping a firm sustain its position in the industry while at the same time sharing the task of value creation across industry value chain (Chesbrough, et al., 2006). According to Chesbrough et al. (2006), the Open Innovation model regards R&D as an "open system" in which ideas can come from both inside and outside of the organization and can go to the market through similar channels. Therefore, in the Open Innovation approach, the boundaries of the firm are porous and the external ideas and external paths to market are considered as important as internal ideas and internal paths to market (Chesbrough, 2003a). This is often a result of an alliance or collaboration or any such agreement between firms and since the knowledge is distributed, the innovation process is also distributed among the players involved in this process (Acha & Cusmano, 2005). As the boundaries become porous, there is more interaction between partner firms that results in greater technology acquisition and exploitation (Chesbrough, 2006). As a result there is a greater amount of resources and expertise at hand than expected in a closed innovation model, thereby providing many benefits including faster innovations. The next section discusses the dimension of Open Innovation.

2.1.2 Dimensions of Open Innovation

In their seminal work, Chesborough et al. (2006) divide Open Innovation into two conceptually different dimensions: In-bound or outside-in Open Innovation and Out-bound or inside-out Open Innovation. Quite similar to this dimensionalizing of Open Innovation, Dahlander and Gann (2010) reviewed 150 papers published on Open Innovation in the ISI database and concluded that there are two types of Open Innovation: In-bound and Out-bound Open Innovation.

a) In-bound or Outside-in Open Innovation

In-bound or outside-in Open Innovation refers to the use of discoveries that others make and involves opening up to and establishing relationships with external firms with the aim to access their competencies in order to enhance the firm's innovation performance. It implies purposive inflows of knowledge or technology exploration relating to innovation activities aimed at capturing and benefiting from external sources of knowledge to enhance current technological developments.

According to Dahlander and Gann (2010), In-bound innovation entails two processes termed sourcing and acquiring. Sourcing refers to how firms can use external sources of innovation after they scan the external environment for possible ideas and technologies. Acquiring is defined as acquiring inputs to the innovation process through the market place. This can happen through licensing-in and acquiring expertise from the external environment. Sourcing is non-pecuniary in nature and may not bring any direct financial benefits to a firm while acquiring is pecuniary and is undertaken with profit-making in mind. Based on an empirical database of 124 firms, Gassmann and Enkel (2004) concluded that the outside-in dimension of Open Innovation enriches a company's knowledge base and innovative capabilities due to greater integration of customers,

suppliers, and external knowledge sources. Chesbrough and Crowther (2006) reported that the main motives for firms to engage in In-bound Open Innovation were growth and revenue.

b) Out-bound or Inside-out Open Innovation

The Out-bound or inside-out dimension implies that firms can search for external players that have better fitting business models to exploit and commercialise a particular technology than just depend on internal paths to market (Vanhaverbeke, 2006). It refers to the purposive outflows of knowledge, or technology exploitation, meant to leverage existing technological capabilities outside the boundaries of the organization. The external exploitation of ideas can happen in different markets by selling intellectual property rights and multiplying technology by diverting ideas to the external environment (Gassmann & Enkel, 2004). The aim however remains to exploit better innovation opportunities. In addition, Out-bound Open Innovation involves opening up the innovation process for technology exploitation and outward technology (Lichtenthaler, 2009).

Like In-bound Open Innovation, Out-bound innovation also involves two processes which are revealing and selling. Revealing, as the name suggests refers to how internal resources of a firm are disclosed to the external environment without the firm hoping for any immediate financial rewards and seeking indirect benefits only. Thus revealing is non-pecuniary in nature. Selling implies how firms accrue benefits by commercialising their inventions and technologies through selling or licensing out to other firms (Dahlander & Gann, 2010). Selling therefore is pecuniary in nature and is undertaken for direct profit to the firm.

Both the dimensions of Open Innovation are important in performing Open Innovation practices (Parida, Westerberg, & Frishammar, 2011). In a fully open setting, firms combine both technology exploitation and technology exploration in order to create maximum value from their technological capabilities or other competencies (Chesbrough & Crowther, 2006; Lichtenthaler, 2008). However, while firms may adopt both the dimension of Open Innovation, research seems to suggest that the Out-bound processes of Open Innovation may not be as widespread as the In-bound processes (Chesbrough & Crowther, 2006; Enkel, Gassmann, & Chesbrough, 2009). Parida et al. (2011) believe that this can be due to the fact that starting with Open Innovation practices in an exploitation mode is more challenging. By first engaging in exploration using Open Innovation ideas, firms may find it more feasible later to exploit the ideas in a more open fashion. There may thus be an element of path dependence, where exploration precedes exploitation in the general case.

In addition to the two dimensions of Open Innovation highlighted above, Gassmann and Enkel (2004) identified a third dimension which they called “the coupled process” and defined as a process that links outside-in and inside-out processes of Open Innovation by working in alliances with complementary companies involving give and take as crucial elements of success. However, not many researchers have written about this dimension/process of Open Innovation. The next section discusses the advantages of Open Innovation.

2.1.3 Advantages of Open Innovation

Open Innovation offers many advantages to firms adopting this model. Firms create value externally by acquiring skills and knowledge from partners to complement the internal capabilities of their organizations (Love, Irani, Cheng, & Li, 2002). Some of the reasons for firms to enter into collaborative relationships are to improve innovation,

increase speed to market, and reduce the costs of internal vertical integration. When the partner firms share information, it improves their efficiency and helps them focus on joint opportunity recognition (Moffat & Archer, 2004). If the partner firms have compatible goals and they pool their resources, it creates increased value for the partner organizations as well as the customers (Kesler, 2002). This joining of hands finally provides for the potential for improved designs, shorter lead times, and greater customer value (Ragatz, Handfield, & Petersen, 2002). Such collaborations can also result in engagements of different forms with suppliers, customers, competitors, complementors, or even partners outside the industry (Parise & Henderson, 2001).

In their need to adapt to global change, organizations focus on their core competency by looking outside and relying on other companies to provide complementary capabilities (Hagel & Brown, 2005). This is also one of the reasons why strategic alliances between organizations are becoming increasingly important for capturing and internalizing knowledge (Parise & Henderson, 2001; Paswan, 2003). Different forms of such alliances may have varied objectives. For instance, alliances may be formed to support a specific project (Love et al., 2002). Firms may enter into relationship-specific alliances to gain valuable market insight and an intimate understanding of the customer, environment, culture, situation dynamics and create value (Subramani, 2004). Sometimes firms may engage in cooperative alliances to enhance their portfolios of capabilities (Taylor, 2005). van de Vrande et al. (2009) mention that besides market-related motives, Open Innovation may serve the firms (the study is about Dutch SMEs) by providing access to missing knowledge, complementary resources and by sharing risk. In the case of collaborating firms, such benefits were also highlighted by Koruna (2004).

Moreover, firms may also gain non-financial benefits from Open Innovation like better customer satisfaction etc. Chesbrough and Crowther (2006) in an interview-based study found that the commonest reason for firms to adopt Open Innovation was that Open Innovation helped critically in maintaining growth. This was corroborated by van de Vrande et al. (2009) who reported that SMEs use several Open Innovation practices simultaneously to serve customers effectively or to open up new markets, with higher-order objectives to secure revenues and to maintain growth.

As a result of collaborative efforts of the partnering firms, a heady mix of talent and expertise from people working together in new ways often stimulates innovation. This has further been made easier by the advent of information technology which has enabled better coordination of alliance partner value chains and greater integration as demanded by the new global market forces (Shaw, 2000). Research has shown that effective collaboration with external partners like suppliers, buyers, and other organizations is a contributing factor to innovation (Faems, Van Looy, & Debackere, 2005; Ritter & Gemünden, 2004). Learning to access and partner with organizations who bring resources and capabilities creates value in unprecedented ways (Palmisano, 2006a). Through networks and alliances, Open Innovation encourages the development of human and social capital. The value of the organizations is linked to the current and prospective engagements with the tangible and intangible influences of the other organization (Lev & Zambon, 2003).

Many firms have realised the benefits of engaging in Open Innovation in several spheres. Vanhaverbeke et al. (2008) looked at the advantage of working in Open Innovation style in external corporate venturing. In real option terms, Open Innovation gives companies a chance to scan through a wide array of technologies or new market developments, instead of just investing in internal projects alone. This has financial

value for the focal firm as there can be different opportunities available, and some of these may not be aligned or correlated with internally perceived opportunities (Vanhaverbeke, Van de Vrande, & Chesbrough, 2008). In the case of external corporate venturing in the Open Innovation paradigm, the innovating firms in question also gain from delayed entry or delayed financial commitment. The benefits may also come from an option of early exit and the chance to create some value from projects that are difficult to go forward internally. Besides, as the venture grows and matures, the firm can decide on whether to spin in the venture or to sell it off to external financiers like venture capitalists (Vanhaverbeke et al., 2008). This can bring profit to the firm as well. For these and other reasons discussed in up-coming sections, firms are moving from the closed innovation model to the Open Innovation strategies.

2.1.4 Shift from Closed to Open Innovation paradigm

Kemppainen and Vepsäläinen (2003) heralded how firms will change between 2003 and 2010 in terms of strategic orientation by predicting that industries will shift from functional participation toward broader collaborative participation. In his book, *Open Innovation - The new imperative for Creating and Profiting from Technology*, Chesbrough (2003a) explains how in the 20th century firms profited from innovations that were the outcomes of heavy investments in internal research and development of firms. However, with the changing times towards the end of the 20th century, many factors combined together to cause the closed innovation process to break up in the United States. The two main such factors were: 1) Rise in the number and mobility of knowledge workers and 2) Growing availability of private venture capital. While the increase in the number and mobility of knowledge workers made it hard for companies to safeguard their proprietary ideas and expertise, a spike in the availability of private venture capital spurred financing of new firms and commercialization of new ideas that

would otherwise be found useless or less useful in corporate research labs. This paved the way for more Open Innovation (Chesbrough, 2003b).

Given the urgencies of global markets, it becomes imperative for the organizations and new entrants to regenerate their core strategies and reinvent their industries by developing sustainable core competencies (Prahalad & Hamel, 1994). Organizations that sense the changing environment create focus on the right metrics, align and mobilize the entire organization, implement quickly, and create a generative learning environment to stay competitive (Pietersen, 2001). Hence to lead in the global markets, organizations must think outside their own business units and leverage resources of a coalition of companies (Prahalad & Hamel, 1994). The Open Innovation paradigm provides exactly that.

In addition, the advances in information technology and the forces of globalization have increased the demand for pooling complementary assets of external organizations (Archabal, Badgett, Chu, & Kalyanam, 2005). Further, competition causes organizations to come up with new products with improved quality, lower cost, and greater intellectual capital (Ragatz et al., 2002). Chesbrough and Crowther (2006) conducted a qualitative study of the asset-intensive industries and identified some more reasons for the shift to Open Innovation paradigm: profitable growth, improvement in product margins, perceived inability to meet corporate growth objectives without turning to external technologies, increased speed to market, cost reduction and monitoring of potentially disruptive technologies.

Besides, ever-changing markets and cost of doing business force organizations to look beyond their organizational structure for competencies (Parise & Henderson, 2001). These two factors explain the main aims for firms to enter into strategic alliance or collaborations whereby firms form inter- and intra-organizational relationships to

engage partners in collaborative behaviour and to tap into resources exterior to the firm (Love et al., 2002). This is noticeable even among the industries that historically invested in internal R&D to innovate. For instance, Ili, Albers, and Miller (2010) studied 42 automotive industry and because of increasing innovation, cost pressure, globalization, technology intensity and fusion, the authors conclude that Open Innovation is far better to achieve better R&D productivity than a closed innovation model.

As stated above, globalization has also in many ways further made it necessary to collaborate with external firms in the Open Innovation process. The effects of globalization in terms of increased competition, increased mobility of skilled workers, shorter product life cycles, higher risks and lower profit margins have forced the firms to diffuse risk and develop new products and services quickly and efficiently (Chesbrough, 2003a). In addition, complex environments that are a result of increased collaborations between different players have in many ways necessitated the shift from closed to open systems that facilitate informal behaviour to match situational and contextual factors (Brodbeck, 2002).

Furthermore, Dahlander et al. (2010) came up with four reasons for the currency of Open Innovation. Firstly, Open Innovation shows social and economic changes with respect to the working patterns. Professionals now tend to seek portfolio careers instead of a permanent job-for-life working for a single employer[1]. Hence firms need to tailor their approach in order to access talent that may not be ready for direct and exclusive employment. Secondly, globalization has expanded the extent of the market allowing for an increased division of labour. Thirdly, well-controlled institutions such as intellectual property rights, venture capital, and technology standards make the firms

[1] This may not be completely true, particularly after the subprime mortgage crisis in the USA in 2008 and current (2012) debt crisis in Europe.

feel safe to trade ideas. Fourthly, new technologies have added a new dimension to the ways firms collaborate and coordinate across geographical distances (Dahlander & Gann, 2010). Research has shown that effective collaboration with external partners like suppliers, buyers, and other firms is one of the important factors for innovation (Faems et al., 2005; Ritter & Gemünden, 2004). Learning to access and partner with organizations who bring resources and capabilities creates value in unprecedented ways (Palmisano, 2006b).

Adding a new angle to the switch from closed to Open Innovation paradigm, recent research has shown that Open Innovation may also be a result of the internal weaknesses of a firm, specifically, impediments to innovation (Keupp & Gassmann, 2009). These impediments could be information- and capabilities-related impediments or risk-related. Keupp et al. (2009) show that these internal impediments to innovation influence the width and depth of Open Innovation – width being the number of sources or external actors a firm uses for its Open Innovation activities and depth meaning the intensity of collaboration with each source (Laursen & Salter, 2006). Research shows that the firms with internal innovatory activities facing information- and capabilities-related impediments or risk-related impediments to innovation are more likely to use Open Innovation with more intensity in both width and depth (Keupp & Gassmann, 2009).

A good case study on the shift to Open Innovation is the journey of *Italcementi*. An Italian cement manufacturer, *Italcementi* evolved from operating in the closed innovation model to operating in the Open Innovation paradigm. This firm operated in a mature and asset-intensive industry and adjusted its organizational and managerial systems to suit the Open Innovation paradigm by bringing in a series of changes in the organization. During the early 1990s, *Italcementi* focused on the Italian cement market,

where, in the presence of a few small players working on a local basis, it operated with indisputable leadership. As a result of lack of any strong competitors, innovation activities in *Italcementi* mainly concentrated on enhancing internal production processes and bettering products' reliability for general construction uses. There was no formal research and development unit in place and innovation activities took place in the firm's technical support centre that saw to addressing the technical problems identified by customers.

By 1991, the wave of globalization swept the cement industry and the changes in European Union laws lowered the entry barrier to the national markets. Given such circumstances, *Italcementi* management acquired *Ciments Frances* to stay competitive and to demonstrate that the acquisition increased its innovation potential besides creating a larger firm. However the competitiveness in the industry kept increasing as a result of a number of mergers and acquisitions among *Italcementi*'s competitors. In such a situation, the TX Active project of *Italcementi* turned out to be useful.

This project started from the lucrative idea of mixing photo-catalytic elements with traditional cement components to reduce pollution. However despite being *Italcementi*'s idea, the firm lacked knowledge about photo-catalysis. Therefore embarking on the Open Innovation paradigm, *Italcementi* started to develop formal ties with many Italian universities and research centers leading to significant growth in the power and skills of the internal project managers and a number of research and development personnel with a technical or scientific degree. During the period 1995–2005, innovation projects implemented every year shot up from nearly 7–8 in 1995 to more than 20 in 2004 and 2005. As a result of this increase in the number of projects, an increase in the adoption of ICT systems was also seen to manage better cross-functional teams separated

geographically and for searching in database of scientific publications and patents (Chiaroni, Chiesa, & Frattini, 2011).

However, despite such successful examples of Open Innovation adoption and the benefits discussed above, operating in the Open Innovation paradigm can entail many challenges. Those challenges are highlighted in the next section.

2.1.5 Challenges to Open Innovation

Being a part of the Open Innovation paradigm and reaping its benefits in the case of organizational collaborations or alliances does not seem to be easy. Many barriers- such as lack of resources, free-riding behaviour, and problems with contracts - exist in the way of effective collaboration between firms (Hoffmann & Schlosser, 2001; Mohr & Spekman, 1994). Open Innovation therefore requires an over-all organizational fit between the partners, the absence of which can derail the whole intent of any such collaboration. Needless to say that the Open Innovation process first involves compatibility in terms of the nature of business. But beyond the nature of business, many other important factors may impact the success of any collaboration for Open Innovation.

Open Innovation first entails many organizational changes. The capacity of a firm to align with value-added partners enhances tangible value and responsiveness to the changing needs of the customers (Ulrich & Smallwood, 2004). But at the same time, joining hands with the external players leads to some degree of complexity relating to culture, organizational personality, and trust. Thus the success of a collaboration and the execution and implementation of the alliance strategy relies on leading human, information, and organizational capital that is external to the organizational structure.

Since Open Innovation involves profound organizational change in the firm that intends to abide by its principles, Chiaroni et al. (2011) contend that the implementation of Open Innovation takes place in a multi-phase organizational change process. Drawing on the work of Lewin (1947) on organizational change, Chiaroni et al. (2011) show that the implementation of the Open Innovation paradigm takes place along a three-phase process that include the stages of unfreezing, moving and institutionalising. The first phase, *unfreezing* refers to creating a sense of urgency for change in the organization and the formulation and conveyance of the new vision to the firm's internal and external stakeholders like suppliers, customers, personnel, senior management, etc. The second stage, *moving* implies to the on-ground implementation of the changes. This is done by formulating new procedures and patterns which are aligned with the new vision, eventually acting on budget constraints, schedules, targets, and reward systems. Finally, the third stage deals with *institutionalising* the new order, by consolidating the improvements achieved in the previous stage and ensuring the organization does not go back to the antecedent status quo (Chiaroni et al., 2011).

Besides suggesting that Open Innovation as an organizational change process happens sequentially from unfreezing to moving to institutionalising, Chiaroni et al. (2011) also identify four managerial levers that are important for Open Innovation to take place. They are: networks, organizational structures, evaluation processes and knowledge management systems. The study shows that the implementation of Open Innovation as a process begins in the organizational structures lever. The study further shows that the firms' network of customers and suppliers play a marginal role at least in the first phase of the process. Individual social networks are also pivotal in the implementation of Open Innovation while a deep change takes place in the processes and evaluation metrics.

Chesbrough and Crowther (2006) in their study of non-hi-tech industries identify two more challenges that firms face. The first challenge relates to the not-invented-here (NIH) syndrome. Katz and Allen (1982) also found the NIH syndrome as a main barrier to external knowledge acquisition. Chesbrough and Crowther's (2006) study found that the surveyed firms overcame this challenge by making clear the growth gap and stating why reliance on internal efforts was insufficient to meet the organizational objectives. The second challenge identified relates to sustaining internal commitment to the concepts of Open Innovation overtime. The study found that this challenge was overcome by the surveyed firms by ensuring senior management support and funding at the start of the project, by creating Open Innovation champions that handle the processes that incorporate the technologies in the business, and by rethinking internal processes, metrics, and award systems to encourage adoption.

De Jong et al. (2007) investigated Open Innovation practices in Dutch SMEs and found that barriers related to open innovation adoption were related to the organizational cultural differences, administrative burdens, financing issues and knowledge transfer problems when cooperating with other partners. In line with this, Boschma (2005) highlighted forms of proximity that are important for effective collaboration, which include cognitive, organizational, cultural and institutional differences between the collaborating players. This implies that insufficient knowledge, cultures or modes of organization, or bureaucratic elements may cause problems in collaborations (van de Vrande et al., 2009).

Furthermore, managing Open Innovation also poses considerable challenges. Should external innovators be organized as collaborative community or competitive market? Boudreau et al. (2009) identify three issues that managers need to consider when making a decision on the question of whether to deal with external innovators as

collaborative community or competitors: a) the type of innovation that a firm seeks to shift to the external innovators, b) the motivations of the individuals involved in the process of innovation, and c) the nature of the platform business model. The authors mention that communities which operate with intrinsic motivations are useful if an innovation problem involves cumulative knowledge which continually builds on past progress. However, in case an innovation problem is best solved by broad experimentation, competitive markets which operate on extrinsic motivations are efficacious. The authors also state that companies might also use nested strategy which is a mixed strategy involving both communities and markets to solve innovation problems.

Moreover, the collaboration efforts of firms many times yield positive results, but failures have also been reported (Duysters, Heimeriks, & Jurriëns, 2004). Despite the success of many strategic alliances (e.g. Apple-Clearwell; Hewlett-Packard-Disney; Starbucks-Barnes and Nobles), Das et al. (2000) report that alliance performance has remained weak. Strategic alliances can face difficulties which may often lead to unsatisfactory firm performance (Larsson, Bengtsson, Henriksson, & Sparks, 1998). Open Innovation may involve multi-faceted problems. Open Innovation involves substantial transaction costs due to the evaluation of external partners and in fact it may be hard to get access to external partners (Chesbrough, 2003a; Omta & Van Rossum, 1999).

According to Keupp and Gassmann (2009), Open Innovation also entails intellectual property considerations which may hinder its implementation. Embarking on an Open Innovation paradigm also involves many managerial challenges in implementation as deeply ingrained mindsets need to be changed (Chesbrough, 2003a). Supplier integration may be sabotaged by inter-company communication, cross-functional team

difficulties, design responsibility, tier structure, and alignment. A collaboration effort may also be marred by sharing proprietary information and cultural mismatches (Ragatz et al., 2002).

Open Innovation can also lead to a firm's resources being exploited by another firm given that intellectual property rights are hard to protect and benefits from innovations difficult to appropriate (Dahlander & Gann, 2010). In an alliance, a firm may also face issues regarding protecting themselves from the opportunistic behaviour of the partners to keep their core proprietary assets and leakage of critical know-how and information (Hamel, 1991; Kale, Singh, & Perlmutter, 2000).

In collaborations in general the partnering players, contribute capabilities that are superior to those available internally and craft agreements that protect them against partner opportunism (Hennart & Zeng, 2005). These concerns can be addressed by having a commitment to open relationships with partnering firms, shared team vision, and downstream coordination (Koufteros, Vonderembse, & Jayaram, 2005). Besides, since not all alliance partners are equally adept at learning, the asymmetries in learning alter the relative bargaining power of partners (Hamel, 1991). Realising the benefits of capturing and internalizing knowledge from alliance partners needs the discipline of developing an alliance learning capability (Grant & Baden Fuller, 2004). To derive the maximum benefit out of a collaboration, partners must learn to collaborate, integrate, and internalize knowledge rather than acquiring knowledge (Grant & Baden Fuller, 2004).

While many challenges could beset project partnering, there must be clear procedures for resolving disputes effectively in a timely manner (Doz & Hamel, 1998; Love et al., 2002). It is important to build trust to create an environment for improved information sharing between the partners. The good news is that as partnerships mature, trust among

knowledge agents builds from people pulling in the same direction (Taylor, 2005). While embarking on the Open Innovation paradigm, firms need to assess their position with reference to the above-mentioned challenges and accordingly position themselves in order to benefit from Open Innovation. It is however possible that some of the challenges discussed above can be overcome if employees in an organization practise proper citizenship behaviours. The next section discusses the literature related to such Organizational Citizenship Behaviours.

2.2 Organizational Citizenship Behaviours (OCB)

2.2.1 Definition of OCB

Organizational Citizenship Behaviours (OCB), a term slightly less than 30 years old, has been the subject matter of numerous studies since it was introduced by Dennis W. Organ during the 42nd National Academy of Management meeting in 1982 in New York. One of the most widely studied topics in organizational behaviour research in recent years (Podsakoff & MacKenzie, 1997), a look at the related literature of the construct suggests that it is a complex phenomenon involving a lot of tacit elements. The concept of OCB however is emerging as an important aspect of employee behaviour at work.

Organizational Citizenship Behaviours are defined as discretionary, extra-role behaviours of employees which exceed the prescribed formal roles, and are not directly or clearly demanded by the formal award system (Organ, 1988). Positive employee voluntary behaviours like acting cooperatively, being a team player, suggesting ways to improve the product, and promoting a positive climate, which Organ termed as OCB are shown by the activities that are aimed toward other employees in the office or in the organization. These activities can include helping co-workers, being conscientious

toward the work environment, communicating new and critical information, actively taking part in decision processes and discussions, and not complaining about minor issues (Yen et al., 2008).

Organizational Citizenship Behaviours performed by the employees of a firm exceed the minimum job requirements as anticipated by the employer and advance the well-being of the co-workers, the organization or the work groups. At the same time, organizations rely on the employees' practice of OCB so as to encourage a positive work atmosphere, to assist other employees with any problems, be more tolerable of any inconveniences, and protect the resources of the firm (Witt, 1991).

Three main types of behaviours are required for high organizational effectiveness: one, people must join and remain in the organization (employee retention rate); two, employees must stick to the in-role behaviour which is performed as per the formal role descriptions; and three, extra-role behaviour which goes beyond the formal requirements of the role must be practiced (Katz & Kahn, 1978). The in-role behaviour expected of an employee is usually codified in job description or role requirement. However, for increased organizational effectiveness, the employees must also practice the extra-role and cooperative behaviours which go beyond what is stated in their role descriptions. OCB is a term used to describe such extra-role and employee cooperation.

Notwithstanding this explanation, it often becomes difficult to make a distinction between the in-role requirement and OCB. Morrison (1994) showed that employees differ in their perception of in-role and extra-role behaviour. While some employees may think of a given behaviour as an OCB, others with broader view may consider the same as in-role behaviour. The boundary between in-role and extra-role behaviour thus is not clearly defined and that OCB emerges as a function of how broadly employees

define their job responsibilities. The impact of OCB on the performance of the firm accordingly varies.

2.2.2 Characteristics of OCB

In an influential book, *Organizational Citizenship Behaviours: The good soldier syndrome,* Organ (1988) argues that good citizenship behaviour is characterized by traits of Altruism, Conscientiousness, Sportsmanship, and Courtesy among the employees. Organ however recognizes that in isolation any one instance of OCB may be insignificant, but in the aggregate this discretionary behaviour has a major beneficial impact on organizational operations and effectiveness. Later in 1997, Organ acknowledged the conceptual difficulties and ambiguities associated with OCB being discretionary and unrewarded (Motowidlo, 2000) and re-defined it as ‘‘performance that supports the social and psychological environment in which task performance takes place” (Organ, 1997).

The pioneering researchers of OCB emphasized that OCB should be viewed as extra-role and organizationally functional and separate from in-role job performance (Bateman & Organ, 1983; Smith, Organ, & Near, 1983). This, according to Graham (1994) created the difficulty of determining what is in-role and what is extra-role. To remove this difficulty, Graham proposed a second approach based on research of civic citizenship in philosophy, political science, and social history arguing that organizational citizenship can be conceived as a global concept, involving all positive organizationally relevant behaviours of employees. This conceptualization of organizational citizenship thus encompasses the traditional in-role job performance behaviours, organizationally functional extra-role behaviours, and political behaviours, such as full and responsible organizational participation.

Several nomenclatures have been used to describe extra-role behaviour such as Organizational Citizenship Behaviours (Bateman & Organ, 1983; Graham, 1991; Organ, 1988; Schnake, 1991; Smith et al., 1983), civic organizational behaviour (Graham, 1991), contextual performance (Borman & Motowidlo, 1997b), pro-social organizational behaviour (Brief & Motowidlo, 1986), organizational spontaneity (George & Brief, 1992), counter role behaviour (Staw & Boettger, 1990) and contextual performance (Borman & Motowidlo, 1997a). Notwithstanding this diverse vocabulary, all of these concepts aim at identifying a work behaviour among employees that leads to organizational effectiveness (Dyne et al., 1994). The next section discusses the dimensions of OCB as discussed in most of the literature on this concept.

2.2.3 Dimensions of OCB

While OCB has been given several nomenclatures as stated above, it has also been variously dimensionalized and operationalised. Smith et al. (1983) proposed `Altruism' and `generalized compliance' as the components of OCB. In 1988, Organ proposed Altruism, Conscientiousness, Courtesy, Civic Virtue, and Sportsmanship as the five dimensions of OCB (Organ, 1988). Dyne et al. (1994a) proposed interpersonal helping, organizational loyalty, organizational obedience, and organizational participation as the OCB dimensions. Podsakoff et al. (1994) proposed helping behaviours, Sportsmanship and Civic Virtue as the dimensions of OCB. However the dimensions of OCB as proposed by Organ (1988) have become widely accepted as they encompass the constructs on extra-role behaviour or voluntary behaviour proposed in previous studies (Yoon, 2009). There are numerous studies on OCB that have used the OCB dimensions as proposed by Organ (1988). The five dimensions are:

1. **Altruism:** It refers to voluntary behaviours. It is displayed when one member of the organization helps the other in completing his/her work under unusual

circumstances (Organ, 1988). For instance, being helpful, cooperative, and other instances of extra-role behaviour, which help a specific individual with a given work related problem (Podsakoff & Philip, 1990).

2. **Conscientiousness:** It refers to how much someone is punctual, regular in attendance and exceeds normal requirements or expectations. In other words, it refers to a member of an organization performing his/her tasks (in-role behaviour) beyond expectation (Podsakoff & Philip, 1990).

3. **Sportsmanship:** It refers to emphasizing more the positive aspects of an organization rather than the negative ones. In other words, Sportsmanship describes the employees who tolerate the inevitable irritants at the workplace and exhibit behaviours that show tolerance of less than ideal work conditions without complaining (Podsakoff & Philip, 1990). Sportsmanship refers to maintaining a positive attitude by employees even when things go wrong or when there are minor setbacks, and their willingness to give up personal interests for the good of the organization by, for example, not complaining about trivial matters or not finding fault with other employees.

4. **Courtesy:** It refers to behaviours that are aimed at preventing future problems. This dimension is different from Altruism in the sense that Altruism involves helping someone with a problem, while Courtesy involves assisting in preventing the problems and performing thoughtful or considerate gestures towards others (Podsakoff & Philip, 1990). In the words of Organ (1988), Courtesy includes behaviour such as ‘‘helping someone prevents a problem from occurring, or taking steps in advance to mitigate the problem”.

5. **Civic Virtue:** It involves supporting the administrative functions of the firm. It relates to the employee behaviours that deal with the political life of the organization (e.g., engage in policy debates, attend meetings, and express one's

opinions in implementing a new policy). Derived from Graham's (1991) concept of organizational “citizens” who are willing to participate actively in organizational governance and monitor the environment for possible threats and opportunities even at personal cost, Civic Virtue refers to employees’ commitment to the organization as a whole (Ackfeldt & Coote, 2005; Yen et al., 2008).

The OCB framework by Organ (1988) encompassing the five dimensions highlighted above is the only one that has been treated consistently over a fairly large number of studies (LePine, Erez, & Johnson, 2002). However, Podsakoff and Philip (1990) revealed that Altruism is highly correlated with Courtesy (r=0.86), implying that using one of the dimensions is sufficient to describe both of them. Besides, LePine et al. (2002) found that Sportsmanship and Civic Virtue overlapped. The relevance of this to the current study is discussed in Chapter 3.

The next section discusses how these dimensions of OCB affect a firm and its performance.

2.2.4 OCB and Firm Performance

Organizational Citizenship Behaviours are known to contribute to organizational performance (Organ, Podsakoff, & MacKenzie, 2005). Several studies have studied the relationship between different elements of Organizational Citizenship Behaviours and organizational performance. The positive contribution that OCB make toward business performance is well accepted in the literature (Podsakoff & MacKenzie, 1997; Podsakoff & Mackenzie, 1994). Organizational Citizenship Behaviours can contribute to organizational performance as these behaviours provide an effective means of managing the interdependencies between members of a work unit and resultantly increase the collective outcomes achieved. OCB also enhance organizational performance in that practicing the dimension of OCB lubricate the social machinery of

the organization, reducing friction, and increasing efficiency (Bateman & Organ, 1983; Smith et al., 1983). OCB may also lower the requirement of firms to dedicate scarce resources to maintenance functions. Fewer resources devoted to maintenance means more resources available for immediately productive purposes. (Organ, 1988; Smith et al., 1983).

Wright et al. (2003) found a significant relationship between organizational commitment (a dimension of OCB) and operational measures of performance, operating expenses and pre-tax profits. Another unit-level, longitudinal study about the effects of OCB on organizational effectiveness involving 774 employees and 64 managers from the units of a regional restaurant chain suggested through a cross-lagged regression analysis that employee attitudes and behaviours at Time 1 are related to organizational effectiveness at Time 2 (Koys, 2001). In yet another study on the effects of OCB in a paper mill in the North-eastern United States, results showed that there was a significant relationship between helping behaviour and Sportsmanship on one hand and performance quantity on the other. The results of the same study also indicated that helping behaviour significantly impacted performance quality (Podsakoff, Ahearne, & MacKenzie, 1997).

The results of a recently published article that meta-analytically reviewed 38 independent samples (N=3,097) suggests a positive overall relationship between OCB and performance (Nielsen, Hrivnak, & Shaw, 2009). The results of a review of the available empirical evidence on OCB and organizational performance indicate that OCB significantly influence organizational effectiveness (Podsakoff & MacKenzie, 1997). Besides several other studies also consider OCB as a means of positively impacting a firm’s performance (Dunlop & Lee, 2003; Ehrhart, Bliese, & Thomas, 2006). The constraints of space may not allow to discuss all such studies here, however many more

studies establish a positive relation between OCB and superior performance (e.g. Podsakoff, Whiting, Podsakoff, & Blume, 2009; Yen et al., 2008).

Besides impacting performance of a firm, OCB also have implications on the managerial evaluation of the employees. Although Organizational Citizenship Behaviours are not easily enforceable by the threat of sanctions because they extend beyond formal role requirements (Smith et al., 1983), managers may give better evaluations to employees who perform OCB because this may help the managers to focus on and devote their time to more important activities like planning, scheduling, problem solving, and organizational analysis that enhance the manager's personal effectiveness. For instance, an experienced employee assisting a newly-hired employee acclimatize to his job may improve performance of the manager and thus become 'distinctive' for evaluation in the eyes of the manager (Organ, 1988; Posdakoff & MacKenzie, 1994). Many studies indicate that managers do consider OCB while evaluating their sub-ordinates (Avila, Fern, & Mann, 1988; Borman & Motowidlo, 1997b; Krilowicz & Lowery, 1996; MacKenzie, Podsakoff, & Fetter, 1991).

In contrast to the above findings, however a careful look at the emerging literature suggests that there is a positive as well as negative relationship between OCB and various measures of individual and organizational performance (Ackfeldt & Coote, 2005). While Posdakoff and MacKenzie (1994) found positive relationships between Civic Virtue and Sportsmanship and unit performance, another dimension of OCB, Helping Behaviour, was found to have a significant negative impact on unit performance (standardized y 1,1 = -.494). Moreover, Barksdale and Werner (2001) found no relationship between another important dimension of OCB, Conscientiousness and employee performance. Hence in view of the above, while overwhelming evidence

suggests positive impact of OCB on performance, some studies disagree with this too. The next section discusses how OCB relate to Open Innovation.

2.2.5 OCB and Open Innovation

While the link between OCB and business performance has been discussed both conceptually and supported by empirical evidence as shown above, some studies have also shown that there is a relationship between innovative performance of a firm and OCB (Ishak, 2005). According to Jex (2002), employee innovations in organizations in the form of new products and services have always been quite visible. In the organizational innovation literature, some researchers have focused on the process by which employees generate innovative ideas, while others have devoted their time to identifying characteristics of highly innovative employees. In either case the focus has been employees (Jex, 2002). This has however been stated about the closed innovation paradigm which assumes reliance on internal research and development only.

Similarly, the effect of OCB on business performance has also been studied and found to be significant in closed innovation paradigm only. There seems to be no study that investigates the relationship between OCB and business performance as measured in terms of Open Innovation – a paradigm that assumes using both internal research and development and external collaborations to fuel innovation. Most of the research about Open Innovation has either been exploratory and qualitative in nature or very anecdotal. Of late, in the European context, quantitative studies based on surveys have started coming up (e.g. Parida, Westerberg, & Frishammar, 2012; Salmi, 2012). Yet there seems to be no study to the best of this researcher's knowledge that answers how OCB impact Open Innovation. Given the recency of Open Innovation, this study finds it difficult to find any specific literature on the relationhip between Open Innovation and

OCB. However it is interesting to investigate OCB and Open Innovation due to several reasons:

Firstly, Chesbrough (2003a) mentions that firms draw on their firm-level capabilities to make critical project-level decisions in the Open Innovation paradigm. However, these decisions in turn are influenced by underlying attitudes of a firm's employees at the individual level which may constitute important micro-foundations of innovation capabilities (Chesbrough, 2003a; Gavetti, 2005; Teece, 2007). Thus analyses of individual-level variables can contribute to identifying micro-foundations of managing Open Innovation (Lau & Ngo, 2004; Lichtenthaler, 2011).

Secondly, Lichtenthaler (2011) states that firms need to address multiple determinants at distinct levels – from the individual to the organizational – to enhance their Open Innovation management lest the corporate Open Innovation strategy is impeded by employee attitudes at the individual level. In his paper, Lichtenthaler (2011) highlights studying employees at the individual-level as an important research gap.

Thirdly, adopting Open Innovation involves adapting to new external environment changes and conditions full of uncertainty. Lindegaard (2010) states that success in Open Innovation depends on managing organizational change which entails uncertainities. Research has shown that OCB can enhance the ability of an organization to adapt to environmental changes (Podsakoff & MacKenzie, 1997). Thus OCB are expected to facilitate Open Innovation. Moreover, shifting from a closed innovation paradigm to an Open Innovation paradigm may entail scarcity or unpreparedness of resources or teething problems. In view of this, OCB shown by the employees may go a long way in ensuring success of the Open Innovation projects as they may help their firms overcome infancy-stage related issues solving which could be crucial in determining ultimate outcome of open innovation efforts.

Based on the discussion in above sections, the following hypotheses are developed:

H1a: *There is a positive relationship between Altruism and In-bound Open Innovation in that Altruism facilitates In-bound Open Innovation.*

H1b: *There is a positive relationship between Altruism and Out-bound Open Innovation in that Altruism facilitates Out-bound Open Innovation.*

H2a: *There is a positive relationship between Conscientiousness and In-bound Open Innovation in that Conscientiousness facilitates In-bound Open Innovation.*

H2b: *There is a positive relationship between Conscientiousness and Out-bound Open Innovation in that Conscientiousness facilitates Out-bound Open Innovation.*

H3a: *There is a positive relationship between Sportsmanship and In-bound Open Innovation in that Sportsmanship facilitates In-bound Open Innovation.*

H3b: *There is a positive relationship between Sportsmanship and Out-bound Open Innovation in that Sportsmanship facilitates Out-bound Open Innovation.*

The next section discusses related literature on the second predictor variable in this study, Managerial Ties. Like OCB, Managerial Ties are also expected to impact Open Innovation outcomes for a variety of reasons which are discussed in later sections.

2.3 Managerial Ties

2.3.1 Definition of Managerial Ties

Managerial Ties are defined as "executives' boundary-spanning activities and their associated interactions with external entities" (Geletkanycz & Hambrick, 1997). Managerial Ties form a part of social capital or social exchange. Social capital, according to Adler and Kwon (2002) is “roughly understood as the goodwill that is engendered by the fabric of social relations and that can be mobilized to facilitate action”. Social capital explains how actors succeed in different organizational settings. Adler and Kwon (2002) cite a number of studies showing the effect of social capital on career success, executive compensation, job search, in obtaining better recruits for organizations, facilitating inter-unit exchange of resources and product innovation,

creating, cross-functional team effectiveness, reducing turnover, intellectual capital and organizational dissolution rates, facilitating entrepreneurship, helping in launching start-up companies, strengthening supplier relations, regional production networks and improving inter-firm learning. To succeed, particularly in a transition economy developing ties with business leaders and government officials can be vital as relationship with an influential contact can often be more useful than even the capabilities of a firm (Tsang, 1998; Xin & Pearce, 1996). Ties of managers may thus work wonders for a manager and the firm employing such a manager. However, social exchange involves exchanging gifts and favors among individuals without specified reciprocal obligations. This can lead to several problems which are discussed later.

A rough equivalent of Managerial Ties (somewhat similar to *blat* in Russia, *pratik* in Haiti and *compadre* in Latin America) in the Chinese language is *guanxi*. *Guanxi*, as social capital is called in the Chinese context has been the focus of numerous studies on social relationships and social capital. Though many times considered equivalent to networking in the western literature, *guanxi* is different because unlike networking, guanxi is not primarily associated with commercially based corporate-to-corporate relations (Luo & Chen, 1997). Guanxi relates to personal relations and exchanges that take place amongst members of the *guanxi* network which are not only commercial, but also social.

The next section discusses the dimension of Managerial Ties as explored in the literature.

2.3.2 Dimensions of Managerial Ties

Li and Zhang (2007) divide Managerial Ties along two dimensions: attribute of the ties (whether business ties and support ties) and geographical boundaries of the ties

(whether cluster ties and non-cluster ties). As a result of this classification, there are four types of Managerial Ties. Along the attributes dimension, managers cultivate business ties with managers at other firms such as suppliers, competitors etc. In contrast, managers cultivate support ties with supportive institutions such as government and business associations. On the other hand, along the geographical boundary dimension, managers cultivate ties within a cluster or beyond a cluster. Li and Zhang (2007) found that *within a cluster*, there is a significant and positive correlation between sales growth and ties with executives of suppliers, ties with executive among buyers, government officials, business associations while, *beyond a cluster*, a significant relationship was also found between sales growth and ties with executives among buyers.

Luo and Chen (1997) explored Managerial Ties in China and state that two types of Managerial Ties can be found in China: one, the ties with managers at other firms such as suppliers, buyers and even competitors; two, the ties with government officials. While ties with managers at other firms bring value to the firm (Li & Zhou, 2010), Peng and Luo (2000) found that in a transition economy, closer ties of managers with government officials help a firm get institutional support like favorable interpreting of regulations, settling negotiations, enforcing contracts, or even erecting barriers to new entry. Establishing ties with government officials can make it easier for firms to procure scarce resource such as human resources and access to capital land (Li & Zhou, 2010).

However, besides ties with managers at other firms and ties with government officials, managers also forge ties with researchers in universities and other research centers. Currently universities around the world are mainly financed by public money, but this funding is expected to decrease. Gassmann, Enkel, and Chesbrough (2010) reveal that big companies like ABB, Siemens, Daimler and GE have already slashed down their in-house research activities which will further increase collaboration between the

innovation players. In this regard, the alliance between IBM and the ETH Zurich in Switzerland on research into nanotechnology allows both the partners right to publish and commercialize the jointly created intellectual property (Gassmann et al., 2010).

Laursen and Salter (2005) studied the sources of knowledge for innovation activities in UK manufacturing firms using a sample of more than 2300 firms across 13 different broad industries and found "universities or higher education institutes" as the highest used sources of knowledge among the institutional sources of knowledge. Another study by the same authors, Laursen and Salter (2004) found that firms have a higher probability of considering university knowledge while searching for external knowledge sources. Hence the role played by university-industry linkages in spurring R&D activities in firms is well documented (Rasiah & Govindaraju, 2009). Success in adopting the Open Innovation paradigm as mentioned before is contingent upon a firm's ability to identify, assimilate and exploit the external knowledge sources. Knowledge created in universities has traditionally contributed to the knowledge of firms. However, seeking out and using this knowledge effectively requires firms to establish collaborative networks with external scientists (Fabrizio, 2006). Given the benefits it offers in stimulating R&D activities in firms, the university-industry collaboration has been in place for a long time. Such ties therefore between R&D centers and firms are vital in enhancing the output of Open Innovation.

2.3.3 Advantages of Managerial Ties

The benefits of Managerial Ties are many, both for the individuals and the businesses. Managers reputed for trust and the ones with good relationships are in a better position to procure resources for themselves, their firms and their friends and family. Such managers provide more efficiency as they can bypass certain procedures and processes, get expedient approvals and receipt of permits. They also get bonuses, kickbacks from

sales, stocks or options, commissions, promotions, new job offers, better career advancement opportunities, lure finances both from domestic and foreign sources and win government projects, build customer networks quickly and develop efficient market channels.

Managerial Ties can also help in exchanging information such as trade secrets, news, competitor information and enable access to new technology and innovation. Managerial Ties benefit the managers as enterprises prefer candidates with wide relationships with government, other institutions and customers. Employing such managers makes it easy for the firms to get favorable policies, changes in laws, access to unobtainable or scarce resources like land, loans, preferential treatment in selling and purchasing for day-to-day operations and so on (Adler & Kwon, 2002). Chung (2006) studied the deregulated banking industry in Taiwan and found that in case a business group does not have previous experience in the deregulation process, Managerial Ties give a clear advantage by providing valuable information and tangible benefits in acquiring approval licenses and making a decision to seek such a license. On the basis of secondary data they concluded that Managerial Ties possessed by key individuals in a business group influence decision to enter the deregulated banking industry.

The role of Managerial Ties becomes more important in uncertain times and in transition economies which are less regulated and lack market supporting institutions like clear laws and regulations (Peng & Luo, 2000). A look at the related literature reveals that a lot of work on Managerial Ties has been done in emerging economies where uncertainty is higher. In case of emerging economies, the rules for market competition remain less predictable and less clear as compared to many Western economies, since the formal institutions that support free markets are still evolving (Hoskisson, Eden, Lau, & Wright, 2000). In cases of weak institutional support and

information distortion typical of imperfect competition, the social capital embedded in Managerial Ties becomes important whereby a well-connected manager exhibits entrepreneurial spirit and adds value by networking with others (Burt, 1997a; Peng & Luo, 2000). Such social capital is not only valuable but rare and an intangible resource which becomes difficult to imitate, thus giving firms possessing such ties a significant advantage against competitors (Tsang, 1998). Nevertheless, institutional support is less likely to exist in a developed country where advantages are largely based on some intangible assets (e.g., technological capabilities, organizational skills) and where the government has a less direct and involved role (Sim & Pandian, 2003). In spite of these advantages of Managerial Ties, there are some disadvantages as well which are discussed in the following section.

2.3.4 Disadvantages of Managerial Ties

Although Managerial Ties (*guanxi* in Chinese) can be beneficial for a firm, there could be some negative implications also as Managerial Ties may involve some undefined and unspecified obligations. In their review of concepts related to social exchange and social capital in literature, Adler and Kwon (2002) highlight the benefits and risks of such exchanges for primary and other related actors. The risks of Managerial Ties include investing more in a relationship than it is worthy of; sometimes Managerial Ties may create value for the primary actor but prove to be inimical to the aggregate; Managerial Ties may limit action because of the obligations associated with the relationship.

Managerial Ties may also be harmful to individuals and businesses. Managerial Ties can lead to payment of bribes (cash and kind), unethical gratification, smuggling, distraction from duties, present conflicting responsibilities, lower ethical standards, low work efficiency, low morale, affect negotiations and economic outcomes in a negotiation negatively, lead to recruiting unsuitable employees, buying of low quality

products and service, unfair competition, monopolies, low economic efficiency, may hinder development of legal and economic systems, undermine meritocracy, resource ownership and allocation problems, imperiled public health and safety, poor decision making and even result in unwillingness to initiate action and loss of ambition for the managers who are talented but with no access to exchanges (Tenbrunsel, Wade-Benzoni, Moag, & Bazerman, 1999; Warren, Dunfee, & Li, 2004). In addition, sustaining competitive advantage gained as a result of Managerial Ties might not be easily sustainable as the benefits accrued from Managerial Ties can be affected by even something as simple as staff mobility (Tsang, 1998). Given these disadvantages of Managerial Ties, it becomes interesting to know how Managerial Ties impact firm performance. The section thus looks at this relationship between Managerial Ties and firm performance.

2.3.5 Managerial Ties and Firm Performance

Managerial Ties have been found to impact organizational performance both conceptually and empirically (Batjargal, 2003; Granovetter, 1985; Luo & Chen, 1997; Peng & Luo, 2000; Xin & Pearce, 1996). In addition, Luo and Chen (1997) found empirically that the Managerial Ties have a positive and deep influence on the efficiency and growth of a firm[2]. The social network theory states that the managers who have superior interpersonal connections tend to receive more income, get promoted more often, and have better careers (Granovetter, 1985). This implies that firms value Managerial Ties and reward such interpersonal connections. In transition economies due to the lack of market supporting institutions, managers are often required to perform even basic functions like getting market information, understanding regulations and enforcing contracts (Khanna & Palepu, 1997). In view of this, ties of managers can play

[2] Luo & Chen (1997) use the Chinese word *guanxi* which refers to the concept of drawing on connections or networks to secure favors in personal or business relations.

a crucial part in easing economic exchanges and hence improve firm performance (Peng & Heath, 1996).

Li and Zhou (2010) studied the effect of Managerial Ties on competitive advantage and found that Managerial Ties improve firm performance by providing an institutional advantage in terms of securing scarce resources and obtaining institutional support. The key path to get an institutional advantage is to establish ties with government officials and managers at other firms. This institutional advantage enhances differentiation and cost advantages, finally leading to better performance.

Geletkanycz and Hambrick (1997) studied the effect of Managerial Ties on organizational strategy and performance and found that the intra-industry Managerial Ties of executives were related to strategic conformity while the extra-industry ties were related to the adoption of deviant strategies, and that matching the executives' external relations with the informational needs of the firm's strategy improves performance of the organization. This study later became one of the most definitive studies examining the significance of boundary spanning ties of the executives on firm-level outcomes of strategy and performance. Also most of the literature defines Managerial Ties in accordance with the definition as posited in this study.

Peng and Zhou (2005) state that firms' and their managers' dense networks of ties with dominant institutions help them to cash in on economies of scale based on their social relations. Peng and Luo (2000) studied Managerial Ties and firm performance in China's transition economy and empirically concluded that managers' ties with managers at other firms and with government officials affect firm performance measured in terms of market share and return on assets (ROA). They however found that Managerial Ties were necessary but not sufficient for good firm performance because a number of strategy variable also affected performance of firms. Based on a

survey in China in 1996-1997, they further argued that ties with government officials were more important than ties with managers at other firms.

However, in contrast to Peng and Luo (2000), Zhu and He (2010) in their empirical study found that Managerial Ties do not directly influence organizational performance and that this relationship is mediated by another variable called sense-making which is strengthened by Managerial Ties to improve firm performance . This is because with the development of the market system and maturity of players, market rules such as a good product quality matter more than managerial relationships. The same study also revealed that Managerial Ties with government officials help a firm by shaping an advantageous environment. Managerial Ties with market actors (managers at other firms) were found to have a more positive total effect on firms' performance than the ties with non-market actors (government officials). Hence this finding is in sharp contrast to Peng and Luo (2000) who found ties with government officials to be more important than ties with managers at other firms. Given this discussion about whether or not Managerial Ties affect firm performance and somewhat conflicting results, it appears that Managerial Ties offer value conditionally – this is taken up in the next section.

2.3.6 Conditional value of Managerial Ties

Recent developments in the social network theory show that Managerial Ties may not always be useful to the firm and that the efficacy of such ties may depend on vital contextual factors (Li, Poppo, & Zhou, 2008). Researchers have investigated such factors that lead to positive or negative implications of Managerial Ties. Li et al. (2008) examined the three sources of heterogeneity which can alter the usefulness of Managerial Ties: firm ownership (foreign and domestic), competition, and structural uncertainty. They found that despite both foreign and domestic firms utilizing ties at a

similar level, there is a positive, monotonic impact of Managerial Ties on performance for domestic firms, whereas for foreign firms the effect is curvilinear. This study also revealed that in case of stiff competition Managerial Ties may not be as efficacious in improving the performance but Managerial Ties lead to better organizational performance in case of high structural uncertainty.

To solve the conundrum of whether the foreign firms entering China should adopt a differentiation or low-cost position to achieve superior performance or actively build Managerial Ties in view of the market and institutional environments in China, Li et al. (2009) reported that both differentiation and low-cost strategies increase profitability of the foreign firm. However it was found that the benefits of a differentiation position depended on political and business ties. Political ties blocked the positive influence of a differentiation position on foreign firms' profitability while business ties did the opposite. The study also showed that foreign firms benefit from ties with businesses while their increasing dependence political ties mars their profitability.

Xin and Pearce (1996) tested the argument that a weak legal system for private businesses predisposes managers to develop connections in societies and concluded that due to an underdeveloped legal framework, private company executives become more dependent on ties than executives of state-owned or collective-hybrid companies (Nee, 1992). It was found that in comparison to executives of state-owned firms, private-company executives depended more on ties for protection, deemed business ties more crucial, had more government ties, exchanged more unreciprocated gifts, and trusted their ties more. This is because private structure enjoys less structural support in a transition economy. However, managers' decision to develop ties with government officials comes with both benefits and costs (Warren et al., 2004) as has been discussed in the previous sections.

2.3.7 Managerial Ties and Open Innovation

Networking at the firm level can improve competitive advantage of a firm by allowing access to resources of members of other networks which can help in entering markets that need a firm's core technologies and competencies (Thorelli, 1986). However, if the aim of networking is creation of innovation, such a process entails several challenges. This is because the participating firms may require entering into relationships with universities and research institutions (Perkmann & Walsh, 2007), suppliers (Emden et al., 2006) and users (von Hippel & Katz, 2002; von Hippel, 2001). The view that embeddedness of firms in networks has important implications in their functioning has assumed added importance in that networks are important particularly for learning and innovation between firms (Gilsing & Nooteboom, 2005). In fact, firms have regarded their managers' ability to establish a network of contacts outside the firm as critical for their appointment and subsequent evaluation (Chiaroni et al., 2011).

In the case of Open Innovation, firms rely on an extensive use of inter-organizational relationships to internalize external ideas from a variety of external innovation sources and to market the ideas that are developed within the firm but fall outside the firm's current business model (Chesbrough, 2006; Vanhaverbeke, 2006). Such firms look for novel ideas and technologies by increasing the search breadth (the number of innovation sources they depend upon for creating innovation) and the search depth (the degree/depth to which firms utilize their external knowledge sources) of their innovation networks (Laursen & Salter, 2006). The purpose of this could either be to use the inter-organizational relationship for explorative or exploitative purposes (March, 1991). However, in the Open Innovation paradigm, given the diversity of partners, the activities of acquisition, assimilation, transformation and exploitation (Zahra & George, 2002) become all the more complex. During exploration, there are good reasons for

establishing many dense ties which are strong in all dimensions. During the exploitation process, there are good reasons for establishing non-dense ties which are strong in dimensions other than those in networks for exploration (Gilsing & Nooteboom, 2005). This is where the role of well-connected managers and Managerial Ties becomes paramount. Several case studies stress the importance of informal ties of employees with the employees of other organizations in understanding how new products are created and commercialized (e.g. Vanhaverbeke, 2006).

Vanhaverbeke (2006) considers external networking - which includes all activities related to acquiring and maintaining connections with external sources of social capital, including individuals and organizations - as an important and consistently associated dimension of Open Innovation (van de Vrande et al., 2009). The processes of In-bound and Out-bound Open Innovation, involve a high degree of uncertainty both in terms of exploration for better partners and outcomes of such partnerships. It is here that Managerial Ties can play a crucial role in the making of right decision about identifying the right partners, forging proper partnerships and ensuring their outcomes. Therefore, on the basis of discussion in the above sections, the following hypotheses are developed:

H4a: *Managerial Ties with Government Officials facilitate In-bound Open Innovation.*

H4b: *Managerial Ties with Government Officials facilitate Out-bound Open Innovation.*

H5a: *Managerial Ties with Managers at other firms facilitate In-bound Open Innovation.*

H5b: *Managerial Ties with Managers at other firms facilitate Out-bound Open Innovation.*

H6a: *Managerial Ties with Universities and/or other Research Centers facilitate In-bound Open Innovation.*

H6b: *Managerial Ties with Universities and/or other Research Centers facilitate Out-bound Open Innovation.*

2.4 Organizational Culture

2.4.1 Definition of Organizational Culture

The earliest significant formal writing on Organizational Culture can be traced to Pettigrew (1979). Pettigrew (1979) contended that people "create, shape, change and manage the culture according to their beliefs, values, knowledge and needs". Pettigrew (1979) thus speaks about the collective nature of Organizational Culture by stating that human beings collectively accept certain things and that they use this collective knowledge to interpret the processes and relationships that evolve in the organization. Since Pettigrew's (1979) work on Organizational Culture, a large number of studies have emerged, defining and explaining the concept of Organizational Culture in different ways.

Not much agreement exists over an exact definition and scope of Organizational Culture (Ogbonna & Harris, 2000; Scott, Mannion, Davies, & Marshall, 2003) and there is no method to conclusively end debates about one true definition or concept of Organizational Culture (Ott, 1989). Organizational Culture has been defined differently by a multitude of scholars (Denison, 1990; Hofstede, Neuijen, Ohayv, & Sanders, 1990; Keesing, 1974; Ott, 1989; Schein, 1981, 1990). However, while many definitions of Organizational Culture exist, one definition has come to be regarded as somewhat like a standard definition. Accordingly, Organizational Culture is defined as a set of shared, values, beliefs, assumptions and practices that shape and guide the attitude of members of an organization (Davis, 1990; Denison, 1990; Kotter & Heskett, 1992; O'Reilly & Chatman, 1996). Another oft-cited definition of Organizational Culture is by Schein (2004, p. 17) who defined Organizational Culture as:

> “a pattern of basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems”.

Hofstede (1980), who has had tremendous impact on Organizational Culture research referred to Organizational Culture as the collective programming of the mind including shared beliefs, values and practices that distinguish between organizations and members of different organizations. According to Scott et al. (2003), “Organizational Culture refers to a wide range of social phenomena that include an organization's customary dress, language, behavior, beliefs, values, assumptions, symbols of status and authority, myths, ceremonies and rituals, and modes of deference and subversion”. All these help to define an organization's character and norms.

More recently and not in much disagreement with the above definitions, Park et al. (2004) defined Organizational Culture as “the shared, basic assumptions that an organization learns while coping with the environment and solving problems of external adaptation and internal integration that are taught to new employees as the correct way to solve those problems”. Getting more complex, Detert et al. (2000) remarked that Organizational Culture is holistic, historically determined, and socially constructed, and involves beliefs and behaviours and exists at a variety of levels and manifests itself in a wide range of features of organizational life. In line with these definitions, researchers broadly agree that culture can be regarded as a set of cognitions shared by members of a social unit (Hause, 2000).

This study uses the definition of Organizational Culture as given by Schien (1992). This definition, quoted above, focuses on external adaptation as well as internal integration aspects of a firm’s culture. Xin, Tsui, Wang, Zhang, and Chen (2002) built upon this

definition and came up with ten dimensions of Organization Culture of which six relate to internal integration and four to external adaptation. The six dimensions that relate to internal integration are: employee development, harmony, leadership, pragmatism, employee contribution and fair rewards; while the four dimensions that relate to external adaptation are: outcome orientation, customer orientation, future orientation and innovation. Using the same definition of Organizational Culture by Schien (1992), Tsui et al. (2006) used an inductive approach and found five dimensions of Organizational Culture: employee development, harmony, customer orientation, social responsibility and innovation. The first two, employee development and harmony represented the internal integration aspect of Organizational Culture while the latter three, customer orientation, social responsibility and innovation represented the external adaptation aspect of Organizational Culture.

Since a configurational approach takes a holistic view and emphasizes simultaneity and interaction among multiple causes of any outcomes (Tsui et al., 2006), these five dimensions are configured into Organizational Culture Types. As a result, in Tsui, et al,'s (2006) study, the five dimensions configure four culture types namely: *Highly Integrative Culture*, which focused both on internal integration and external adaptation; the Market Oriented Culture, that emphasized Customer Orientation dimension more than any other cultural dimension; the *Moderately Integrative Culture*, that showed an average score on all the five culture dimensions; and the *Hierarchy Culture*, that had a low mean score on all the five culture dimensions. The five dimensions of Organizational Culture stated above and other prominent dimensions of Organizational Culture proposed by various researchers are discussed in the next section.

2.4.2 Dimensions of Organizational Culture

Organizational Culture has been evaluated along many dimensions and this has resulted in models and theories which are conceptually different but fundamentally similar (Yiing & Ahmad, 2009). Given the multitude of its definitions, it is not surprising that the dimensions of Organizational Culture have also been proposed and explained differently. Al-Alawi et al. (2007) mention that Organizational Culture develops gradually over time and can be broadly classified as visible and invisible which reflect an organization's identity. The visible dimension of culture is enshrined in the espoused values, philosophy and mission of the firm. On the other hand, the invisible dimension is reflected in the values that guide the acts and perceptions of the organization's members. (McDermott & O'Dell, 2001).

Based on two dimensions of solidarity and sociability, Goffee and Jones (1998) forwarded four main types of Organizational Culture: Networked, Communal, Fragmented and Mercenary. Sociability is the relational friendliness among organizational members while solidarity is the ability of organizational members to work towards shared goals efficiently and effectively, keeping in view organizational objectives without paying much attention to the impact on individuals and the relationships between them. Networked organizations have high sociability and low solidarity. On the other hand, Communal organizations are equally high in sociability and solidarity, characterized by common goals and social bonds. Fragmented groups are equally low in sociability and solidarity, appearing dysfunctional and ungovernable. Mercenary groups have low sociability and high solidarity, focusing on strategy and success (Rashid, Sambasivan, & Rahman, 2004). Rashid, et al. (2004) used Goffee and Jones' (1998) framework in the Malaysian context and found that certain culture types facilitate organizational change while others do not.

Somewhat similar to the dimensions of Goffee and Jones (1998), Locander (2005) also introduced four quadrants but labelled them as A, B, C, and D; each quadrant representing a flock of geese. Like in Goffee and Jones' (1998) model, these four quadrants differed in terms of presence of degree of sociability and solidarity. Quadrant A represented high sociability but less alignment and is characterized by more politics than values or performance. Quadrant B represented an Organizational Culture with high fragmentation, independent individuals and no common goal among the members of the organization. Quadrant C represented an Organizational Culture in which the members of the organization, like a buffalo herd, blindly follow one leader and the decisions of the inflexible management. The last quadrant, Quadrant D represents an Organizational Culture in which the members exercise a balance between solidarity and sociability and are goal-aligned and communally share the lead.

Using the Q-sort method, O'Reilly (1991) developed an Organizational Culture profile with seven dimensions of Organizational Culture namely: innovation, outcome orientation, respect for people, team orientation, stability, aggressiveness and attention to detail. These dimensions were identified after Q-sorting 54 value statements obtained as a result of an extensive literature review. These dimensions of Organizational Culture have been widely used in many situations and settings.

One of the pioneers in the field, Hofstede (1980) identified four dimensions of national culture values: Power Distance, Uncertainty Avoidance, Individualism/Collectivism and Masculinity/Femininity. Power Distance implies the extent to which the less powerful members of an organization accept that the power is distributed unequally. Uncertainty Avoidance refers to the extent to which people feel threatened by ambiguous situations and have created beliefs and institutions that they try to avoid. Individualism reflects a culture type in which people look after themselves or their immediate families. In the

case of Collectivism, on the other hand people belong to a group or collectives and look after each other in exchange for loyalty. Lastly, Masculinity implies a situation in which the dominant values are success, money and professions while as femininity refers to a situation in which the dominant value are caring for others and quality of life.

This dimensionalization by Hofstede (1980) has been used in many studies covering many countries (Jarad, Yusof, & Nikbin, 2011). The above four dimensions were identified as national culture values which Hofstede (1980) mentioned were primarily based on differences in values learnt during early childhood. However, it must be noted that Organizational Culture is based more on differences in norms and shared practices learnt at the work place and considered valid within the boundaries of the organization (Jarad et al., 2011). In his book, Hofstede (1991) reports that based on his survey two main ethnic groups in Malaysia (Malay and Chinese) are low on masculinity and high on power distance. Abdullah (1992) used the above four dimensions of Hofstede (1980) and reported that Malays scored low on individualism and attributed it to their religion (Islam) which emphasizes groups and societies rather than individuals. The Global Leadership Organizational Behaviour Effectiveness (GLOBE) Research Program (1992-2000) updated the above-mentioned model of Hofstede (1980) and included four more dimensions in it. The new dimensions added were: future orientation, performance orientation, human orientation and assertiveness.

Hofstede (1991) also conducted another extensive study of Organizational Culture and identified six dimensions of Organizational Culture namely process oriented vs. results oriented, employee oriented vs. job oriented, parochial vs. professional, open system vs. closed system, loose control vs. tight control, and normative vs. pragmatic. These dimensions however were not related to antecedents or consequences of Organizational Culture (Tsui et al., 2006).

Another well-known set of dimensions of Organizational Culture is given by Cameron and Quinn (2006). According to these authors, organizations can have four culture types, which are: hierarchy culture, market culture, clan culture and adhocracy culture (Cameron & Quinn, 2006, pp. 37-45). The hierarchy culture is characterized by a formalized and structured place to work, procedures governing what people do, stability, predictability and efficiency, formal rules and policies. Organizations having a market culture are oriented towards the external environment instead of internal affairs. This culture is made of tough and demanding producers and competitors who are focused on goals and targets to outpace the market competition. The focus is on transactions with external constituencies like suppliers, customers, contractors etc. Profitability, bottom-line results, strength in market niches, stretch targets, and secure customer bases are primary objectives while competitiveness and productivity are the core values of an organization with this type of culture.

The clan culture is team-oriented, with a focus on the humane work environment, employee empowerment, participation, commitment, and loyalty. The use of the word 'clan' in clan culture comes from its similarity to a family-type organization. Teamwork, employee involvement programs and corporate commitment to employees characterizes this Organizational Culture. Customers in this culture are dealt with as partners. Lastly, the adhocracy culture is dynamic, visionary, innovative and risk oriented, and is focused on rapid leading edge knowledge and growth while being responsive to the hyper-turbulent and ever-accelerating conditions. It aims "to foster adaptability, flexibility, and creativity where uncertainty, ambiguity, and information overload are typical".

In a recent paper, Asmawi & Mohan (2011) set out to identify the existing dimensions of Organizational Culture in Malaysian R&D organizations. Based on qualitative

interviews, a literature review and quantitative survey of private R&D companies (PRCs), universities and government research institutes (GRIs), the authors suggest that the Organizational Culture construct in R&D organizations may best be represented through a structure of eight factors: teamwork and knowledge sharing, empowerment and recognition, conformity and impediments to R&D, risk-taking, customer orientation, autonomy, social networking, and organizational design. The measurement scale developed by the authors for the above dimensions in this same paper however does not seem to be highly reliable and this, in fact, is acknowledged by the authors as a weakness of the study as well.

Tsui et al. (2006) conducted an extensive study of state-owned, foreign-invested companies and private domestic firms in the Chinese context and identified five cultural values namely: employee development, harmony, customer orientation, social responsibility and innovation. Based on scores for these culture values obtained in their study and comparing with "existing models", the authors identified four configurations of culture profiles: *Highly Integrative Culture*, Market Oriented Culture, *Moderately Integrative Culture* and *Hierarchy Culture*. The five culture values identified in this study relate to both internal integration and external adaptation functions of the firms. A firm with a *Highly Integrative Culture* pays equally high attention to employee development and harmony (facilitating thereby internal integration) and customer orientation, social responsibility and innovation (facilitating external adaptation).

Consistent with Schien (1992), according to this model firms emphasizing dimensions that contribute to these two functions (internal integrations and external adaptability) are more effective in terms of managers' perception of firm performance, organizational support and commitment to the firm. As mentioned before, this study uses the definition of Organizational Culture as given by Schien (1992) and uses the dimensions and

measurements of Organizational Culture, based on this definition, developed by Tsui, et al. (2006).

Several reasons exist for choosing the dimensions and measurements given by Tsui et al. (2006). Firstly, the framework by Tsui et al. (2006) is quite recent as compared to other older models found in literature. Secondly, Tsui et al.'s (2006) framework captures cultural values that lead to both internal integration and external adaptability. In case of Open Innovation, both internal integration and external adaptability are important. Thirdly, Tsui et al.'s (2006) framework captures cultural dimensions which are relevant to Open Innovation. Employee development, harmony, customer orientation and innovation dimensions in particular are relevant in the context of Open Innovation. Fourthly, Tsui et al. (2006) developed the cultural dimensions scale, based on the seminal work of Schein (1992), using both a qualitative and a quantitative approach. A two-phase design helps to ensure methodological rigour and capitalizes on the unique strengths of the two traditionally separate research orientations (Lee, 1999). Fifthly and lastly, to the best of this researcher's knowledge, there is no study done in the Malaysian context using Tsui et al.'s (2006) framework. Therefore, in addition to help answer the explicit objectives of this study, this research exercise will as well validate Tsui et al.'s (2006) instrument in the Malaysian business context.

2.4.3 Organizational Culture and Performance

The impact of Organizational Culture on several aspects of an organization, particularly the performance of an organization is well-known and cannot be underestimated. A review of literature leads to the conclusion that Organizational Culture is one of the most popular concepts in management and organizational theory (Ogbonna & Harris, 2000). One reason for this widespread popularity stems from the argument/assumption that certain Organizational Cultures lead to superior firm performance (Ogbonna &

Harris, 2000). There is such a multitude of studies investigating the relationship between Organizational Culture and firm performance that due to constraints of space, it is difficult and perhaps pointless to review all of them here. That is because several common threads run through many of these studies and the results of a majority of these studies lead to somewhat similar conclusions about the link between Organizational Culture and performance (Barney, 1986), with only the settings and contexts changing. Therefore only a few of such studies are elaborated here to drive home the point.

Much of the literature on Organizational Culture and firm performance suggests that culture can have a significant effect on the economic value for a firm (Barney, 1986). The positive and strong relation between Organizational Culture and firm performance has been reported in many studies (e.g. Aluko, 2003; Barney, 1986; Corbett & Rastrick, 2000; Deal & Kennedy, 1982; Oparanma, 2010; Ouchi, 1981; Peters & Waterman, 1982; Petty, Beadles, Lowery, Chapman, & Connell, 1995; Wilkins & Ouchi, 1983; Yusoff, 2011). However, contrary to this, a few authors have argued that such a relationship is either non-existent or is weak (e.g. Reynolds, 1986; Saffold, 1988).

Kotter and Heskett (1992) reported a significant and positive impact of corporate culture on long-term firm performance and noted that firms emphasizing different dimensions of Organizational Culture (customers, stakeholders and employees) significantly out-performed the firms that did not possess these cultural features. Broadly in line with these findings, Sadri and Lees (2001) stated that a positive corporate culture could benefit a firm immensely and give the firm a competitive edge over its competitors while the presence of a negative Organizational Culture could cause the firm performance to deteriorate as it could prevent the firm from adopting the necessary strategic or tactical changes. Citing Crozier (1964), Porter (1980) and others, Barney (1986) state that all Organizational Cultures do not necessarily have a positive economic

impact on the firm; instead Organizational Culture can also significantly reduce a firm's effectiveness "disabling the firm from perceiving all its competitive/operational options and preventing it from choosing options consistent with competitive/operational necessities". He also contends that a firm's culture can generate sustained competitive advantage, however for this to happen, the firm's culture should have three attributes of being valuable, rare and inimitable.

At the macro level, Hofstede (1980) suggested that culture accounts for the economic performance of various countries. Narrowing down the scope, Schein (1990) stated that Organizational Culture can help understand the differences that may exist between successful firms operating in the same national culture. In addition, by becoming a platform for specific and concrete actions, cultural values can also help a firm meet difficulty and challenges (Quick, 1992). Organizational Culture factors like market orientation, interaction orientation and innovativeness have been found to positively affect innovative capacity which in turn affects firm performance (Chih, Huang, & Yang, 2011). Partly similar to this, Canalejo (1995) shows that an innovation-based Organizational Culture must possess values namely: client-orientation, compromise with objectives, challenge and initiative, exemplary behaviour, team work and permanent improvement.

From the above discussion, it is clear that in most cases desirable Organizational Culture values, when measured by economic or financial indicators, lead to superior firm performance. However some studies have investigated the impact of Organizational Culture on another measurement of firm performance: innovation. The next section discusses this relationship between Organizational Culture and innovation.

2.4.4 Organizational Culture and Open Innovation

The criterion variable of interest in this study is Open Innovation. However, there are hardly any studies about the relationship between Organizational Culture and Open Innovation. This seems to be due to the fact that Open Innovation is a rather new research area and there clearly is a need for further theoretical and empirical research (Lichtenthaler, 2011).

Scarce though, the current body of literature on Open Innovation (e.g. Boschma, 2005; Carbone et al., 2010; Lichtenthaler, 2011; van de Vrande et al., 2009) highlights organizational culture as a major challenge. This is because a favorable organizational culture, as against an unfavorable one, allows an organization to address ever-changing problems of adaptation to the external environment and the internal integration of organization resources, personnel and policies to support external adaptation (Pool, 2000); facilitate Open Innovation adoption (De Jong et al., 2007); and make collaborations effective (Boschma, 2005). This implies that, among other factors, an unfavourable culture can cause problems in collaborations (van de Vrande et al., 2009). However, despite the current literature rightly identifying Organizational culture as a challenge, it is unclear as to what type of organizational culture supports Open Innovation, or stifles it. According to Lichtenthaler (2011), one of the most prolific authors on Open Innovation (Scopus, 2011), this could be attributed to the infancy of the Open Innovation research, thereby leaving pending a clear and 'fruitful avenue' for further theoretical and empirical research (Lichtenthaler, 2011).

According to Lichtenthaler (2011), Open Innovation processes involve foreign partners, and this adds an international dimension to it; and leads to cultural issues which deserve further analysis. van de Vrande et al. (2009) found in the case of Dutch SMEs that, diverse in nature, the managerial and organizational barriers to Open Innovation are

related to the organizational and cultural issues which arise when SMEs start to interact and collaborate with external partners. They found that such issues are encountered in a range of innovation activities, including venturing, customer involvement, external networking, R&D outsourcing and external participations. Therefore, in addition to helping in predicting the success of Open Innovation initiatives in many ways, an understanding of the link between Organizational Culture and Open Innovation can also give insights into the degree of openness a firm should practise (Lichtenthaler, 2011).

As mentioned above, while the relationship between Organizational Culture and Open Innovation is uninvestigated, at least empirically; the same cannot be said about the link between Organizational Culture and (closed) innovation. Several studies have reported on this link. Ahmed (1998) stated that possessing positive cultural characteristics can help an organization innovate and that culture could enhance or inhibit innovation. Jaskyte (2004; 2005) studied the relationships between Organizational Culture and innovation in the non-profit organizational setting and concluded that some dimensions of Organizational Culture significantly affect innovation.

Looking at the issue from a practitioner's view-point, Phillips (2007) stresses that Organizational Culture can be an unlikely yet powerful barrier to innovation. He suggests that for innovation to succeed the culture of an organization must be dynamic enough to accommodate risk and uncertainty. Concurring with the need for this organizational dynamism, Khazanchi, Lewis, and Boyer (2007) state that innovation requires flexibility, empowerment, control and efficiency, all at the same time. Their research goes on to corroborate some of the past studies that have established this paradoxical view of innovation-supportive culture. In another research on the relationship between Organizational Culture and innovation, Nacinovic, Galetic, and Cavlek (2009) argue based on the data collected among Croatian firms that a

statistically significant relationship exists between innovation-supportive corporate culture and reward system features. In other words, these authors show that firms need to focus on innovation-supportive Organizational Culture which must be accompanied by an appropriate reward system.

In Organizational Culture literature, integrative culture refers to organizations that have widely shared and strongly held values that address the firm's needs of internal integration and external adaptation (Schien, 1992). It is apparent that organizations with integrative cultures emphasize the values of caring for employees, customers, and the society in addition to emphasizing high standards for performance, innovation and responsiveness to changes in the external environment (O'Reilly, Chatman, & Caldwell, 1991; Tsui et al., 2006). According to Denison and Mishra (1995), organizations that care for their customers and are socially responsible tend to be more flexible in dealing with changes in the environment and directing employees toward fulfilling their objectives. Integrative culture organizations unite employees by promoting their aspirations to succeed, instilling a purpose for work, and strengthening their involvement with the organization (Chatman & Jehn, 1994). Employees in integrative culture organizations reciprocate with high levels of affective commitment, task performance, and citizenship behaviors. In addition, a firm with an integrative culture pays equally high attentions to employee development and harmony (facilitating thereby internal integration) and customer orientation, social responsibility and innovation (facilitating external adaptation) (Schien, 1992; Tsui et al., 2006).

In contrast to this, hierarchy culture does not emphasize cultural values (which organizations with integrative culture emphasize) when dealing with customers and society (Cameron & Freeman, 1991). Hierarchy cultures focus least on all the five organizational culture dimensions discussed above (Tsui et al., 2006). Organizations

with hierarchy culture achieve goals through formal rules and close supervision rather than through shared values. There is very little participation in decision making and employees are expected to follow standard operating procedures and rules. In these circumstances, the employees are psychologically detached from the organization. They are unwilling to contribute much beyond basic task performance and exhibit low organizational citizenship behavior. As a result, hierarchy cultures have been found to promote imitation strategies (Naranjo-Valencia, Jiménez-Jiménez, & Sanz-Valle, 2011). Hierarchy culture in firms is expected to impede Open Innovation because such a culture focuses least on internal integration and external adaptation, emphasis on which is critical for the success of In-bound open innovation. Similarly, traditional cultures, which are more inward-looking like the hierarchy culture, are often seen as a barrier for a more open approach that open innovation involves (Golightly, Ford, Sureka, & Reid, 2012).

Based on the discussion above and Organizational Culture types identified[3] by following the procedures adopted by Tsui et al. (2006), the following hypotheses are developed:

H7a: *Highly Integrative Organizational Culture relates positively to In-bound Open Innovation.*

H7b: *Highly Integrative Organizational Culture relates positively to Out-bound Open Innovation.*

H8a: *Hierarchy Organizational Culture relates negatively to In-bound Open Innovation.*

H8b: *Hierarchy Organizational Culture relates negatively to Out-bound Open Innovation.*

[3]In this study, three types of Organizational Cultures were identified post cluster analysis, as opposed to four types found in the study by Tsui, et al. (2006). Of these three types of Organizational Cultures represented by dummy variables in the regression models during data analysis, only two, *Highly Integrative Culture* and *Hierarchy Culture*, are introduced in the regression models while the third Organizational Culture, Moderately Integrative Culture is chosen as the reference category for the other two dummy variables. Please refer to Section 4.11 of Chapter 4 for full explanation of this.

Open Innovation, besides being affected by OCB, Managerial Ties and Organizational Culture can also be determined by another variable called Regimes of Appropriability. Regimes of Appropriability in this study is suggested to moderate the relationship between OCB, Managerial Ties & Organizational Culture and Open Innovation. This moderating variable is discussed in the next section.

2.5 Regimes of Appropriability

Often, merely having favourable internal resources and conditions within a firm, like the ones discussed in previous sections, may not be good enough to lead to successful Open Innovation. Firms need to understand their external environment to survive volatile times (Yeo, 2005). Teece (1988) showed that the benefits of an innovation by a firm are potentially shared by four groups: the innovating firm, the customers of the firm, suppliers of the firm, and the imitators or followers who even without investing much in the initial R&D accrue benefits of the innovations. As Teece (1986) noted, the ability of firms to monetize their innovations depends on appropriability. In the absence of appropriability, imitators will commercialize the idea, depriving the innovating firm of any incentives to invest in innovation activities again.

Before creating Open Innovation, it is thus important for a firm to measure its potential benefits and check whether it can appropriate the results of its innovative activities. Seizing the results of innovation is vital for innovative companies because it allows them to benefit from the profits their innovations generate (González-Álvarez & Nieto-Antolín, 2007). In the absence of favourable Regimes of Appropriability, firms may be unable to seize even the cost of investment in their innovation activities while the "second mover" firms may benefit more than the original innnovator firm. Therefore reconnoitring the appropriability conditions of the industry can help determine *ex ante* the benefits of potential Open Innovation. Regimes of Appropriability can also decide

whether firms in a particular setting should enter the Open Innovation paradigm or continue to rely on their internal R&D.

Appropriability is defined as the “ability of the owner of a resource to receive a return equal to the value created by that resource” (Levin et al., 1987; Teece, 1986). Atkins (1998) defines appropriability as “the ability of different stakeholders to retain for themselves the financial benefits that arise through the exploitation of an innovation”. West et al. (2006a) state that in the context of public policy, “appropriability is what allows the innovator to capture a return from the value created by an innovation”. Regimes of Appropriability thus are the institutional or industry dynamics that allow a firm to safeguard its innovations and benefits thereof. If the firm that creates innovation is the main beneficiary of the innovation, the situation is called ‘strong appropriability regime’, and if the creator of innovation gains less than other stakeholders, it is referred to as ‘weak appropriability regime’.

Strong Regimes of Appropriability are generally characterized by tacit knowledge and strong legal protection. On the contrary, codified knowledge and weak legal protection are the features of weak Regimes of Appropriability (Hurmelinna, Kyläheiko, & Jauhiainen, 2007). Developed economies generally exhibit the characteristics of strong Regimes of Appropriability wherein advantages are based on some intangible assets (Sim & Pandian, 2003) and laws and regulations are strong. Thus in economies with proper market supporting institutions like clear laws and regulations (Peng & Luo, 2000), strong appropriability regimes are expected to exist and thus knowledge spillovers are low and investments in potential innovations are likely to be high as investors expect positive returns. On the other hand, under weak appropriability regimes as may be expected in transition economies, since knowledge spillovers are high

(Kafouros & Buckley, 2008), investors would be sceptical about the returns and thus investments in projects related to innovation are likely to be low.

In addition, under strong appropriability regimes, firms will choose to patent their innovations in order to deter imitation by rivals and protect their revenue streams (Anton & Yao, 2004). Under weak appropriability regimes, as obtaining patents, copyrights, etc requires some disclosure of enabling knowledge to the parties concerned (Anton & Yao, 2004) and since patents and copyright laws often do not provide the extent of protection they were supposed to (Atkins, 1998), firms may use isolating mechanisms like adopting secrecy in routines and operations to obstruct imitation and derive benefits from innovations (Zahra & George, 2002). Hence, in a fully protected innovation environment (strong appropriability conditions), full disclosure poses no risk of unauthorized imitation, but with limited protection (weak appropriability conditions), disclosure risks imitation (Anton & Yao, 2004).

In line with the conventional view that strong appropriability regimes encourage Open Innovation (Chesbrough, 2003a; Cohen & Walsh, 2001; West et al., 2006a), Laursen and Salter (2005) empirically showed that that Open Innovation is strongest in industries with strong Regimes of Appropriability (e.g. pharmaceutical, electrical) and weakest in industries with low Regimes of Appropriability (e.g. textile). Nevertheless, Teece, Pisano, and Shuen (1997) concluded that absent strong appropriability regimes, firms can create an advantage through superior `dynamic capabilities' such as rapid learning, although such advantages would be rare and less sustainable than those provided by formal appropriability (as read in: West et al., 2006a, pg 115).

In general, reconnoitring the appropriability conditions of an industry can help determine its favorableness for innovation. Although, according to Harabi (1995), measuring appropriability is difficult because of the lack of a “theoretically sound” and

an “empirically precise” method of measuring the private and social returns of innovation. Nonetheless, some means of judging appropriability conditions, brought forth due to the efforts of many researchers, are: patents, lead time, secrecy, superior sales or service efforts, moving quickly down the learning curve, economies of scale, making imitation more difficult for competitors, national advertisement and national distribution (López & Roberts, 2002). These have been broadly divided into three groups: a) patents, b) secrecy, and c) lead time and related advantages (Scherer & Ross, 1992). This study uses these three industry-level measures of appropriability to study appropriability of the target industries in this study.

There are hardly any studies about how appropriability conditions affect the relationship between OCB, Managerial Ties and Organizational Culture, and Open Innovation. A few studies report on the relation between appropriability regimes and Open Innovation, but the results are contradictory. According to the conventional view, strong appropriability regimes create increased willingness among innovators to offer internal innovations for others to use thereby enhancing Open Innovation outcomes (Chesbrough, 2003a). However, Laursen and Salter (2005) found through a large-scale survey that Open Innovation provides better results in moderate Regimes of Appropriability. Adding to this difference in results, Fabrizio (2005) reported a negative relationship between high appropriability and aspects of Open Innovation. Hence there is no clear role for the appropriability regimes established in the literature.

Can appropriability conditions skittle the creation of Open Innovation even in the presence of OCB, favorable Organizational Cultures and good Managerial Ties? How effective are appropriability conditions in creating successful Open Innovation? Research stresses examining both internal and external contingency factors in the case of Open Innovation and highlights regimes of appropriability as a potentially critical

environmental contingency factor (Arora & Gambardella, 2010; Lichtenthaler, 2011). Against this backdrop, the relationship between the predictor variables of this study and dimensions of Open Innovation are also expected to change under different Regimes of Appropriability. This is because environmental factos play a vital role in altering internal factors of an organization (Lichtenthaler, 2011). Therefore, this research aims to address the moderating role of Regimes of Appropriability on the relationships between OCB, Organizational Culture, Managerial Ties and Open Innovation. Based on the discussion above, the following hypotheses are developed:

H9a: *Regimes of Appropriability moderates the relationship between OCB and In-bound Open Innovation in such a way that OCB will be more strongly associated with In-bound Open Innovation under strong Regimes of Appropriability than under weak Regimes of Appropriability.*

H9b: *Regimes of Appropriability moderates the relationship between OCB and Out-bound Open Innovation in such a way that OCB will be more strongly associated with Out-bound Open Innovation under strong Regimes of Appropriability than under weak Regimes of Appropriability.*

H10a: *Regimes of Appropriability moderates the relationship between Managerial Ties and In-bound Open Innovation in such a way that Managerial Ties will be more strongly associated with In-bound Open Innovation under strong Regimes of Appropriability than under weak Regimes of Appropriability.*

H10b: *Regimes of Appropriability moderates the relationship between Managerial Ties and Out-bound Open Innovation in such a way that Managerial Ties will be more strongly associated with Out-bound Open Innovation under strong Regimes of Appropriability than under weak Regimes of Appropriability.*

H11a: *Regimes of Appropriability moderates the relationship between Organizational Culture and In-bound Open Innovation in such a way that Organizational Culture will be more strongly associated with In-bound Open Innovation under strong Regimes of Appropriability than under weak Regimes of Appropriability.*

H11b: *Regimes of Appropriability moderates the relationship between Organizational Culture and Out-bound Open Innovation in such a way that Organizational Culture will be more strongly associated with Out-bound Open Innovation under strong Regimes of Appropriability than under weak Regimes of Appropriability.*

2.6 Theoretical Underpinnings

In conducting any research study, it is important to support the investigation with relevant theory/theories. Therefore, building on the existing knowledge of organizational behaviour, networks and innovation management, this study is conducted on the basis of the Dynamic Capabilities approach and Social Exchange Theory.

2.6.1 Dynamic Capabilities

The study seeks to answer how several organizational variables affect Open Innovation. The focal variable in this study is Open Innovation. The dynamic capabilities theory is used to support the framework of this study.

According to Teece (1992) and Teece et al. (1997), since the 1990s relentless competition has forced firms to constantly adapt, renew, reconfigure and re-create their resources and capabilities in line with the changing competitive environment. The notion of dynamic capabilities captures this. Globally, Teece et al. (1997) believe, competitiveness in high-technology industries has highlighted the need for an expanded paradigm to understand how competitive advantage is achieved. The authors state that merely having a “resource-based strategy” to accumulate valuable technology assets - often guarded by an aggressive intellectual property stance - does not often support a significant competitive advantage. Achieving competitive advantage requires both the exploitation of existing internal and external firm-specific capabilities, and developing new ones (Edith, 1959; Wernerfelt, 1984). Winners are the firms that demonstrate timely responsiveness and rapid and flexible product innovation, coupled with the management capability to effectively coordinate and redeploy internal and external competences (Teece et al., 1997). Teece et al. (1997) refer to this ability to achieve new forms of competitive advantage as 'dynamic capabilities' and define it as a firm's ability

to integrate, build, and reconfigure internal and external competences to address rapidly changing environments. Acknowledging that the elements of the dynamic capabilities approach can be found in many past works including those of Schumpeter (1942), Edith (1959) and many others, Teece et al. (1997) build upon the theoretical foundations provided by the pioneering scholars.

In line with this, the dynamic capabilities approach provides support for the framework of this study. Open Innovation refers to "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively" (Chesbrough et al., 2006). The Open Innovation paradigm assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology. The Open Innovation process provides for projects to be initiated from internal or external sources. Similarly, new technology can come in at different stages. Besides traditional sales channels, projects can go to the market in different ways, such as through out-licensing or spin-off ventures (Chesbrough, 2003a).

Teece et al. (1997) emphasize two key aspects of dynamic capabilities: *dynamic* and *capabilities*. 'Dynamic' refers to the capacity to renew competences so as to achieve congruence with the changing business environment; certain innovative responses are required when time-to-market and timing are critical, the rate of technological change is rapid and the nature of future competition and markets difficult to determine. On the other hand, 'capabilities' emphasizes the key role of strategic management in appropriately adapting, integrating, and reconfiguring internal and external organizational skills, resources, and functional competences to match the requirements of a changing environment. Both these aspects are relevant to Open Innovation. The dynamic capabilities approach also emphasizes the development of management

capabilities, and difficult-to-imitate combinations of organizational, functional and technological skills. This approach also stresses exploiting existing internal and external firm-specific competences to address changing environments.

In concurrence with this, the Open Innovation model regards R&D as an "open system" in which ideas can come from both inside and outside of the organization and can go to the market through similar channels (Vanhaverbeke, 2006). Thus Open Innovation also refers to the innovation process in which the boundaries of the firm are porous (Chesbrough, 2003a). In addition, in the Open Innovation paradigm and in line with the dynamic capabilities approach (Teece et al., 1997), in order to adapt to global change, organizations focus on their core competency by looking outside and relying on other companies to provide complementary capabilities (Hagel & Brown, 2005). Therefore, the dynamic capabilities approach provides strong support for the framework of this study.

2.6.2 Social Exchange Theory

Social Exchange Theory states that individuals or groups interact with each other for a reward or in its expectation (Emerson, 1976). Pioneering scholars like Blau, Homans, Kelly and Thibaut (1964; 1958; 1959) laid the foundation of this theory which later became popular in many disciplines including management research. Social Exchange Theory states that people engage in a relationship if there is a feeling that their commitment will be responded to by the people they are dealing with and that all human relationships are a result of a subjective cost-benefit analysis. Social exchange relationships also implicitly assume that extra-role efforts over time are recognized, appreciated and rewarded (Ishak, 2005).

The basic assumptions of the Social Exchange Theory are that (1) rationality of the people who seek to maximize their profit by opting for the best possible means to interact; (2) most gratification is centered in others; (3) individuals assess alternatives and more profitable situations than their current conditions as they enjoy access to information related to the social, economic and psychological dimensions; (4) people are goal-oriented; (5) building social credit is preferred to social indebtedness; and (6) Social Exchange Theory operates within the limits of a cultural context designed by others (Narasimhan, Nair, Griffith, Arlbjorn, & Bendoly, 2009).

Extending this theory to the setting of this study, employees can expect benefits from their employers if they practice Organizational Citizenship Behaviours and help the organization overcome challenges that it may face while embracing the Open Innovation model. These benefits can come in the form of promotions, awards, incentives and other methods of recognition. In this hope employees can be expected to perform the extra-role behaviours while the firm is embracing the Open Innovation paradigm and is in need of addition commitment and support from the employees. Similarly, the *raison d'être f*or ties that managers establish with different people is a rational expectation of a reward or reciprocation. Managerial Ties form a part of social capital or social exchange. Social capital is known to affect among others career success, executive compensation, improving inter-firm learning etc. (Adler & Kwon, 2002). The ties of managers thus are not only expected to benefit the managers as individuals but help the firm meet its objectives as well.

To conclude, the Social Exchange Theory provides a cogent reason to believe that employees practicing Organizational Citizenship Behaviours and establishing Managerial Ties as processes of social exchange in their given Organizational Cultures

will be favorable to Open Innovation efforts of the firms they work for besides accruing to them individual recognition in different forms.

2.7 Summary of the chapter

This chapter reviewed the literature related to the variables of interest in this study. The literature was reviewed in a thematic manner. The first section discussed literature related to the criterion variable of this study, Open Innovation. The second section presented a discussion of literature review on the first predictor variable, Organizational Citizenship Behaviours. The third section highlighted relevant literature on the second predictor variable of this study, Managerial Ties. The fourth section of this chapter reviewed the relevant literature on the third predictor variable of this study, Organizational Culture. In the fifth section, the literature related to the moderator in this study, Regimes of Appropriability was discussed. In the last section, the theoretical underpinnings of this study were explained.

The next chapter discusses the methodology used to test the twenty-two (22) hypotheses developed in the chapter.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

In the previous chapter, a number of hypotheses were developed. The aim of this study is to test those hypotheses. It is only with an appropriate methodology that the results can be meaningful. Thus the eight sections of this study present the methodology that was used to conduct this study. The first section discusses the philosophical underpinnings of this study. The second section discusses the research design while the third section discusses the research approach taken to conduct this study. In the fourth section, sample, target population, sampling method, sampling constraints, sampling frame and procedures and finally sample size are discussed. The fifth section gives a brief discussion of the questionnaire design. The sixth section provides the operational definitions and measurement of the variables of interest of this study. In the seventh section, an assessment of the questionnaire validity is done on the basis of literature review and expert judgement. In the same section, reliability of the questionnaire is also checked through a pilot test. In the eighth section, a brief overview of the main data analysis techniques used in this study, including exploratory factor analysis, confirmatory factor analysis and multiple hierarchical regression is given.

3.1 Research Paradigm

For any knowledge to be taken seriously, it is important to consider some underlying assumptions regarding how it was acquired. In a well-cited paradigmatic framework, Iivari, Hirschheim, and Klein (1998) delineate four such main assumptions:

1. *Ontology*, which is concerned with the structure and properties of what is assumed to exist, i.e., the basic building blocks that make up the phenomena or objects to be examined.
2. *Epistemology*, which is concerned with the nature of knowledge and the procedures or means by which knowledge can be obtained.
3. *Research methodology*, which refers to the procedures (research methods) used to acquire knowledge.
4. *Ethics of research*, which refers to assumptions about the responsibility of a researcher for the consequences of his/her research approach and its results.

This research is a positivist study. Positivism seeks to explain and predict what happens in the social world by searching for irregularities and causal relationships between its constituent elements (Iivari et al., 1998). Auguste Comte formalized the idea of "positivism" as an epistemological position. Building on the ideas of Aristotle, Francis Bacon and Isaac Newton, Comte (1856) held that all metaphysical speculation is invalid and the only appropriate objects and criteria of human knowledge are data from sense experience. Comte, unlike Newton who focused on the physical world only, extended the idea of axiomatic scientific thinking to the study of all phenomena, including social relations (Bennett, 2005).

Thus being a positivist study, the aim of this research is to objectively measure the social phenomena, in this case, the relationship between Organizational Citizenship Behaviours, Organizational Culture, Managerial Ties and Open Innovation under the moderating effect of Regimes of Appropriability. Positivist research aims to identify causal explanations and fundamental laws that explain regularities in human social behaviour and considers natural science as the only rational source of knowledge and should thus be applied to social sciences, focussing on internal validity, external

validity, reliability and operationalization (Johnson & Duberley, 2000, p. 39). All these are explained in the following sections.

3.2 Research Design

Research design plays a vital role in conducting any research and provides the basic directions or "recipe" for carrying out the project (Hair, Money, Samouel, & Page, 2007). After the research problems are identified and hypotheses are developed, research design acts as a master plan guiding the methods and procedures for collecting and analysing the needed information. Research design involves determining the sources of information, the design technique (survey or experiment, for example) the sampling methodology and the schedule and cost of the research (Zikmund, 1997).

According to Hair et al. (2007), there are three main types of research designs: exploratory, descriptive and causal design. For descriptive and causal research, there are four basic design techniques: surveys, experiments, secondary data and observation. Zikmund (1997) states that the objectives of the study, availability of the data sources among others determine the choice of a proper type of research design. According to the *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data,* innovation data can be collected through census or sample surveys. While in most cases, census (survey of entire population) may not be possible due to resource limitations, sample survey is useful (Oslo Manual, 2005, p. 120).

In this backdrop, the survey method, which is the most common method of gathering primary data, is chosen to meet the objectives of this study. In addition to other factors, the absence of any secondary data regarding the model this study aims to test necessitates using the survey method. A survey method is a research technique in which questionnaires are used to gather information from a sample of people. The survey is a

systematic, standardized and common approach for collecting information from individuals who represent the study population. This method is simple to administer, the data obtained are reliable, variability is less, and coding, analysis and interpretation of the data are relatively simple (Malhotra, 2004). Pursuant to an in-depth literature review and face validity tests by experts in the field, a questionnaire was prepared and administered to the sample.

This study is a cross-sectional study. In a cross-sectional study, either the entire population or a subset thereof is selected, and from these individuals, data are collected to help answer the research questions of interest. The information gathered represents what is going on at only one point in time (Olsen & George, 2004). It is recommended that the length of the observation period for innovation surveys be less than one year or not exceed three years (Oslo Manual, 2005, p. 61). In line with this, data for the purpose of this study were collected over a five-month period from January 2012 to May 2012. All these are explained in further detail in the following sections.

3.3 Research Approach

There are two main research approaches: quantitative and qualitative. In quantitative research, numbers are assigned directly to represent characteristics of something while as in qualitative approach numbers are not assigned to the description of things (Hair et al., 2007). Since quantitative research involves numbers, statistical analyses are appropriate. Hair et al. (2007) compare the two approaches, highlighting the differences and noting that, in quantitative research, hypotheses are developed whereas in qualitative research developing hypotheses is avoided or less frequent. Many differences exist between these two approaches as Hair et al. (2007) explain in their book. A positivist paradigm typically uses a quantitative approach while the interpretivist paradigm usually employs a qualitative approach. Besides the quantitative

approach tends to be deductive in nature as against the qualitative approach which tends to be inductive. In the case of deductive research, sometimes also called a top-down approach, a researcher begins with a general theory and ends with observations and their confirmation. In other words, deductive research works from the more general to the more specific. In contrast, in inductive research - exemplified by the qualitative approach - a researcher moves from specific observations to generalizations and theories (Burney, 2008).

This study uses a quantitative approach to answer its objectives. The qualitative approach is not chosen because the qualitative approach is appropriate in the early stages of research, mainly in exploratory research. Exploratory research is used when the researcher has little information (Hair et al., 2007). All the variables in this study are either well-researched (Organizational Citizenship Behaviour, Organizational Culture, Managerial Ties and Regimes of Appropriability) or moderately well-researched (Open Innovation). Therefore in this study the researcher seeks to quantify relationships between different variables of interest by first developing hypotheses and later testing those hypotheses using statistical analyses. Questionnaire survey, a typical quantitative technique, is used to collect the data

3.4 Population, Sample, and Data Collection Procedures

3.4.1 Sample and Unit of Analysis

As indicated above, this study used the questionnaire survey method to collect data from the respondents. Choosing a firm's most suitable respondents is of utmost importance to innovation surveys. This is because the questions are very specialized and can be properly answered by only a few people in the firm. As per the Oslo Manual (2005, p. 123), Managing Directors are often good respondents for innovation surveys in small

firms, while in larger firms, several people can be appropriate respondents. In this study, these guidelines were kept in view and the information related to the surveyed firms was collected only from middle managers (at least managers) and top managers (above senior managers) who were mostly R&D executives. The unit of analysis of this study is the employees of the surveyed firms. The middle managers and top managers are chosen because of their know-how of the strategic direction of their firms. Moreover, a proper completion of the questionnaire requires reliable knowledge of the technology as well as of the market conditions in a certain line of business (Harabi, 1995) and middle and top managers are deemed to be the appropriate personnel involved with the firm strategy and direction, participating in the making and implementation of many policies.

3.4.2 Target Population

Target population is defined as the complete group of specific population elements relevant to the research project (Zikmund, 1997). The target population for innovation surveys involves innovators and non-innovators, R&D performers and non-R&D performers in the business enterprise sector, including both goods-producing and services sectors. In the case of sample surveys, the sample frames should correspond as closely as possible to the target population (Oslo Manual, 2005, p. 21).

The population of this study was the middle and top managers who were working in the Malaysian manufacturing firms operating in the four industries classified as high-tech (aka hi-tech): Aerospace, Computers and office machinery, Electronics and communication, and Pharmaceuticals.

Although innovation activities take place in all parts of an economy - in manufacturing, the service industries, public administrations, the health sector and even private households - in reality, for various theoretical and practical reasons, a survey cannot

cover all possible units. This is because the concept of innovation may be less clear in some parts of the economy, especially for non-market-oriented activities (Oslo Manual, 2005, p. 118). Keeping this in view, the manufacturing sector, as opposed to the services sector, is chosen in this study because the incidence and adoption of Open Innovation are anticipated to be stronger in the manufacturing sector (van de Vrande et al., 2009). According to Gassmann (2006), industries characterized by globalization, technology intensity, technology diffusion, new business models and knowledge leveraging are more prone to Open Innovation adoption; and van de Vrande et al. (2009) suggest that these characteristics are more applicable to manufacturers than service enterprises.

This study uses the industry classification as provided by OECD (1997). According to this classification of industries, the high-technology sector comprises four industries namely: Aerospace industry, Computers and office machinery industry, Electronics and communication industry and Pharmaceuticals industry. Hence, the variables of interest of this study are analyzed by means of a sample of firms operating in these four industries. The high-tech sector has been chosen for many reasons.

Firstly, the industries in this sector are primarily knowledge-driven industries (Hatzichronoglou, 1997). Cloodt, Hagedoorn, and Van Kranenburg (2006) quote Bierly and Chakrabarti (1996) stating that learning is expected to be a key determinant in creating and sustaining a competitive advantage for many of the sample firms in the high-tech industries. Secondly, this sector is chosen because the level of adoption of Open Innovation in high-tech industries is expected to be relatively higher than in other industries. Since Open Innovation is rather a new concept, more so in the Asian context, much of the existing research shows that the adoption of Open Innovation is higher among high-tech industries than in asset-intensive mature industries. Thirdly, the high-

tech sector is chosen because, particularly in these industries, R&D expenditures, patents and new products play a role in indicating important aspects of innovative performance (OECD, 1997). This is not to say that Open Innovation has not been reported in other industries. A few studies have reported adoption of Open Innovation among non-high-tech industries also (e.g. Chesbrough & Crowther, 2006; Chiaroni et al., 2011), however, to ensure proper population and adequate sample selection, this study chose the industries classified as high-tech sector.

3.4.3 Sampling Constraints

In order to get responses from relevant respondents, certain sampling constraints were applied in this research (Oslo Manual, 2005). These sampling constraints are highlighted below:

a) The responding firm should have a Research and Development (R&D) department and only the firms that met this requirement were approached (Oslo Manual, 2005).
b) The respondents should be at least at the middle management level or above (Oslo Manual, 2005).
c) The respondents should have served at least five (5) years in the same firm.

3.4.4 Sampling Method

Two broad categories of traditional sampling methods exist: probability and non-probability sampling. In probability sampling, each element of the target population has a known, but not necessarily equal, probability of being selected in the sample; whereas in non-probability sampling the researcher decides the inclusion or exclusion of the elements of the target population (Hair et al., 2007). According to Zikmund (1997, pp. 430-436), there are four main types of probability sampling techniques: a) simple

random sampling, a procedure that assures each element in the population has an equal chance of being included in the sample, b) systematic sampling, in which an initial starting point is selected by a random process, and then every *n*th number on the list is selected, c) stratified sampling, in which sub-samples are drawn from samples within different strata that are more or less equal on some characteristic, and d) cluster sampling, in which the primary sampling unit is not the individual element but a large cluster of elements.

Hair et al. (2007) highlight four main types of non-probability sampling: a) convenience sampling, in which sample elements are most readily available to participate in the study and who can provide the required information; b) judgment sampling, also referred to as purposive sampling, in which elements are selected for a particular purpose based on the researcher's judgment and belief that the sample elements represent the target population; c) quota sampling in which the researcher defines the strata of the target population, determines the sample size and sets a quota for the sample elements from each stratum; and, d) snowball sampling in which the initial respondents are used to identify the other respondents in the target population and the process is continued till the required sample size is reached.

This study used a two-stage sampling procedure (Davis, 2005) involving stratified sampling and convenience sampling techniques. In the first stage, stratified sampling was used and the high-tech industry was sub-divided into four (4) industries, namely Aerospace industry, Computers and Office Machinery industry, Electronics and Communications industry and Pharmaceuticals industry. As is explained in detail in Section 3.4.5 later, two sampling frames were used to obtain relevant lists of firms in these four industries. In the second stage, convenience sampling was used to select firms from the four industries. In this stage, efforts were made to include as many

eligible respondents as possible from the four high-tech industries. The procedure of sample selection is explained further in detail in the next section.

3.4.5 Sampling Frame and Procedures

Sampling frame is the set of source materials from which the sample is selected (Turner, 2003). The sampling frame must capture, in a statistical sense, the target population and a perfect sample frame is one that is complete, accurate and up-to-date (Turner, 2003). In other words, sampling frame is required to define the population. Sometimes also called as the working population, the sampling frame provides the list that can be operationally worked with. It could be a list of households, establishments, and industries with detailed addresses, products produced and/or consumption, expenditure, revenue data, etc (International Monetary Fund, 2010). For sample surveys, the sample of enterprises should be large enough to give reliable results for the units in the target population and characteristics of interest in the target population, such as specific sectors (Oslo Manual, 2005, p. 120).

Keeping the above guidelines in mind, the current study involved two sampling frames. The first sampling frame was taken from Malaysian Manufacturers' Directory (2011). Researchers have used this database in the past also to study Malaysian manufacturers (Chong, Ooi, & Sohal, 2009). An updated list of the manufacturing firms operating in three (3) high-tech industries was retrieved. These industries included: Computers and office machinery, Electronics and communication and Pharmaceuticals. In the Computers and office machinery industry, 82 organizations were identified; in Electronics and communication industry, 614 organizations were identified; while in the Pharmaceuticals industry, 122 firms were identified. Details of all these organizations were retrieved. As highlighted earlier, many sampling constraints were applied to these lists of companies to meet the requirements of this study. As a result, a total of 76

organizations in Computers and office machinery industry, 135 in Electronics and communication industry and 35 in Pharmaceuticals industry were finally short-listed and contacted. In addition, a Pharmaceutical exposition by the name of *15th SouthEast Asian Healthcare & Pharma Show*, was held in Kuala Lumpur City Centre (KLCC), Kuala Lumpur from April 17-19, 2012. This exposition provided an opportunity to the researcher to collect more data from the pharmaceutical companies. Pharmaceutical companies from over fifteen countries participated in this exposition, however only the managers of Malaysian pharmaceutical firms that had R&D departments were asked to participate in this study by filling up the questionnaires. Fifty-two firms were approached in the exposition and asked to fill up the questionnaire. This researcher, with the help of two fellow PhD students, distributed and collected the questionnaires on the first two days of this three-day exposition.

The second sampling frame of this study involved the fourth high-tech industry, the Aerospace industry. As aerospace firms were not indexed in the Malaysian Manufacturers' Directory (2011), a list of firms operating in the Aerospace industry was retrieved from the Aerospace Industry Report (AIR) Online Database. This database is run by The Malaysian Aerospace Council (MAC), "a national level steering body, dedicated to the development of the aerospace industry in Malaysia". Looked after by Malaysian Industry-Government Group for High Technology (MIGHT), this council works under the chairmanship of the Prime Minister of Malaysia. According to the council website, the AIR Database is a regularly updated, comprehensive list of the aerospace industry players in Malaysia.

This researcher was able to retrieve a list of 233 aerospace firms from the database (Malaysian Aerospace Council, 2011). However, a large number of these firms provided *services* to their customers and, thus could not form the sample of this study. For the

purpose of this study, 130 firms were considered appropriate and were approached, out of which only 48 agreed to participate in this study.

According to the Oslo Manual (2005, p. 119), the frame population underlying the survey may include units that no longer exist, or units that no longer belong to the target population. At the same time, it may not contain units that in fact do belong to the target population (Hair et al., 2007, p. 173). In view of this, the short-listed firms in all the four high-tech industries were contacted by telephone and after initial enquiry, appointments were made for questionnaire distribution; and explanations were provided wherever needed.

In view of the researcher's inability to speak the local Malaysian languages effectively, the help of a local undergraduate student (who could speak the local languages) was used in making appointments. This significantly reduced the otherwise usual rejections. In total, 900 questionnaires were distributed by email and in person; 366 were returned from 139 firms – 68 by email and 298 in person. As suggested by Hair et al. (2010), the questionnaires that had more than 10 percent missing values were discarded. No questionnaires received electronically had missing values, apparently because the electronic questionnaires prompted the respondents to answer all the questions before submitting. On the other hand, all the discarded questionnaires, 27 in number, were those that were collected in person from the respondents.

In total, 339 usable responses, from 133 firms, were considered 'clean' and thus used in further data analysis. The response rate thus achieved in this study is 37.66 percent. This can be considered a decent response rate considering that some recent similar studies in the Asian context (e.g. Abulrub & Lee, 2012) wherein less than 7% response rate was reported. This and the other statistics related to data collection are shown below in Table 3.1.

Table 3.1: Response rate to the survey

Industry	Total firms identified	Total Firms shortlisted and contacted	No. of firms that agreed to answer	No. of questionnaires distributed[b]	No. of firms that responded	No. of questionnaires collected	No. of respondent firms after data cleaning	No. of questionnaires after data cleaning[a]	Response rate (%)
Aerospace	233	130	48	170	21	77	20	73	15.38
Computers	82	76	28	130	19	87	19	87	25.00
Electronics	614	135	72	300	31	97	28	76	20.74
Pharmaceutical	122	35	22	100	16	38	15	40	
(Collected in Expo workshops)	52	52	52	200	52	67	51	63	
Total Pharmaceutical	174	87	74	300	68	105	66	103	78.16
Grand total	1277	428	222	900	139	366	133	339	37.66*

* Response rate = (a/b) (100)

However, before the questionnaires were sent out to 'real' managers, a pilot test was conducted. The procedures and need for pilot-testing is discussed in Section 3.7.3.

3.4.6 Sample Size

There are several guidelines about determining the size of sample. One rule of thumb is to have at least five respondents for each parameter estimate as long as other multivariate assumptions are met (Bentler & Chou, 1987). The total number of parameter estimates (questions in the questionnaire) is 60. Hence to meet the criterion suggested by Bentler and Chou (1987), the minimum sample size for this study needs to be: 60 x 5 = 300. Given that the sample size of this study is 339 usable responses, it is well above the threshold.

3.5 Validity and Reliability Assessment of Questionnaire

3.5.1 Assessment of Questionnaire Validity

Validity refers to the degree to which instruments truly measure the constructs which they are intended to measure. If the measures used in a discipline have not been demonstrated to have a high degree of validity, that discipline is not a science (Peter, 1979). While acknowledging the multitude of definitions of content validity in the literature, Haynes, Richard, and Kubany (1995) state that most of those definitions consider content validity as the degree to which elements of an assessment instrument are relevant to and representative of the targeted construct for a particular assessment purpose. Content validity thus relates to "the representativeness or sampling adequacy of the questionnaire regarding the content or the theoretical construct to be measured" (Cavana, Delahaye, & Sekeran, 2001, p. 238).

In this study, content validity of the questionnaire was tested in two ways as recommended by Cavana et al. (2001). First, all the items that measured the variables of interest in this study were taken from past research after studying the evolution of those variables. Most well-known measurements were used for the variables. Despite this, additional validity assessment was felt needed for two reasons: one, because variables in this study were never before used together in such a combination; two, because the scale for the criterion variable Open Innovation was never before used in the Malaysian context.

Therefore, content validity was further assessed by identifying through literature review five experts in Open Innovation research, and later by emailing the scale of Open Innovation (for both In-bound and Out-bound dimensions) to them for face validity. Two out of these five experts, Prof. Dr. Ulrich Lichtenthaler, Chair-holder of Management and Organization at the University of Mannheim, Germany, and Assoc. Prof. Dr. Mattia Bianchi, Assistant Professor of Business Administration at the Stockholm School of Economics, Sweden, replied. These two researchers have published a significant number of papers on the topic of Open Innovation in many top-tier journals. Prof. Dr. Ulrich Lichtenthaler validated the scale as good and Assoc. Prof. Dr. Mattia Bianchi suggested making the items more symmetric (reverse-scored) for both the dimensions of Open Innovation. This suggestion by Assoc. Prof. Dr. Mattia Bianchi was not incorporated because non-symmetric measures have been used in the literature to measure the two dimensions of Open Innovation. In addition, making the measurement items symmetric would go against the suggestion of Malhotra (2004, p. 296) who recommended the use of dual statements (some of which are positive and the others negative) in case the questions are worded as statements to which respondents indicate their degree of agreement or disagreement. Furthermore, Prof. Dr. Ulrich Lichtenthaler, whose scale is used in this study to measure Out-bound Open Innovation,

did not refer to making the scales for the two dimensions symmetric in his email. As far as the content of the items measuring the two dimensions of Open Innovation is concerned, both the experts face-validated it positively. Correspondence with these two experts is enclosed in Appendix B.

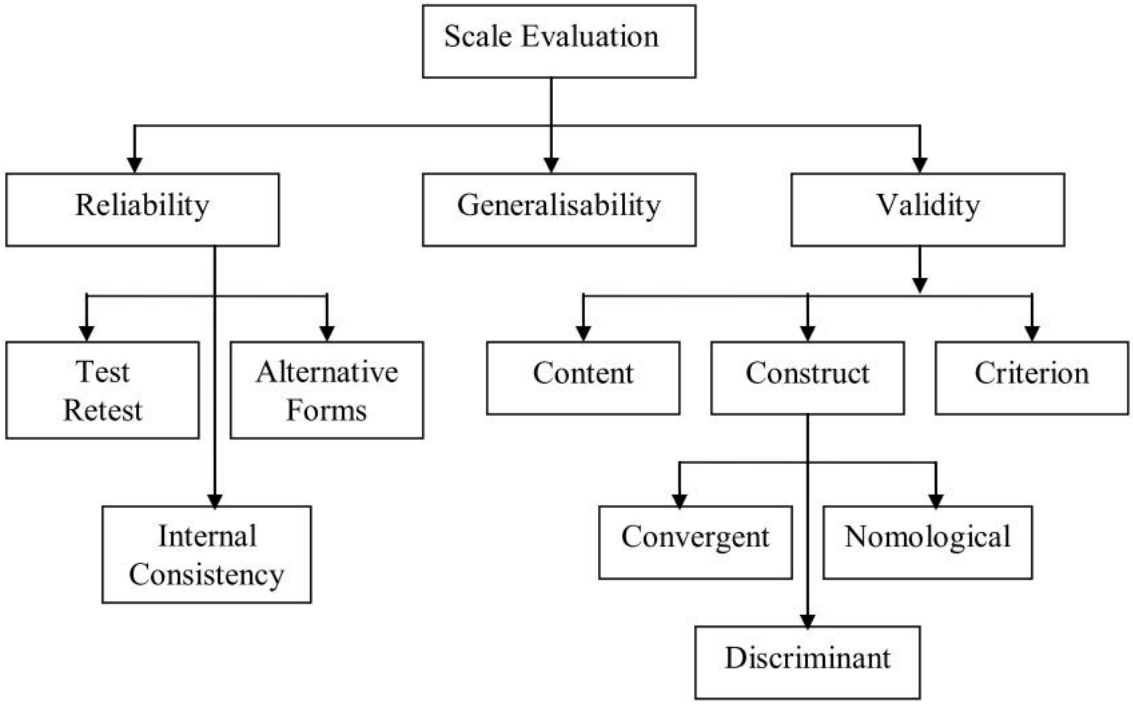

Figure 3.1: Evaluation of a multi-item scale

Source: **Malhotra (2004, p. 266)**

3.5.2 Assessment of Questionnaire Reliability

For measures to be valid (that is, have validity), "a necessary (but not sufficient)" condition is that they be reliable. Reliability is defined as the degree to which measures are free from error and therefore yield consistent results. There are three different methods for assessing reliability of a measurement scale: test-retest, internal consistency and alternative forms (Peter, 1979). Internal consistency is the most common method of assessing reliability of a scale and it draws on the homogeneity of a set of items and is expressed as a number between 0 and 1 (Hair et al., 2010). Appropriate for the purpose

of this study, internal consistency describes the extent to which all the items in a test measure the same concept or construct and hence it is connected to the inter-relatedness of the items within the test. Cronbach's coefficient alpha (Cronbach, 1951) provides a measure of the internal consistency of a test or a scale (Tavakol & Dennick, 2011) and is the most commonly accepted formula for assessing the reliability of a measurement scale with multi-point items (Peter, 1979). Cronbach's alpha is an index of reliability associated with the variation accounted for by the true score of the "underlying construct (Santos, 1999). Tavakol and Dennick (2011) mention that, to ensure reliability, internal consistency should be determined before a test is employed for research or examination purposes. Therefore, this study used Cronbach's α to assess the reliability of the measuring instrument. To this end, a pilot study was conducted prior to approaching the 'real' respondents of the study for their response. The pilot-testing exercise, including its outcome, is described in detail in the next section.

3.5.3 Pilot Test

Questionnaire design is only one step in the process that ultimately leads to generating answers to research questions of interest. After the questionnaire is designed, researchers should run a pilot test of the questionnaire to make sure it is understandable and acceptable to the intended audience (Olsen & George, 2004). According to the Oslo Manual (2005), when designing the questionnaire for an innovation survey, the questionnaire should be tested before it is used in the field. This pre-testing of the questionnaire, which may include interviewing a group of managers or experts concerning their understanding of the draft questionnaire or sending the questionnaire to a small sample of units, can be valuable in improving the quality of the questionnaire and can help in identifying and eliminating potential problems (Malhotra, 2004, p. 301).

The process of pilot-testing ideally involves administering the questionnaire to a small group of persons. This helps in eliciting feedback on various aspects of the questionnaire, such as wording of the questions, whether the respondents understood the questions, whether the respondents felt comfortable answering them, whether the questionnaire was too long, potential barriers to getting good responses etcetera. Pilot testing also evaluates other attributes like precision (reliability) and accuracy (validity). Reliability and validity are critical in developing a questionnaire which has the attributes of result reproducibility and good measurement of the phenomena of interest. After incorporating feedback from the pilot test, the questionnaire becomes ready for administration to the target respondents (Olsen & George, 2004).

In addition, to the best of this researcher's knowledgde, no previous research exists on Open Innovation in the Malaysian context. Hence, although most of the scales used in this study have high reliability in other contexts, the modification of the scale by this researcher and the integration of scales from different studies may affect the reliability of the newly-developed instrument used in this research.

Therefore keeping this in mind, a pilot-test was conducted before distributing the questionnaire on a full scale. Questionnaires were distributed among students from three faculties of the University of Malaya namely: Faculty of Computer Sciences, Faculty of Engineering and Faculty of Business and Accountancy. Constraints were applied and only the post-graduate students with previous work experience were targeted. From the Faculty of Business and Accountancy, only the MBA students were administered the questionnaire. MBA students have been used successfully for pretests for firm level research in many studies (for instance: Atuahene-Gima & Murray, 2004; Frels, Shervani, & Srivastava, 2003; Sisodiya, 2008). Frels et al. (2003) followed a similar

path and subjected their initial questionnaire to IT professionals enrolled in an executive education class to improve reliability of their instrument.

This pilot study used an online questionnaire to seek responses with respect to the variables of interest. Respondents were required to click radio buttons to record their answers. However for some questions text boxes were made available to record responses. A text box asking for any general comments was also included in the questionnaire. A total of sixty-three (63) responses were received. The responses were analyzed and the feedback was used to improve the final questionnaire. Following is a summary of the changes that were made based on the feedback to improve the final version of the questionnaire which was later administered to 'real' industry respondents.

a) Respondents indicated that the instruction for answering the questions related to Regimes of Appropriability were not clear. Changes were made and the new instruction read: "*Please indicate the extent to which the following mechanisms are effective in safeguarding innovations in your industry*".
b) Respondents indicated that from the firm profile questions, two questions about the size of the company (one, revenue in Malaysia; second, number of employees in Malaysia) were ambiguous and double-barreled. This issue was addressed by re-phrasing and separating the two questions into four questions, making the questions clearer and in line with the recommendations provided by Malhotra (2004, p. 284).
c) Respondents indicated that providing an option to tick one of the four industry types would be preferable rather asking them to write the name of the industry themselves – this change was also made.

Apart from the above, the respondents did not report any issues in answering the questionnaire. The data thus collected from the respondents of the pilot study were entered into SPSS® v.16 and analyzed for reliability of measurements. The table below

shows the reliability assessment of the variables of this study. As can be seen, Cronbach's alpha for all the variables is above the .60 threshold, thus confirming reliability of the measurements used in this study (Hair et al., 2010). It is therefore safe to conclude that the instrument that is going to be used in this study has no problems in terms of reliability and the researcher can proceed administering the instrument to the 'real' respondents.

Table 3.2: Reliability assessment of variables

S. No	Variable	No. of items	Cronbach's α
1	Organizational Citizenship Behaviour	12	0.690
2	Organizational Culture	23	0.711
3	Managerial Ties	9	0.826
4	Regimes of Appropriability	6	0.839
5	Open Innovation	10	0.818

3.6 Measurement of Variables

The variables of interest in this study were measured with items adapted from various past studies. A survey questionnaire was designed to elicit responses from the respondents with respect to Organizational Citizenship Behaviours (predictor variable), Organizational Culture (predictor variable), Managerial Ties (predictor variable), Regimes of Appropriability (moderating variable) and Open Innovation (criterion variable). In addition, questions related to the firm profile were also asked in the questionnaire. A detailed explanation about the measurement/operationalization of the variables is given below.

3.6.1 Organizational Citizenship Behaviours

Organizational Citizenship Behaviours (OCB) are defined as discretionary, extra-role behaviours of employees which exceed the prescribed formal roles, and are not directly

or clearly demanded by the formal award system (Organ, 1988). OCB performed by the employees of a firm exceed the minimum job requirements as anticipated by the employer and hence advance the well-being of the co-workers, the organization or the work groups.

Several dimensions of OCB have been proposed by various researchers (see for example Smith et al., 1983; Van Dyne, Graham, & Dienesch, 1994b). However, the five dimensions of OCB as proposed by Organ (1988) have become widely accepted as they encompass the constructs on extra-role behaviour or voluntary behaviour proposed in previous studies (Yoon, 2009). These five dimensions are: altruism, courtesy, conscientiousness, sportsmanship and civic virtue. The first two of these dimensions, altruism and courtesy, represent Organizational Citizenship Behaviour Interpersonal (OCBI) while the last three dimensions, conscientiousness, sportsmanship and civic virtue represent Organizational Citizenship Behaviour Organization (OCBO) (Coleman & Borman, 2000; Williams & Anderson, 1991). The OCB framework of Organ (1988) encompassing these five dimensions is the only one that has been treated consistently over a fairly large number of studies (LePine et al., 2002) and hence using these dimensions in this study is appropriate.

However, instead of the five dimensions, only three of these dimensions - altruism, sportsmanship and conscientiousness - are used. This is because, firstly, in a seminal study, Podsakoff and Philip (1990) revealed that altruism is highly correlated with courtesy (r=0.86), implying that using one of the dimensions is sufficient to describe both of them. Secondly, LePine et al. (2002) found overlapping of sportsmanship and civic virtue. In addition, both sportsmanship and civic virtue represent Organizational Citizenship Behaviour Organization (OCBO) (Williams & Anderson, 1991). Therefore using one of these dimensions is sufficient to capture the construct.

A look at the related literature reveals that many instruments have been used to measure the dimensions of OCB. Each scale has a history of reliable measurement; however almost all of them draw on the work of Organ (1988) for theoretical justifications and adapt with modification the instrument developed by Podsakoff and Philip (1990).

The scale used to measure the three dimensions of OCB - altruism, conscientiousness and sportsmanship - in this study was adapted from the seminal study of Podsakoff and Philip (1990). Podsakoff and Philip (1990) are among the first researchers to operationalize the dimensions of OCB given by Organ (1988). In their study, based on the definition of OCB and work of Organ (1988), Podsakoff and Philip (1990) generated a list of items for the construct which were given to 10 of their colleagues for Q-sorting; only those items made it to the final scale on which at least 80% of the judges agreed. These items measured the five dimensions of OCB namely altruism, conscientiousness, sportsmanship, courtesy and civic virtue as defined by Organ (1988). This instrument has been used in many empirical studies to measure OCB as its reliability and validity are established.

However, in this study the exact scale as developed by Podsakoff and Philip (1990) was not used. Instead, the researcher used the scale that was employed in the study by Bell and Menguc (2002). This was owing to the comparative recency of this study and because the questions/items in their study were found to be easier-to-understand, particularly in the context of Malaysia. Bell and Menguc (2002) cite Podsakoff and Philip (1990) as the source of their measurements of OCB dimensions. This researcher compared the scale developed by Podsakoff and Philip (1990) with that of Bell and Menguc (2002). Clear language differences were noticed. For instance, one of the questions/items in Podsakoff and Philip (1990) scale representing sportsmanship is “(the employee) tends to make mountains out of molehills”. In Bell and Menguc’s

(2002) scale, this item is asked in an easy-to-understand manner: " (the employee) tends to make problems bigger than they are". Another example of an abstruse question/item in Podsakoff and Philip's (1990) scale is "(the employee) is the classic squeaky wheel that always needs greasing". In Bell and Menguc's (2002) scale, this item was replaced by "(the employee) constantly talks about wanting to quit his/her job". Therefore for the purpose of this study, Bell and Menguc's (2002) scale was chosen with modifications. This was done following the feedback given at the Doctoral Colloquium in December, 2010 at the Graduate School of Business, University of Malaya.

The responses were assessed on a 7-point Likert scale ranging from "strongly disagree" to "strongly agree". Twelve (12) items in total and four (4) items each measure the three dimensions of OCB in this study. The items of OCB allowed the respondents (middle and top managers) to evaluate their contact employees on every item. The table below shows the items used to measure the three dimensions of OCB and their sources.

Table 3.3: Table showing items measuring Organizational Citizenship Behaviours

No.	Items	Sources
Altruism		
1	Help others who have heavy workloads	Podsakoff & Philip, 1990; Bell & Menguc, 2002
2	Help others who have been absent	
3	Willingly give their time to others who have work-related problems	
4	Help orient new people even if not required	
Sportsmanship		
1	Consume a lot of time complaining about trivial matters (r)	Podsakoff & Philip, 1990; Bell & Menguc, 2002
2	Tend to make problems bigger than they are (r)	
3	Constantly talk about wanting to quit their job (r)	
4	Always focus on what is wrong with their situation, rather than a positive side (r)	
Conscientiousness		
1	Are always punctual	Podsakoff & Philip, 1990; Bell & Menguc, 2002
2	Never take long breaks	
3	Do not take extra breaks	
4	Obey company rules, regulations, and procedures even when no one is watching	

(r): *reversed-scored item*

3.6.2 Organizational Culture

Organizational Culture is *"a pattern of basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems"* (Schein, 2004, p. 17). Organizational Culture has been evaluated along many dimensions and this has resulted in models and theories which are conceptually different but fundamentally similar (Yiing & Ahmad, 2009).

In this research the dimensions as proposed by Tsui et al. (2006) are used to capture Organizational Culture in the respondent firms. Tsui et al.'s (2006) five dimensions of

Organizational Culture which are based on the definition of Schien (1992) are: employee development, harmony, customer orientation, social responsibility and innovation. This study uses the measurements of these dimensions as developed by Tsui et al. (2006). Employee development, harmony and customer orientation are measured using five items each while social responsibility and innovation are measured using four items each. In total twenty-three items measure Organizational Culture in this study. All the items are anchored on a 5-point Likert scale ranging from “strongly disagree” to “strongly agree”. The following table shows the items measuring the five dimensions of Organizational Culture.

Table 3.4: Table showing items measuring Organizational Culture

No.	Items	Source
Employee Development		
1	Concern for individual development	Tsui, Wang, and Xin (2006)
2	Developing employees' potentials	
3	Trusting employees	
4	Caring about employees' opinions	
5	Providing training in knowledge and skills	
Harmony		
1	Emphasizing team building	Tsui, Wang, and Xin (2006)
2	Supporting cooperative spirit	
3	Promoting feeling/sharing among employees	
4	Encouraging cooperation	
5	Consideration among employees	
Customer Orientation		
1	Satisfying need of customers on largest scale	Tsui, Wang, and Xin (2006)
2	Strongly emphasizing profit of customer	
3	Providing first-class service	
4	Customer is number 1	
5	Providing sincere service	
Social Responsibility		
1	Showing social responsibility	Tsui, Wang, and Xin (2006)
2	Mission of the firm is to serve society	
3	Emphasizing economic as well as social profits	
4	Encouraging development of society	
Innovation		
1	Ready to accept changes	Tsui, Wang, and Xin (2006)
2	Developing new products and services continuously	
3	Encouraging innovation	
4	Adopting high-tech bravely	

3.6.3 Managerial Ties

Managerial Ties are defined as "executives' boundary-spanning activities and their associated interactions with external entities" (Geletkanycz & Hambrick, 1997). Managerial Ties form a part of social capital or social exchange. Managerial Ties in this study are measured on three dimensions: ties with managers at other firms, ties with government officials and ties with researchers at universities and other research centers. Following the seminal study of Peng and Luo (2000), ties with managers at other firms and ties with government officials are measured using a three-item scale each. To measure the ties with researchers at universities and other research centers, this study built on the scale developed by Ramos-Vielba et al. (2010) and used a three-item scale to capture ties with researchers at universities and other research centers. All the responses are assessed on a 7-point Likert scale ranging from “very little” to “very extensive”. Thus nine items (9) in all and three items each measure the three dimensions of Managerial Ties in this study.

Table 3.5: Table showing items measuring Managerial Ties

No.	Items	Sources
Ties with Managers		
1	Managers at supplier firms	Peng & Luo (2000)
2	Managers at buyer firms	
3	Managers at competitor firms	
Ties with Research Centers and Universities		
1	University researchers for commercialization related to Intellectual Property Rights	Ramos-Vielba et al. (2010)
2	University researchers for R&D activities and formal consulting work	
3	University researchers for training and transfer of personnel	
Ties with Government Officials		
1	Officials in industrial bureaus	Peng & Luo (2000)
2	Political leaders in various levels of the government	
3	Officials in regulatory and supporting organizations such as tax bureaus, state banks, commercial administration bureaus, and the like	

3.6.4 Open Innovation

This study uses the definition of Open Innovation as given by Chesbrough et al. (2006). According to this definition, Open Innovation is *"the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively"* (Chesbrough et al., 2006). Open Innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology. Open Innovation in this study is measured on two dimensions: In-bound Open Innovation and Out-bound Open Innovation. Given that Open Innovation is rather a new concept, there is no standardized scale to measure its dimensions. Therefore this

study adapted or modified measurement scales developed by many researchers. Details of the measurements of the two dimensions of Open Innovation are given below.

a) In-bound Open Innovation

In-bound or outside-in Open Innovation refers to the use of discoveries that others make and involves opening up to and establishing relationships with external firms with the aim to access their competencies in order to enhance the firm's innovation performance. To measure the In-bound dimension of Open Innovation, this study used the scale developed by Sisodiya (2008) and De Jong et al. (2007). This scale measures the In-bound dimension of Open Innovation using six items which are anchored on a 7-point Likert scale ranging from "strongly disagree" to "strongly agree".

A total of six items (6) measure this dimension of Open Innovation in this study. Sisodiya (2008) developed measurements for the In-bound dimension of Open Innovation by generating a pool of items after reviewing the related literature on Open Innovation and then presenting those items to industry managers to ensure proper capture of Open Innovation. In addition, inputs from the study of De Jong et al (2007) were used to refine and modify this scale to suit the context of this study. Moreover, in this study instead of anchoring the items on a 7-point Likert scale as was done by Sisodiya (2008), a 5-point Likert scale was used to check common method bias. The rationale for doing this is further explained in Section 3.7.2.

b) Out-bound Open Innovation

Out-bound or the inside-out dimension implies that firms can search for external players that have better fitting business models to exploit and commercialize a particular technology than just depend on internal paths to market. To measure the Out-bound dimension, the scale developed by Lichtenthaler (2009) was used. Four (4) items were used to measure this dimension by capturing a firm's willingness to commercialize

technological knowledge. Lichtenthaler's (2009) study is among the first studies that operationalized Out-bound Open Innovation quantitatively and the validity and reliability of this scale are established. Although Lichtenthaler (2009) anchored the items on a 7-point scale, in this study, to check common method bias, a 5-point scale ranging from "strongly disagree" to "strongly agree" is used to measure the Out-bound dimension of Open Innovation. In addition, as done with respect to the scale measuring the In-bound dimension, inputs from the study of De Jong et al. (2007) were used to refine and modify this scale to suit the context of this study.

In all, a total of 10 items measure the criterion variable, Open Innovation in this study. The table below shows the ten (10) items used to measure the two dimensions of Open Innovation, and their sources.

Table 3.6: Table showing items measuring Open Innovation

No.	Items	Sources
	In-bound	
1	My organization constantly scans the external environment for inputs such as technology, information, ideas, knowledge, etc.	Sisodiya (2008); De Jong et al. (2007)
2	My organization actively seeks out external sources (e. g., research groups, universities, suppliers, customers, competitors, etc.) of knowledge and technology when developing new products.	
3	My organization believes it is good to use external sources (e. g., research groups, universities, suppliers, customers, competitors, etc.) to complement our own R&D.	
4	My organization often brings in externally developed knowledge and technology to use in conjunction with our own R&D.	
5	My organization seeks out technologies and patents from other firms, research groups, or universities.	
6	My organization purchases external intellectual property to use in our own R&D.	
	Out-bound	
1	Generally, in my organization all technologies are externally commercialized (i.e. sold to outside firms)	Lichtenthaler (2009); De Jong et al. (2007)
2	In my organization, external technology commercialization is restricted to technologies that are not used internally (r)	
3	In my organization, external technology commercialization is restricted to relatively mature technologies (r)	
4	In my organization, external technology commercialization is restricted to non-core technologies (r)	

(r): *reversed-scored item*

3.6.5 Regimes of Appropriability

Appropriability is defined as the ability of the owner of a resource to receive a return equal to the value created by that resource (Levin et al., 1987; Teece, 1986). Atkins (1998) defines appropriability as “the ability of different stakeholders to retain for themselves the financial benefits that arise through the exploitation of an innovation”. Regimes of Appropriability is the moderating variable in this study. Given the difficulties in measuring appropriability regimes as highlighted in the literature review, this researcher built on the concepts related to appropriability regimes like patents, secrecy and making imitation more difficult for competitors to develop the scale for

appropriability regimes. Levin, Klevorick, Nelson, and Winter (1983) pioneered the development of measures for appropriability regimes which has had significant influence on all subsequent studies on this topic. In this backdrop, Levin et al. (1987) identified six alternative mechanisms that firms use to appropriate the returns of innovative activities: (1) patents to prevent duplication, (2) patents to secure royalty income, (3) secrecy, (4) lead time, (5) moving quickly down the learning curve, and (6) sales or service efforts. Almost all the empirical studies on appropriability regimes revolve around these six alternative mechanisms of appropriating returns of innovation activities. In this study, the measures are adopted from Harabi (1992) and (Harabi, 1995). A total of six items are used to measure this variable on a 5-point Likert scale ranging from “least effective’ to “most effective”. The table below shows the six items measuring Regimes of Appropriability and their source.

Table 3.7: Table showing items measuring Regimes of Appropriability

No.	Items	Sources
Regimes of Appropriability		
1	In your industry, to what extent are patents and other legal mechanisms effective in protecting against imitation of new or improved products?	Harabi (1992;1995)
2	In your industry, to what extent are patents effective in securing royalty income?	
3	In your industry, to what extent is adopting secrecy effective in protecting product and process innovations?	
4	In your industry, to what extent is being first to market (lead time) effective in protecting product and process innovations?	
5	In your industry, to what extent are Intellectual Property (IP) laws effective in protecting product and process innovations?	
6	In your industry, to what extent is moving quickly down the learning curve effective in accruing benefits of product and process innovations?	

3.7 Questionnaire Design

A researcher can choose to have the questionnaires filled up by telephone, by snail-mail, by email or in person (Hair et al., 2007; Malhotra, 2004; Zikmund, 1997). This study used the latter two methods - email and personal administration - to collect the data due to the feasibility of these two methods. Therefore, firstly a questionnaire was designed and hardcopies of the same, to be administered in person, were printed in the booklet format.

Secondly, Malhotra (2004, p. 361) mentions that the use of the Internet increases response rate to surveys because the Internet provides easy of access to the respondents and makes it easy for them to complete the survey in multiple sessions if necessary. In view of this, an online version of the questionnaire was also designed using *KwikSurveys*, a free online survey tool. This website offers the ability to generate unlimited number of links to the same questionnaire so that a different link can be sent to the respondents of each firm – thereby helping in tracking the responses. Both the printed version and the online version of the questionnaire were replicas of each other.

3.7.1 Sections of the Questionnaire

The questionnaire used in this study, both the printed and the online version, had five (5) sections. The first section sought information with respect to the first predictor variable, Organizational Citizenship Behaviour. The second section asked questions about the moderating variable of this study, Regimes of Appropriability. The third section contained questions related to the second predictor variable Organizational Culture and the criterion variable Open Innovation. The fourth section asked questions about the third predictor variable, Managerial Ties. The fifth section sought demography-related information: type of industry, respondent position, respondent tenure in the firm, age of the firm, whether the firm has an R&D department, firm's market, firm ownership, number of employees and annual revenue. A text box asking for any general comments was also included at the end of the questionnaire. In addition, the first page of the questionnaire acted as the cover letter, inviting respondents' response and explaining the purpose of the research besides giving the contact details of the researcher. Please refer to Appendix A for a full copy of the questionnaire used in this study.

3.7.2 Precautions for Common Method Bias and Common Method Variance

Method biases are one of the main sources of measurement error which threatens the validity of conclusions about the relationships between variables being tested (Nunnally, 1978). In this regard, common method bias (CMB) and common method variance (CMV) have often been cited as a cause of concern in organizational research (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). According to Meade, Watson, and Kroustalis (2007), while CMB refers to the degree to which correlations are altered (inflated) due to a methods effect while CMV implies that the variance in observed scores is partially attributable to a methods effect. There are several sources of CMB

and CMV. Podsakoff et al. (2003) evaluated the relevant literature and identified the sources of method biases and grouped them into four categories: a) a common rater, b) item characteristic effects (e. g., item ambiguity), c) item context effects (e.g., priming effects, grouping of items), and d) measurement context effects. Keeping this in mind and to reduce methods effects, several precautionary measures were taken in this study (right) from the questionnaire designing stage to reduce any potential effects of CMB and CMV and thus the ground was prepared for obtaining valid findings. The steps are:

1. In the first section of the questionnaire, six (6) psychological separators were inserted between the real questions of interest. Hence in total the first section contained 18 questions (12 real + 6 psychological separators).
2. In the third section, four (4) psychological separators were inserted between the real questions. Besides, the third section contained the questions/items representing two constructs namely Organizational Culture and Open Innovation. The items of these two variables and the 4 psychological separators were jumbled up. Thus thirty-seven (37) questions/items (Organizational Culture + Open Innovation + psychological separators = 23+10+4) formed the third section of the questionnaire used in this study.

3.8 Data Analysis Techniques

The data collected for this study were analyzed quantitatively. As mentioned earlier, this study has three predictor variables, one criterion variable and a moderating variable. In addition, the respondents were asked to answer some questions related to firm profile (type of industry, respondent position in the firm, respondent tenure with the firm, age of the firm, firm's market, firm's ownership, number of employee and yearly revenue of the firm). To analyze the data related to all these variables, several statistical techniques were used. IBM SPSS® Statistics v.20 and Analysis of Moment Structures v.18

(AMOS™) were used to run the relevant statistical tests. The next section provides a brief over-view of the main data analysis techniques used in this study.

3.8.1 Exploratory Factor Analysis

Exploratory Factor Analysis (EFA) is an interdependence technique used to define the underlying structure among the variables in the analysis. EFA provides the tools for analyzing the structure of the interrelationships among a large numbers of variables by defining sets of variables that are highly interrelated, known as factors (Hair et al., 2010). Thus EFA is used to reduce a number of items to a lesser number of factors. The factors thus obtained act as building blocks and can be used in several statistical analyses to establish relationships.

In the current study, EFA was used to establish dimensionality of items/questions and reduce those items (of the variables) to factors. Therefore the main purpose of using EFA in this study is to reduce the data by creating an entirely new set of variables, small in number, which replace and represent the original items/questions (Hair et al., 2010, p.99). This study uses the Bartlett test of sphericity to determine whether EFA is appropriate for the data of this study. The Bartlett test of sphericity checks the presence of correlation among the variables and provides the statistical significance that the correlation matrix has significant correlations among at least some of the variables. The Bartlett test of sphericity however has a drawback in that as the sample size increases, it becomes more sensitive in detecting correlations among the variables.

Keeping this in mind, this study also uses the Kaiser-Meyer-Olkin (KMO). The KMO measures the sampling adequacy and quantifies the degree of inter-correlation among the variables and the appropriateness of EFA. The KMO is interpreted as per the

following guidelines: .80 or above, meritorious; .70 or above middling; 0.60 or above, mediocre; .50 or above, miserable; and below .5, unacceptable.

The results obtained in EFA are used to guide the confirmatory factor analysis (CFA). Post CFA, the confirmed latent variables/factors are used in establishing relationships among the variables of interest in this study. The next section briefly explains the CFA and structural equation modeling.

3.8.2 Structural Equation Modeling and Confirmatory Factor Analysis

3.8.2.1 Structural Equation Modeling

Structural equation modeling (SEM) is a powerful statistical technique that takes a confirmatory approach to the analysis of a structural theory bearing on some phenomenon. According to Byrne (2001), SEM involves two important aspects: a) the causal processes under study are represented by a series of structural (regression) equations, and b) the structural relations in the model can be shown pictorially, enabling a clearer conceptualization of the theory under study. In SEM, a hypothesized model developed by the researcher is compared against the data that is gathered in the field. If the goodness-of-fit is found to be adequate, plausibility of the relations depicted in the model is claimed. If adequate goodness-of-fit is not achieved, the tenability of the relations in the model is rejected.

SEM is considered as a second generation multivariate technique which takes a confirmatory approach to data analysis as opposed to the exploratory approach. It consists of confirmatory factor analysis, regression and path analysis. This technique scores as compared to the older techniques which could not assess or correct for measurement error, in that it provides explicit estimates of these error variance parameters. In addition, the older data analysis methods relied on observed

measurements only, whereas SEM procedures can include unobserved (latent) as well as observed variables. SEM also provides relatively easy solutions for modeling multivariate relations, for estimating point or interval indirect effects. All these features have made SEM increasing popular for non-experimental research (Byrne, 2001).

Kline (2005) mentions that structural equation modeling uses two types of analytical procedures to assess and validate the model: the first one being the confirmatory factor analysis (CFA) which determines the set of observed variables that share common variance characteristics to identify the latent variables (factors); and the second one being the regression analysis which is run to establish relationships among the latent variables. To establish the strength of the model, certain goodness-of-fit measures are used which fall into three categories: comparative fit of the data to a base model, model parsimony and the overall fit. Many statistics can be used in AMOS™ to assess the hypothesized model and if a good fit is not found between the model and the data, AMOS™ can as well provide suggestions for modification of the model.

3.7.2.2 Confirmatory Factor Analysis

SEM in essence is a combination of factor analysis and multiple regression. The model based on multiple regression is called the structural model, while the model based on (confirmatory) factor analysis is called the measurement model. The variables in SEM are: measured variables also known as observed or manifest variables, and factors also called latent variables. The measurement model relates the measured variables to the latent variables while the structural model relates the latent variables to one another. In this study, the researcher used the measurement model portion (i.e. CFA) of SEM only. CFA is used to validate the proposed measurement model. Guided by the results of the exploratory factor analysis (EFA), the researcher specified a measurement model and

shifted to a confirmatory mode by specifying which indicators/items define each construct/factor (Hair, Anderson, Tatham, & William, 1998, p. 598).

CFA is a way of testing how well measured variables represent a smaller number of constructs. Hair et al. (2010, p. 693) mention that CFA is similar to EFA in some ways, but the philosophy is "quite different". CFA determines the set of observed variables that share common variance characteristics to identify the constructs or latent variables (Kline, 2005). CFA requires specification of the number of factors that exist for a set of variables and which factors each variable will load on before results can be computed. In this way, it is the researcher (and not the statistical technique) that assigns the variables to the factors based on the theory being tested. CFA is then run to test the extent to which a researcher's a-priori, theoretical pattern of factor loading on pre-specified constructs represents the actual data. In other words, model fit is assessed. CFA confirms the measurement theory which specifies how the measured variables "logically and systematically" represent constructs involved in the theoretical model. The measurement theory is then combined with a structural theory to fully specify an SEM model (Hair et al., 2010). CFA results in combination with construct validity tests provide a better understanding of the quality of the measures being used (Hair et al., 2010). In addition, CFA assesses the measurement model by examining the unidimensionality, reliability and validity of the constructs including convergent validity (correspondence or convergence between similar constructs) and discriminant validity (discrimination between dissimilar constructs) (Garver & Mentzer, 1999).

The measurement model in this study is evaluated using multiple fit criteria. This is in line with Hair et al. (2010, p. 644) who suggested that using at least three to four fit indices provides adequate evidence of model fit. These authors suggest against reporting all the goodness-of-fit indices in view of redundancy and recommend reporting at least

one incremental index and one absolute index in addition to Chi-square statistic (χ^2) and associated degrees of freedom. Therefore following Hair et al. (2010, p. 644), this study used χ^2 values and degrees of freedom, the CFI and the RMSEA to evaluate the measurement model.

3.8.3 Hierarchical Multiple Regression

According to Hair et al. (1998, pp. 148-149), multiple regression is a statistical technique that is used to analyze the relationship between a single criterion variable and several predictor variables; the objective being to use the predictor variable with known values to predict the single criterion variable. This study uses hierarchical multiple regression for hypothesis testing. Sometimes also called sequential regression, hierarchical multiple regression is chosen because this technique tests with logic and ease the hypotheses of this study and answers the objectives.

In hierarchical multiple regression, the predictor variables are entered into the model/block in the order specified by the researcher based on theoretical grounds. The variables or sets of variables are entered in steps with each predictor variable being assessed in terms of what it contributes to the prediction of the criterion variable after the variables in the previous step have been controlled for (Hair et al., 1998, pp. 148-149; Pallant, 2007, p. 147).

In this study, the criterion variable, Open Innovation, has two dimensions: In-bound Open Innovation and Out-bound Open Innovation. Therefore to assess contribution of the predictor variables in predicting both the dimensions of the criterion variable, two separate hierarchical multiple regressions are conducted to test all the hypotheses. In addition, this study also seeks to test whether Regimes of Appropriability moderates the relationships between the dimensions of the predictor variables and the criterion

variables (In-bound and Out-bound Open Innovation). This is tested again using hierarchical multiple regression. Following the procedure delineated by Baron and Kenny (1986), interaction terms (as shown in Figure 3.2) between all the dimensions of the predictor variables and the moderating variable are created and introduced in the regression model.

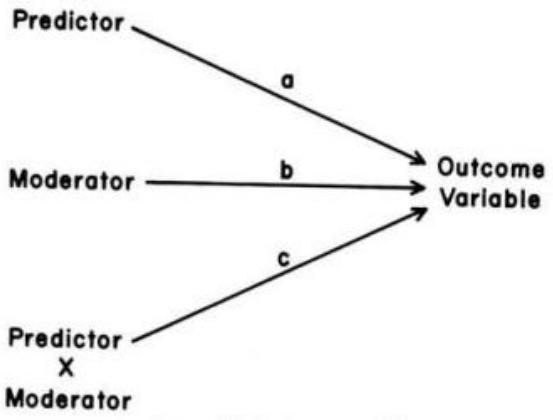

Figure 3.2: Moderator Model

Source: Baron and Kenny (1986, p. 1174)

3.9 Summary of the chapter

This chapter discussed the research design of this study. Philosophical underpinnings and research approach taken in this study were highlighted. Further, sample, target population, sampling method, sampling constraints, sampling frame and procedures and sample size were also discussed. Questionnaire design was discussed and the validity and reliability of the questionnaire were established through expert judgement and pilot test, respectively. Following a brief discussion on measurements of the constructs, the data analysis techniques used in this study were also discussed.

In the next chapter, analysis of the data is presented. The data are first prepared following which descriptive statistics are presented. This is followed by exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Later, validity –

convergent and discriminant – is checked. Finally, the hypotheses are tested to answer the research questions of this study.

CHAPTER FOUR

DATA ANALYSIS

4.0 Introduction

This chapter presents the exercise of data analysis and provides the findings of this study. The first section of this chapter deals with coding of the data, reverse scoring of negatively-worded items, and missing values. In the second section, descriptive statistics are presented, giving a summary of the demographic profile of the respondents and the firms that participated in this study. In the third section, multivariate assumptions including normality, outliers linearity, homoscedasticity and multicollinearity are looked at. The fourth and the fifth sections of this chapter show the results of the tests for non-response bias and common method bias respectively. In the sixth section, purity of the scales used in this study is assessed using item-total-correlation and Cronbach's alpha. The seventh section presented the results of exploratory factor analysis conducted on all variables of this study. In the eighth section, the results of the exploratory factor analysis with the 'offending' items dropped are presented. In the ninth section, reliability of the scale without the 'offending' items is examined. The tenth section deals with confirmatory factor analysis and construct validity including discriminant validity and convergent validity. In the eleventh section of this chapter, the results of cluster analysis performed on the dimensions of Organizational Culture are presented. This section is followed by the twelfth section in which hypotheses of this study are tested.

4.1 Data Preparation

Following data collection using the questionnaire survey method, the data were readied for data analysis. As mentioned in the previous chapter, this study used SPSS® v.20 and

AMOS™ to analyze the data. However before analyzing the data, the data were entered into SPSS®. The data coding procedures as suggested by Sekaran (2006) were followed. The data were coded as shown in Table 4.1 below.

4.1.1 Coding of Data

Table 4.1: Table showing coding of data

Item	Categories	Code
Type of industry	Aerospace	1
	Computers	2
	Electronics	3
	Pharmaceuticals	4
Respondent position	Middle Management	1
	Top Management	2
Respondent years in firm	5-10 years	1
	11-15 years	2
	16-20 years	3
	Above 20 years	4
Firm's market	Local / National	1
	Regional	2
	Global	3
Firm ownership	Publicly owned	1
	Privately owned	2
	State owned	3
	Foreign ownership	4
	Mixed ownership/ Joint venture	5
Company age	1-10 years	1
	11-20 years	2
	21-30 years	3
	31-40 years	4
	Above 50 years	5
Number of employees	Less than 100	1
	101-500	2
	501-1000	3
	1001-5000	4
	Above 5000	5
Annual revenue (RM)	Less than 200,000	1
	200,000 -500,000	2
	500,000-1mil	3
	1mil- 5 mil	4
	5mil-10mil	5
	10-mil-25mil	6
	25 mil-above	7

Table 4.1: Table showing coding of data (continued)

Organizational Citizenship Behaviours	Strongly Disagree	1
	Disagree	2
	Disagree Somewhat	3
	Neutral	4
	Agree Somewhat	5
	Agree	6
	Strongly Agree	7
Organizational Culture and Open Innovation	Strongly Disagree	1
	Disagree	2
	Neutral	3
	Agree	4
	Strongly Agree	5
Managerial Ties	Very Little	1
	.	.
	.	.
	.	.
	Very Extensive	7
Regimes of Appropriability	Least Effective	1
	Less Effective	2
	Somewhat Effective	3
	Effective	4
	Most Effective	5

4.1.2 Reverse Scoring Items

Some of the questions/items in the questionnaire were negatively-worded. Four (4) such items representing *Sportsmanship* dimension of the Organizational Citizenship Behaviours Construct and three (3) items measuring Out-bound Open Innovation were negatively asked in the questionnaire. Hence these 7 items were reverse-coded using the "Recode" function in SPSS® v.20 so that all the questions became uni-directional.

4.1.3 Dealing with Missing Values

The Oslo Manual (2005, pp. 126-127) states that responses to innovation surveys are always incomplete, irrespective of the survey method used. Striking a similar note, Hair et al. (1998, pp. 46-47) mention that missing data are "a fact of life" in multivariate analysis. Two types of missing values exist: item and unit non-responses. While unit

non-response refers to a reporting unit not replying at all, the item non-response refers to the response rate to a specific question and is equal to the percentage of blank or missing answers among the reporting units. Item non-response rates are frequently higher for quantitative questions than for questions using binary or ordinal response categories (Oslo Manual, 2005, pp. 126-127). Hair et al. (1998, p. 47) mention that from a substantive perspective, any statistical results based on data with a nonrandom missing data process could be biased. On the other hand, the practical impact of missing data is the reduction of sample size available for analysis. A researcher therefore needs to remedy the missing data to have accurate statistical results.

There are several techniques of dealing with the missing values. One way is to use the *complete case approach* in which observations with complete data only are considered for data analysis. The second way is to delete the 'offending' variable/s. Another remedy for missing values is to use one of the imputation methods available (Hair et al., 1998, pp. 51-54). In this study, the *complete case approach* was used to remove the missing values in the data, that is, only the observation with complete data were used for data analysis. As mentioned in the previous chapter, 366 questionnaires were collected for this study. However, upon examination of the questionnaires, twenty-seven (27) questionnaires were found to be incomplete; these 27 questionnaires were discarded and thus a total of 339 missing value-free questionnaires were left.

In addition, the open-ended question at the end of the questionnaires failed to elicit any responses from the respondents which were worth mentioning. Moreover, a few respondents evinced interest in receiving a copy of the research findings of this study – such respondents will be appropriately emailed copies of the research papers that emerge from this research exercise.

4.2 Descriptive Statistics

Frequency and percentage distributions were obtained for all the demographic variables of this study. These descriptive statistics are tabulated in Table 4.2. The table shows that the data were collected from respondents working in four high-tech industries. The majority of the respondents (30.4%) belonged to the Pharmaceutical industry while to the Computers and Office Machinery industry, the Electronics and Communications industry and the Aerospace industry belonged 25.7%, 22.4% and 21.5% respondents respectively. The spread of respondents across the four high-tech industries indicates quite a balanced distribution.

This required target respondents for this research needed to be middle and top managers only. In line with this, most of the respondents (54.9%) were in top management positions while roughly half the number of respondents (45.1%) occupied middle management positions. Middle management positions refer to positions from Manager onwards till senior managerial level, while top management positions indicate managers serving in occupational levels that are above senior managers. The table below also indicates that an overwhelming majority of the respondents (64.0%) who participated in this study had served the 'current' organization for 5-10 years. One of the sampling constraints applied in this study required the respondents to have served for at least 5 years in the 'current' organization and all the respondents of this study are well above this threshold. In addition, 28% of the respondents had worked in the same firm for 11-15 years while 7.1% and 0.9% had served for 16-20 years and above 20 years respectively.

With respect to the market of the firms surveyed, a majority 42.2% operated globally while 31.9% and 26% operated regionally and locally respectively. Regarding the ownership of the firms surveyed, 47.5% were privately-owned, 32.4% had foreign

ownership, 7.7% were publicly-owned, another 7.7% had mixed ownership while 4.7% were state-owned.

Managers working in firms of different (firm) age groups participated in this study. Nearly half of the firms (45.1%) surveyed for this study had been operating for 11-20 years while 25.7%, had been operating for 21-30 years, 21.2% for 31-40 years, 6.5% for 1-10 years and a minuscule 1.5% for above 50 years. These statistics indicate that most of the firms surveyed had been in business for quite a long time and thus knew the market reasonably well.

As far as the size of the surveyed firms is concerned, it was measured using two questions: number of employees and revenue of the firm. Regarding the number of employees, the majority (40.4%) had 101-500 employees while 35.7% of the firms had 501-1000 employees. Only 15.3% of the surveyed firms can be considered small with less than 100 employees, while 7.7% and 0.9% of the firms were quite large with 1001-5000 and above 5000 employees, respectively. The size of the firms was also gauged in terms of the annual revenue in Ringgit Malaysia (RM). As Table 4.2 below shows, most of the firms (40.7%) earned revenue between RM 10-25 million, while 19.5% of the firms earned revenue of RM 1-5 million. 16.8% of the firms earned revenue of RM 25 million and above, 10.3% earned between half a million RM and one million, 7.1% earned RM 5-10 million, 3.8% earned RM 2000, 000 - 500,000 while a minority 1.8% of the surveyed firms earned revenue of less than RM 200, 000.

Table 4.2: Showing characteristics of the sample

	Categories	Frequency	Percent	Cumulative
Type of industry	Aerospace	73	21.5	21.5
	Computers and Office Machinery	87	25.7	47.2
	Electronics and Communications	76	22.4	69.6
	Pharmaceuticals	103	30.4	100
Respondent position	Middle Management	153	45.1	45.1
	Top Management	186	54.9	100
Respondent years in firm	5-10 years	217	64.0	64.0
	11-15 years	95	28.0	9.0
	16-20 years	24	7.1	99.1
	Above 20 years	03	0.9	100
Firm's market	Local / National	88	26.0	26.0
	Regional	108	31.9	57.8
	Global	143	42.2	100
Firm ownership	Publicly owned	26	7.7	7.7
	Privately owned	161	47.5	55.2
	State owned	16	4.7	59.9
	Foreign ownership	110	32.4	92.3
	Mixed ownership/ Joint venture	26	7.7	100.0
Company age	1-10 years	22	6.5	6.5
	11-20 years	153	45.1	51.6
	21-30 years	87	25.7	77.3
	31-40 years	72	21.2	98.5
	Above 50 years	05	1.5	100.0
Number of employees	Less than 100	52	15.3	15.3
	101-500	137	40.4	55.8
	501-1000	121	35.7	91.4
	1001-5000	26	7.7	99.1
	Above 5000	03	.9	100
Annual revenue (RM)	Less than 200,000	6	1.8	1.8
	200,000 -500,000	13	3.8	5.6
	500,000-1mil	35	10.3	15.9
	1mil- 5 mil	66	19.5	35.4
	5mil-10mil	24	7.1	42.5
	10-mil-25mil	138	40.7	83.2
	25 mil-above	57	16.8	100.0

4.3 Multivariate Assumptions

Meeting certain multivariate assumptions is critical to successful data analysis. According to Hair, Black, Babin, and Anderson (2010, p. 68), data should be tested for compliance with the statistical assumptions of multivariate techniques to lay foundation

for making proper statistical inferences and results. These authors mention that meeting the assumptions in multivariate analysis is important due its two characteristics: a) complexity of the relationships, owing to the typical use of a large number of variables, makes the potential distortions and biases more potent when the assumptions are violated, particularly when the violations compound to become even more detrimental than if considered separately; and b) complexity of the analyses and results may mask the indicators of assumption violations apparent in the simpler univariate analyses. In view of the above, to obtain statistically accurate findings, the researcher must ensure that the multivariate assumptions are not violated. In the next sub-section, the multivariate assumptions of the data of this study are evaluated.

4.3.1 Normality, Linearity and Homoscedasticity

Hair et al. (1998, pp. 70-71) highlight that the most important assumption in multivariate analysis is normality which refers to the shape of the data distribution for individual metric variable and its correspondence to normal distribution. Normality also means a symmetrical and bell shaped distribution of data. The easiest way to test normality is a visual check of the histograms. A look at the histograms obtained for the variables of this study reveals that the data are normally distributed. However, testing for normality using histograms could sometimes be problematic. Therefore a more reliable way of testing for normality is normal probability plots. A look at the normal probability plots of the variables of the study indicates that the data are normally distributed. In addition, the sample size of this study is 339 which is quite large and greater than 200, implying that the detrimental effect of non-normality in this study cannot be more than negligible (Hair et al., 2010, p. 70).

Moreover, a visual inspection of the graphical plots was conducted to check whether the data meet the assumptions of homoscedasticity and linearity. Homoscedasticity refers to

the assumption that the criterion variable exhibits equal levels of variance across the range of predictor variables (Hair et al., 1998, pp. 73). This visual inspection of the graphical plots did not reveal any pattern of non-linearity (i.e. the dots are far away from a linear line relationship) or heteroscedasticity (i.e. the dots are not concentrated in the centre but spread out across the scatter plot graph). Therefore, there is evidence of linearity and homoscedasticity between the criterion and predictor variables of this study. Graphical plots are attached in Appendix C.

4.3.2 Outliers

According to Hair et al. (1998, pp. 64), "outliers are observations with a unique combination of characteristics identifiable as distinctly different from the other observations". Just like the missing values can distort statistical findings, the outliers present in the data can as well lead to misleading statistical findings. The causes of outliers present in the data can be divided into four classes. Firstly, outliers may arise from procedural error such as data entry error or a mistake in coding. Secondly, outliers can be present in the data due to an extraordinary event, which explains the uniqueness of the observation. Thirdly, the presence of outliers in the data may be inexplicable. Fourthly, outliers may contain observations that fall within the ordinary range of values on each of the variables but are unique in their combination of values across the variables (Hair et al., 1998, pp. 64-65).

Whatever the reason for the presence of outliers in the data, a researcher needs to deal appropriately with the outliers that can bias the statistical findings. With regard to the data of this study, graphical plots were visually examined to look for any outliers and no extreme outliers were found as all the cases were found to be generally within the specified residual range of 3.3 to -3.3 (Hair et al., 1998). Graphical plots are attached in Appendix C.

4.3.3 Multicollinearity

Multicollinearity is the extent to which a variable can be explained by the other variables in the analysis. In other words, it refers to the high inter-correlations among the predictor variables. Multicollinearity complicates the interpretation of the results as it becomes difficult to ascertain the effect of any single variable because of their interrelationships. Therefore, it becomes important to ensure that no multicollinearity exists among the predictor variables. There are two most popular ways of testing for multicollinearity in the data: a) Tolerance, and b) Variance Inflation Factor (VIF). VIF can be derived from Tolerance by inversing it. According to Hair et al. (1998), multicollinearity exists among the predictor variables when the value of Tolerance is less than 0.10 and the value for VIF is more than 10.

Tolerance and VIF can be calculated using SPSS® v.20 while performing multiple regression. The values for Tolerance and VIF for all the predictor variables of the study are shown in the table below. As can be seen in Table 4.3, multicollinearity does not seem to be a problem in this study[4] as the value for Tolerance for all the variables is greater than the cut-off point of 0.10 and the value for VIF is far less than 10.

[4] In addition to this procedure, Pearson Correlation Coefficients were obtained to measure the strength of relationships between all the variables of this study. None of the correlation coefficient values exceeded 0.80, thus ruling out any concern of multicolinearity (Pallant, 2007). Table of Pearson Correlation is attached in Appendix C.

Table 4.3: Tolerance and VIF values for predictor and moderating variables

		Collinearity Statistics	
Construct	**Dimension**	**Tolerance**	**VIF**
Organizational Citizenship Behaviours	Altruism	.874	1.145
	Sportsmanship	.782	1.278
	Conscientiousness	.892	1.121
Managerial Ties	Ties with Managers	.835	1.197
	Ties with Research Centers	.613	1.631
	Ties with Govt. Officials	.560	1.787
Organizational Culture	Highly Integrative Culture	.615	1.627
	Hierarchy Culture	.775	1.290
Regimes of Appropriability	Regimes of Appropriability	1	1

Criterion variable: Open Innovation

4.4 Test of Non-response Bias

Non-response bias refers to the mistake one expects to make in estimating a population characteristic based on a sample of survey data in which, due to non-response, certain types of survey respondents are under-represented (Berg, 2010). Non-response to a questionnaire survey can potentially bias the findings of a study because those who do not respond to the questionnaires may differ in some systematic way from those who responded (Boström et al., 1993). It is therefore important to investigate and estimate a possible bias as a result of loss of information due to some people not responding to the questionnaire (Sheikh & Mattingly, 1981).

In this study non-response bias was examined by comparing means of the first and last 40 respondents of this study. To do this, t-test was used for each variable to compare the mean difference between the two groups, that is early and late respondents. The results of the tests, which are shown in Table 4.4 indicate that there were no significant differences between the means for the two groups; hence non-response bias in this study is ruled out.

Table 4.4: T-test results for differences between early and late respondents

Variables	First respondents (N=40)	Last respondents (N=40)	T-statistic	Significance
Organizational Citizenship Behaviours	57.62	56.37	.642	.523
Organizational Culture	94.22	95.12	-.358	.721
Managerial Ties	44.57	43.40	.608	.545
Open Innovation	38.5	38.75	-.202	.841
Regimes of Appropriability	23.15	23.75	-.775	.441

4.5 Test of Common Method Bias

As discussed in Section 3.7.2, method biases lead to problems because they are one of the main sources of measurement error which threaten the validity of conclusions about the relationships between variables being tested (Nunnally, 1978). In this study many efforts were made to reduce common method bias and common method variance (please refer to section 3.7.2). However, it is worthwhile to assess whether common method bias is a problem in this study. Therefore, method bias in this study was assessed using Harman's single factor test that is performed using the exploratory factor analysis (Podsakoff et al., 2003). Harman's single factor test tests if the majority of variance is explained by a single factor.

To conduct this test, EFA is performed on all the items with the number of factors constrained to 1 and the unrotated solution is analyzed. In a study that has significant common method bias, a single factor will account for majority of the variance (usually more than 50%) in the model. In this study, results of the EFA with number of factors constrained to 1 show no signs of a single factor explaining majority of the variance. It is therefore concluded that the data is free from common method bias.

4.6 Scale Purification

Following the procedure suggested by Churchill Jr (1979), the purity of the scales used in this study is assessed using item-total-correlation and Cronbach's alpha. This method has been used in the past to purify the scales (e.g. Husin, 2009). The conventional cut-off point of 0.5 is used and the items with item-total-correlation below this cut-off point are considered weak and thus dropped. In this study, a total of nine items were found to have item-total-correlation below the cut-off point of 0.5. The items are: OC.EmpDev.1, OC.Harmony.1, OC.CustOrient.4, OC.SocRes.1, MT.Man.3, IBOI.3, IBOI.4, OBOI.2, RA4. The item-total-correlation for OC.EmpDev.1 was .507, which is a borderline case and a decision on whether to drop it or not will be taken later after further analysis. The results of scale purification are shown below in Table 4.5. However before dropping the 'offending' items with low item-total-correlation, the decision regarding such items is re-confirmed by conducting an exploratory factor analysis on the predictor variables of this study. This is explained in the next section. In addition, as Table 4.5 shows the Cronbach's alpha for all the sub-scales was well above the satisfactory point of 0.7; thus confirming reliability of the scales (Nunnally, 1978).

Table 4.5: Item-total-correlation and Cronbach's Alpha for all items

Items	Mean	SD	Item-total-Correlation	Cronbach's Alpha
OCB.Alt.1	5.48	.895	.735	.845
OCB.Alt.2	5.33	.826	.633	
OCB.Alt.3	5.51	.949	.688	
OCB.Alt.4	5.34	.891	.672	
OCB.Spo.1	4.48	1.575	.769	.909
OCB.Spo.2	4.39	1.639	.844	
OCB.Spo.3	4.18	1.741	.800	
OCB.Spo.4	4.51	1.636	.768	
OCB.Con.1	5.37	.899	.611	.854
OCB.Con.2	5.30	.877	.748	
OCB.Con.3	5.37	.899	.738	
OCB.Con.4	5.36	.867	.687	
OC.EmpDev.1	4.19	.843	**.507**	.831
OC.EmpDev.2	4.35	.715	.632	
OC.EmpDev.3	4.28	.759	.745	
OC.EmpDev.4	4.20	.814	.705	
OC.EmpDev.5	4.31	.735	.578	
OC.Harmony.1	3.89	1.316	**.411**	.768
OC.Harmony.2	4.35	.728	.628	
OC.Harmony.3	4.31	.773	.681	
OC.Harmony.4	4.33	.712	.576	
OC.Harmony.5	4.33	.751	.609	
OC.CustOrient.1	4.22	.678	.577	.769
OC.CustOrient.2	4.19	.654	.598	
OC.CustOrient.3	4.22	.661	.617	
OC.CustOrient.4	4.28	.792	**.364**	
OC.CustOrient.5	4.23	.657	.589	
OC.SocRes.1	4.11	.814	**.406**	.794
OC.SocRes.2	4.03	.770	.557	
OC.SocRes.3	4.24	.871	.797	
OC.SocRes.4	4.25	.832	.685	
OC.Innov.1	4.29	.730	.658	.849
OC.Innov.2	4.24	.830	.725	
OC.Innov.3	4.35	.780	.746	
OC.Innov.4	4.20	.879	.638	
MT.Man.1	4.94	1.423	.573	.745
MT.Man.2	5.01	1.458	.677	
MT.Man.3	5.13	1.573	**.479**	

Table 4.5: Item-total-correlation and Cronbach's Alpha for all items (continued)

Items	Mean	SD	Item-total-Correlation	Cronbach's Alpha
MT.Res.1	4.73	1.426	.664	.854
MT.Res.2	4.88	1.373	.774	
MT.Res.3	4.85	1.402	.744	
MT.Gov.1	4.88	1.332	.598	.814
MT.Gov.2	4.91	1.394	.704	
MT.Gov.3	5.07	1.392	697	
IBOI.1	4.39	.672	.535	.740
IBOI.2	4.31	.755	.566	
IBOI.3	4.02	.686	**.259**	
IBOI.4	3.92	1.26	**.348**	
IBOI.5	4.19	.774	.689	
IBOI.6	4.17	.781	.652	
OBOI.1	4.35	.768	.639	.786
OBOI.2	4.04	.813	**.398**	
OBOI.3	4.10	.920	.690	
OBOI.4	4.05	.935	.670	
RA1	4.27	.891	.697	.814
RA2	4.12	.968	.710	
RA3	4.17	.943	.693	
RA4	3.70	.879	**.207**	
RA5	4.27	.851	.632	
RA6	4.13	.874	.557	

4.7 Exploratory Factor Analysis

Exploratory Factor Analysis (EFA) was conducted using Principal Component Analysis as the extraction method and Varimax with Kaiser Normalization as the rotation method to gain a better understanding of the underlying structure of the data (Pitt & Jeantrout, 1994) and to examine factor loadings of all the items measuring the constructs. Appropriateness of conducting EFA on the data of this study was determined by examining the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and the Bartlett's Test of Sphericity. This is in line with the plan laid out in Section 3.8.2 of the previous chapter. Both these tests indicate suitability of performing factor analysis on

all the constructs of this study. Table 4.6 shows the results of Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and the Bartlett's Test of Sphericity for the variables of this study: three predictor variables, one moderating variable and one criterion variable. The results of EFA are explained in the sub-sections below.

Table 4.6: KMO and Bartlett's Test for OCB, OC, MT, RA and OI

		OCB, OC & MT	**RA**	**OI**
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.880	.783	.789
Bartlett's Test of Sphericity	Approx. Chi-Square	8336.742	833.58	1060.42
	df	946	15	45
	Sig.	.000	.000	.000

4.7.1 EFA of predictor variables

Exploratory factor analysis is conducted on all the predictor variables of this study. The results presented in Table 4.7 below show that with an Eigen value of more than 1, eleven factors emerge for the predictor variables. The variance explained by these eleven factors (in the order they appear in Table 4.7 below) is as follows: 11.16%, 3.838%, 2.878, 2.509%, 2.048%, 1.834%, 1.557%, 1.437%, 1.236%, 1.112% and 1.065%. In total, the eleven factors explain 69.73% of the total variance extracted.

The 12 items measuring Organizational Citizenship Behaviours formed three factors. This factor structure is consistent with many past studies and the theoretical prediction of this study. None of the 12 items was dropped because factor loadings for all the items were above the threshold of 0.5 (Hair et al., 1998). In addition, for Organizational Citizenship Behaviours, the factor labels proposed by Podsakoff and Philip (1990) suited the extracted factors in this study and were thus retained.

The 23 items measuring Organizational Culture formed 5 factors. These five factors are consistent with the seminal study of Tsui et al. (2006) who also found five factors of Organizational Culture in the Chinese context. Thus the factor labels as proposed by Tsui, Wang, and Xin (2006) suited the extracted factors in this study and were retained. However, a total of four items were eliminated because they did not contribute to a simple factor structure and failed to meet the minimum criterion of having factor loading of 0.5 or above (Hair et al., 1998). The four items are: "My organization shows concern for individual development" (OC.EmpDev.1), "My organization Emphasizes team building" (OC.Harmony.1), "For my organization, customer is number 1" (OC.CustOrient.4) and "My organization shows social responsibility" (OC.SocRes.1). These 'offending' items were not used in further analysis.

The 9 items that measured Managerial Ties formed 3 factors. These three factors are consistent with the theoretical prediction of this study and thus the labels of past studies for these factors are retained. However one item, "Ties with managers at competitor firms" (MT.Man.3) was found to have a low factor loading of .460 which is below the threshold of 0.5 (Hair et al., 1998). This 'offending' item was thus eliminated and not used in further data analysis.

Table 4.7: EFA of predictor variables

Items	Factors										
	1	2	3	4	5	6	7	8	9	10	11
OCB.Alt.1						.836					
OCB.Alt.2						.795					
OCB.Alt.3						.808					
OCB.Alt.4						.806					
OCB.Spo.1	.833										
OCB.Spo.2	.872										
OCB.Spo.3	.873										
OCB.Spo.4	.841										
OCB.Con.1					.764						
OCB.Con.2					.852						
OCB.Con.3					.856						
OCB.Con.4					.812						
MT.Man.1										.822	
MT.Man.2										.829	
MT.Man.3										**.460**	
MT.Res.1		.784									
MT.Res.2		.832									
MT.Res.3		.823									
MT.Gov.1											.797
MT.Gov.2											.555
MT.Gov.3											.621
OC.EmpDev.1								**.355**			
OC.EmpDev.2								.572			
OC.EmpDev.3								.711			
OC.EmpDev.4								.738			
OC.EmpDev.5								.721			
OC.Harmony.1				**.437**							
OC.Harmony.2				.717							
OC.Harmony.3				.665							
OC.Harmony.4				.703							
OC.Harmony.5				.542							
OC.CustOrient.1							.693				
OC.CustOrient.2							.777				
OC.CustOrient.3							.759				
OC.CustOrient.4							**.357**				
OC.CustOrient.5							.646				
OC.SocRes.1									**.490**		
OC.SocRes.2									.759		
OC.SocRes.3									.835		
OC.SocRes.4									.701		
OC.Innov.1			.665								
OC.Innov.2			.793								
OC.Innov.3			.838								
OC.Innov.4			.725								
% of variance	11.165	3.838	2.878	2.509	2.048	1.834	1.557	1.437	1.236	1.112	1.065
Eigen value	8.002	7.673	7.433	6.938	6.412	6.357	6.257	6.174	5.798	4.541	4.141
Total variance extracted by 11 factors = 69.73%.											

4.7.2 EFA of Regimes of Appropriability (moderating variable)

Regimes of Appropriability is the moderating variable in this study. Exploratory factor analysis is conducted on this moderating variable. The factor loading matrix presented in Table 4.8 below shows that with Eigen value of more than 1, one factor emerges. This single factor explains 54.24% of the variance. However one item, "In your industry, to what extent is being first to market (lead time) effective in protecting product and process innovations?" was found to have low factor loading of 0.294 which was below the threshold of 0.5 (Hair et al., 1998). This item was thus discarded and not used in further data analysis.

Table 4.8: EFA of Regimes of Appropriability

Items	Communalities	Factor
	Extraction	1
RA1	.683	.826
RA2	.714	.845
RA3	.658	.811
RA4	**.086**	**.294**
RA5	.609	.780
RA6	.504	.710
% of variance		54.24
Eigen value		3.254

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Factor loadings < .3 are suppressed.

4.7.3 EFA of Open Innovation

Exploratory factor analysis was conducted on the criterion variable of this study, Open Innovation. The factor loading matrix is presented in Table 4.9 which shows that with an Eigen value of more than 1, two factors emerge for Open Innovation. The first factor explains 29.35% of the variance while the second factor explains 24.69% of the variance. In total, these two factors explain 57.62% of the variance. These two factors

are consistent with the theoretical prediction of this study. In addition, the two factors are also consistent with past studies on Open Innovation which highlight two dimensions of Open Innovation: In-bound Open Innovation and Out-bound Open Innovation. Hence the labels for these two factors from past studies, In-bound and Out-bound, are retained in this study. However, a total of three items were eliminated because they did not contribute to a single factor structure and had factor loadings of below 0.5 (Hair et al., 1998). Two of these items were from the In-bound dimension while one was from the Out-bound dimension of Open Innovation. The three items are: "My organization believes it is good to use external sources (e. g., research groups, universities, suppliers, customers, competitors, etc.) to complement our own R&D" [IBOI.3], "My organization often brings in externally developed knowledge and technology to use in conjunction with our own R&D" [IBOI.4] and "In my organization, external technology commercialization is restricted to technologies that are not used internally" [OBOI.2]. These three 'offending' items were eliminated and not used in further data analysis.

Table 4.9: EFA of Open Innovation

Items	Communalities	Factors	
	Extraction	1	2
IBOI.1	.506	.703	
IBOI.2	.584	.762	
IBOI.3	**.160**	**.400**	
IBOI.4	**.248**	**.498**	
IBOI.5	.738	.858	
IBOI.6	.688	.828	
OBOI.1	.673		.810
OBOI.2	**.367**		.601
OBOI.3	.727		.851
OBOI.4	.713		.841
% of variance		29.348	24.691
Eigen value		3.132	2.272
Total variance extracted by 2 factors = 57.62 %			

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Factor loadings < .3 are suppressed

4.8 EFA post removal of 'offending' items

Exploratory factor analysis conducted on all the variables of this study confirmed the results of scale purification conducted earlier in Section 4.6 in which nine items were identified as 'offending' item. The exploratory factor analysis confirmed that four items from Organizational Culture construct, one item from Managerial Ties construct, three items from Open Innovation construct and one item from Regimes of Appropriability construct had unacceptable factor loadings. Therefore a decision is made not to use these nine 'offending' items in further analysis[5].

Based on the results of scale purification and exploratory factor analyses above, the number of items has been reduced in the Organizational Culture construct, Managerial Ties construct, Open Innovation construct and Regimes of Appropriability construct. This is expected to affect reliability of the scale and therefore exploratory factor

[5] In addition, one item (OC.EmpDev.1) from Employee Development dimension of Organizational Culture that had borderline item-total-correlation was found to have low factor loading (.355) in exploratory factor analysis. This item is thus dropped from further analysis.

analysis and reliability tests need to be performed again. The results of the factor analysis tests and reliability tests for all the variables are presented in the sections below.

However, before Exploratory Factor Analysis (EFA) tests are conducted using Principal Component Analysis as the extraction method and Varimax with Kaiser Normalization as the rotation method, appropriateness of conducting EFA on the data of this study with reduced number of items is determined by examining the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and the Bartlett's Test of Sphericity. Table 4.10 shows the results of Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and the Bartlett's Test of Sphericity for the variables of this study. The results indicate suitability of conducting an exploratory factor analysis of the data with reduced items.

Table 4.10: KMO and Bartlett's Test for OCB, OC and MT.

		OCB, OC & MT	**RA**	**OI**
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		867	.783	.789
Bartlett's Test of Sphericity	Approx. Chi-Square	7365.251	833.58	1060.42
	df	741	15	45
	Sig.	.000	.000	.000

4.8.1 EFA of predictor variables

Exploratory factor analysis was conducted on the predictor variables of this study after removing the 'offending' items identified in the first EFA. The new factor loading matrix is shown in Table 4.11 below. The table shows that all the items have acceptable factor loadings. The table further shows that with an Eigen value of more than 1 and consistent with the theoretical prediction, eleven factors emerged. The variance explained by these eleven factors (in the order they appear in Table 4.11 below) is as follows: 3.806 %, 2.432%, , 1.807%, 1.348%, 1.052%, 8.855%, 7.217%, 6.792%,

6.665%, 5.957% and 4.439%. In total, the eleven factors explain 73.21% of the total variance extracted.

Three factors were obtained for Organizational Citizenship Behaviours, five for Organizational Culture and three for Managerial Ties. It is evident that all the items have acceptable factor loadings. In addition, internal consistency for each scale was examined using Cronbach's alpha; and as the table below shows, some improvements in reliability of the scales were also achieved.

Table 4.11: EFA of the predictor variables

Items	Factors											Item-total-correlation	Improvement in Cronbach's Alpha
	1	2	3	4	5	6	7	8	9	10	11		
OCB.Alt.1				.836								.735	No change.
OCB.Alt.2				.793								.633	
OCB.Alt.3				.809								.688	
OCB.Alt.4				.809								.672	
OCB.Spo.1	.831											.769	No change.
OCB.Spo.2	.878											.844	
OCB.Spo.3	.873											.800	
OCB.Spo.4	.845											.768	
OCB.Con.1			.764									.611	No change.
OCB.Con.2			.851									.748	
OCB.Con.3			.856									.738	
OCB.Con.4			.813									.687	
MT.Man.1											.859	.632	.029
MT.Man.2											.856	.632	
MT.Res.1							.832					.664	No change.
MT.Res.2							.837					.774	
MT.Res.3							.798					.744	
MT.Gov.1										.805		.598	No change.
MT.Gov.2										.642		.704	
MT.Gov.3										.694		.697	
OC.EmpDev.2								.569				.623	.004
OC.EmpDev.3								.725				.761	
OC.EmpDev.4								.753				.710	
OC.EmpDev.5								.739				.576	
OC.Harmony.2					.766							.684	.063
OC.Harmony.3					.672							.704	
OC.Harmony.4					.745							.630	
OC.Harmony.5					.474							.621	
OC.CustOrient.1						.697						.583	.027
OC.CustOrient.2						.807						.666	
OC.CustOrient.3						.771						.618	
OC.CustOrient.5						.650						.564	
OC.SocRes.2									.777			.546	.041
OC.SocRes.3									.860			.834	
OC.SocRes.4									.743			.730	
OC.Innov.1		.673										.658	No change.
OC.Innov.2		.802										.725	
OC.Innov.3		.855										.746	
OC.Innov.4		.731										.638	
% of variance	3.806	2.432	1.807	1.348	1.052	8.855	7.217	6.792	6.665	5.957	4.439		
Eigen value	9.798	3.806	2.651	2.432	1.993	1.807	1.488	1.348	1.146	1.052	1.030		
Total variance extracted by 11 factors = 73.21%.													

4.8.2 EFA of Regimes of Appropriability (moderating variable)

Exploratory factor analysis was conducted after removing the one 'offending' item of Regimes of Appropriability identified in the first EFA. Table 4.12 below shows the new factor loading matrix. It can be seen that all the items have acceptable factor loadings. With an Eigen value of more than 1, one factor emerged explaining 63.86% variance. As a result of deleting the 'offending' item, an improvement in internal consistency was also noticed with Cronbach's Alpha improving by .044.

Table 4.12: EFA of Regimes of Appropriability

Items	Communalities	Factor	Item-total-correlation	Improvement in Cronbach's Alpha
	Extraction	1		
RA1	.683	.827	.704	.044
RA2	.727	.853	.747	
RA3	.653	.808	.690	
RA5	.617	.786	.652	
RA6	.512	.716	.578	
% of variance		63.86		
Eigen value		3.193		
Total variance extracted by 1 factor = 63.86 %				

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Factor loadings < .3 are suppressed.

4.8.3 EFA of Open Innovation

Exploratory factor analysis was conducted after removing the three 'offending' items of Open Innovation identified in the first EFA. Table 4.13 below shows the new factor loading matrix. It can be seen that all the items have acceptable factor loadings. With an Eigen value of more than 1, two factors emerged explaining total of 69.42% variance. The first factor explained 37.60% variance while the second factor explained 31.82% variance. As a result of deleting the three 'offending' items, an improvement in internal consistency, measured using Cronbach's Alpha was also noticed.

Table 4.13: EFA of Open Innovation

Items	Communalities	Factors		Item-total-correlation	Improvement in Cronbach's Alpha
	Extraction	1	2		
IBOI.1	.520	.714		.543	.086
IBOI.2	.619	.784		.621	
IBOI.5	.770	.876		.746	
IBOI.6	.726	.851		.705	
OBOI.1	.726		.846	.667	.036
OBOI.3	.747		.863	.686	
OBOI.4	.753		.865	.694	
% of variance		37.60	31.82		
Eigen value		2.874	1.985		
Total variance extracted by 2 factors = 69.42 %					

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Factor loadings < .3 are suppressed.

In summary, after purifying the scales, all the items measuring all constructs have acceptable loadings of more than .5 and Cronbach's Alpha for all the scales is above the threshold of .70. The factors extracted were in line with the theoretical predictions. The results of the factor analyses and reliability statistics suggest unidimensionality of the constructs, which consequently can be used in further analyses (Lu, Lai, & Cheng, 2007).

4.9 Scale reliability sans 'offending' items

As mentioned above, nine items were discarded in total from all the constructs leading to changes in the item-total-correlation and reliability of the scales. Table 4.14 below presents the item-total-correlation of all the items and the final Cronbach's Alphas for all the scales. As is evident, item-total-correlation for all the items are greater than 0.5 while Cronbach's Alphas for all the scales are well above the threshold of 0.7, indicating reliability of all the scales as suggested by (Hair et al., 1998).

Table 4.14: Reliability statistics

Items	Mean	SD	Item-Total-Correlation	Cronbach's Alpha
OCB.Alt.1	5.48	.895	.735	.845
OCB.Alt.2	5.33	.826	.633	
OCB.Alt.3	5.51	.949	.688	
OCB.Alt.4	5.34	.891	.672	
OCB.Spo.1	4.48	1.575	.769	.909
OCB.Spo.2	4.39	1.639	.844	
OCB.Spo.3	4.18	1.741	.800	
OCB.Spo.4	4.51	1.636	.768	
OCB.Con.1	5.37	.899	.611	.854
OCB.Con.2	5.30	.877	.748	
OCB.Con.3	5.37	.899	.738	
OCB.Con.4	5.36	.867	.687	
OC.EmpDev.2	4.35	.715	.620	.834
OC.EmpDev.3	4.28	.759	.752	
OC.EmpDev.4	4.20	.814	.708	
OC.EmpDev.5	4.31	.735	.585	
OC.Harmony.2	4.35	.728	.684	.831
OC.Harmony.3	4.31	.773	.704	
OC.Harmony.4	4.33	.712	.630	
OC.Harmony.5	4.33	.751	.621	
OC.CustOrient.1	4.22	.678	.583	.796
OC.CustOrient.2	4.19	.654	.666	
OC.CustOrient.3	4.22	.661	.618	
OC.CustOrient.5	4.23	.657	.564	
OC.SocRes.2	4.03	.770	.546	.835
OC.SocRes.3	4.24	.871	.834	
OC.SocRes.4	4.25	.832	.730	
OC.Innov.1	4.29	.730	.658	.849
OC.Innov.2	4.24	.830	.725	
OC.Innov.3	4.35	.780	.746	
OC.Innov.4	4.20	.879	.638	
MT.Man.1	4.94	1.423	.632	.774
MT.Man.2	5.01	1.458	.632	
MT.Res.1	4.73	1.426	.664	.854
MT.Res.2	4.88	1.373	.774	
MT.Res.3	4.85	1.402	.744	
MT.Gov.1	4.88	1.332	.598	.814
MT.Gov.2	4.80	1.394	.704	
MT.Gov.3	5.07	1.392	.697	

Table 4.14: Reliability statistics (continued)

Items	Mean	SD	Item-Total-Correlation	Cronbach's Alpha
IBOI.1	4.39	.672	.543	.826
IBOI.2	4.31	.755	.621	
IBOI.5	4.19	.774	.746	
IBOI.6	4.17	.781	.705	
OBOI.1	4.35	.768	.667	.822
OBOI.3	4.10	.920	.686	
OBOI.4	4.05	.935	.694	
RA1	4.27	.891	.704	.858
RA2	4.12	.968	.747	
RA3	4.17	.943	.690	
RA5	4.27	.851	.652	
RA6	4.13	.874	.578	

4.10 Confirmatory Factor Analysis

As planned in section 3.7.2.2 of the previous chapter, confirmatory factor analysis is conducted with the aim to evaluate and validate the measurement model used in this study (Byrne, 2001, p. 164). The measurement model is the link between factors and their measured variables and thus defines relations between the observed and the unobserved variables (Byrne, 2001, pp. 6, 12). There are two ways of evaluating validity of the measurement model: one, testing each construct separately, that is having only one construct in the measurement model; two, testing all the constructs together at a time in one measurement model (Cheng, 2001). While researchers (e.g. Woo, Trail, Kwon, & Anderson, 2009) have preferred testing all constructs at once to testing each construct separately as the former allows taking into account the relationships between the items of different constructs - in this study, the researcher takes a more rigorous approach by choosing both the methods.

In the EFA, the factor structure is explored while in the CFA the factor structure extracted in the EFA is confirmed. Thus, guided by the results of the exploratory factor analysis (EFA), in Approach I, one measurement model each was specified for all the

constructs of the study: that is, three predictor variables, one moderating variable and one criterion variable. In Approach II, all the constructs are assessed in a single measurement model. As mentioned in section 3.8.2 in the previous chapter and consistent with Hair et al. (2010, p. 644) who suggested using at least three to four fit indices to evaluate model fit, this study used χ^2 values and degrees of freedom, the CFI and the RMSEA to evaluate the measurement models. Only these indices are used because Hair et al. (2010, p. 644) suggest against reporting all the goodness-of-fit indices in view of redundancy and recommend reporting at least one incremental index and one absolute index in addition to Chi-square statistic (χ2) and associated degrees of freedom.

Approach I: Assessing Individual Measurement Models

The summary details of the five measurement models for the five constructs and their corresponding model fit indices are shown below in Table 4.15. For complete visual representations of all the five measurement models and additional statistical outputs, please refer to Appendix C.

As can be seen in the table, the initial model fits for all the constructs except Organizational Citizenship Behaviours were not reasonable. The table shows the initial model fits for all constructs (taking into consideration all the items representing those constructs). Therefore based on the modification index provided by AMOS™, certain model modifications with respect to all the constructs with poor fit were made. The items in the table below with asterisks against them were dropped from the final model due to unacceptable factor loadings. The last column in Table 4.15 shows the final model fits for all the constructs after the 'offending' items were dropped.

The initial model fit index for Organizational Culture showed unreasonable fit: CMIN/DF = 2.910; CFI = .888; RMSEA = .075. Therefore the model was modified and four items namely OC.EmpDev.1, OC.Harmony.1, OC.CustOrient.4 and OC.SocRes.1 were dropped. From the dimension *Employee development*, one item OC.EmpDev.1 (My organization provides training in knowledge and skills) was dropped because the concept of this item was covered in the item OC.EmpDev.2 (My organization shows concern for individual development) and OC.EmpDev.5 (My organization develops employees' potentials). The concept of an item dropped from the dimension *Harmony*, OC.Harmony.1 (My organization emphasizes team building), was covered in OC.Harmony.2 (My organization supports cooperative spirit) and OC.Harmony.3 (My organization promotes feeling/sharing among employees). Another item dropped was from the dimension *Customer Orientation*, OC.CustOrient.4 (For my organization, customer is number 1). This item was conceptually covered in item OC.CustOrient.1 (My organization satisfies need of customers on largest scale) and item OC.CustOrient.2 (My organization strongly emphasizes profit of customer. The fourth item dropped from Organizational Culture construct was OC.SocRes.1 (My organization shows social responsibility) from *Social Responsibility* dimension. Conceptually, this item was also adequately covered by item OC.SocRes.2 (My organization's mission is to serve society). After removing these items from the measurement model for Organizational Culture, the new model fitted the data better: CMIN/DF = 2.571; CFI = .931; RMSEA =.068.

In addition, the initial model fit index for Managerial Ties showed unreasonable fit: CMIN/DF = 8.568, CFI = .879, RMSEA =.150. Therefore this measurement model was also modified and one item namely MT.Manager.1 was dropped. This item was dropped from the *Ties with Managers* dimension. This item, MT.Manager.1 (Ties with managers at supplier firms) could be partially considered to be covered by the item MT.Manager.2

(Ties with managers at buyer firms) and item MT.Manager.3 (Ties with managers at competitor firms). After removing this item from the measurement model for Managerial Ties, the new model fitted the data better: CMIN/DF = 3.678; CFI = .967; RMSEA =.089.

Further, the initial model fit index for the moderating variable, Regimes of Appropriability showed unreasonable fit: CMIN/DF = 12.970; CFI = .870; RMSEA =.188. Therefore this measurement model too was modified and one item namely RA.4 (In your industry, to what extent is being first to market (lead time) effective in protecting product and process innovations?) was dropped. After removing this item from the measurement model for Regimes of Appropriability, the new model fitted the data much better: CMIN/DF = 1.449; CFI = .999; RMSEA =.036.

Lastly, the initial model fit index for the criterion variable of this study, Open Innovation showed quite reasonable fit: CMIN/DF = 1.262; CFI = .991; RMSEA =.028. However, three (3) items from this construct were dropped as retaining these 3 items caused convergent and discriminant validity issues (as explained later in sub-section 4.10.1). These 3 items are: IBOI.3 (My organization believes it is good to use external sources [e. g., research groups, universities, suppliers, customers, competitors, etc.] to complement our own R&D); IBOI.4 (My organization often brings in externally developed knowledge and technology to use in conjunction with our own R&D); and OBOI.2 (In my organization, external technology commercialization is restricted to technologies that are not used internally). After removing these 3 items, the measurement model fit was still acceptable: CMIN/DF = 1.550; CFI = .992; RMSEA =.040.

Table 4.15: Model fit indices

Construct	Dimension	Items	Initial Model Fit	Final Model Fit
Organizational Culture	Employee Development	OC.EmpDev.1*****	CMIN/DF = 2.910 CFI = .888 RMSEA = .075	CMIN/DF = 2.571 CFI = .931 RMSEA =.068
		OC.EmpDev.2		
		OC.EmpDev.3		
		OC.EmpDev.4		
		OC.EmpDev.5		
	Harmony	OC.Harmony.1*****		
		OC.Harmony.2		
		OC.Harmony.3		
		OC.Harmony.4		
		OC.Harmony.5		
	Customer Orientation	OC.CustOrient.1		
		OC.CustOrient.2		
		OC.CustOrient.3		
		OC.CustOrient.4*****		
		OC.CustOrient.5		
	Social Responsibility	OC.SocRes.1*****		
		OC.SocRes.2		
		OC.SocRes.3		
		OC.SocRes.4		
	Innovation	OC.Innov.1		
		OC.Innov.2		
		OC.Innov.3		
		OC.Innov.4		
Organizational Citizenship Behaviours	Altruism	OCB.Altruism.1	CMIN/DF = 1.878 CFI = .979 RMSEA =.051	Unchanged
		OCB.Altruism.2		
		OCB.Altruism.3		
		OCB.Altruism.4		
	Sportsmanship	OCB.Sports.1		
		OCB.Sports.2		
		OCB.Sports.3		
		OCB.Sports.4		
	Contentiousness	OCB.Consent.1		
		OCB. Consent.2		
		OCB. Consent.3		
		OCB. Consent.4		

Table 4.15: Model fit indices (continued)

Construct	Dimension	Items	Initial Model Fit	Final Model Fit
Managerial Ties	Ties with Managers	MT.Manager.1*****	CMIN/DF = 8.568 CFI = .879 RMSEA =.150	CMIN/DF = 3.678 CFI = .967 RMSEA =.089
		MT.Manager.2		
		MT.Manager.3		
	Ties with Researchers	MT.Researcher.1		
		MT.Researcher.2		
		MT.Researcher.3		
	Ties with Govt. Officials	MT.Govt.1		
		MT.Govt.2		
		MT.Govt.3		
Regimes of Appropriability	Regimes of Appropriability	RA.1	CMIN/DF = 12.970 CFI = .870 RMSEA =.188	CMIN/DF = 1.449 CFI = .999 RMSEA =.036
		RA.2		
		RA.3		
		RA.4*****		
		RA.5		
		RA.6		
Open Innovation	In-bound Open Innovation	IBOI.1	CMIN/DF = 1.262 CFI = .991 RMSEA =.028	CMIN/DF = 1.550 CFI = .992 RMSEA =.040
		IBOI.2		
		IBOI.3*****		
		IBOI.4*****		
		IBOI.5		
		IBOI.6		
	Out-bound Open Innovation	OBOI.1		
		OBOI.2*****		
		OBOI.3		
		OBOI.4		

Indicates the items deleted from the final model

Approach II: Assessing the Measurement Model with all Variables

As mentioned before some researchers such as Woo et al. (2009) have suggested testing all constructs at once as this approach allows taking into account the relationships between the items of different constructs. Consequently, all the five constructs of this study including three predictor variables, one moderating variable, and one criterion variable were evaluated in one measurement model. The summary details of this measurement model for all the five constructs put together and the model fit indices are

shown below in Table 4.16. In addition, the visual representations of the initial and the final measurement models are provided in Appendix C.

As can be seen in Table 4.16 below, the initial model fit for the measurement model was not reasonable: CMIN/DF = 1.882; CFI = .867; RMSEA = .05. Therefore, the 'offending' items identified in the individual assessment of the measurement models (which, quite logically, were the same as those identified in Scale Purification in Section 4.6 and EFA in Section 4.7) were eliminated and the measurement model was re-assessed. This final measurement model, as per Hair et al. (2010) fitted the data acceptably: CMIN/DF = 1.764; CFI = .909; RMSEA = .048

Table 4.16: Initial and final model fit of the measurement model

Construct	Items	Initial Model Fit	Final Model Fit
All Constructs	All Items	CMIN/DF = 1.882 CFI = .867 RMSEA = .051	CMIN/DF = 1.764 CFI = .909 RMSEA = .048

4.10.1 Construct Validity

According to Hair et al. (2010, p. 124), validity is the extent to which measures of a construct accurately represent the construct. After the researcher ensures that the scale conforms to its conceptual definition, is uni-dimensional and has appropriate levels of reliability, validity is the last assessment that needs to be made. Two of the most widely accepted forms of validity are discriminant and convergent validity. Byrne (2001, p. 275) states that for proper inferences to be drawn based on the data, the data needs to exhibit evidence of discriminant and convergent validity. Although Schumacker and Lomax (1996) state that validating the measurement model is enough to address any issue of convergent validity and discriminant validity, in this study these aspects of construct validity are further analyzed as follows.

4.10.1.1 Discriminant Validity

Hair et al. (2010, p. 124) define discriminant validity as the "*degree to which two conceptually similar concepts are distinct*" while, based on the work of Campbell and Fiske (1959), Byrne (2001, p. 275) states that discriminant validity is the "*extent to which independent assessment methods diverge in their measurement of different trials*". In simple words, in the presence of discriminant validity issues, the variables of a study correlate more highly with variables outside their parent factor than with the variables within their parent factor, as a result of which, the latent factors are better explained by some other variables than by its own observed variables[6].

Discriminant validity can be assessed with the help of AMOS™ and a Microsoft® Excel™ Macro. To assess discriminant validity, Maximum Shared Squared Variance (MSV), Average Shared Squared Variance (ASV) and Average Variance Extracted (AVE) are calculated. According to Hair et al. (2010), for discriminant validity to be present:

1. Maximum Shared Squared Variance (MSV) should be less than Average Variance Extracted (AVE), that is MSV < AVE, and
2. Average Shared Squared Variance (ASV) should also be less than Average Variance Extracted (AVE), that is ASV < AVE.

In this study, a macro developed by *kolobkreations.com* was used to calculate MSV, ASV and AVE. This Microsoft® Excel™ macro calculates these statistics based on standardized regression weights and correlation tables of the measurement model as obtained in AMOS™. The macro can be had from: *http://statwiki.kolobkreations.com/*. The results obtained after using this macro are displayed below in Table 4.17.

[6] Pre-digested explanation from *kolobkreations.com*

Table 4.17: Discriminant validity test

	Dimensions	AVE	MSV	ASV
1.	Employee Development	0.572	0.524	0.229
2.	Harmony	0.554	0.540	0.264
3.	Customer Orientation	0.499	0.389	0.180
4.	Social Responsibility	0.665	0.329	0.162
5.	Innovation	0.596	0.520	0.195
6.	Ties with Managers	0.595	0.457	0.176
7.	Ties with Researchers	0.668	0.468	0.179
8.	Ties with Govt. Officials	0.597	0.468	0.222
9.	Sportsmanship	0.717	0.244	0.119
10.	Conscientiousness	0.600	0.125	0.023
11.	Altruism	0.579	0.125	0.025
12.	Regimes of Appropriability	0.551	0.483	0.259
13.	In-bound Open Innovation	0.560	0.540	0.302
14.	Out-bound Open Innovation	0.612	0.129	0.050

AVE: *Average Variance Extracted*
MSV: *Maximum Shared Squared Variance*
ASV: *Average Shared Squared Variance*

As can be seen in Table 4.17 above, Maximum Shared Squared Variance (MSV) and Average Shared Squared Variance (ASV) for all the dimensions of the constructs of this study is less than Average Variance Extracted (AVE). Hence this provides enough evidence that all the 14 dimensions (forming 5 constructs) used in this study are distinct and thus discriminant validity is established.

4.10.1.2 Convergent Validity

Convergent validity assesses the "*degree to which two measures of the same concept are correlated*" (Hair et al., 2010, p. 124). It is also interpreted as the extent to which different assessment methods concur in their measurement of the same traits (Byrne, 2001, p. 275). In simple words, in the absence of convergent validity, variables do not

correlate well with each other within their parent factor, and hence the latent factor is not well explained by its observed variables[7].

Convergent validity of the constructs of this study can be assessed with the help of AMOS™ and Microsoft® Excel™ macro that was used to assess discriminant validity as well. To assess convergent validity, Composite Reliability (CR) and Average Variance Extracted (AVE) are calculated. According to Hair et al. (2010), for convergent validity to be present:

1. Composite Reliability (CR) should be greater than Average Variance Extracted (AVE), that is CR > AVE, and
2. Average Variance Extracted (AVE) should be greater than 0.5, that is AVE > 0.5.

In this study, as mentioned above, the macro developed by *kolobkreations.com* was used to calculate CR and AVE. This Microsoft® Excel™ macro calculates these statistics based on standardized regression weights and correlation tables of the measurement model as obtained in AMOS™. The results obtained after using this macro are displayed below in Table 4.18.

[7] Pre-digested explanation from *kolobkreations.com*

Table 4.18: Convergent validity test

	Dimensions	CR	AVE
1.	Employee Development	0.840	0.572
2.	Harmony	0.832	0.554
3.	Customer Orientation	0.799	0.499
4.	Social Responsibility	0.851	0.665
5.	Innovation	0.855	0.596
6.	Ties with Managers	0.729	0.595
7.	Ties with Researchers	0.857	0.668
8.	Ties with Govt. Officials	0.814	0.597
9.	Sportsmanship	0.910	0.717
10.	Conscientiousness	0.855	0.600
11.	Altruism	0.846	0.579
12.	Regimes of Appropriability	0.859	0.551
13.	In-bound Open Innovation	0.835	0.560
14.	Out-bound Open Innovation	0.826	0.612

CR: *Composite Reliability*
AVE: *Average Variance Extracted*

As can be seen in Table 4.18 above, the Composite Reliability (CR) for all the dimensions of the constructs of this study is greater than Average Variance Extracted (AVE). Besides, the AVE for all the dimensions, except *Customer Orientation*, is greater than 0.5. In the case of *Customer Orientation*, AVE is 0.499 which is a borderline case and can be considered acceptable. Hence there is enough evidence that all the 14 dimensions (forming 5 constructs) used in this study exhibit convergent validity.

In addition to this, the Composite Reliability (CR) of all the dimensions in the measurement model is greater than 0.7 while factor loadings of all the items are above the cutoff point of 0.5. This provides enough evidence of unidimensionality of the

constructs of interest and reliability of the measures used in this study (Hair et al., 2010).

In summary, CFA results in combination with construct validity tests provide a better understanding of the quality of the measures being used (Hair et al., 2010). In this study CFA assessed the measurement model by examining the unidimensionality, reliability and validity of the constructs including convergent validity (correspondence or convergence between similar constructs) and discriminant validity (discrimination between dissimilar constructs) (Garver & Mentzer, 1999). The results of the CFA offered evidence for discriminant and convergent validity of the latent variables and also indicated that the measurement model of this study fits the data quite well and the findings of this study can thus be considered valid and generalizable. Table 4.19 below summarizes the statistics with regard to validity, reliability and uni-dimensionality of the constructs of this study.

Table 4.19: Discriminant validity, convergent validity and reliability of measures

Construct	Dimensions	Items	Factor Loading	CR	AVE	ASV	MSV	Sqr AVE
Organizational Culture	Employee Development	OC.EmpDev.2	.72	.840	.572	.229	.524	.756
		OC.EmpDev.3	.87					
		OC.EmpDev.4	.80					
		OC.EmpDev.5	.61					
	Harmony	OC.Harmony.2	.75	.832	.554	.264	.540	.744
		OC.Harmony.3	.78					
		OC.Harmony.4	.70					
		OC.Harmony.5	.74					
	Customer Orientation	OC.CustOrient.1	.68	.799	.50	.180	.389	.706
		OC.CustOrient.2	.76					
		OC.CustOrient.3	.68					
		OC.CustOrient.5	.70					
	Social Responsibility	OC.SocRes.2	.58	.851	.665	.162	.329	.815
		OC.SocRes.3	.93					
		OC.SocRes.4	.89					
	Innovation	OC.Innov.1	.74	.855	.596	.195	.520	.772
		OC.Innov.2	.82					
		OC.Innov.3	.80					
		OC.Innov.4	.71					
Organizational Citizenship Behaviours	Altruism	OCB.Altruism.1	.82	.846	.579	.025	.125	.761
		OCB.Altruism.2	.70					
		OCB.Altruism.3	.78					
		OCB.Altruism.4	.74					
	Sportsmanship	OCB.Sports.1	.82	.910	.717	.119	.244	.847
		OCB.Sports.2	.91					
		OCB.Sports.3	.85					
		OCB.Sports.4	.80					
	Contentiousness	OCB.Consent.1	.63	.855	.600	.023	.125	.774
		OCB. Consent.2	.86					
		OCB. Consent.3	.85					
		OCB. Consent.4	.73					
Managerial Ties	Ties with Managers	MT.Manager.2	.52	.729	.597	.176	.457	.771
		MT.Manager.3	.92					
	Ties with Researchers	MT.Researcher.1	.70	.857	.668	.179	.468	.817
		MT.Researcher.2	.87					
		MT.Researcher.3	.87					
	Ties with Govt. Officials	MT.Govt.1	.63	.814	.597	.222	.468	.773
		MT.Govt.2	.85					
		MT.Govt.3	.82					

Table 4.19: Discriminant validity, convergent validity and reliability of measures (continued)

Construct	Dimensions	Items	Factor Loading	CR	AVE	ASV	MSV	Sqr AVE
Regimes of Appropriability	Regimes of Appropriability	RA.1	.81	.859	.551	.259	.483	.742
		RA.2	.80					
		RA.3	.72					
		RA.5	.62					
		RA.6	.75					
Open Innovation	In-bound Open Innovation	IBOI.1	.66	.835	.560	.302	.540	.748
		IBOI.2	.71					
		IBOI.5	.82					
		IBOI.6	.79					
	Out-bound Open Innovation	OBOI.1	.76	.826	.612	.050	.129	.783
		OBOI.3	.80					
		OBOI.4	.79					

CR: *Composite Reliability*
AVE: *Average Variance Extracted*
ASV: *Average Shared Squared Variance*
MSV: *Maximum Shared Squared Variance*
Sqr AVE: *Square root of Average Variance Extracted*

4.11 Cluster Analysis

Following the procedure used by Tsui et al. (2006), and to make further sense of Organizational Culture of high-tech firms in Malaysia, cluster analysis was performed on the five dimensions of Organizational Culture obtained in the EFA and confirmed in the CFA. This enabled the researcher to extract easier-to-understand conclusions about the data. Denison and Mishra (1995) state that an important approach to study Organizational Culture is to identify Organizational Culture types that involve different combinations of a set of culture dimensions.

Therefore, cluster analysis was performed using the K-means procedure on the five dimensions of Organizational Culture. Results of three-cluster, four-cluster and five cluster solutions were compared and examined. Although a four-cluster solution was the most “interpretable” in the study of Tsui et al. (2006), in the current study a three-

cluster solution was found to be most interpretable. This three-cluster solution was also very close to the past studies including the one by Tsui et al. (2006). The first cluster had high value on all the five dimensions of Organizational Culture (i.e. both internal integration and external adaptation). This cluster, in line with past studies, was named *Highly Integrative Culture* to describe firms' high focus on both internal integration and external adaptation. The second cluster, with good scores on all dimensions (but less than it was in case of *Highly Integrative Culture*) was named *Moderately Integrative Culture*. The third culture, with low score on all the five dimensions of Organizational Culture was named *Hierarchy Culture*, again deriving the phrase from past studies. As can be seen in Table 4.20 below, the three culture types classify the surveyed firms in this study into three categories: those with *Highly Integrative Culture* (169 firms; 49.85%), *Moderately Integrative Culture* (121 firms; 35.70%) and *Hierarchy Culture* (49 firms; 14.45%).

The three culture types obtained as a result of cluster analysis were turned into dummy variables[8] to be used later during hypothesis testing. This was done because the three clusters obtained were not continuously measured variables and thus could not be directly entered into the hierarchical multiple regression models. Table 4.20 below shows the descriptive statistics related to the cluster analysis. For complete SPSS® output of the cluster analysis, please refer to Appendix C.

[8] Dummy variable coding is a means of transforming non-metric data into metric data. It involves the creation of dummy variables, in which 1s and 0s are assigned to subjects, depending on whether they possess a characteristic in question (Hair et al., 2010, p. 14).

Table 4.20: Organizational Culture dimensions under Organizational Culture types

	Highly Integrative Culture			**Moderately integrative culture**			**Hierarchy Culture**			**F-test**
	Mean	SD	N	Mean	SD	N	Mean	SD	N	
Organizational Culture dimensions										
Employee development	4.72	.37	169	3.94	.43	121	3.68	.59	49	168.39*
Harmony	4.75	.34	169	4.03	.43	121	3.63	.60	49	196.96*
Customer orientation	4.47	.36	169	4.06	.50	121	3.70	.54	49	70.02*
Social responsibility	4.55	.46	169	4.18	.41	121	2.90	.56	49	220.64*
Innovation	4.75	.35	169	3.89	.56	121	3.58	.51	49	209.85*
Total firms	169	49.85		121	35.7		49	14.45		339

Note: *P<0.01

4.12 Hypothesis Testing

This study is undertaken with the purpose to study the effects of Organizational Citizenship Behaviours, Organizational Culture, and Managerial Ties on In-bound and Out-bound dimensions of Open Innovation. The purpose of this study is also to investigate the moderating role of Regimes of Appropriability on the relationships between the above predictor variables and criterion variables. These hypothesized relationships were encapsulated in the 22 hypotheses developed for this study. These hypotheses are now ready to be tested statistically.

To test the hypotheses of this study, hierarchical multiple regression is employed to test the direct relations between the predictor variables and the criterion variables as well as the moderating effects. Since this study has two criterion variables, In-bound Open Innovation and Out-bound Open Innovation, hierarchical multiple regression was run twice, once for each criterion variable. In addition, two control variables namely industry type and firm ownership were also introduced in Step 1 of both the hierarchical multiple regression models .

Table 4.21 summarizes the results of the two hierarchical multiple regressions. Support for each hypothesis or the lack of it is discussed below. For complete SPSS® output of the two hierarchical multiple regressions, please see Appendix C.

4.12.1 Testing Direct Effects of Predictor Variables

Hypothesis 1: the relationship between Altruism and Open Innovation

Hypothesis 1a: *There is a positive relationship between Altruism and In-bound Open Innovation in that Altruism facilitates In-bound Open Innovation.*

The results of the hierarchical multiple regression in Table 4.21 with regard to the relationship between the predictor variable, Altruism and the criterion variable, In-bound Open Innovation show that the standardized regression coefficient is .086, t is 2.19 and these results are statistically significant at $p < .05$ level. Hence Hypothesis 1a is supported. In other words, the results indicate that higher level of Altruism among the employees of a firm facilitates In-bound Open Innovation.

Hypothesis 1b: *There is a positive relationship between Altruism and Out-bound Open Innovation in that Altruism facilitates Out-bound Open Innovation.*

The results of the hierarchical multiple regression in Table 4.21 below with regard to the relationship between the predictor variable, Altruism and the criterion variable, Out-bound Open Innovation show that the standardized regression coefficient is .229, t is 4.392 and these results are statistically significant at $p < .01$ level. Hence **Hypothesis 1b** is supported. In other words, the results indicate that higher level of Altruism among the employees of a firm facilitates Out-bound Open Innovation.

Hypothesis 2: the relationship between Conscientiousness and Open Innovation

Hypothesis 2a: *There is a positive relationship between Conscientiousness and In-bound Open Innovation in that Conscientiousness facilitates In-bound Open Innovation.*

The results of the hierarchical multiple regression in Table 4.21 below with regard to the relationship between the predictor variable, Conscientiousness and the criterion

variable, In-bound Open Innovation show that the standardized regression coefficient is .092, t is 2.43 and these results are statistically significant at $p < .05$ level. Hence Hypothesis 2a is supported. In other words, the results indicate that higher level of Conscientiousness among the employees of a firm facilitates In-bound Open Innovation.

Hypothesis 2b: *There is a positive relationship between Conscientiousness and Out-bound Open Innovation in that Conscientiousness facilitates Out-bound Open Innovation.*

The results of the hierarchical multiple regression in Table 4.21 below with regard to the relationship between the predictor variable, Conscientiousness and the criterion variable, Out-bound Open Innovation show that the standardized regression coefficient is .196, t is 3.805 and these results are statistically significant at $p < .01$ level. Hence Hypothesis 2b is supported. In other words, the results indicate that higher level of Conscientiousness among the employees of a firm facilitates Out-bound Open Innovation.

Hypothesis 3: the relationship between Sportsmanship and Open Innovation

Hypothesis 3a: *There is a positive relationship between Sportsmanship and In-bound Open Innovation in that Sportsmanship facilitates In-bound Open Innovation.*

The results of the hierarchical multiple regression in Table 4.21 below with regard to the relationship between the predictor variable, Sportsmanship and the criterion variable, In-bound Open Innovation show that the standardized regression coefficient is .076, t is 1.88 and these results are statistically significant at $p < .01$ level. Hence Hypothesis 3a is supported. In other words, the results indicate that higher level of Sportsmanship among the employees of a firm facilitates In-bound Open Innovation.

Hypothesis 3b: *There is a positive relationship between Sportsmanship and Out-bound Open Innovation in that Sportsmanship facilitates Out-bound Open Innovation.*

The results of the hierarchical multiple regression in Table 4.21 below with regard to the relationship between the predictor variable, Sportsmanship and the criterion

variable, Out-bound Open Innovation, show that the standardized regression coefficient is .228, t is 4.15 and these results are statistically significant at $p < .01$ level. Hence Hypothesis 3b is supported. In other words, the results indicate that higher level of Sportsmanship among the employees of a firm facilitates Out-bound Open Innovation.

Hypothesis 4: the relationship between Ties with Government Officials and Open Innovation

Hypothesis 4a: *Managerial Ties with Government Officials facilitate In-bound Open Innovation.*

The results of the hierarchical multiple regression in Table 4.21 below with regard to the relationship between the predictor variable, Ties with Government Officials and the criterion variable, In-bound Open Innovation, show that the standardized regression coefficient is .132, t is 2.79 and these results are statistically significant at $p < .01$ level. Hence Hypothesis 4a is supported. In other words, the results indicate that more Ties between managers of a firm and government officials facilitates In-bound Open Innovation.

Hypothesis 4b: *Managerial Ties with Government Officials facilitate Out-bound Open Innovation.*

The results of the hierarchical multiple regression in Table 4.21 below with regard to the relationship between the predictor variable, Ties with Government Officials and the criterion variable, Out-bound Open Innovation, show that the standardized regression coefficient is -.008, t is -.120 and these results are not statistically significant at $p < .05$ level. Hence Hypothesis 4b is not supported. In other words, the results indicate that there is no statistically significant relationship between Ties of managers of a firm with government officials and Out-bound Open Innovation.

Hypothesis 5: the relationship between Managerial Ties with managers at other firms and Open Innovation

Hypothesis 5a: *Managerial Ties with Managers at other firms facilitate In-bound Open Innovation.*

The results of the hierarchical multiple regression in Table 4.21 below with regard to the relationship between the predictor variable, Ties with Managers at other firms and the criterion variable, In-bound Open Innovation, show that the standardized regression coefficient is -.023, t is -.584 and these results are not statistically significant at $p < .05$ level. Hence Hypothesis 5a is not supported. In other words, the results indicate that more Ties between managers of a firm with managers of other firms do not facilitate In-bound Open Innovation.

Hypothesis 5b: *Managerial Ties with Managers at other firms facilitate Out-bound Open Innovation.*

The results of the hierarchical multiple regression in Table 4.21 below with regard to the relationship between the predictor variable, Ties with Managers at other firms and the criterion variable, Out-bound Open Innovation, show that the standardized regression coefficient is -.062, t is -1.151 and these results are not statistically significant at $p < .05$ level. Hence Hypothesis 5b is not supported. In other words, the results indicate that more Ties between managers of a firm with managers of other firms do not facilitate Out-bound Open Innovation.

Hypothesis 6: the relationship between Managerial Ties with universities and/or other research centers and Open Innovation

Hypothesis 6a: *Managerial Ties with Universities and/or other Research Centers facilitate In-bound Open Innovation.*

The results of the hierarchical multiple regression in Table 4.21 below with regard to the relationship between the predictor variable, Managerial Ties with Universities

and/or other Research Centers and the criterion variable, In-bound Open Innovation, show that the standardized regression coefficient is .204, t is 4.43 and these results are statistically significant at $p < .01$ level. Hence Hypothesis 6a is supported. In other words, the results indicate that more Managerial Ties with Universities and/or other Research Centers facilitate In-bound Open Innovation.

Hypothesis 6b: *Managerial Ties with Universities and/or other Research Centers facilitate Out-bound Open Innovation.*

The results of the hierarchical multiple regression in Table 4.21 below with regard to the relationship between the predictor variable, Managerial Ties with Universities and/or other Research Centers and the criterion variable, Out-bound Open Innovation, show that the standardized regression coefficient is -.128, t is -2.126 and these results are statistically significant at $p < .01$ level. Hence Hypothesis 6b is supported. In other words, the results indicate that there is a statistically significant relationship between Managerial Ties with Universities and/or other Research Centers and Out-bound Open Innovation.

Hypothesis 7: the relationship between Highly Integrative Culture and Open Innovation

Hypothesis 7a: *Highly Integrative Organizational Culture relates positively to In-bound Open Innovation.*

The results of the hierarchical multiple regression in Table 4.21 below with regard to the relationship between the predictor variable, Highly Integrative Organizational Culture (dummy variable) and the criterion variable, In-bound Open Innovation, show that the standardized regression coefficient is .414, t is 8.93 and these results are statistically significant at $p < .01$ level. Hence Hypothesis 7a is supported. The standardized regression coefficient for Highly Integrative Organizational Culture is interpreted in relation to the reference category Moderately Integrative Organizational

Culture. Therefore, the results indicate that facilitation of Open Innovation is .414-points higher if an organization has *Highly Integrative Culture* as compared to the case when the organization has Moderately Integrative Organizational Culture.

Hypothesis 7b: *Highly Integrative Organizational Culture relates positively to Out-bound Open Innovation.*

The results of the hierarchical multiple regression in Table 4.21 below with regard to the relationship between the predictor variable, Highly Integrative Organizational Culture (dummy variable) and the criterion variable, Out-bound Open Innovation, show that the standardized regression coefficient is .084, t is 1.381 and these results are not statistically significant at $p < .05$ level. Hence Hypothesis 7b is not supported. The standardized regression coefficient for Highly Integrative Organizational Culture is interpreted in relation to the reference category Moderately Integrative Organizational Culture. Therefore, the results indicate that *Highly Integrative Culture* does not facilitate Out-bound Open Innovation.

Hypothesis 8: the relationship between Hierarchy Culture and Open Innovation

Hypothesis 8a: *Hierarchy Organizational Culture relates negatively to In-bound Open Innovation.*

The results of the hierarchical multiple regression in Table 4.21 below with regard to the relationship between the predictor variable, Hierarchy Organizational Culture (dummy variable) and the criterion variable, In-bound Open Innovation, show that the standardized regression coefficient is -.131, t is -3.24 and these results are statistically significant at $p < .01$ level. Hence Hypothesis 8a is supported. The standardized regression coefficient for Hierarchy Organizational Culture is interpreted in relation to the reference category Moderately Integrative Organizational Culture. Therefore, the results indicate that facilitation of Open Innovation is .131-points lower if an

organization has Hierarchy Organizational Culture as compared to the case when the organization has Moderately Integrative Organizational Culture.

Hypothesis 8b: *Hierarchy Organizational Culture relates negatively to Out-bound Open Innovation.*

The results of the hierarchical multiple regression in Table 4.21 below with regard to the relationship between the predictor variable, Hierarchy Organizational Culture and the criterion variable, Out-bound Open Innovation, show that the standardized regression coefficient is -.095, t is -1.714 and these results are not statistically significant at $p < .05$ level. Hence Hypothesis 8b is not supported. In other words, the results indicate that statistically there is no significant relationship between Hierarchy Organizational Culture and Out-bound Open Innovation.

Table 4.21 also shows that the R^2 Change after introducing the predictor variables into the hierarchical multiple regression models is .407 and .028 for In-bound and Out-bound Open Innovation respectively. Thus the predictor variables of this study account for 40.7% and 2.8% of the variance in the criterion variables In-bound Open Innovation and Out-bound Open Innovation respectively.

4.12.2 Testing Moderating Effects of Regimes of Appropriability

One of the aims of this study is to test the moderating effect of Regimes of Appropriability on the relations between all the predictor variables and the criterion variables. In this study, the moderating effect of Regimes of Appropriability was analyzed using hierarchical multiple regression. Hierarchical multiple regression has been used in many studies to test the moderating effect (e.g. Yiing & Ahmad, 2009). This researcher followed the procedure delineated by Baron and Kenny (1986) to test for moderation; and as a result interaction terms were obtained and introduced in Step 4 of the hierarchical regression models.

In general, the moderating role of Regimes of Appropriability was not found to be statistically significant. In addition, Table 4.21 also shows that the R^2 Change after introducing the interaction terms into the hierarchical multiple regression models in Step 4 is 0.018 and 0.017 for In-bound and Out-bo1.8% and 1.7% of the variance in the criterion variables In-bound Open Innovation and Out-bound Open Innovation respectively. Therefore the present study concludes that *in general* Regimes of Appropriability does not moderate the relationships between:

1. Organizational Citizenship Behaviours and any of the two dimensions of Open Innovation
2. Organizational Culture and any of the two dimensions of Open Innovation
3. Managerial Ties and any of the two dimensions of Open Innovation.

However, while Regimes of Appropriability was not found in general to moderate the relationships between the predictor variables and the criterion variables of this study, one weak moderating effect was noticed. This and other details of the results of moderation are discussed below.

Hypothesis 9: the moderating effect of Regimes of Appropriability between Organizational Citizenship Behaviours and Open Innovation

Hypothesis 9a: *Regimes of Appropriability moderates the relationship between OCB and In-bound Open Innovation in such a way that OCB will be more strongly associated with In-bound Open Innovation under strong Regimes of Appropriability than under weak Regimes of Appropriability.*

The results of hierarchical multiple regression in Table 4.21 below with regard to the moderating effect of Regimes of Appropriability on the relationship between the predictor variable, Organizational Citizenship Behaviours and the criterion variable, In-bound Open Innovation, show that only one interaction term between Regimes of Appropriability and Sportsmanship (one dimension of Organizational Citizenship

Behaviours) is significant at $p < .05$ level with the standardized regression coefficient being .084 and t equaling 2.11. Hence Hypothesis 9a is partially supported. Therefore, it is concluded that Regimes of Appropriability moderates the relationship between Organizational Citizenship Behaviours and In-bound Open Innovation with respect to only one dimension of OCB i.e. Sportsmanship. The moderating effect of Regimes of Appropriability on the relationship between Sportsmanship and In-bound Open Innovation is shown below graphically in Figure 4.1.

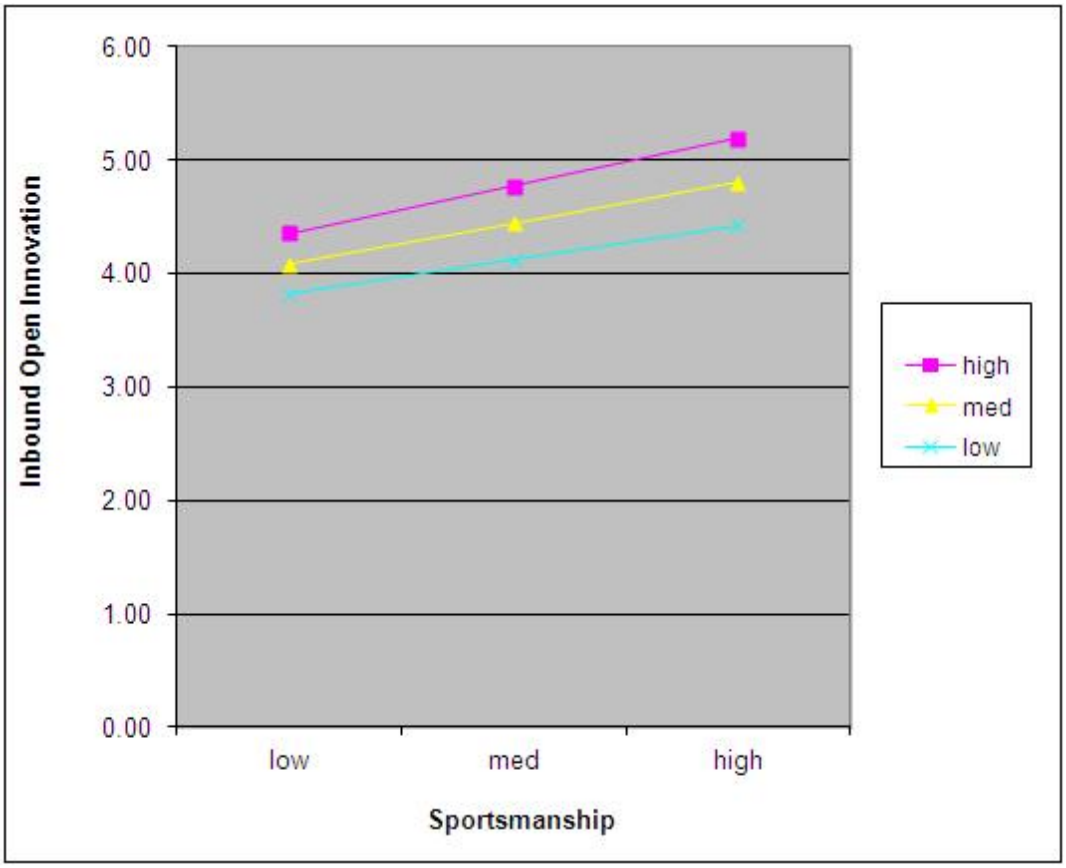

Figure 4.1: Moderating effect of Regimes of Appropriability on the relationship between Sportsmanship and Inbound Open Innovation.

As Figure 4.1 above shows, employees' practice of Sportsmanship under high (strong) Regimes of Appropriability was found to lead to greater facilitation of Open Innovation than under low Regimes of Appropriability.

Hypothesis 9b: *Regimes of Appropriability moderates the relationship between OCB and Out-bound Open Innovation in such a way that OCB will be more strongly*

associated with Out-bound Open Innovation under strong Regimes of Appropriability than under weak Regimes of Appropriability.

The results of hierarchical multiple regression in Table 4.21 below with regard to the moderating effect of Regimes of Appropriability on the relationship between the predictor variable, Organizational Citizenship Behaviours and the criterion variable, Out-bound Open Innovation, show that none of the interaction terms between Regimes of Appropriability and any dimension of Organizational Citizenship Behaviours is significant at $p < .05$ level. Hence Hypothesis 9b is not supported. Therefore, Regimes of Appropriability does not moderate the relationship between Organizational Citizenship Behaviours and Out-bound Open Innovation.

Hypothesis 10: the moderating effect of Regimes of Appropriability between Managerial Ties and Open Innovation

Hypothesis 10a: *Regimes of Appropriability moderates the relationship between Managerial Ties and In-bound Open Innovation in such a way that Managerial Ties will be more strongly associated with In-bound Open Innovation under strong Regimes of Appropriability than under weak Regimes of Appropriability.*

The results of hierarchical multiple regression in Table 4.21 below with regard to the moderating effect of Regimes of Appropriability on the relationship between the predictor variable, Managerial Ties and the criterion variable, In-bound Open Innovation, show that none of the interaction terms between Regimes of Appropriability and any dimensions of Managerial Ties is significant at $p < .05$ level. Hence Hypothesis 10a is not supported. Therefore, Regimes of Appropriability does not moderate the relationship between Managerial Ties and In-bound Open Innovation.

Hypothesis 10b: *Regimes of Appropriability moderates the relationship between Managerial Ties and Out-bound Open Innovation in such a way that Managerial Ties will be more strongly associated with Out-bound Open Innovation under strong Regimes of Appropriability than under weak Regimes of Appropriability.*

The results of hierarchical multiple regression in Table 4.21 below with regard to the moderating effect of Regimes of Appropriability on the relationship between the predictor variable, Managerial Ties and the criterion variable, Out-bound Open Innovation, show that none of the interaction terms between Regimes of Appropriability and any dimensions of Managerial Ties is significant at $p < .05$ level. Hence Hypothesis 10b is not supported. Therefore, Regimes of Appropriability does not moderate the relationship between Managerial Ties and Out-bound Open Innovation.

Hypothesis 11: the moderating effect of Regimes of Appropriability between Organizational Culture and Open Innovation

Hypothesis 11a: *Regimes of Appropriability moderates the relationship between Organizational Culture and In-bound Open Innovation in such a way that Organizational Culture will be more strongly associated with In-bound Open Innovation under strong Regimes of Appropriability than under weak Regimes of Appropriability.*

The results of hierarchical multiple regression in Table 4.21 below with regard to the moderating effect of Regimes of Appropriability on the relationship between the predictor variable, Organizational Culture and the criterion variable, In-bound Open Innovation, show that none of the interaction terms between Regimes of Appropriability and dimensions of Organizational Culture (introduced in the model as dummy variables) is significant at $p < .05$ level. Hence Hypothesis 11a is not supported. Therefore, Regimes of Appropriability does not moderate the relationship between Organizational Culture and In-bound Open Innovation.

Hypothesis 11b: *Regimes of Appropriability moderates the relationship between Organizational Culture and Out-bound Open Innovation in such a way that Organizational Culture will be more strongly associated with Out-bound Open Innovation under strong Regimes of Appropriability than under weak Regimes of Appropriability.*

The results of hierarchical multiple regression in Table 4.21 below with regard to the moderating effect of Regimes of Appropriability on the relationship between the

predictor variable, Organizational Culture and the criterion variable, Out-bound Open Innovation, show that none of the interaction terms between Regimes of Appropriability and dimensions of Organizational Culture (introduced in the model as dummy variables) is significant at $p < .05$ level. Hence Hypothesis 11b is not supported. Therefore, Regimes of Appropriability does not moderate the relationship between Organizational Culture and Out-bound Open Innovation.

Table 4.21: Results of hierarchical multiple regressions

Criterion Variables →	In-bound OI			Out-bound OI		
	Standardized Coefficients			Standardized Coefficients		
	B	**Std. Error**	**t**	**B**	**Std. Error**	**t**
Step 1: Control Variables						
Industry Type[a]						
Aerospace	-.148*	.087	-2.51	-.017	.080	-.390
Computers	.198**	.082	3.34	.673**	.076	15.27
Electronics	-.168**	.086	-2.84	.590**	.079	13.44
Firm Ownership[b]						
Publically Owned	-.085	.154	-1.25	-.014	.142	-.287
Privately Owned	.290**	.116	3.025	.053	.107	.742
State Owned	.003	.174	.051	.045	.161	1.00
Foreign Ownership	.292**	.120	3.14	-.016	.111	-.238
Step 2: Predictor Variables						
Altruism	.086*	.032	2.19	.229**	.053	4.392
Sportsmanship	.076**	.017	1.88	.228**	.028	4.153
Conscientiousness	.092*	.031	2.43	.196**	.053	3.803
Ties with Managers	-.023	.018	-.584	-.062	.031	-1.151
Ties with Research Centers	.204**	.023	4.43	-.128*	.037	-2.126
Ties with Govt. Officials	.132**	.024	2.79	-.008	.042	-.120
Highly Integrative Culture[c]	.414**	.056	8.93	.084	.091	1.381
Hierarchy Culture	-.131**	.070	-3.24	-.095	.118	-1.714
Step 3: Moderator						
Regimes of Appropriability (RA)	.162**	.043	3.169	.218**	.071	3.17
Step 4: Interaction Terms						
RA x Altruism	.019	.024	.500	.032	.041	.592
RA x Sportsmanship	.084*	.025	2.110	.068	.044	1.243
RA x Conscientiousness	.068	.024	1.759	.015	.042	.279
RA x Ties with Managers	-.015	.023	-.377	.005	.039	.090
RA x Ties with Research Centers	.050	.025	1.052	.087	.043	1.338
RA x Ties with Govt. Officials	-.086	.027	-1.959	.116	.047	1.911
RA x Highly Integrative Culture	-.040	.063	-.659	-.063	.109	-.759
RA x Hierarchy Culture	-.107	.089	-1.506	-.040	.151	-.414
R^2 change						
Step 1	.199			.010		
Step 2	.407			.223		
Step 3	.012			.023		
Step 4	.018			.032		
F change						
Step 1	11.71**			59.615**		
Step 2	41.56**			2.689**		
Step 3	10.04**			.053		
Step 4	1.98*			1.691		

*Note: *p<0.05; ** p<0.01.*

[a]*Pharmaceuticals is the reference category.*

[b]*Mixed Ownership is the reference category.*

[c]*Moderately Integrative Culture is the reference category.*

4.13 Summary of the chapter

This chapter presented the data analysis exercise and the findings of this study. The first section of this chapter dealt with the coding of data, reverse scoring of the items, and missing values. In the second section, descriptive statistics were presented and a summary of the demographic profile of the respondents and the firms that participated in this study was given. In the third section, multivariate assumptions including normality, outliers linearity, homoscedasticity and multicollinearity were examined. The fourth and the fifth sections of this chapter showed the results of the tests for non-response bias and common method bias respectively. In the sixth section, purity of the scales used in this study was assessed using item-total-correlation and Cronbach's alpha. The seventh section presented the results of exploratory factor analysis conducted on all variables of this study. In the eighth section, the results of the exploratory factor analysis with the 'offending' items dropped were presented. In the ninth section, reliability of the scale without the 'offending' items was examined. The tenth section dealt with confirmatory factor analysis and construct validity including discriminant validity and convergent validity. In the eleventh section of this chapter, the results of cluster analysis performed on the dimensions of Organizational Culture were presented. This section was followed by the twelfth section in which hypotheses of this study were tested.

In the next chapter, Chapter 5, the findings of this study are discussed.

CHAPTER 5

DISCUSSION OF FINDINGS

5.0 Introduction

This chapter discusses results of the data analysis presented in the previous chapter. The first section of this chapter dwells upon what is the main purpose of this chapter: to state, explain, discuss, relate and put into proper perspective the findings of this study. This section is further divided into seven (7) sub-sections. The first and second sub-sections deal with the relationships between the dimensions of Organizational Citizenship Behaviours, and In-bound Open Innovation and Out-bound Open Innovation. The third and fourth sub-sections deal with the relationships of dimensions of Managerial Ties with In-bound Open Innovation and Out-bound Open Innovation. The fifth and sixth sub-sections deal with the relationships of the two types Organizational Culture with In-bound Open Innovation and Out-bound Open Innovation. The seventh sub-section deals with the hypothesized moderating role that Regimes of Appropriability plays on the relationships between the dimensions/types of the predictor variables and dimensions of the criterion variable.

5.1 Discussion of findings

This study was undertaken with the purpose to study the effects of Organizational Citizenship Behaviours, Organizational Culture, and Managerial Ties on In-bound and Out-bound dimensions of Open Innovation. The purpose of this study was also to investigate the moderating role of Regimes of Appropriability on the relationships between the above predictor variables and the criterion variables. These hypothesized relationships were encapsulated in twenty-two (22) hypotheses developed for this study. Six (6) hypotheses each related to the relationships between the criterion variable Open

Innovation and the two predictor variables namely Organizational Citizenship Behaviour and Managerial Ties while four (4) hypotheses related to the relationship between Open Innovation and Organizational Culture. Another six (6) hypotheses related to the moderating role of Regimes of Appropriability on the relationships between the predictor variables and two dimensions of Open Innovation (In-bound and Out-bound Open Innovation). Overall, out of the twenty-two (22) hypotheses of this study, eleven (11) were supported; one (1) was partially supported while ten (10) were not supported. Table 5.1, Figure 5.1 and Figure 5.2 below summarize the findings of this study.

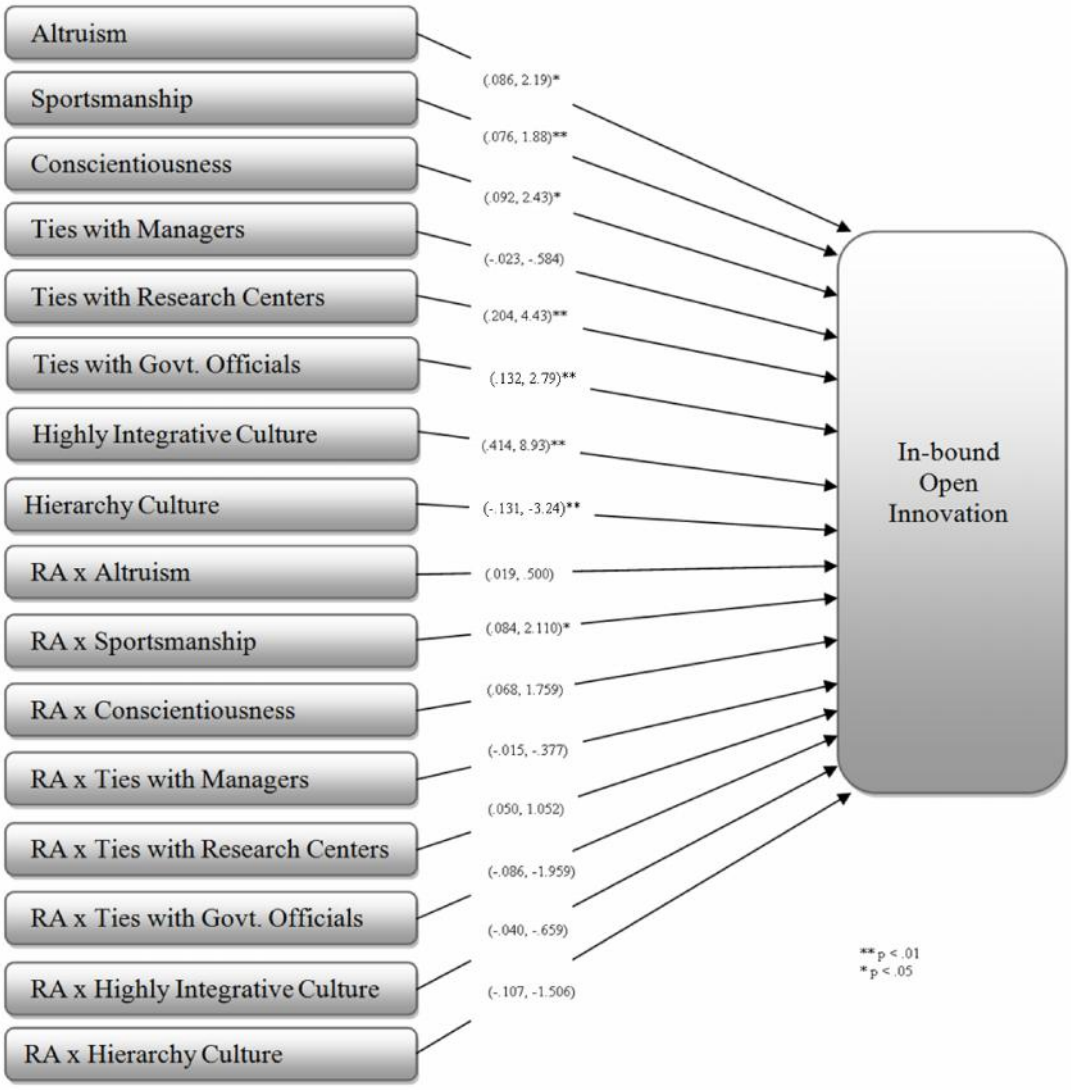

Figure 5. 1: Hierarchical multiple regression results for In-bound Open Innovation

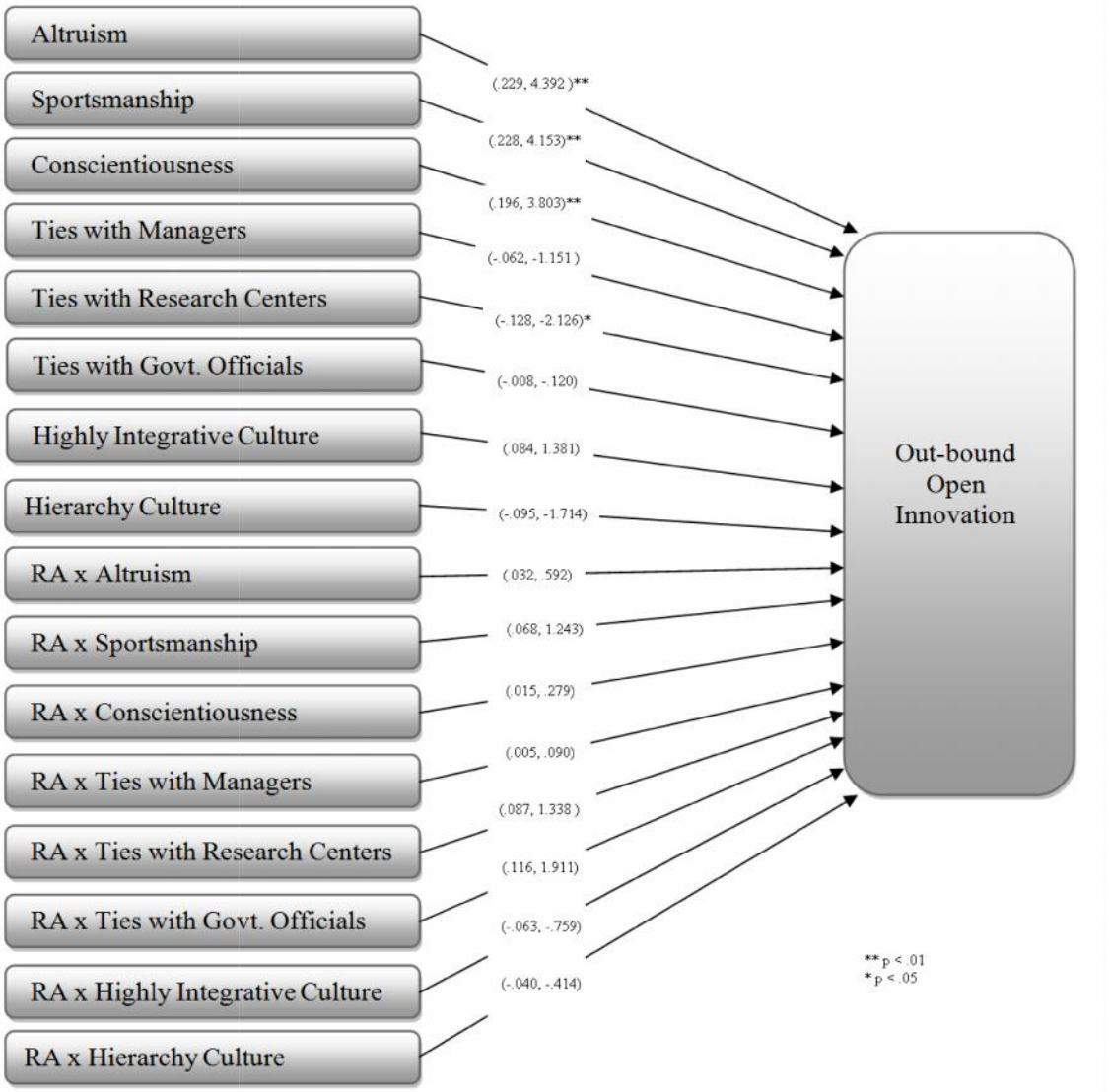

Figure 5. 2: Hierarchical multiple regression results for Out-bound Open Innovation

Table 5.1: Summary of findings

Research Questions	Research Objectives	Research Hypotheses	Findings
What is the nature of relationship between different dimensions of Organizational Citizenship Behaviors and Open Innovation?	To examine the effects of different dimensions of Organizational Citizenship Behaviors on Open Innovation.	**OCB and Open Innovation**	
		H1a: There is a positive relationship between Altruism and In-bound Open Innovation in that Altruism facilitates In-bound Open Innovation.	Supported
		H1b: There is a positive relationship between Altruism and Out-bound Open Innovation in that Altruism facilitates Out-bound Open Innovation.	Supported
		H2a: There is a positive relationship between Conscientiousness and In-bound Open Innovation in that Conscientiousness facilitates In-bound Open Innovation.	Supported
		H2b: There is a positive relationship between Conscientiousness and Out-bound Open Innovation in that Conscientiousness facilitates Out-bound Open Innovation.	Supported
		H3a: There is a positive relationship between Sportsmanship and In-bound Open Innovation in that Sportsmanship facilitates In-bound Open Innovation.	Supported
		H3b: There is a positive relationship between Sportsmanship and Out-bound Open Innovation in that Sportsmanship facilitates Out-bound Open Innovation.	Supported
What is the nature of relationship between different type of Organizational Cultures and Open Innovation?	To examine the effect of different types of Organizational Cultures on Open Innovation.	**Organizational Culture and Open Innovation**	
		H7a: Highly integrative Organizational Culture relates positively to In-bound Open Innovation.	Supported
		H7b: Highly integrative organizational relates positively to Out-bound Open Innovation.	Not Supported
		H8a: Hierarchy Organizational Culture relates negatively to In-bound Open Innovation.	Supported
		H8b: Hierarchy Organizational Culture relates negatively to Out-bound Open Innovation.	Not Supported
What is the nature of relationship between different types of Managerial Ties and Open Innovation?	To examine the effects of different types of Managerial Ties on Open Innovation.	**Managerial Ties and Open Innovation**	
		H4a: Managerial Ties with Government Officials facilitate In-bound Open Innovation.	Supported
		H4b: Managerial Ties with Government Officials facilitate Out-bound Open Innovation.	Not Supported
		H5a: Managerial Ties with Managers at other firms facilitate In-bound Open Innovation.	Not Supported
		H5b: Managerial Ties with Managers at other firms facilitate Out-bound Open Innovation.	Not Supported
		H6a: Managerial Ties with Universities and/or other Research Centers facilitate In-bound Open Innovation.	Supported
		H6b: Managerial Ties with Universities and/or other Research Centers facilitate Out-bound Open Innovation.	Not Supported
What is the moderating role of Regimes of Appropriability on the relations between the predictors and criterion variables of this study?	To investigate the moderating effect of Regimes of Appropriability on the relations between OCB, Managerial Ties and Organizational Culture, and Open Innovation.	**Regimes of Appropriability and Open Innovation**	
		H9a: Regimes of Appropriability moderates the relationship between OCB and In-bound Open Innovation.	Partially Supported
		H9b: Regimes of Appropriability moderates the relationship between OCB and Out-bound Open Innovation.	Not Supported
		H10a: Regimes of Appropriability moderates the relationship between Managerial Ties and In-bound Open Innovation.	Not Supported
		H10b: Regimes of Appropriability moderates the relationship between Managerial Ties and Out-bound Open Innovation.	Not Supported
		H11a: Regimes of Appropriability moderates the relationship between Organizational Culture and In-bound Open Innovation.	Not Supported
		H11b: Regimes of Appropriability moderates the relationship between Organizational Culture and Out-bound Open Innovation.	Not Supported

5.1.1 Organizational Citizenship Behaviours and In-bound Open Innovation

Three (3) hypotheses of this study related to the relationships between three dimensions of the predictor variable, Organizational Citizenship Behaviours and one dimension of the criterion variable, In-bound Open Innovation. The three dimensions of Organizational Citizenship Behaviours used in this study are: Altruism, Conscientiousness and Sportsmanship.

Hypothesis H1a hypothesized a positive relationship between Altruism and In-bound Open Innovation. The findings of this study show that this hypothesis is supported in the context of the current study. As a result, it can be inferred that when the employees of an organization work altruistically, it leads to greater facilitation of In-bound Open Innovation.

Hypothesis H2a hypothesized a positive relationship between Conscientiousness and In-bound Open Innovation. The findings of this study show that this hypothesis is also supported in the context of the current study. As a result, it can be inferred that when the employees of an organization display Conscientiousness, it leads to greater facilitation of In-bound Open Innovation.

Hypothesis H3a hypothesized a positive relationship between Sportsmanship and In-bound Open Innovation. The findings of this study show that this hypothesis is supported as well in the context of the current study. As a result, it can be inferred that when the employees of an organization exhibit Sportsmanship, it leads to greater facilitation of In-bound Open Innovation. Of the three hypothesized relationships between the dimensions of Organizational Citizenship Behaviours and In-bound Open Innovation, the one with Sportsmanship was found to be the strongest (significant standardized coefficient = .076, $p<.01$), followed by the relationship with

Conscientiousness (significant standardized coefficient = .092, $p<.05$), and Altruism (significant standardized coefficient = .086, $p<.05$).

Organizations see Open Innovation as 'primarily a people-driven process (Golightly et al., 2012, p. 62). Therefore the role of people becomes paramount in the Open Innovation process. Organizational Citizenship Behaviours exhibited by an organization's members are known to affect several aspects of an organization including firm performance (Organ et al., 2005; Podsakoff et al., 1997; Podsakoff & Mackenzie, 1994). Dennis Organ, the pioneering researcher who introduced the term Organizational Citizenship Behaviours highlighted that in isolation any one instance of Organizational Citizenship Behaviours may be insignificant, but in the aggregate this discretionary behaviour has a major beneficial impact on organizational operations and effectiveness.

This study's findings however show that all the dimensions of Organizational Citizenship Behaviours, even in isolation, affect Open Innovation. Innovation has been called a highly complex social process requiring effective interaction of a large number of individuals and sub-units within the innovating organization (Zaltman, Duncan, & Holbek, 1973). On the other hand, Open Innovation involves a high degree of uncertainty both in terms of exploration for better partners and outcomes of such partnerships. It is therefore not surprising that Sportsmanship is found to have the strongest effect on In-bound Open Innovation. Sportsmanship helps employees maintain a positive attitude even when things go wrong or when there are minor setbacks. When needed, an organization's employees may even be willing to give up personal interests for the good of the organization and show tolerance of less than ideal work conditions without complaining (Podsakoff & Philip, 1990). Thus employees, who exhibit sportsmanship, by demonstrating a willingness to take on new responsibilities or learn

new skills, enhance the organization's ability to adapt to changes in its environment (Podsakoff & MacKenzie, 1997).

In general, the significant impact of Organizational Citizenship Behaviours on In-bound Open Innovation seems to be logical. Shifting from a closed innovation paradigm to an Open Innovation paradigm can entail scarcity or unpreparedness of resources or teething problems. In addition, managers may not be able to foresee all uncertain events or fully expect the activities that they may desire or need employees to perform (Katz & Kahn, 1978; Organ, 1988). In such a situation, Organizational Citizenship Behaviours shown by the employees, as this study shows, can go a long way in facilitating In-bound Open Innovation.

The above findings can also be looked at from the perspective of *pro-social behaviour*. Pro-social behaviour includes positive social acts such as helping, sharing, donating, co-operating, and volunteering which are carried out to produce and maintain the well-being and integrity of others. Altruism, which is studied as a dimension of Organizational Citizenship Behaviours in this study, is a particular form of pro-social behaviour that is performed by an organization's members, is directed towards an individual or organization and is performed with the intention of promoting welfare of the individual or organization (Brief & Motowidlo, 1986).

This study's findings show that Altruism is linked significantly and positively to In-bound Open Innovation, and logically so. Altruism involves behaviours such as "cooperating with co-workers, taking action when necessary to protect the organization from unexpected danger, suggesting ways to improve the organization, deliberate self-development and preparation for higher levels of organizational responsibility, and speaking favorably about the organization to outsiders. This is vital for organizational survival. As a result of practicing Altruism, an individual can act spontaneously and

voluntarily to promote the organization's interests and contribute to the accomplishment of organizational objectives – in this case facilitation of In-bound Open Innovation.

In addition, Open Innovation involves dynamic and changing environments. In order to respond to the challenges Open Innovation poses, organizations often need to change their work methods, policies and procedures. Employees' own initiatives and ideas can significantly contribute to these processes since the employees often know best the current practices and their weaknesses (Lawler, 1992; Seppälä, Lipponen, Bardi, & Pirttilä-Backman, 2012). Thus performing Organizational Citizenship Behaviours – argued by Organ (1997) as behaviours often regarded by organizational officials as even more important than exceptional productivity – can help organizations in facilitating Open Innovation. Furthermore, Maria, Tobias, and Susanne (2009) pointed to the role of the individual that is supposed to be part of Open Innovation scheme and suggested investigating the motivation for the employee to engage in practices that may be beyond the scope of his/her work". Such motivations, it can be concluded in view of the findings of this study, are perhaps the same that make employees practice Organizational Citizenship Behaviours.

5.1.2 Organizational Citizenship Behaviours and Out-bound Open Innovation

Three (3) hypotheses of this study related to the relationships between three dimensions of the predictor variable, Organizational Citizenship Behaviours and one dimension of the criterion variable, Out-bound Open Innovation.

Hypothesis H1b hypothesized a positive relationship between Altruism and Out-bound Open Innovation. The findings of this study show that this hypothesis is supported. It can be therefore inferred that when the employees of an organization display Altruism, it leads to greater facilitation of Out-bound Open Innovation. Hypothesis H2b

hypothesized a positive relationship between Conscientiousness and Out-bound Open Innovation. The findings show that this hypothesis is supported in this study. It can be therefore inferred that when the employees of an organization display Conscientiousness, it leads to greater facilitation of Out-bound Open Innovation. Hypothesis H3b hypothesized a positive relationship between Sportsmanship and Out-bound Open Innovation. The findings of this study show that this hypothesis is supported. It can be therefore inferred that when the employees of an organization display Sportsmanship, it leads to greater facilitation of Out-bound Open Innovation. Of the three hypothesized relationships between the dimensions of Organizational Citizenship Behaviours and Out-bound Open Innovation, the one with Altruism was found to be the strongest (significant standardized coefficient = .229, $p<.01$), followed by the relationship with Sportsmanship (significant standardized coefficient = .228, $p<.01$), and the relationship and Conscientiousness (significant standardized coefficient = .196, $p<.01$).

There does not seem to be any existing literature that supports or refutes these findings. The process of Out-bound Open Innovation, just like the process of In-bound Open Innovation, involves a high degree of uncertainty both in terms of exploration for better partners and outcomes of such partnerships. In the Out-bound Open Innovation process, firms want to license their own technology to other firms either exclusively or in addition to its application in their own products (Lichtenthaler, 2010b). This study's findings show that the relationships between different dimensions of Organizational Citizenship Behaviours do not change with respect to In-bound Open Innovation and Out-bound Open Innovation. Sportsmanship, Altruism and Conscientiousness, in the order of appearance, remain the strongest predictors of both In-bound Open Innovation and Out-bound Open Innovation.

These findings can be explained in light of programs like the ‘integrated technology commercialization roadmap’ and ‘strategic technology planning to outward technology transfer’ which, Lichtenthaler (2010b) suggests, can help organizations overcome managerial difficulties in actively licensing technology. Since Organizational Citizenship Behaviours was found to positively impact Out-bound Open Innovation in the firms surveyed for this study, organizations can make Organizational Citizenship Behaviours a focus of such programs which will in turn help managers deal with the problems involved in commercialization of technology. Currently it is not clear what all factors affect the success of Out-bound Open Innovation. Lichtenthaler and Ernst (2009) mention one factor, strategic openness, as a necessary condition for actively licensing technology. However, the authors note that this factor is most likely insufficient for establishing a successful out-licensing program.

In view of the results of this study, it seems that Organizational Citizenship Behaviours performed by the employees of an organization can go a long way in facilitating Out-bound Open Innovation. Organizations can foster Organizational Citizenship Behaviours to facilitate Out-bound Open Innovation by developing practices related to recruitment and selection, training and development, and performance appraisal and compensation/benefits (Bolino, Turnley, & Averett, 2003).

Bolino et al. (2003) and Grant and Mayer (2009) discuss ways in which Organizational Citizenship Behaviours can be fostered in organizations. Organizations, for instance, can use selection procedures that are predictive of employee citizenship or they seek out applicant pools comprising individuals committed to causes than themselves. Similarly organizations can sponsor training programs that teach cooperation or the importance of taking initiatives and exceeding one’s formally prescribed job duties. In addition, organizations can reward citizenship behaviours by focusing on the extent to which

employees engage in such behavior besides their prescribed job duties. Compensation systems can also be linked to group- or organizational-level outcomes while employees engaging in competitive or non-cooperative behaviors that are inconsistent with the notion of good citizenship should not be rewarded. All these steps – in addition to initiating a flexible and family-friendly workplace that shows appreciation for employees and makes it easier for them to go beyond the call of duty – can positively impact the Out-bound Open Innovation efforts of an organziation.

5.1.3 Managerial Ties and In-bound Open Innovation

According to Martino (2011), managers' talent for relationship building both within and outside the organization is one of the critical personal competencies needed for Open Innovation success. Sakkab (2002) and Huston and Sakkab (2006) state that exploitation of personal relationships of the managers helps firms pursue Open Innovation 'easily and deeply' as managers' personal relationships help start technological collaborations, evaluate the collaboration's objectives and risks formally, and analyze and select potential partners with a formal and explicit process (Lazzarotti, Manzini, & Pellegrini, 2010).

Enough evidence exists in the literature to support the view that networking ties impact innovation (Gronum, Verreynne, & Kastelle, 2012; Maria et al., 2009). In the Triple Helix Model, the national innovation systems involve three players: the state, industries and universities (Leydesdorff, 2012). While the state plays its role by devising appropriate innovation policies and building basic structures, the industry converts the R&D outputs into profitable goods; and the universities cultivate research talents and conduct academic research (Leydesdorff, 2012). In case of Open Innovation, the very definition of this construct implies establishment of ties of a firm with other organizations. Therefore in a good networking culture, employees develop and nurture

internal and external relationships that support the innovation strategy of the organization (Lindegaard, 2011). In this backdrop, three (3) hypotheses of this study related to the relationships between the three dimensions of the predictor variable, Managerial Ties and one dimension of the criterion variable, In-bound Open Innovation.

Hypothesis H4a hypothesized a positive relationship between *Managerial Ties with Government Officials* and In-bound Open Innovation. The findings of this study show that this hypothesis is supported. Therefore, it can be concluded that ties of managers of the surveyed organizations with government officials facilitate In-bound Open Innovation. It is not surprising to see the significant and positive effect of *Managerial Ties with Government Officials* on In-bound Open Innovation as political ties can provide information and knowledge related to government policies and regulations (Shu, Page, Gao, & Jiang, 2011). Of the three hypothesized relationships between the dimensions of Managerial Ties and In-bound Open Innovation, the one between *Managerial Ties with Government Officials* and In-bound Open Innovation was found to be the second strongest (significant standardized coefficient = .132, $p<.01$).

This finding however does not seem to concur with Shu et al. (2011) who indicate that political ties of the managers tend to have a lesser influence on organizational knowledge creation processes and firm innovation in the closed innovation paradigm. In contrast to this, in a seminal study by Peng and Luo (2000), *Managerial Ties with Government Officials* were found to help improve firm performance measured financially and strategically (i.e. return on assets and market share). Peng and Luo's (2000) results might seem irrelevant to relate here, however, if In-bound Open Innovation is considered as a measure of firm performance, the findings of this study show that *Managerial Ties with Government Officials* facilitate In-bound Open Innovation as well. In addition, given that Malaysia is a developing country, managers

of the sampled organizations, it appears, need to make substantial efforts to establish and maintain personal ties with the officials of regulatory and supporting organizations such as tax bureaus, state banks, and other government and bureau officials. That may not be unusual in an emerging economy, like Malaysia, where more fitting, market-supporting institutions and legal systems are relatively weak and because of institutional voids managers often depend on their ties with the business community and/or government officials to conduct business and coordinate exchanges (Li, 2008; North, 2005; Peng & Luo, 2000).

Hypothesis H5a hypothesized a positive relationship between *Managerial Ties with Managers* (at other firms) and In-bound Open Innovation. The findings of this study show that this hypothesis is not supported. Therefore, it can be concluded that ties of managers of the surveyed organizations with the managers of other firms did not facilitate In-bound Open Innovation. This finding is not consonant with Qin and Shanxing (2010) who studied managerial ties and innovative performance through an Open Innovation perspective among Chinese manufacturing organizations and reported positive association between *Managerial Ties with Managers* (at other firms) and innovative performance[9].

Similarly this finding also does not agree with the case study of *Procter & Gamble* (Huston & Sakkab, 2006) which showed that *Procter & Gamble* encouraged meetings and interactions between their senior leaders and those of the suppliers to improve relationships, increase the flow of ideas and strengthen each company's understanding of the other's capabilities – all of which helped to innovate. In addition, the finding does not concur with the work of Lindegaard (2011, pp. 54-55) which suggests that for

[9] While this study looks at the issue from an 'Open Innovation perspective', it does not seem to be an Open Innovation study as the criterion variable in this study - Innovative Performance - is measured by focusing on R&D cost reduction, patent counts and new product announcements; and details related to these are not *specifically* sought with respect to Open Innovation.

organizations moving towards Open Innovation, 'possibilities include peer-to-peer networks for people working with innovation in different companies, value- and supply-chain networks, feeder networks, and events and forums connecting problem solvers and innovators'. The finding is however consistent with Maria et al. (2009) who found ties with managers (referred to as '*business ties'* in their paper) to be irrelevant to innovation in the closed innovation paradigm.

The findings also seem to be consistent with the observation of Cohen and Levinthal (1990) who, in the case of corporate innovation, pointed out that corporations are not apt to acquire scientific knowledge from the business ties (Gao, Xu, & Yang, 2008). The finding is somewhat surprising in light of the fact that managers of the surveyed firms were expected to contribute to their firms in the exploration and exploitation processes of In-bound Open Innovation (March, 1991). This finding is also surprising since in the case of In-bound Open Innovation, firms rely on an extensive use of inter-organizational relationships to internalize external ideas from a variety of external innovation sources and to market the ideas that are developed within the firm but fall outside the firm's current business model (Chesbrough, 2006; Chesbrough et al., 2006). It however seems that the firms surveyed in this study relied on ties other than ties with managers at other firms to perform these functions. As the findings show, ties with government officials and ties with universities and/or research centers were preferred to facilitate In-bound Open Innovation by the surveyed firms.

Hypothesis H6a hypothesized a positive relationship between *Managerial Ties with Universities and/or other Research Centers* and In-bound Open Innovation. The findings of this study show that this hypothesis is supported. Therefore, it can be concluded that ties between managers of the surveyed organizations with Universities and/or other Research Centers facilitated In-bound Open Innovation. Of the three

hypothesized relationships between the dimensions of Managerial Ties and In-bound Open Innovation, the one with *Managerial Ties with Universities and/or other Research Centers* was found to be the strongest (significant standardized coefficient = .204, $p<.01$). This finding confirms many previous studies that focus on the relevance of universities and research centers as collaborators for innovation (Chiaroni et al., 2011; Cohen, Nelson, & Walsh, 2002; Philbin, 2008). In particular, the finding is consistent with Su, Tsang and Pengis (2009) who found ties with universities and research institutes to significantly impact product and process innovation. Tödtling, Lehner, and Kaufmann (2009) suggest that firms interacting with universities and research organizations – irrespective of whether the relation is based on information exchange (informal links), contract research (market type) or collaborative research (network type) – access complementary scientific knowledge such as R&D and patents knowledge that enhances advanced innovation.

The finding also concurs with a qualitative study conducted recently in Slovenia by Krapez, Škerlavaj, and Groznik (2012) that promises 'big benefits' in Open Innovation collaborations with research and educational institutions. This finding of the current study is also quite expected and broadly consistent with Fritsch and Rolf (1999) who found that a high level of co-operation between the participants is conducive to the performance of the regional innovation systems. This finding is also consistent with the work of Qin and Shanxing (2010) who reported a significant positive relationship between ties of managers with people in universities and public research institutes in the Chinese context.

The finding seems to be in line with the observation of Cohen and Levinthal (1990) who, in the context of corporate innovation, pointed out that corporations can obtain new scientific knowledge as well as technological knowledge through university ties.

The finding is also consistent with Su, Tsang and Pengis (2009) who in the closed innovation paradigm found ties with universities and research institutes to significantly impact product and process innovation. Universities and research centers play an important part in the national innovation systems and, as mentioned before, contribute by conducting academic research and training the talent (Leydesdorff, 2012). Lindegaard (2011, p. 81) mentions that collaborations of institutions of higher education and research institutes with businesses around the world have gained momentum in recent years with institutions of higher education wanting to commercialize innovations developed on campus.

Westhead, Storey, and Britain (1994) speak in a similar vein highlighting that informal links with higher educational institutes can help corporations gain access to knowledge and resources which can facilitate technological innovation and productivity. It may be difficult for firms to contact people like researchers in universities not only because they are outside of their business networks but also because in the case they contacted an academic, it would be confusing to reach the right person in the first place (Cadiou & Boldrini, 2012). Ties of a firm's managers with people in universities and other research centers can thus be a boon for In-bound Open Innovation.

In addition, several case studies – focusing on prominent high-tech regions like the Silicon Valley, the Austin/San Antonio Corridor, the Cambridge region, for example – highlight the contribution of universities and research institutions towards innovation processes. While the higher institutions in Malaysia are relatively new to university-industry collaboration (Othman & Uthayakumaran, 2012), yet many examples of such collaborations exist (Hamdan et al., 2011). As the findings of this study indicate that ties of managers in the industry with people in universities and other research centers strongly and positively affect facilitation of In-bound Open Innovation, firms that wish

to see In-bound Open Innovation facilitated in their organizations should increase their managerial ties with people in the universities and/or research centers. Given that many Malaysian universities figure in the world's top 500 universities list, with ranking and research quality of some of them improving (QS World University Rankings, 2012), university-industry collaboration in Malaysia can prove to be beneficial for all the parties involved. The benefits can further be increased if organizations give their employees time and means to network and help them polish their personal networking skills (Lindegaard, 2011, p. 55).

5.1.4 Managerial Ties and Out-bound Open Innovation

Three (3) hypotheses of this study related to the relationships between the three dimensions of the predictor variable, Managerial Ties and one dimension of the criterion variable, Out-bound Open Innovation.

Hypothesis H4b hypothesized a positive relationship between *Managerial Ties with Government Officials* and Out-bound Open Innovation. The findings of this study show that this hypothesis is not supported. Therefore, it can be concluded that ties of managers of the surveyed organizations with Government Officials did not facilitate Out-bound Open Innovation. Out-bound Open Innovation involves identifying the right partners to market innovations generated inside a firm. The finding implies that managers of firms do not need to liaise with the government official when it comes to marketing their innovations. This is pretty straight as the relevant transactions are expected to happen between the buyer and the seller with no or very limited role for the government officials to interfere.

Hypothesis H5b hypothesized a positive relationship between *Managerial Ties with Managers* (at other firms) and Out-bound Open Innovation. The findings of this study

show that this hypothesis is not supported either. Therefore, it can be concluded that ties of managers of the surveyed organizations with the managers of other firms did not facilitate Out-bound Open Innovation. This could be due to the fear of losing intellectual property, preventing managers from interacting with their peers outside the firm. The existence of such a positive relationship between *Managerial Ties with Managers* (at other firms) could be thought of as crucial for Out-bound Open Innovation, as it could be an avenue for potential to market a firm's internal technology and knowledge. Thus, strengthening the intellectual property rights within the country, which is a policy issue, could possibly lead to *Managerial Ties with Managers* (at other firms) contributing positively to Out-bound Open Innovation. This issue, however, merits further investigation before concrete suggestions are made.

Hypothesis H6b hypothesized a positive relationship between *Managerial Ties with Universities and/or other Research Centers* and Out-bound Open Innovation. The findings of this study show that this hypothesis is not supported. However, a statistically significant and negative relationship – not a relationship that was hypothesized in this study – was found between *Managerial Ties with Universities and/or other Research Centers* and Out-bound Open Innovation. Of the three hypothesized relationships between the dimensions of Managerial Ties and Out-bound Open Innovation, only one with *Managerial Ties with Universities and/or other Research Centers* was found to be significant, but negative (significant standardized coefficient = -.128, $p<.05$). Therefore ties of managers of the surveyed organizations with Universities and/or other Research Centers were found to stifle facilitation of Out-bound Open Innovation. This means such Managerial Ties with *Universities and/or other Research Centers* are not beneficial for Out-bound Open Innovation; rather such ties can prove counter-productive. This finding makes sense as Out-bound Open Innovation implies that firms can search for external players that have better fitting business models to exploit and

commercialize a particular technology than just depend on internal paths to market (Vanhaverbeke, 2006). In the case of Out-bound Open Innovation, firms aim at purposive outflows of knowledge and technology exploitation, intending to leverage existing technological capabilities outside the boundaries of the organization. Universities, in particular, do not buy technology or other goods from businesses so as to process and later sell them competitively. Instead, the organizational environment, goals, structures and values (Boyne, 2002) of universities and research centers focus on cultivating research talents and conducting academic research (Leydesdorff, 2012). Due to this, pursuing *Managerial Ties with Universities and/or other Research Centers* may not be a wise thing to do for firms intending to facilitate the Out-bound dimension of Open Innovation.

These findings related to Mangerial Ties and Out-bound Open innovation are somewhat difficult to explain. No previous research seems to have looked at the relationship between Managerial Ties and Out-bound Open Innovation. It seems that for the facilitation of Out-bound Open Innovation, factors other than Managerial Ties are influential.

5.1.5 Organizational Culture and In-bound Open Innovation

Culture is known to support innovation by creating an organizational climate that institutionalizes innovation as an important activity. By focusing attention on innovation, a supportive culture helps to motivate and sustain the complex, interactive process of social exchange necessary for successful innovation (Russell, 1989). In this study two (2) hypotheses related to the relationships between the two types of the predictor variable, Organizational Culture and one dimension of the criterion variable, In-bound Open Innovation. To recall, In-bound or Outside-in Open Innovation refers to the use of discoveries that others make and involves opening up to and establishing

relationships with external firms with the aim to access their competencies in order to enhance the firm's innovation performance.

Hypothesis H7a hypothesized a positive relationship between *Highly Integrative Culture* and In-bound Open Innovation. The findings of this study show that this hypothesis is supported. Therefore, it can be concluded that *Highly Integrative Culture* in the surveyed organizations facilitated In-bound Open Innovation. Hypothesis H8a hypothesized a negative relationship between *Hierarchy Culture* and In-bound Open Innovation. The findings of this study show that this hypothesis is supported as well.

Therefore, it can be concluded that *Hierarchy Culture* in the surveyed organizations did not facilitate In-bound Open Innovation. In fact, presence of *Hierarchy Culture* in the surveyed firms negatively impacted facilitation of In-bound Open Innovation. Of the two hypothesized relationships between the two types of Organizational Culture and In-bound Open Innovation, the impact of *Highly Integrative Culture* on In-bound Open Innovation was found to be significant and positive (significant standardized coefficient = .414, $p<.01$) while the impact of *Hierarchy Culture* on In-bound Open Innovation was also found to be significant but negative (significant unstandardized coefficient = -.131, $p<.01$).

Culture has oft been cited as a major challenge when adopting Open Innovation (Huston & Sakkab, 2006; Verbano, Crema, & Venturini, 2011). Many empirical studies provide evidence of a significant relation between Organizational Culture and innovation (e.g. Chang & Lee, 2007; Mavondo & Farrell, 2003; Miron, Erez, & Naveh, 2004; Naranjo-Valencia et al., 2011). This empirical evidence however is related to innovation in the Closed Innovation paradigm. This current study investigated the link between Organizational Culture and innovation in the Open Innovation paradigm. Due to the nascency of the concept of Open Innovation (Maria et al., 2009), there are no empirical

studies that can be directly related to the findings of this study. However, authors have pointed towards the significance of Organizational Culture in the Open Innovation paradigm (e.g. Golightly et al., 2012).

The above results - linking Organizational Culture to In-bound Open Innovation so clearly for the first time in any research setting - help in understanding an important aspect of Open Innovation cited by Herzog and Leker (2011); West and Gallagher (2004), among others, as an important future research direction and called the *culture of Open Innovation*. Golightly et al. (2012) remark that "the optimum 'balance' of open and closed innovation for a large corporation will be found through fostering a culture and attitude where `Open Innovation' is always actively considered as an option for new knowledge, and the onus is on those who wish to remain closed to make their case". The current study shows that the *type* of Organizational Culture to be fostered that will facilitate In-bound Open Innovation is *Highly Integrative Culture*. The findings are consistent with the ten essential elements of Open Innovation culture – focused on dimensions that form internal integration and external adaptation – as outlined by Lindegaard (2010) in his book.

The finding also concurs with the work of Bell and Laurent (2012). Furthermore, the findings are consistent with *Procter & Gamble*'s experience of adopting Open Innovation that involved a radical shift from an inward-looking Organizational Culture to a culture that was inward- as well as outward-looking. Such a shift to an integrative culture was vital in order to access the external resources and involved change in the Organizational Culture in *Procter & Gamble* to encourage and facilitate searching outside of the company for innovations (Dodgson, Gann, & Salter, 2006).

In their now famous case study of *Procter & Gamble*, Dodgson et al. (2006) show how the company - after it launched a new strategy called *Organization 2005* to fuel growth

through innovation - had to prepare itself to bring in ideas from outside sources, including using the entrepreneurial advantages of small firms, in contrast to its past autarkic approach and high-level supervision culture for new product development. In order to embark on the Open Innovation paradigm, it had to focus on both internal integration and external adaptation and in the process experience a shift in its Organizational Culture.

These findings - that is, *Highly Integrative Culture* impacting In-bound Open Innovation strongly and positively while *Hierarchy Culture* having a strong negative impact on In-bound Open Innovation - seem to be quite logical. Witzeman et al. (2006) state that the more external innovation is sourced by a firm, the more systems, processes, values and culture also need to be transformed. The firms these authors surveyed resisted Open Innovation implementation due to the *Not Invented Here* syndrome (Katz & Allen, 1982). Open innovation on the other hand demands a shift from the *Not Invented Here* syndrome - a common barrier to its adoption (Golightly et al., 2012) - to the *Invented Anywhere* approach.

Creating a culture that values outside competence and know-how is crucial for open innovation practice (Gassmann et al., 2010). For a firm to make this shift in their approach, Organizational Culture plays a critical role as it is a critical means for firms to integrate internal processes and to adapt to the external environment (Denison & Mishra, 1995). The firms with integrative cultures have widely shared and strongly held values that address the firm's needs of internal integration and external adaptation. On the contrary, firms with *Hierarchy Culture* lay a low level of emphasis on these values (Cameron & Freeman, 1991).

In view of this, *Highly Integrative Culture* of the firms facilitates In-bound Open Innovation as In-bound Open Innovation involves interaction of the firms with their

environment. At the same time, *Hierarchy Culture* in firms impedes In-bound Open Innovation because such a culture focuses least on internal integration and external adaptation, emphasis on which is critical for the success of In-bound Open Innovation. This finding of the current study is consistent with the view that traditional cultures, which are more inward-looking like the *Hierarchy Culture*, are often seen as a barrier for a more open approach that Open Innovation involves (Golightly et al., 2012).

In addition, another possible reason for *Highly Integrative Culture* and *Hierarchy Culture* to positively and negatively, respectively, impact In-bound Open Innovation could be that values that enhance the organization's capacity for internal integration and external adaptation can be useful for the firm in contexts undergoing restructuring and facing major changes (Tsui et al., 2006). In fact, innovation by definition deals with uncertain problems (Dasanayaka, 2009). King (1990) highlights that though not all organizational change involves innovation, all organizational innovation involves change.

Embarking thus on the Open Innovation journey involves problems of setting up structures for Open Innovation and making changes (Maria et al., 2009); and since firms may not be used to evaluate external innovation, managing such external innovations may involve many challenges (Fetterhoff & Voelkel, 2006). A *Highly Integrative Culture*, based on values focusing internal integration and external adaptation, can clearly help in tackling such challenges and facilitate In-bound Open Innovation. In addition, consistent with Gordon (1985) who found that better performing firms in dynamic or fast-changing industries (high-tech manufacturers) scored high on external adaptability, the above findings show that a high score on external adaptation (and internal integration) facilitates In-bound Open Innovation.

5.1.6 Organizational Culture and Out-bound Open Innovation

Two (2) hypotheses of this study related to the relationships between the two types of the predictor variable, Organizational Culture and one dimension of the criterion variable, Out-bound Open Innovation. To recall, out-bound dimension implies that firms can search for external players that have better fitting business models to exploit and commercialize a particular technology than just depend on internal paths to market (Vanhaverbeke, 2006).

Hypothesis H7b hypothesized a positive relationship between *Highly Integrative Culture* and Out-bound Open Innovation. The findings of this study show that this hypothesis is not supported. Therefore, it can be concluded that *Highly Integrative Culture* in the surveyed organizations did not facilitate Out-bound Open Innovation. Hypothesis H8b hypothesized a negative relationship between *Hierarchy Culture* and Out-bound Open Innovation. The findings of this study show that this hypothesis is not supported either. Therefore, it can be concluded that *Hierarchy Culture* in organizations did not stifle Out-bound Open Innovation. The findings of this study, indicating no support for the above two hypotheses are interesting in that when compared to similar findings with respect to In-bound Open Innovation, it emerges that for firms to use discoveries of others and open up to and establish relationships with external firms, *Highly Integrative Culture* and *Hierarchy Culture* have positive and negative impact respectively.

On the other hand, when firms have the resources and technologies and they want to sell them for lack of a fit with the firms' existing business model (Lichtenthaler, 2010b), the Organizational Culture types studied in this study do not have a role to play in Out-bound Open Innovation. This finding shows that firms may not need to worry about having either *Highly Integrative Culture* or *Hierarchy Culture* to be successful in Out-

bound Open Innovation. It must however be noted that it is rare to find firms that pursue Out-bound Open Innovation and not In-bound Open Innovation. It emerges that marketing innovations is purely a selling decision for firms which is independednt from Organizational Culture. It must however be noted that the limited role of Organizational Culture is suggested only to the extent of marketing the innovation and not in creating them. Organizatinal Culture generally does play a role in creating innovation which may not be the case in marketing them, as is suggested by this study. Therefore while firms may make efforts to inculcate *Highly Integrative Culture* and avoid *Hierarchy Culture* to be successful in In-bound Open Innovation, the presence of any of these types of Organizational Cultures may not have any effect on Out-bound Open Innovation.

5.1.7 Moderating effect of Regimes of Appropriability between predictor variables and Open Innovation

A. Regimes of Appropriability as a moderator between Organizational Citizenship Behaviours and Open Innovation

Two (2) hypotheses of this study related to the moderating role of Regimes of Appropriability on the relationships between the three dimensions of Organizational Citizenship Behaviours and two dimensions of Open Innovation. It was hypothesized that Regimes of Appropriability will moderate the relationships that exist between Altruism, Conscientiousness and Sportsmanship, and In-bound Open Innovation. Similar moderating effect of Regimes of Appropriability was hypothesized to exist on the relationships of Altruism, Conscientiousness and Sportsmanship with Out-bound Open Innovation.

The findings of this study indicate that the moderating role of Regimes of Appropriability is non-existent with respect to all the relations between the dimensions

of the predictor variable and the dimensions of the criterion variable, except in the case of the relationship between Sportsmanship and In-bound Open Innovation. Therefore weak statistical proof exists in this study to prove that the relationship between Organizational Citizenship Behaviours and Open Innovation is moderated by Regimes of Appropriability. At best, based on one significant moderating effect, it can be concluded that Hypothesis H9a is partially supported while Hypothesis H9b is not supported. The significant moderating effect suggests that employees' practice of Sportsmanship under high (strong) Regimes of Appropriability leads to greater facilitation of Open Innovation than under low Regimes of Appropriability.

B. Regimes of Appropriability as a moderator between Managerial Ties and Open Innovation

Two (2) hypotheses of this study related to the moderating role of Regimes of Appropriability on the relationships between the three dimensions of Managerial Ties and two dimensions of Open Innovation. It was hypothesized that Regimes of Appropriability moderates the relationships that exist between *Managerial Ties with Managers, Managerial Ties with Universities and/or other Research Centers* and *Managerial Ties with Government Officials,* and In-bound Open Innovation. Similar moderating effect of Regimes of Appropriability was hypothesized to exist on the relationships of Altruism, Conscientiousness and Sportsmanship with Out-bound Open Innovation. The findings of this study indicate that the moderating role of Regimes of Appropriability is non-existent with respect to all these relations between the dimensions of the predictor variable and both the dimensions of the criterion variable. Therefore it is concluded that no statistical proof exists to prove that the relationship between Managerial Ties and Open Innovation is moderated by Regimes of Appropriability. As a result, Hypotheses H10a and H10b are not supported.

C. Regimes of Appropriability as a moderator between Organizational Culture and Open Innovation

The last two (2) hypotheses of this study related to the moderating role of Regimes of Appropriability on the relationships between the two types of Organizational Culture and two dimensions of Open Innovation. It was hypothesized that Regimes of Appropriability moderates the relationships that exist between *Highly Integrative Culture* and *Hierarchy Culture*, and In-bound Open Innovation. Similar moderating effect of Regimes of Appropriability was hypothesized to exist on the relationships of *Highly Integrative Culture* and *Hierarchy Culture* with Out-bound Open Innovation. The findings of this study indicate that the moderating role of Regimes of Appropriability is non-existent with respect to all these relations between the types of the predictor variable and both the dimensions of the criterion variable. Therefore weak statistical proof emerged in this study to prove that the relationship between Organizational Culture and Open Innovation is moderated by Regimes of Appropriability. Hypotheses H11a and H11b are thus not supported.

The Open Innovation paradigm assumes that a multitude of ideas exist outside the firm and that the firms should actively buy and sell Intellectual Property (Maria et al., 2009). Therefore, firms using Open Innovation need to deal with the need to protect their intellectual capital (Henkel, 2006). No previous study, to the best of the researcher's knowledge, examines the moderating role of Regimes of Appropriability on the relationship between the dimensions of Open Innovation and the predictor variables of interest in this study. Due to this the findings of this study cannot be directly related to any past literature. However, in the larger context of Open Innovation, Hurmelinna et al. (2007) state that, depending upon the situation of the organization, the strength of Regimes of Appropriability may be useful as well as harmful. The authors show that in

most cases involving whether to be protective or to exploit new knowledge externally, moderate Regimes of Appropriability may be the most effective strategy, providing the firm with more control and various alternatives to react proactively to emerging opportunities.

The above findings of the current study with respect to the moderating role of Regimes of Appropriability between all the predictor variables and dimensions of Open Innovation are neither expected nor surprising. While moderation of Regimes of Appropriability on the relationships between the predictor variables and dimensions of Open Innovation has hardly been tested before, according to the conventional view, strong appropriability regimes – i.e. when the firm that creates innovation is the main beneficiary of the innovation – create increased willingness among innovators to offer internal innovations for others to use thereby enhancing Open Innovation outcomes (Chesbrough, 2003a). However, the findings of this study provide no evidence to this effect. At the same time, this study's findings may be broadly - and perhaps wrongly[10] - considered to be inconsistent with Hurmelinna et al. (2007) and Laursen and Salter (2005) who found that Open Innovation provides better results in moderate Regimes of Appropriability. The findings also seem to be in contrast with Fabrizio (2005) who reported a negative relationship between high Regimes of Appropriability and aspects of Open Innovation.

It should however be noted again that the above-cited studies looked at whether different Regimes of Appropriability favoured or hindered Open Innovation and did not test the moderating role of Regimes of Appropriability on the relationship between the predictor variables and dimensions of Open Innovation. This study shows that Regimes

[10] It may be wrong to relate the findings of other studies with those of this study because most studies examine the direct effect of Regimes of Appropriability on Open Innovation, while this study aimed at investigating the moderating (indirect) role of Regimes of Appropriability on the relationship between the predictor variables and dimensions of Open Innovation.

of Appropriability did not matter in the case of Malaysian high-tech sector as far as the relations between the predictor variables of interest in this study and dimensions of Open Innovation are concerned.

5.2 Summary of the chapter

This chapter presented a discussion of the findings of this study. The aim of this section was to state, explain, discuss, relate and put into proper perspective the findings of this study. The first and second sub-sections of this chapter provided a discussion of findings related to the relationships between the dimensions of Organizational Citizenship Behaviours, and In-bound Open Innovation and Out-bound Open Innovation. The third and fourth sub-sections dealt with the discussion of findings relatd to the relationships of dimensions of Managerial Ties with In-bound Open Innovation and Out-bound Open Innovation. The fifth and sixth sub-sections presented discussion of findings related to the relationships of the two Organizational Culture types with In-bound Open Innovation and Out-bound Open Innovation. This chapter ended with the seventh sub-section which dealt with the discussion of findings related to the hypothesized moderating role that Regimes of Appropriability plays on the relationships between the dimensions/types of the predictor variables and dimensions of the criterion variable.

In the next chapter, Chapter 6, a summary of this thesis, the theoretical contributions, managerial implications, research limitations, future research directions and conclusions are provided.

CHAPTER 6

CONCLUSIONS

6.0 Introduction

This is the concluding chapter of the thesis. The chapter is divided into five main sections. In the first section, a summary of this research exercise is provided. The second section, divided into two sub-sections, deals with the theoretical contributions and managerial implications of the findings of this thesis. The third section points to the limitations of this study while the fourth section suggests future research direction.

6.1 Summary of the study

This research was conducted with the aim to study the effects of Organizational Citizenship Behaviours, Organizational Culture and Managerial Ties on Open Innovation and to study the moderating role of Regimes of Appropriability on these relationships. Specifically the following four research questions were investigated:

- What is the nature of relationship between different dimensions of Organizational Citizenship Behaviors and Open Innovation?
- What is the nature of relationship between different types of Managerial Ties and Open Innovation?
- What is the nature of relationship between different types of Organizational Cultures and Open Innovation?
- What is the moderating role of Regimes of Appropriability on the relations between the predictors and criterion variables of this study?

This research investigated the above research questions by pursuing the following four research objectives:

- To examine the effects of different dimensions of Organizational Citizenship Behaviors on Open Innovation.
- To examine the effects of different types of Managerial Ties on Open Innovation.
- To examine the effect of different types of Organizational Cultures on Open Innovation.
- To investigate the moderating effect of Regimes of Appropriability on the relations between Organizational Citizenship Behaviors, Managerial Ties and Organizational Culture, and Open Innovation.

The above objectives of this study were achieved as follows. This being a positivist study, it aims at measuring objectively the social phenomena, in this case, the relationships between Organizational Citizenship Behaviours, Organizational Culture, Managerial Ties and Open Innovation under the moderating effect of Regimes of Appropriability.

A cross-sectional study, using the survey method was done to meet these objectives of the study. The data were collected over a five-month period from January 2012 to May 2012. The population of this study was the middle and top managers working in the Malaysian manufacturing firms operating in the four industries classified as high-tech: Aerospace, Computers and office machinery, Electronics and communication, and Pharmaceuticals. The manufacturing sector, as opposed to the services sector, was chosen in this study because the incidence and adoption of Open Innovation are anticipated to be stronger in the manufacturing sector (van de Vrande et al., 2009). Following the guidelines laid down in the Oslo Manual (2005), certain sampling constraints were applied. The responding firm, as a result, were required to have a Research and Development (R&D) department and only the firms that met this

requirement were approached. Besides, the respondents were required to have served the same organization for at least five (5) years.

This study used a two-stage sampling procedure (Davis, 2005) involving stratified sampling and convenience sampling techniques. In the first stage, stratified sampling was used and the high-tech industry was sub-divided into four (4) industries. In the second stage, convenience sampling was used to select firms from the four industries. This study involved two sampling frames. The first sampling frame was taken from Malaysian Manufacturers' Directory (2011). An updated list of the manufacturing firms operating in three (3) high-tech industries was retrieved. A total of 76 organizations in Computers and office machinery industry, 135 in Electronics and communication industry and 35 in Pharmaceuticals industry were short-listed and contacted.

In addition, a Pharmaceutical exposition held in Kuala Lumpur from April 17-19, 2012 provided an opportunity to the researcher to collect more data from the Malaysian pharmaceutical companies. The second sampling frame of this study involved the fourth high-tech industry, the Aerospace industry. As aerospace firms were not indexed in the Malaysian Manufacturers' Directory (2011), a list of firms operating in the Aerospace industry was retrieved from the Aerospace Industry Report (AIR) Online Database. This researcher was able to retrieve a list of 233 aerospace firms from the database (Malaysian Aerospace Council, 2011). However, a large number of these firms provided services to their customers and, thus could not form the sample of this study. For the purpose of this study, 130 firms were considered appropriate and were approached, out of which only 48 agreed to participate in this study.

The variables of interest in this study were measured with items adapted from various past studies. A survey questionnaire was designed to elicit responses from the respondents with respect to Organizational Citizenship Behaviours (predictor variable),

Organizational Culture (predictor variable), Managerial Ties (predictor variable), Regimes of Appropriability (moderating variable) and Open Innovation (criterion variable). In addition, questions related to the firm profile were also asked in the questionnaire.

Keeping in mind the problems method biases can cause, several precautionary measures were taken in this study right from the questionnaire designing stage to reduce any potential effects of CMB and CMV and thus ground was prepared for obtaining valid findings. Furthermore, validity of the questionnaire was tested as suggested by Cavana et al. (2001)**.** To check reliability of the measures, a pilot-test was conducted before distributing the questionnaire on a full scale. Questionnaires were distributed among students from three faculties of the University of Malaya namely: Faculty of Computer Sciences, Faculty of Engineering and Faculty of Business and Accountancy. Constraints were applied and only the post-graduate students with previous work experience were targeted. Reliability was assessed using Cronbach's alpha which was found to be above the .60 threshold for all the variables, thus confirming reliability of the measures used in this study (Hair et al., 2010). In addition, the pilot test helped in rectifying some minor questionnaire-design related issues as highlighted by the respondents. After the pilot test, questionnaires were distributed to the 'real' respondents working in firms operating in the Malaysian high-tech sector. The questionnaires were administered by email and in person.

Pursuant to data collection, the data collected were analyzed quantitatively. Several statistical techniques were used. IBM SPSS® Statistics v.20 and Analysis of Moment Structures v.18 (AMOS™) were used to run the relevant statistical tests. After running descriptive and frequency tests, the exploratory factor analysis (EFA) was used to establish dimensionality of items/questions and reduce those items (of the variables) to

factors. This study used the Bartlett test of sphericity to determine whether EFA was appropriate for the data of this study. Besides, Kaiser-Meyer-Olkin (KMO) was also used. The results obtained in EFA were used to guide the confirmatory factor analysis (CFA). Post CFA, the confirmed latent variables/factors were used to test relationships among the variables of interest in this study. In this study, the criterion variable, Open Innovation, has two dimensions: In-bound Open Innovation and Out-bound Open Innovation. Therefore to assess contribution of the predictor variables in predicting both the dimensions of the criterion variable, two separate hierarchical multiple regressions were conducted to test all the hypotheses. Further, this study checked whether Regimes of Appropriability moderated the relationships between the dimensions of the predictor variables and the criterion variables (In-bound and Out-bound Open Innovation). This was tested again using hierarchical multiple regression by following the procedure delineated by Baron and Kenny (1986), which involves creating interaction terms between all the dimensions of the predictor variables and the moderating variable which were later introduced in the regression model.

The results of this study show that all the dimensions of Organizational Citizenship Behaviours positively predict both In-bound and Out-bound dimensions of Open Innovation. Managers' ties with government officials and with research centers are also found to positively affect In-bound Open Innovation while ties of managers with research centers negatively affect Out-bound Open Innovation. It emerges that *Highly Integrative Culture* positively affects In-bound Open Innovation while *Hierarchy Culture* has a negative effect on it. None of the Organizational Culture types, on the other hand, are found to affect Out-bound Open Innovation signigicantly. Further, weak, almost no support for the moderating role of Regimes of Appropriability is established in this research. These findings make important contributions to the literature and have several managerial implications, which are discussed in the next sub-section.

6.2 Contribution and Implications of the study

This research, focusing on Open Innovation practices in the Malaysian high-tech sector, has theoretical and managerial implications. These are discussed below.

6.2.1 Theoretical Implications

This study has several theoretical implications. First, this study contributes to academic research by providing empirical evidence regarding Open Innovation and factors affecting Open Innovation in Malaysia. The findings make an important contribution to the body of knowledge highlighting how several organizational variables operate in the Open Innovation paradigm. To the best of this researcher's knowledge, this is the first empirical study which attempted to establish the link between Open Innovation and Organizational Citizenship Behaviours, Organizational Culture, and Managerial Ties. Thus answering the research questions of this study fills up important research gaps in Open Innovation literature.

The context of this study makes it important. According to West et al. (2006b), Open Innovation is practiced within the context of a given set of political and economic institutions, including regulations, intellectual property law, capital markets and industry structure. However most of the prior research on Open Innovation has focused on the U.S system which makes an examination of Open Innovation in other contexts important to clearly identify the prerequisites for and limits of Open Innovation. Chesbrough et al. (2006) called for further research in non-American contexts. In addition, Tsui, Nifadkar, and Ou (2007) suggested that unless we test the theories largely developed in the United States in non-Western settings, researchers and practitioners will have little confidence about their generalizability in other regions.

Therefore, this research contributes by making a step forward in filling this gap and helping understand the prerequisites for and limits to Open Innovation in the Malaysian context. Malaysia is a developing Asian country and this study's findings, in contrast to the findings of most Open Innovation studies emerging from the western context, add to the body of knowledge by providing evidence concerning Open Innovation in the Asian context and widen scope of the Open Innovation debate with new evidence from Asia. With respect to the unique cultural context of Malaysia, this study brings a significant value to Open Innovation literature in developing economies.

Second, this study is the first to create a framework that puts together several organizational variables which explain facilitation of Open Innovation. Theoretically the study contributes by highlighting what types of Organizational Culture, what types of Managerial Ties and which Organizational Citizenship Behaviours affect Open Innovation positively and negatively. In addition this study looks at both the dimensions of Open Innovation, In-bound and Out-bound, to understand how these aspects of Open Innovation are affected by the organizational variables of interest. Given that the organizational variables in question explain quite a lot of variance in Open Innovation, this study presents a model that can help in fostering Open Innovation in Malaysia and other developing countries.

While this model helps explain how the organizational variables affect In-bound Open Innovation, it is also important in light of an increasing interest of academics and managers to understand fundamental enablers and barriers to the successful commercialization of technologies outside a firm's boundaries i.e. Out-bound Open Innovation (Lichtenthaler, 2010a). In this study Organizational Citizenship Behaviours emerges as an important predictor of In-bound and Out-bound Open Innovation. These findings set a base for future scholars to explore this relationship in detail in different

developing and developed countries to add to the generalizability of these findings. These findings are also an important extension in the theory of Open Innovation and to the literature of Organizational Citizenship Behaviours. These findings play an important role in emergence of a new sub-area of future research which is Organizational Citizenship Behaviours and Open Innovation enablers.

Third, the findings of Organizational Culture and Open Innovation are also a major contribution in theory and literature related to both these constructs. This study made an advance by suggesting *Highly Integrative Culture* as a major predictor of In-bound Open Innovation while this type of culture is not suggested as a significant predictor of Out-bound Open Innovation. On the other hand, this study could not establish any of the culture types studied as a predictor of Out-bound Open Innovation. Due to this, an important area for future research is highlighted: what culture type(s) or factors significantly influence Out-bound Open Innovation. Moreover, *Hierarchy Culture* was found to be negatively related to In-bound Open Innovation but no significant effect was recorded for Out-bound Open Innovation. This inconsistency in the results highlights the importance of unique cultural factors in Malaysia. These findings are a valuable addition to the literature related to culture and Open Innovation providing ample room for future research in the area.

Fourth, the results of this study related to Managerial Ties and Open Innovation bring key insights for the scholars in the field of Open Innovation. The results also contribute to the Open Innovation theory by highlighting the ties that affect Open Innovation positively and negatively (West et al., 2006b). Traditionally and logically all the ties are expected to be positively related with Open Innovation. This general notion – highlighted by many past studies (cf. Huston & Sakkab, 2006; Qin & Shanxing, 2010) – was confirmed for industry-academia relationship and industry-government

relationships in this study. Surprisingly, however, ties of managers with managers at other firms was not found to be significant. On the other hand, Managerial Ties had no significant effect on Out-bound Open Innovation. This finding contributes to the Open Innovation theory and fills a void in the literature as highlighted by West et al. (2006b) while at the same time provides a base to investigate the potential mediators between these relationships to clarify the important theoretical link.

Fifth, in addition to unraveling the role of the predictor variables of this study in Open Innovation facilitation, this study also shows that Regimes of Appropriability largely do not have any significant role in altering the relationships of Open Innovation with Organizational Citizenship Behaviours, Managerial Ties and Organizational Culture. In other words, this study adds a new dimension to our understanding of the role of Regimes of Appropriability viz-a-viz Open Innovation. The current literature contains several contradictions with respect to the role of Regimes of Appropriability in Open Innovation (e.g. Chesbrough, 2003a; Fabrizio, 2006; Laursen & Salter, 2005). This study contributes to the theory by removing the contradictions to some extent, at least in the context of a developing country like Malaysia. While this study does not look at the direct relationship of Regimes of Appropriability with Open Innovation, it does make an important theoretical contribution by showing that Regimes of Appropriability have largely no role in the relation between Open Innovation and the predictor variables studied in this study.

6.2.2 Managerial Implications

In addition to the theoretical implications stated above, this study has several managerial implications which are highlighted below:

First, the results of this study showed that both the dimensions of Open Innovation (In-bound and Out-bound) are significantly determined by all the dimensions of Organizational Citizenship Behaviours. This finding suggests that Organizational Citizenship Behaviours are important factors for the facilitation of Open Innovation. The examples of pioneering firms like *Procter & Gamble* indicate that a firm's strategic planning activities play a critical role in developing a successful technology licensing program (Chesbrough, 2007). Therefore, managers should pay attention to increasing employees' Organizational Citizenship Behaviours in order to facilitate both Inbound- and Out-bound Open Innovation. Managers can also design training programs to incorporate scope for Organizational Citizenship Behaviours in such programs to ensure facilitation of Open Innovation in their organizations. While the In-bound Open Innovation dimension can be facilitated by performing Organizational Citizenship Behaviours, managers should particularly take note of the Out-bound Open Innovation and tap Organizational Citizenship Behaviours of employees to facilitate this dimension as well. This study recommends practitioners to consider Organizational Citizenship Behaviours as one of the major predictors of Open Innovation. Along with all the structural, group, policy and cultural interventions to promote Open Innovation, managers should also focus at the individual-level to establish a mechanism which can promote Organizational Citizenship Behaviors among the employees. Specifically the promotion of Organizational Citizenship Behaviours can be established through different initiatives at the workplace, such as:

1. Rewarding and recognizing the employees who exhibit Organizational Citizenship Behaviours at the workplace.
2. Linking Organizational Citizenship Behaviours with performance management system and performance appraisals.

3. Motivational and mindset building trainings should be provided to the employees to encourage the display of Organizational Citizenship Behaviours.
4. Top management/leaders should exhibit their strong commitment to and appreciate Organizational Citizenship Behaviours at the workplace, and
5. Organizational Citizenship Behaviours should be linked and incorporated into organizational norms and values.

Lichtenthaler (2010b) mentions that firms which do not recognise the importance of Out-bound Open Innovation are in danger of missing opportunities and that an integrated approach to strategic technology planning will most likely gain importance in the future because firms will actively license technology. Hence, such technology licensing (i.e. Out-bound Open Innovation) – which will not merely be an option but a necessity to keep up with the competition (Lichtenthaler, 2010b) – can be facilitated by employees who perform Organizational Citizenship Behaviours. The recommendations made above can help managers in fostering Organizational Citizenship Behaviours at the workplace and in turn help in facilitating Open Innovation in organizations.

Second, the results of this study also show that *Highly Integrative Culture* significantly facilitates In-bound Open Innovation. This is an important finding in that managers can veer their organizations towards *Highly Integrative Culture* in order to facilitate In-bound Open Innovation. These findings bring deep insights for managers and practitioners striving to promote Open Innovation at the workplace. Based on the knowledge of their Organizational Culture, managers can even predict whether In-bound Open Innovation will be successful in their organizations in the present culture.

Besides, this study found that *Hierarchy Culture* related negatively to In-bound Open Innovation and thus managers should endeavor to avoid this Organizational Culture type. Cultural issues have often been identified as key barriers to implementation of

Open Innovation in the literature (Bigliardi, Dormio, & Galati, 2012; Chesbrough & Crowther, 2006). This study's findings will help overcome this barrier as the managers can focus on *Highly Integrative Culture* and avoid *Hierarchy Culture* to facilitate In-bound Open Innovation in their organizations. Since the main motives for firms to engage in In-bound Open Innovation are growth and revenue (Chesbrough & Crowther, 2006), developing *Highly Integrative Culture* can help a firm improve growth and revenue through In-bound Open Innovation

This study recommends promotion and establishment of a *Highly Integrative Culture* in the organization where free flow of ideas and initiatives is possible horizontally as well as vertically. The top managers concerned for promoting Open Innovation at the workplace should discourage all the aspects of *Hierarchy Culture* and show strong commitment towards the promotion of *Highly Integrative Culture* in the organization.

Another issue highlighted in the findings is relevant to Out-bound Open Innovation. No significant association was found between Out-bound Open Innovation and either type of culture studied in this research. This indicates that there may be certain mediators of these relationships or some other form of culture may be suitable for promotion of Out-bound Open Innovation at the workplace. These findings highlight the sensitivity of handling complex cultural construct at the workplace towards which managers and practitioners should be more vigilant. Future research in this area may help managers identify the type of culture which can help foster Out-bound Open Innovation at the workplace. The study's finding are useful for managers in terms of generating cultural consciousness and stressing upon the importance of local context while using interventions to achieve strategic goals such as establishing an Open Innovation climate in the organizations.

Third, this study also found that for a firm's managers to have ties with government officials and scholars in universities and other research centers can facilitate In-bound Open Innovation. It is thus recommended that firms should encourage their managers to cultivate such ties in order to have their In-bound Open Innovation projects facilitated. Numerous studies show the importance of university-industry collaboration. This collaboration can be enhanced by the ties of managers with university and research centers. So an open culture which encourages managers' networking with universities and government institutions may help organizations foster In-bound Open Innovation at the workplace. At the same time, this study surprisingly revealed that managerial ties of a firm with managers at other firms may not be worth pursuing as such ties were not found to have any significant effect on either dimension of Open Innovation. Similar insignificant relationships were found between managerial ties with government officials and Out-bound Open Innovation; and managerial ties with universities and research centers and Out-bound Open Innovation. This finding brings key insight for Malaysian organizations that the inter-organizational ties may not be fruitful for Open Innovation. Therefore, it is recommended that the practitioners avoid investing in such relations as doing so may only be a waste of time, money and other organizational resources. This study at the same time recommends Malaysian managers/scholars to delve deeper into this issue and investigate the reasons due to which managerial ties between organizations do not predict Open Innovation in Malaysian organizations.

The second part of these findings relates to the insignificant results for all types of Managerial Ties with Out-bound Open Innovation. This seems to be due to the Malaysian culture which does not appear to support the association between Managerial Ties and Out-bound Open Innovation. As no association is found between these two constructs, one may be tempted to suggest that managers should not encourage Managerial Ties in order to facilitate Open Innovation. However, it must be noted that

this finding might also be construed as pointing towards the presence of possible mediators between Managerial Ties and dimension of Open Innovation. Therefore it is recommended that managers and scholars working in Malaysia should focus more on identifying such possible mediators (which could possibly be culture related). A deeper analysis can be helpful in identifying the unique attributes which currently are playing the key role to buffer the influence of Managerial Ties on Out-bound Open Innovation.

Fourth, this study with strong theoretical support hypothesized Regimes of Appropriability as a moderator of relationships between predictor variables in this study and dimensions of Open Innovation. The study revealed no support for this association. Therefore, it is recommended that the managers should focus on the predictor variables of this study and their influence or lack of it on Open Innovation. The managers do not need to worry about whether Regimes of Appropriability will affect any of the direct relationships as no moderating role in general was established in this study. This study recommends that since Regimes of Appropriability was not found to be a moderator, managers and scholars should be attentive to other environmental moderators which may help or hinder the relationships between the predictor variables of this study and dimensions of Open Innovation.

6.3 Research Limitations

While this study makes several important theoretical and managerial contributions, it has some limitations.

First, this analysis was restricted to a specific sector and only the high-tech sector in Malaysia was surveyed. Therefore the findings of this study may not be completely relevant and generalisable to other sectors like the medium- and low-tech. However, the high-tech sector only was chosen in this study because the industries in this sector are

primarily knowledge-driven industries (Hatzichronoglou, 1997), and since Open Innovation is rather a new concept, more so in the Asian context, the adoption of Open Innovation is expected to be higher among high-tech industries than in asset-intensive mature industries.

Second, both the dimensions of Open Innovation were measured using non-standard measures. This is however justified as the measures used are the only measures developed for Open Innovation. Given the recency of Open Innovation research, no standard and widely-used scale exists for this construct. However the scale used in this study captured the essence of Open Innovation and was developed by generating a pool of items after reviewing the related literature on Open Innovation and then presenting those items to industry managers to ensure proper capture of Open Innovation (Sisodiya, 2008). Besides, since validity and reliability of the scale stand established by the researcher (Sisodiya, 2008), using the measures seems to be proper in this study.

Third, this study used a cross-sectional sample to collect data. Use of cross-sectional data may be problematic as such data may be mismatched with the research questions that implicitly or explicitly deal with causality or change, which can be measured properly by measuring the relevant variables more than once (Bono & McNamara, 2011). In Open Innovation research, however, many previous studies (e.g. Parida et al., 2012; Salmi, 2012; Valentina, Raffaella, & Luisa, 2010) have used cross-sectional data and thus use of such data in this study can be considered appropriate.

6.4 Future Research

Research into Open Innovation practices of organizations is a fruitful avenue. First, the framework developed in this study can be empirically tested in other sectors, for example, in medium- and low-tech sectors. Future research can look at whether the

effects of the predictor variables of this study on the two dimensions of Open Innovation vary from sector to sector or remain the same across sectors.

Second, this study surveyed the manufacturing sector only. Empirical research, testing the framework of this study, can be conducted in the services sector as well. This can lead to interesting research as research into Open Innovation in the service industry is not only a new area of research but an under-explored area also (Chesbrough, 2011).

Third, the framework of this study can be tested in different country settings. This can add to the understanding of whether the effects of the predictor variables on the dimensions of the criterion variable of this study are related to the country context. The research framework developed in this study can be applied in other countries, particularly developing ones like Indonesia, Thailand, India and China so that its applicability is tested across different cross-cultural contexts.

Fourth, as mentioned above, this study used a cross-sectional sample to collect data. To have a better understanding of Open Innovation practices and issues, future research may consider using longitudinal data to capture causality (Bono & McNamara, 2011).

Fifth, pursuant to this study and given that Open Innovation research is in its nascent stage particularly in Asia, this study leaves ample room to test for the mediating and moderating roles of several variables in the relationships proven and not proven in this study.

APPENDIX (A)

Research Questionnaire

QUESTIONNAIRE SURVEY

Organizational Citizenship Behaviours, Organizational Culture and Managerial Ties: Impact on Open Innovation

Dear Sir/Madam:

It is my pleasure to invite you to participate in this study. I am conducting this study on open innovation practices in Malaysian firms. The goal of this study is to understand how Organizational Citizenship Behaviours, Organizational Culture and Managerial Ties affect the outcomes of Open Innovation. Your participation is instrumental in increasing understanding of this emerging theme in management. So that I obtain accurate and consistent information, the middle and top management levels only should complete the enclosed questionnaire.

Aware of how busy you are, I have kept this questionnaire short. The survey should take less than **15 minutes** to complete.

I also want to assure you of **complete confidentiality**. My concern is with the information aggregated over a large number of firms, not with any individual firm or manager. Identity of the firms or managers participating in this study will not be disclosed in any form at any time – in fact, I do not seek it. I will use the information in summary form only.

I very much hope that you will help me by completing the survey and thank you very much for your participation. If you think you are not in the right position to participate in this study, please forward the enclosed questionnaire to someone you think may be appropriate in your firm. If you have any questions with respect to this survey, please be in touch.

Once you have completed this questionnaire, please let me know so that I can collect it. Alternatively, you can send it to the address below:

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1. Organizational Citizenship Behavior (OCB)

Please encircle the number which reflects the employees working under you. The employees working under me...

1	2	3	4	5	6	7	Strongly Disagree	Strongly Agree
Strongly Disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly Agree	1 ←	→ 7

1	Help others who have heavy workloads	1	2	3	4	5	6	7
2	Help others who have been absent	1	2	3	4	5	6	7
3	Represent the office by participating in different sporting activities	1	2	3	4	5	6	7
4	Willingly give their time to others who have work-related problems	1	2	3	4	5	6	7
5	Help orient new people even if not required	1	2	3	4	5	6	7
6	Consult with me or others who might be affected by their actions or decisions	1	2	3	4	5	6	7
7	Do not abuse rights of others	1	2	3	4	5	6	7
8	Use social networking websites in office	1	2	3	4	5	6	7
9	Take steps to prevent problems with other people	1	2	3	4	5	6	7
10	Inform me before taking any important actions	1	2	3	4	5	6	7
11	Consume a lot of coffee to prevent themselves from falling asleep during work	1	2	3	4	5	6	7
12	Consume a lot of time complaining about trivial matters	1	2	3	4	5	6	7
13	Tend to make problems bigger than they are	1	2	3	4	5	6	7
14	Constantly talk about wanting to quit their job	1	2	3	4	5	6	7
15	Always focus on what is wrong with their situation, rather than a positive side	1	2	3	4	5	6	7
16	Are always punctual	1	2	3	4	5	6	7
17	Always talk about movies and TV serials with other colleagues	1	2	3	4	5	6	7
18	Never take long breaks	1	2	3	4	5	6	7
19	Do not take extra breaks	1	2	3	4	5	6	7
20	Obey company rules, regulations, and procedures even when no one is watching	1	2	3	4	5	6	7
21	Often carry home-made food to the office	1	2	3	4	5	6	7
22	Keep abreast of changes in the organization	1	2	3	4	5	6	7
23	Attend functions that are not required, but that help the company image	1	2	3	4	5	6	7
24	Have a lot of refreshment drinks during office hours	1	2	3	4	5	6	7
25	Attend and participate in meetings regarding the organization	1	2	3	4	5	6	7
26	Keep up with developments in the company	1	2	3	4	5	6	7

2. Regimes of Appropriability

Please indicate the extent to which the following mechanisms are effective in safeguarding innovations in your industry.

	1	2	3	4	5	Least Effective				Most Effective
	Least Effective	Less Effective	Somewhat Effective	Effective	Most Effective	1 ◄				► 5
1	In your industry, to what extent are patents and other legal mechanisms effective in protecting against imitation of new or improved products?					1	2	3	4	5
2	In your industry, to what extent are patents effective in securing royalty income?					1	2	3	4	5
3	In your industry, to what extent is adopting secrecy effective in protecting product and process innovations?					1	2	3	4	5
4	In your industry, to what extent is being first to market (lead time) effective in protecting product and process innovations?					1	2	3	4	5
5	In your industry, to what extent are Intellectual Property (IP) laws effective in protecting product and process innovations?					1	2	3	4	5
6	In your industry, to what extent is moving quickly down the learning curve effective in accruing benefits of product and process innovations?					1	2	3	4	5

3. Organizational Culture and Open Innovation

The following statements are about the firm you work for. Please indicate how strongly you agree or disagree with these statements

	1	2	3	4	5	Strongly Disagree				Strongly Agree
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	1 ◄				► 5
1	My organization constantly scans the external environment for inputs such as technology, information, ideas, knowledge, etc.					1	2	3	4	5
2	My organization shows concern for individual development.					1	2	3	4	5
3	My organization develops employees' potentials.					1	2	3	4	5
4	My organization does not mind frequent visitors during office hours.					1	2	3	4	5
5	My organization actively seeks out external sources (e.g., research groups, universities, suppliers, customers, competitors, etc.) of knowledge and technology when developing new products.					1	2	3	4	5
6	My organization trusts employees.					1	2	3	4	5
7	My organization cares about employees' opinions.					1	2	3	4	5
8	My organization allows wearing informal dress to the office.					1	2	3	4	5
9	My organization provides training in knowledge and skills.					1	2	3	4	5
10	My organization believes it is good to use external sources (e. g., research groups, universities, suppliers, customers, competitors, etc.) to complement our own R&D.					1	2	3	4	5

1	2	3	4	5	Strongly Disagree	Strongly Agree
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	1 ←	→ 5

11	My organization emphasizes team building.	1	2	3	4	5
12	My organization supports cooperative spirit.	1	2	3	4	5
13	My organization promotes feeling/sharing among employees.	1	2	3	4	5
14	My organization often brings in externally developed knowledge and technology to use in conjunction with our own R&D.	1	2	3	4	5
15	My organization encourages cooperation.	1	2	3	4	5
16	My organization does not mind if employees spend time with employees of rival firms over weekends.	1	2	3	4	5
17	My organization promotes consideration among employees.	1	2	3	4	5
18	My organization satisfies need of customers on largest scale.	1	2	3	4	5
19	My organization seeks out technologies and patents from other firms, research groups, or universities.	1	2	3	4	5
20	My organization strongly emphasizes profit of customer.	1	2	3	4	5
21	My organization provides first-class service.	1	2	3	4	5
22	For my organization, customer is number 1.	1	2	3	4	5
23	My organization purchases external intellectual property to use in our own R&D.	1	2	3	4	5
24	My organization provides sincere service.	1	2	3	4	5
25	My organization shows social responsibility.	1	2	3	4	5
26	My organization likes to keep the air conditioner at very cold temperatures.	1	2	3	4	5
27	Generally, in my organization all technologies are externally commercialized (i.e. sold to outside firms)	1	2	3	4	5
28	My organization's mission is to serve society.	1	2	3	4	5
29	My organization emphasizes economic as well as social profits.	1	2	3	4	5
30	In my organization, external technology commercialization is restricted to technologies that are not used internally.	1	2	3	4	5
31	My organization encourages development of society.	1	2	3	4	5
32	My organization is ready to accept changes.	1	2	3	4	5
33	In my organization, external technology commercialization is restricted to relatively mature technologies.	1	2	3	4	5
34	My organization develops new products and services continuously.	1	2	3	4	5
35	My organization encourages innovation.	1	2	3	4	5
36	In my organization, external technology commercialization is restricted to non-core technologies	1	2	3	4	5
37	My organization adopts high-tech bravely.	1	2	3	4	5

4. Managerial Ties

Please encircle the number best describing the extent to which managers at your firm have utilized personal ties, networks, and connections with:

	Please answer with score in the range of 1 to 7 (1=very Little, 7=Very Extensive)	Very Little 1 ← → Very Extensive 7						
1	Managers at supplier firms	1	2	3	4	5	6	7
2	Officials in industrial bureaus	1	2	3	4	5	6	7
3	University researchers for R&D activities and formal consulting work	1	2	3	4	5	6	7
4	Managers at buyer firms	1	2	3	4	5	6	7
5	University researchers for commercialization related to Intellectual Property Rights	1	2	3	4	5	6	7
6	Political leaders in various levels of the government	1	2	3	4	5	6	7
7	Managers at competitor firms	1	2	3	4	5	6	7
8	University researchers for training and transfer of personnel	1	2	3	4	5	6	7
9	Officials in regulatory and supporting organizations such as tax bureaus, state banks, commercial administration bureaus, and the like	1	2	3	4	5	6	7

5. Firm Profile

Lastly, please answer the following questions related to your firm:

Type of Industry	▪ Aerospace ▪ Computers and office machinery ▪ Electronics and communication ▪ Pharmaceuticals
Your position in the firm	▪ Middle Management ▪ Top Management (Above Sr. Manager)
How many years have you been working with this firm?	
Please indicate the age of your company	
Does your firm have an R&D department?	▪ Yes ▪ No
Firm's market	▪ Local / National ▪ Regional ▪ Global
Please indicate who owns your company	▪ Publicly owned ▪ Privately owned ▪ State owned ▪ Foreign ownership ▪ Mixed ownership/ Joint venture

What is the approximate **number of employees** working in your company **in Malaysia**?

☐ Less than 100 ☐ 101-500 ☐ 501-1000 ☐ 1001-5000 ☐ Above 5000

What is the approximate **total revenue** generated by your company in **Malaysian Ringgit?**

Total annual sales in **Malaysia**	Less than 200,000	200,000 -500,000	500,000-1mil	1mil-5 mil	5mil-10mil	10-mil-25mil	25 mil-above

Thank you for your valuable participation in this study.

If you wish to receive the summary derived from this research, please either fill in your details or attach a business card.

Name: _____ Company: _____

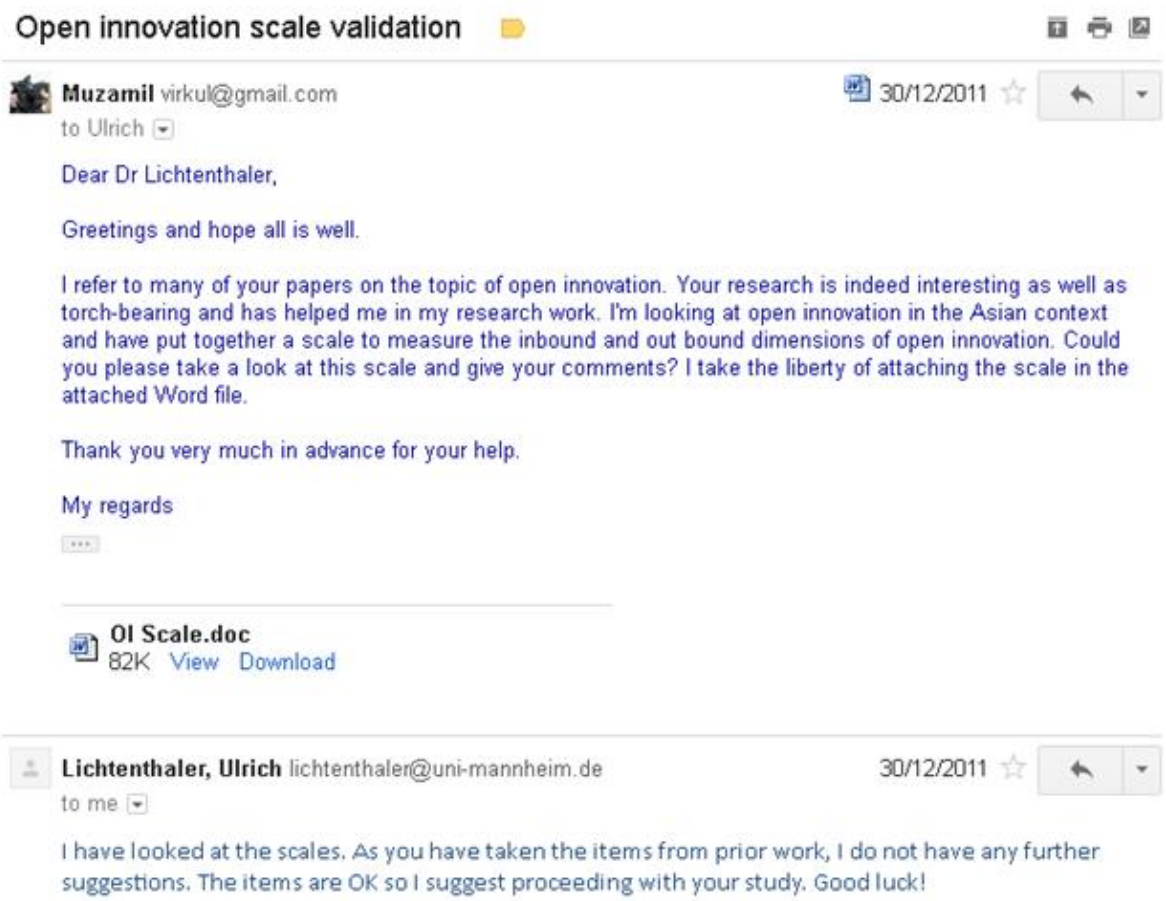
Address: _____

Phone: _____ E-mail: _____

APPENDIX (B)

Correspondence with scholars

Correspondence with Dr. Ulrich Lichtenthaler,
Chair-holder of Management and Organization at the University of Mannheim, Germany.



Open innovation scale validation

Muzamil virkul@gmail.com 30/12/2011
to Ulrich

Dear Dr Lichtenthaler,

Greetings and hope all is well.

I refer to many of your papers on the topic of open innovation. Your research is indeed interesting as well as torch-bearing and has helped me in my research work. I'm looking at open innovation in the Asian context and have put together a scale to measure the inbound and out bound dimensions of open innovation. Could you please take a look at this scale and give your comments? I take the liberty of attaching the scale in the attached Word file.

Thank you very much in advance for your help.

My regards

OI Scale.doc
82K View Download

Lichtenthaler, Ulrich lichtenthaler@uni-mannheim.de 30/12/2011
to me

I have looked at the scales. As you have taken the items from prior work, I do not have any further suggestions. The items are OK so I suggest proceeding with your study. Good luck!

Correspondence with Assoc. Prof. Dr. Mattia Bianchi,
Assistant Professor of Business Administration at the Stockholm School of Economics, Sweden.

Muzamil virkul@gmail.com 28 Jan
to Mattia, mattia.bianchi

Dear Dr Mattia Bianchi ,

Greetings and hope all is well.

I refer to many of your papers on open innovation. Your research is indeed interesting. I'm looking at open innovation in the Asian context and have put together a scale to measure the inbound and out bound dimensions of open innovation. Could you please take a look at this scale and give your comments? I take the liberty of attaching the scale in the attached Word file.

...

OI Scale.doc
82K View Download

Mattia Bianchi Mattia.Bianchi@hhs.se 3 Feb
to me

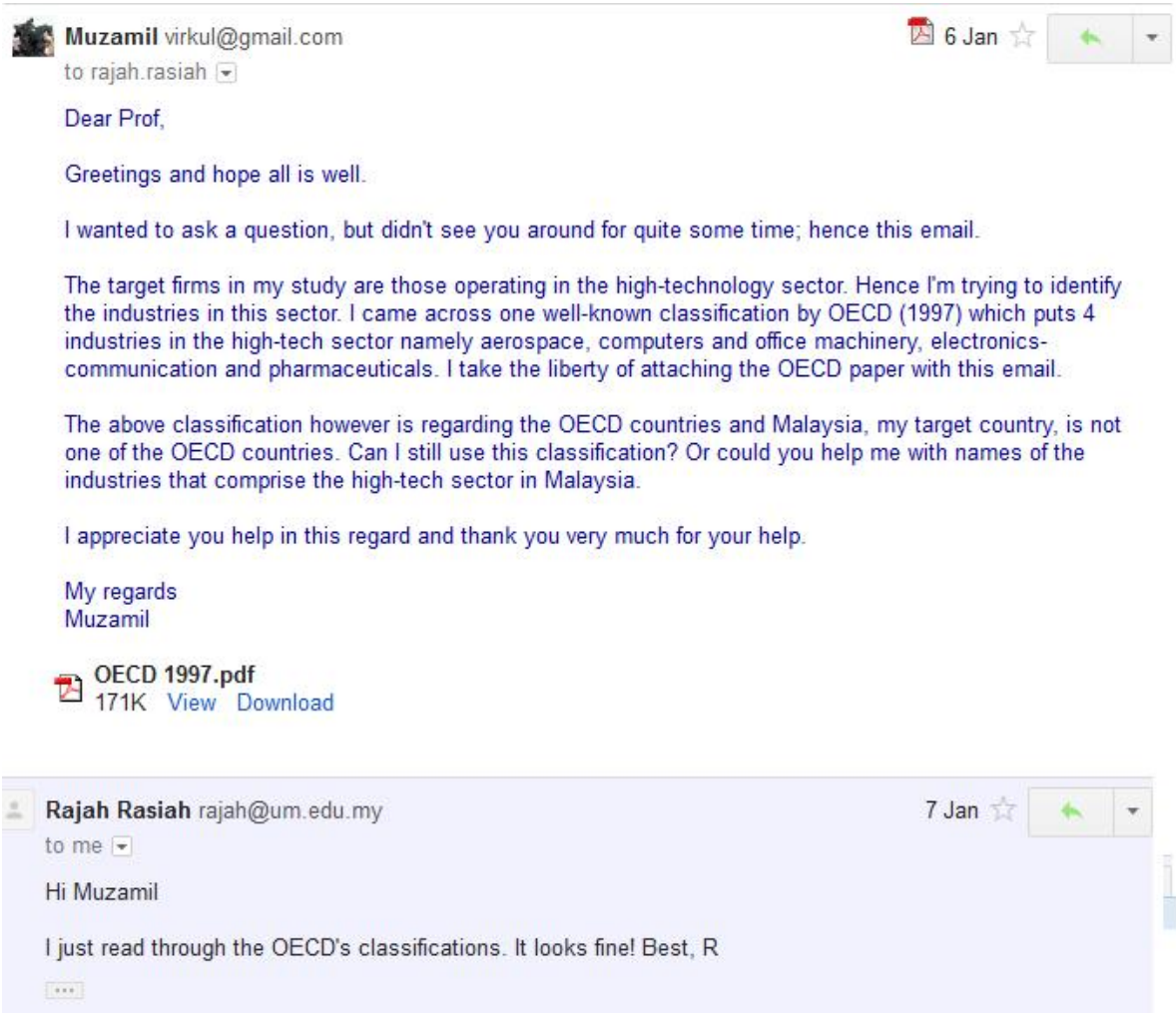
Dear Muzamil,

The scale looks good to me.
Probably you should try to make the items more symmetric: the same item, but reversed, asked for IOI as well as for OOI.

I attach a paper from Lichtenthaler where he uses both IOI and OOI (although he employs only one item for each).
Maybe it's a good idea to make a review of the works of Lichtenthaler. There you can find good suggestions as to what scales to use. But it's mostly OOI.
I have no better suggestions when it comes to IOI.

Good luck!
Mattia

Correspondence with Prof. Dr. Rajah Rasiah,
Professor of Technology and Innovation Policy, University of Malaya, Malaysia



Muzamil virkul@gmail.com 6 Jan
to rajah.rasiah

Dear Prof,

Greetings and hope all is well.

I wanted to ask a question, but didn't see you around for quite some time; hence this email.

The target firms in my study are those operating in the high-technology sector. Hence I'm trying to identify the industries in this sector. I came across one well-known classification by OECD (1997) which puts 4 industries in the high-tech sector namely aerospace, computers and office machinery, electronics-communication and pharmaceuticals. I take the liberty of attaching the OECD paper with this email.

The above classification however is regarding the OECD countries and Malaysia, my target country, is not one of the OECD countries. Can I still use this classification? Or could you help me with names of the industries that comprise the high-tech sector in Malaysia.

I appreciate you help in this regard and thank you very much for your help.

My regards
Muzamil

OECD 1997.pdf
171K View Download

Rajah Rasiah rajah@um.edu.my 7 Jan
to me

Hi Muzamil

I just read through the OECD's classifications. It looks fine! Best, R

APPENDIX (C)

Data Analysis Output

Table displaying results of Pearson Correlation

	Mean	SD	INOI	OUTOI	ALT	SPO	CON	MAN	RES	GOV	EMP	HAR	CUS	SOC	INOI	RA	zRAx ALT	zRAx SPO	zRAx CON	zRAx EMP	zRAx HAR	zRAx CUS	zRAx SOC	zRAx INN	zRAx MAN	zRAx RES	zRAx GOV
In-bound Open Innovation (INOI)	4.27	.61	1																								
Out-bound Open Innovation (OUTOI)	4.17	.75	.162**	1																							
Altruism (ALT)	5.42	.74	.008	.294**	1																						
Sportsmanship (SPO)	4.39	1.46	.397**	.226**	-.035	1																					
Conscientiousness (CON)	5.35	.74	-.039	.284**	.309**	.036	1																				
Ties with Managers (MAN)	4.29	.61	.200**	-.040	.042	.077	.020	1																			
Ties with Universities & Research Centers (RES)	4.33	.60	.467**	-.070	-.136*	.282**	-.036	.312**	1																		
Ties with Govt. Officials (GOV)	4.21	.52	.525**	.031	-.073	.354**	-.023	.347**	.536**	1																	
Employee Development (EMP)	4.18	.72	.631**	.139*	-.017	.311**	-.055	.165**	.275**	.431**	1																
Harmony (HAR)	4.27	.67	.637**	.178**	-.014	.402**	.010	.200**	.302**	.448**	.608**	1															
Customer Orientation (CUS)	4.97	1.30	.520**	.300**	.123*	.259**	.096	.100	.218**	.321**	.420**	.522**	1														
Social Responsibility (SOC)	4.82	1.23	.492**	.101	-.079	.222**	.041	.212**	.317**	.351**	.398**	.492**	.376**	1													
Innovation (INN)	4.96	1.17	.627**	.082	-.022	.253**	.019	.125*	.322**	.431**	.559**	.493**	.365**	.378**	1												
Regimes of Appropriability (RA)	4.19	.72	.616**	.229**	.008	.432**	.047	.214**	.490**	.447**	.483**	.560**	.429**	.500**	.469**	1											
zRAxOCB.ALT	0	1	.003	.073	.121*	-.032	.079	-.009	-.036	-.087	-.085	-.010	.053	-.074	.032	-.075	1										
zRAxOCB.SPO	0	1	.076	.083	-.034	-.016	.027	.023	-.062	.016	.091	.116*	.104	.091	.080	-.131*	.095	1									
zRAxOCB.CON	0	1	.093	.090	.080	.027	.114*	.046	-.069	.001	.019	.048	.103	-.011	.071	.008	.387**	.052	1								
zRAxOC.EMPDEV	0	1	-.151**	-.015	-.078	.081	.017	-.220**	-.086	-.145**	-.156**	-.207**	-.204**	-.202**	-.015	-.183**	.053	.129*	-.070	1							
zRAxOC.HARM	0	1	-.115*	.030	-.010	.108*	.046	-.142**	-.054	-.161**	-.218**	-.254**	-.169**	-.193**	-.047	-.138*	.009	.229**	-.052	.643**	1						
zRAxOC.CUSTORI	0	1	-.161**	.198**	.055	.103	.105	-.203**	-.136*	-.133*	-.230**	-.181**	-.207**	-.196**	-.159**	-.106	.125*	.081	.054	.484**	.455**	1					
zRAxOC.SOCRES	0	1	-.207**	-.021	-.066	.078	-.010	-.179**	-.197**	-.134*	-.196**	-.178**	-.169**	-.376**	-.184**	-.238**	.004	-.009	.056	.391**	.428**	.405**	1				
zRAxOC.INNOV	0	1	-.084	.042	.035	.084	.076	-.158**	-.115*	-.129*	-.018	-.053	-.168**	-.225**	.029	-.182**	.079	.148**	-.032	.600**	.440**	.345**	.412**	1			
zRAxMT.MAN	0	1	-.193**	.040	-.008	.020	.041	-.004	-.230**	-.186**	-.216**	-.132*	-.176**	-.181**	-.130*	-.237**	.046	-.024	.063	.314**	.214**	.189**	.348**	.201**	1		
zRAxMT.RES	0	1	-.169**	.049	-.031	-.051	-.058	-.219**	-.358**	-.122*	-.080	-.048	-.112*	-.189**	-.090	-.418**	-.010	.284**	.072	.291**	.205**	.254**	.332**	.301**	.399**	1	
zRAxMT.GOVT	0	1	-.174**	.101	-.086	.016	.001	-.206**	-.142**	-.168**	-.157**	-.166**	-.128*	-.150**	-.118*	-.200**	.041	.259**	-.043	.519**	.499**	.346**	.342**	.443**	.322**	.382**	1
** Correlation is significant at the 0.01 level (2-tailed).																											
*Correlation is significant at the 0.05 level (2-tailed).																											

CLUSTER ANALYSIS

4-CLUSTER SOLUTION

Initial Cluster Centers

	Cluster			
	1	2	3	4
OC.EMPDEV	4.75	2.75	5.00	4.50
OC.HARM	2.50	5.00	5.00	4.75
OC.CUSTORI	4.25	4.25	5.00	3.75
OC.SOCRES	2.33	4.67	2.33	5.00
OC.INNOV	4.75	2.00	3.00	5.00

Iteration History[a]

Iteration	Change in Cluster Centers			
	1	2	3	4
1	1.921	1.626	1.422	.984
2	.356	.485	.486	.243
3	.063	.246	.178	.158
4	.040	.133	.049	.074
5	.065	.122	.000	.061
6	.067	.050	.000	.026
7	.052	.027	.000	.008
8	.100	.038	.000	.000
9	.048	.017	.000	.000
10	.000	.000	.000	.000

a. Convergence achieved due to no or small change in cluster centers. The maximum absolute coordinate change for any center is .000. The current iteration is 10. The minimum distance between initial centers is 3.152.

Cluster Membership

Case Number	ID	Cluster	Distance
1	27	1	.346
2	31	1	.949
3	32	1	2.109
4	33	1	1.807
5	39	1	1.457
6	43	1	.337
7	45	1	1.062
8	59	1	1.358
9	77	1	1.305
10	79	1	.612
11	89	1	.648
12	91	1	.541
13	92	1	.697
14	94	1	.953
15	95	1	.433
16	100	3	1.174
17	109	1	.413
18	110	1	.934
19	113	1	.711
20	115	1	1.305
21	117	3	1.195
22	120	1	.851
23	124	1	.791
24	126	1	.819
25	149	1	2.211
26	177	1	1.106
27	178	1	1.507
28	181	1	.554
29	183	1	.517
30	184	1	.637
31	185	1	.945
32	186	1	1.041
33	194	1	1.150
34	196	1	1.355
35	197	1	1.127
36	198	1	1.188
37	200	1	.801
38	201	1	.785
39	202	3	1.067
40	203	1	.709
41	204	1	1.251
42	205	1	1.200
43	206	1	.794
44	207	1	.616
45	209	1	.707
46	210	1	.851
47	211	1	.843
48	246	3	1.680
49	247	3	1.608
50	254	3	1.044
51	268	3	1.849
52	1	2	.881

Cluster Membership

Case Number	ID	Cluster	Distance
53	2	2	.898
54	3	2	.601
55	4	2	.278
56	5	2	.574
57	6	2	.489
58	7	2	.379
59	8	2	.791
60	9	2	.278
61	10	2	.304
62	11	2	.434
63	12	2	.549
64	13	2	.425
65	14	2	.634
66	15	2	.418
67	16	2	1.061
68	17	2	.580
69	18	2	.590
70	19	2	.869
71	20	2	.707
72	21	2	.807
73	23	2	.743
74	24	2	1.257
75	25	2	1.169
76	28	2	1.224
77	30	2	1.379
78	35	2	.841
79	37	2	.749
80	38	2	1.207
81	40	2	.686
82	41	2	1.297
83	42	2	.873
84	44	2	.643
85	51	2	.964
86	52	2	.948
87	53	2	1.303
88	54	2	1.088
89	55	2	.791
90	56	2	.939
91	61	2	1.297
92	62	2	.473
93	69	2	.831
94	71	2	.807
95	72	2	.496
96	73	2	.920
97	75	2	1.056
98	78	2	.873
99	80	2	.929
100	81	2	.813
101	82	2	.731
102	84	2	1.203
103	85	2	.992
104	86	2	.351

Cluster Membership

Case Number	ID	Cluster	Distance
105	87	2	.734
106	88	2	1.238
107	93	2	.864
108	96	2	1.322
109	97	2	.813
110	98	2	.742
111	101	2	1.134
112	102	2	.965
113	103	2	.981
114	104	2	.852
115	107	2	.697
116	108	2	1.204
117	111	2	1.172
118	112	3	.621
119	119	2	.772
120	121	2	.701
121	123	2	.790
122	127	2	1.147
123	129	2	.721
124	132	2	.880
125	133	3	1.082
126	134	2	.664
127	135	2	.278
128	137	2	.727
129	138	2	.869
130	179	2	.484
131	180	2	.359
132	182	2	.797
133	187	2	1.291
134	188	2	.359
135	189	2	.709
136	190	2	.752
137	191	2	.337
138	192	2	1.676
139	193	2	1.202
140	199	2	.427
141	212	2	1.011
142	213	2	.971
143	214	2	.572
144	218	2	.587
145	231	3	1.334
146	234	2	1.212
147	242	2	2.474
148	244	2	1.830
149	245	2	1.907
150	253	3	1.464
151	255	2	1.661
152	256	2	1.511
153	257	2	1.913
154	260	2	1.040
155	265	2	1.135
156	267	2	2.289

Cluster Membership

Case Number	ID	Cluster	Distance
157	280	2	1.988
158	290	2	.983
159	291	2	1.319
160	292	2	.853
161	295	2	1.284
162	296	3	.834
163	299	2	.828
164	301	2	.484
165	302	2	.924
166	315	2	1.947
167	325	2	.733
168	327	2	1.172
169	329	2	.552
170	332	2	1.356
171	336	2	.826
172	337	2	1.104
173	338	2	1.012
174	22	4	.432
175	26	4	.718
176	29	4	1.058
177	34	4	.815
178	36	4	.604
179	46	4	1.251
180	47	4	1.005
181	48	4	.996
182	49	4	1.060
183	50	4	1.180
184	57	4	1.127
185	58	4	.825
186	60	4	.767
187	63	4	1.251
188	64	4	.759
189	65	4	.515
190	66	4	.787
191	67	4	.511
192	68	4	.687
193	70	4	.992
194	74	4	.630
195	76	4	.928
196	83	4	.990
197	90	4	.711
198	99	4	.876
199	105	4	.799
200	106	4	.762
201	114	4	.534
202	116	4	1.106
203	118	4	1.192
204	122	4	.644
205	125	4	.563
206	128	4	.576
207	130	4	.716
208	131	4	.801

Cluster Membership

Case Number	ID	Cluster	Distance
209	136	4	.938
210	139	4	.775
211	140	4	.845
212	141	4	.648
213	142	4	.815
214	143	4	.648
215	144	3	.925
216	145	4	.445
217	146	4	.499
218	147	4	.659
219	148	4	.595
220	150	4	.877
221	151	4	.347
222	152	4	.787
223	153	4	.607
224	154	4	.579
225	155	4	.499
226	156	4	.470
227	157	4	.632
228	158	4	.499
229	159	4	.607
230	160	4	.770
231	161	4	.755
232	162	4	.543
233	163	4	.872
234	164	4	.757
235	165	4	.751
236	166	4	.886
237	167	4	.659
238	168	4	.687
239	169	4	.660
240	170	4	.472
241	171	4	.755
242	172	4	.626
243	173	4	.712
244	174	4	.610
245	175	4	1.339
246	176	4	.886
247	195	4	.841
248	208	4	1.106
249	215	4	.522
250	216	4	.423
251	217	4	.805
252	219	4	.541
253	220	4	.691
254	221	4	1.080
255	222	4	.699
256	223	4	.446
257	224	3	.757
258	225	3	.880
259	226	4	.487
260	227	4	.609

Cluster Membership

Case Number	ID	Cluster	Distance
261	228	4	.595
262	229	4	.452
263	230	3	.938
264	232	4	1.085
265	233	4	1.145
266	235	4	.799
267	236	4	1.390
268	237	4	.902
269	238	4	.369
270	239	4	.723
271	240	4	.864
272	241	4	1.061
273	243	4	.596
274	248	4	1.052
275	249	4	.907
276	250	3	.837
277	251	3	1.093
278	252	4	.547
279	258	4	.799
280	259	4	.452
281	261	4	.499
282	262	4	.413
283	263	4	1.080
284	264	4	.435
285	266	4	1.887
286	269	4	.945
287	270	4	.540
288	271	4	.522
289	272	4	.604
290	273	4	.653
291	274	4	.799
292	275	4	.452
293	276	4	.799
294	277	4	.525
295	278	4	.699
296	279	4	.533
297	281	4	.870
298	282	4	.699
299	283	4	.925
300	284	4	.452
301	285	4	.470
302	286	4	.699
303	287	4	.613
304	288	4	.376
305	289	4	.650
306	293	4	.661
307	294	4	.844
308	297	4	1.421
309	298	4	.611
310	300	3	.978
311	303	4	.699
312	304	4	.749

Cluster Membership

Case Number	ID	Cluster	Distance
313	305	4	.714
314	306	4	.567
315	307	4	.956
316	308	4	.645
317	309	4	.870
318	310	4	.580
319	311	4	.799
320	312	4	.522
321	313	4	.659
322	314	4	.799
323	316	4	.483
324	317	4	1.314
325	318	4	.520
326	319	4	.562
327	320	4	.799
328	321	4	.746
329	322	4	.800
330	323	4	.447
331	324	4	.447
332	326	4	.490
333	328	4	.809
334	330	4	.762
335	331	4	.702
336	333	4	.887
337	334	4	.877
338	335	4	1.146
339	339	4	.655

Final Cluster Centers

	Cluster			
	1	2	3	4
OC.EMPDEV	3.47	3.98	4.61	4.71
OC.HARM	3.44	4.04	4.64	4.75
OC.CUSTORI	3.61	4.08	4.33	4.47
OC.SOCRES	3.07	4.22	2.84	4.61
OC.INNOV	3.57	3.86	4.26	4.77

Distances between Final Cluster Centers

Cluster	1	2	3	4
1		1.504	1.948	2.794
2	1.504		1.699	1.471
3	1.948	1.699		1.849
4	2.794	1.471	1.849	

ANOVA

	Cluster Mean Square	df	Error Mean Square	df	F	Sig.
OC.EMPDEV	23.611	3	.164	335	143.590	.000
OC.HARM	24.777	3	.146	335	169.338	.000
OC.CUSTORI	9.508	3	.190	335	50.088	.000
OC.SOCRES	39.241	3	.165	335	237.117	.000
OC.INNOV	27.184	3	.209	335	130.310	.000

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

Number of Cases in each Cluster

Cluster	1	44.000
	2	117.000
	3	19.000
	4	159.000
Valid		339.000
Missing		.000

3-CLUSTER SOLUTION

Initial Cluster Centers

	Cluster		
	1	2	3
OC.EMPDEV	3.25	5.00	4.75
OC.HARM	3.25	5.00	2.50
OC.CUSTORI	4.50	4.00	4.25
OC.SOCRES	5.00	5.00	2.33
OC.INNOV	2.50	5.00	4.75

Iteration History[a]

Iteration	Change in Cluster Centers		
	1	2	3
1	1.638	.970	1.833
2	.248	.144	.210
3	.140	.055	.117
4	.111	.048	.075
5	.042	.021	.018
6	.046	.032	.000
7	.026	.011	.029
8	.020	.010	.033
9	.000	.000	.000

a. Convergence achieved due to no or small change in cluster centers. The maximum absolute coordinate change for any center is .000. The current iteration is 9. The minimum distance between initial centers is 3.553.

Cluster Membership

Case Number	ID	Cluster	Distance
1	27	3	.555
2	31	3	1.069
3	32	3	2.002
4	33	1	1.983
5	39	3	1.527
6	43	3	.588
7	45	3	.824
8	59	3	1.258
9	77	3	1.274
10	79	3	.673
11	89	3	.659
12	91	3	.427
13	92	3	.696
14	94	3	.750
15	95	3	.651
16	100	3	1.143
17	109	3	.467
18	110	3	.780
19	113	3	.706
20	115	3	1.292

Cluster Membership

Case Number	ID	Cluster	Distance
21	117	3	1.239
22	120	3	1.007
23	124	3	1.040
24	126	3	.964
25	149	3	2.098
26	177	3	1.394
27	178	3	1.522
28	181	3	.711
29	183	3	.677
30	184	3	.635
31	185	3	1.031
32	186	3	1.167
33	194	3	1.046
34	196	3	1.545
35	197	3	1.355
36	198	1	1.315
37	200	3	.814
38	201	3	.884
39	202	3	1.146
40	203	3	.545
41	204	1	1.387
42	205	3	1.341
43	206	3	.953
44	207	3	.829
45	209	3	.733
46	210	3	1.007
47	211	3	.732
48	246	3	2.081
49	247	3	2.443
50	254	3	2.290
51	268	3	2.642
52	1	1	.840
53	2	1	.903
54	3	1	.618
55	4	1	.230
56	5	1	.562
57	6	1	.495
58	7	1	.391
59	8	1	.840
60	9	1	.230
61	10	1	.299
62	11	1	.435
63	12	1	.557
64	13	1	.384
65	14	1	.582
66	15	1	.408
67	16	1	1.042
68	17	1	.565
69	18	1	.596
70	19	1	.847
71	20	1	.672
72	21	1	.852

Cluster Membership

Case Number	ID	Cluster	Distance
73	23	1	.691
74	24	2	1.312
75	25	1	1.196
76	28	1	1.273
77	30	1	1.342
78	35	1	.900
79	37	1	.736
80	38	1	1.197
81	40	1	.653
82	41	1	1.242
83	42	1	.844
84	44	1	.607
85	51	1	.919
86	52	1	.894
87	53	1	1.261
88	54	2	1.113
89	55	1	.840
90	56	1	.966
91	61	1	1.330
92	62	1	.443
93	69	1	.814
94	71	1	.852
95	72	1	.476
96	73	1	.914
97	75	1	1.051
98	78	1	.871
99	80	1	.920
100	81	1	.821
101	82	1	.735
102	84	1	1.216
103	85	1	.950
104	86	1	.352
105	87	1	.790
106	88	1	1.289
107	93	1	.840
108	96	1	1.302
109	97	1	.776
110	98	1	.787
111	101	1	1.088
112	102	1	.916
113	103	1	.920
114	104	1	.826
115	107	1	.727
116	108	1	1.184
117	111	1	1.196
118	112	1	1.601
119	119	1	.720
120	121	1	.638
121	123	1	.757
122	127	1	1.176
123	129	1	.685
124	132	1	.898

Cluster Membership

Case Number	ID	Cluster	Distance
125	133	1	1.253
126	134	1	.711
127	135	1	.230
128	137	1	.745
129	138	1	.847
130	179	1	.510
131	180	1	.289
132	182	1	.776
133	187	1	1.242
134	188	1	.289
135	189	1	.661
136	190	1	.684
137	191	1	.376
138	192	1	1.697
139	193	1	1.198
140	199	1	.401
141	212	1	1.032
142	213	1	.954
143	214	1	.610
144	218	1	.627
145	231	1	1.428
146	234	1	1.261
147	242	1	2.487
148	244	2	1.818
149	245	1	1.961
150	253	3	1.723
151	255	1	1.693
152	256	1	1.521
153	257	1	1.929
154	260	1	1.064
155	265	1	1.154
156	267	1	2.325
157	280	1	2.041
158	290	1	.975
159	291	1	1.294
160	292	1	.880
161	295	1	1.324
162	296	1	1.713
163	299	1	.837
164	301	1	.437
165	302	1	.910
166	315	1	1.967
167	325	1	.720
168	327	1	1.182
169	329	1	.545
170	332	1	1.340
171	336	1	.879
172	337	1	1.112
173	338	1	.987
174	22	2	.395
175	26	2	.685
176	29	2	1.011

Cluster Membership

Case Number	ID	Cluster	Distance
177	34	2	.772
178	36	2	.653
179	46	2	1.253
180	47	2	1.025
181	48	2	1.019
182	49	2	1.053
183	50	2	1.160
184	57	2	1.078
185	58	2	.841
186	60	2	.721
187	63	2	1.231
188	64	2	.699
189	65	2	.563
190	66	2	.760
191	67	2	.468
192	68	2	.732
193	70	2	1.033
194	74	2	.638
195	76	2	.939
196	83	2	1.002
197	90	2	.730
198	99	2	.895
199	105	2	.831
200	106	2	.721
201	114	2	.546
202	116	2	1.076
203	118	2	1.196
204	122	2	.625
205	125	2	.516
206	128	2	.573
207	130	2	.709
208	131	2	.793
209	136	2	.903
210	139	2	.781
211	140	2	.858
212	141	2	.662
213	142	2	.839
214	143	2	.662
215	144	2	1.626
216	145	2	.452
217	146	2	.516
218	147	2	.698
219	148	2	.641
220	150	2	.921
221	151	2	.376
222	152	2	.811
223	153	2	.614
224	154	2	.599
225	155	2	.516
226	156	2	.484
227	157	2	.677
228	158	2	.516

Cluster Membership

Case Number	ID	Cluster	Distance
229	159	2	.614
230	160	2	.794
231	161	2	.794
232	162	2	.603
233	163	2	.912
234	164	2	.721
235	165	2	.699
236	166	2	.850
237	167	2	.699
238	168	2	.733
239	169	2	.700
240	170	2	.485
241	171	2	.794
242	172	2	.636
243	173	2	.753
244	174	2	.653
245	175	2	1.358
246	176	2	.850
247	195	2	.856
248	208	2	1.076
249	215	2	.564
250	216	2	.451
251	217	2	.820
252	219	2	.515
253	220	2	.641
254	221	2	1.027
255	222	2	.707
256	223	2	.505
257	224	2	1.592
258	225	2	.941
259	226	2	.535
260	227	2	.652
261	228	2	.641
262	229	2	.468
263	230	2	1.611
264	232	2	1.036
265	233	2	1.088
266	235	2	.832
267	236	2	1.392
268	237	2	.946
269	238	2	.376
270	239	2	.774
271	240	2	.850
272	241	2	1.054
273	243	2	.573
274	248	2	1.017
275	249	2	.868
276	250	2	1.394
277	251	2	1.696
278	252	2	.590
279	258	2	.832
280	259	2	.468

Cluster Membership

Case Number	ID	Cluster	Distance
281	261	2	.515
282	262	2	.415
283	263	2	1.077
284	264	2	.434
285	266	2	1.878
286	269	2	.937
287	270	2	.590
288	271	2	.500
289	272	2	.588
290	273	2	.626
291	274	2	.832
292	275	2	.468
293	276	2	.831
294	277	2	.500
295	278	2	.707
296	279	2	.545
297	281	2	.830
298	282	2	.707
299	283	2	.886
300	284	2	.468
301	285	2	.484
302	286	2	.707
303	287	2	.613
304	288	2	.395
305	289	2	.640
306	293	2	.672
307	294	2	.878
308	297	2	1.413
309	298	2	.638
310	300	2	1.370
311	303	2	.707
312	304	2	.729
313	305	2	.685
314	306	2	.545
315	307	2	.937
316	308	2	.624
317	309	2	.830
318	310	2	.628
319	311	2	.832
320	312	2	.564
321	313	2	.699
322	314	2	.832
323	316	2	.486
324	317	2	1.348
325	318	2	.577
326	319	2	.616
327	320	2	.832
328	321	2	.771
329	322	2	.791
330	323	2	.468
331	324	2	.468
332	326	2	.452

Cluster Membership

Case Number	ID	Cluster	Distance
333	328	2	.763
334	330	2	.721
335	331	2	.718
336	333	2	.840
337	334	2	.904
338	335	2	1.118
339	339	2	.652

Final Cluster Centers

	Cluster		
	1	2	3
OC.EMPDEV	3.94	4.72	3.68
OC.HARM	4.03	4.75	3.63
OC.CUSTORI	4.06	4.47	3.70
OC.SOCRES	4.18	4.55	2.90
OC.INNOV	3.89	4.75	3.58

Distances between Final Cluster Centers

Cluster	1	2	3
1		1.477	1.444
2	1.477		2.648
3	1.444	2.648	

ANOVA

	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
OC.EMPDEV	32.290	2	.183	336	176.870	.000
OC.HARM	32.374	2	.174	336	185.623	.000
OC.CUSTORI	13.223	2	.195	336	67.648	.000
OC.SOCRES	51.608	2	.208	336	247.900	.000
OC.INNOV	40.100	2	.212	336	189.143	.000

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

Number of Cases in each Cluster

Cluster	1	121.000
	2	169.000
	3	49.000
Valid		339.000
Missing		.000

INITIAL MEASUREMENT MODEL (WITH ALL ITEMS)

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	211	3106.878	1619	.000	1.919
Saturated model	1830	.000	0		
Independence model	60	12699.726	1770	.000	7.175

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.063	.762	.730	.674
Saturated model	.000	1.000		
Independence model	.279	.194	.167	.188

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.755	.733	.866	.851	.864
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.915	.691	.790
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	1487.878	1334.029	1649.472
Saturated model	.000	.000	.000
Independence model	10929.726	10575.453	11290.590

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	9.192	4.402	3.947	4.880
Saturated model	.000	.000	.000	.000
Independence model	37.573	32.336	31.288	33.404

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.052	.049	.055	.101
Independence model	.135	.133	.137	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	3528.878	3621.810	4336.164	4547.164
Saturated model	3660.000	4465.993	10661.580	12491.580
Independence model	12819.726	12846.152	13049.286	13109.286

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	10.440	9.985	10.919	10.715

Model	ECVI	LO 90	HI 90	MECVI
Saturated model	10.828	10.828	10.828	13.213
Independence model	37.928	36.880	38.996	38.006

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	187	191
Independence model	50	51

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
OCB.Spo.4	<---	Sports	1.000				
OCB.Spo.3	<---	Sports	1.126	.063	17.765	***	
OCB.Spo.2	<---	Sports	1.141	.059	19.447	***	
OCB.Spo.1	<---	Sports	.985	.058	16.975	***	
OCB.Con.4	<---	Consent	1.000				
OCB.Con.3	<---	Consent	1.212	.083	14.532	***	
OCB.Con.2	<---	Consent	1.205	.082	14.704	***	
OC.EmpDev.4	<---	EmpDev	1.000				
OC.EmpDev.3	<---	EmpDev	.991	.061	16.199	***	
OC.EmpDev.2	<---	EmpDev	.804	.059	13.638	***	
OC.Harmony.4	<---	Harmony	1.000				
OC.Harmony.3	<---	Harmony	1.236	.098	12.618	***	
OC.Harmony.2	<---	Harmony	1.097	.092	11.982	***	
OC.CustOrient.4	<---	CustOrient	1.000				
OC.CustOrient.3	<---	CustOrient	1.371	.194	7.078	***	
OC.SocRes.4	<---	SocRes	1.000				
OC.SocRes.3	<---	SocRes	1.105	.051	21.542	***	
OC.SocRes.2	<---	SocRes	.618	.052	11.850	***	
OC.Innov.4	<---	Innov	1.000				
OC.Innov.3	<---	Innov	1.002	.075	13.442	***	
OC.Innov.2	<---	Innov	1.094	.080	13.725	***	
OC.Innov.1	<---	Innov	.873	.069	12.593	***	
MT.Man.2	<---	Man	1.000				
MT.Man.1	<---	Man	.786	.106	7.404	***	
MT.Res.3	<---	Res	1.000				
MT.Res.2	<---	Res	.977	.051	19.191	***	
MT.Res.1	<---	Res	.825	.057	14.523	***	
MT.Gov.3	<---	Gov	1.000				
MT.Gov.2	<---	Gov	1.032	.063	16.308	***	
MT.Gov.1	<---	Gov	.733	.062	11.757	***	
OCB.Alt.4	<---	Alt	.896	.065	13.808	***	
OCB.Alt.3	<---	Alt	1.011	.069	14.649	***	
OCB.Alt.2	<---	Alt	.785	.061	12.956	***	
OCB.Alt.1	<---	Alt	1.000				
OC.CustOrient.2	<---	CustOrient	1.411	.197	7.171	***	
OCB.Con.1	<---	Consent	.904	.082	10.996	***	
RA3	<---	RA	1.074	.083	12.927	***	

			Estimate	S.E.	C.R.	P	Label
RA2	<---	RA	1.222	.085	14.394	***	
RA1	<---	RA	1.148	.078	14.707	***	
RA5	<---	RA	1.000				
RA4	<---	RA	.280	.080	3.508	***	
IBOI.3	<---	Inbound	.324	.063	5.133	***	
IBOI.6	<---	Inbound	1.000				
IBOI.5	<---	Inbound	1.032	.065	15.993	***	
IBOI.2	<---	Inbound	.876	.065	13.570	***	
OBOI.3	<---	Out-bound	1.000				
OBOI.2	<---	Out-bound	.474	.063	7.488	***	
OBOI.1	<---	Out-bound	.776	.058	13.420	***	
OC.CustOrient.5	<---	CustOrient	1.343	.191	7.042	***	
OC.EmpDev.5	<---	EmpDev	.701	.062	11.281	***	
OC.Harmony.5	<---	Harmony	1.170	.095	12.338	***	
OC.EmpDev.1	<---	EmpDev	.810	.071	11.368	***	
OC.Harmony.1	<---	Harmony	1.245	.106	11.714	***	
OC.CustOrient.1	<---	CustOrient	1.357	.194	6.992	***	
OC.SocRes.1	<---	SocRes	.476	.059	8.083	***	
MT.Man.3	<---	Man	1.557	.152	10.221	***	
RA6	<---	RA	.859	.078	11.078	***	
IBOI.4	<---	Inbound	.805	.115	7.017	***	
IBOI.1	<---	Inbound	.727	.058	12.484	***	
OBOI.4	<---	Out-bound	.998	.071	14.022	***	

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
OCB.Spo.4	<---	Sports	.802
OCB.Spo.3	<---	Sports	.848
OCB.Spo.2	<---	Sports	.913
OCB.Spo.1	<---	Sports	.820
OCB.Con.4	<---	Consent	.726
OCB.Con.3	<---	Consent	.849
OCB.Con.2	<---	Consent	.865
OC.EmpDev.4	<---	EmpDev	.787
OC.EmpDev.3	<---	EmpDev	.836
OC.EmpDev.2	<---	EmpDev	.720
OC.Harmony.4	<---	Harmony	.681
OC.Harmony.3	<---	Harmony	.775
OC.Harmony.2	<---	Harmony	.730
OC.CustOrient.4	<---	CustOrient	.428
OC.CustOrient.3	<---	CustOrient	.703
OC.SocRes.4	<---	SocRes	.883
OC.SocRes.3	<---	SocRes	.932
OC.SocRes.2	<---	SocRes	.590
OC.Innov.4	<---	Innov	.710
OC.Innov.3	<---	Innov	.802
OC.Innov.2	<---	Innov	.823

			Estimate
OC.Innov.1	<---	Innov	.746
MT.Man.2	<---	Man	.601
MT.Man.1	<---	Man	.485
MT.Res.3	<---	Res	.869
MT.Res.2	<---	Res	.867
MT.Res.1	<---	Res	.705
MT.Gov.3	<---	Gov	.823
MT.Gov.2	<---	Gov	.848
MT.Gov.1	<---	Gov	.630
OCB.Alt.4	<---	Alt	.739
OCB.Alt.3	<---	Alt	.782
OCB.Alt.2	<---	Alt	.698
OCB.Alt.1	<---	Alt	.821
OC.CustOrient.2	<---	CustOrient	.732
OCB.Con.1	<---	Consent	.633
RA3	<---	RA	.720
RA2	<---	RA	.798
RA1	<---	RA	.815
RA5	<---	RA	.744
RA4	<---	RA	.201
IBOI.3	<---	Inbound	.290
IBOI.6	<---	Inbound	.786
IBOI.5	<---	Inbound	.818
IBOI.2	<---	Inbound	.712
OBOI.3	<---	Out-bound	.806
OBOI.2	<---	Out-bound	.432
OBOI.1	<---	Out-bound	.750
OC.CustOrient.5	<---	CustOrient	.693
OC.EmpDev.5	<---	EmpDev	.611
OC.Harmony.5	<---	Harmony	.755
OC.EmpDev.1	<---	EmpDev	.615
OC.Harmony.1	<---	Harmony	.712
OC.CustOrient.1	<---	CustOrient	.679
OC.SocRes.1	<---	SocRes	.429
MT.Man.3	<---	Man	.868
RA6	<---	RA	.622
IBOI.4	<---	Inbound	.392
IBOI.1	<---	Inbound	.663
OBOI.4	<---	Out-bound	.792

Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
Sports	<-->	Consent	.058	.050	1.158	.247	
Sports	<-->	EmpDev	.327	.057	5.709	***	
Sports	<-->	Harmony	.307	.048	6.452	***	
Sports	<-->	CustOrient	.133	.034	3.958	***	
Sports	<-->	SocRes	.280	.061	4.623	***	

			Estimate	S.E.	C.R.	P	Label
Sports	<-->	Innov	.223	.053	4.171	***	
Sports	<-->	Man	.414	.085	4.869	***	
Sports	<-->	Res	.552	.105	5.282	***	
Sports	<-->	Gov	.613	.104	5.912	***	
Sports	<-->	Alt	-.042	.059	-.718	.473	
Consent	<-->	EmpDev	-.018	.025	-.701	.483	
Consent	<-->	Harmony	.015	.019	.772	.440	
Consent	<-->	CustOrient	.031	.014	2.160	.031	
Consent	<-->	SocRes	.041	.028	1.460	.144	
Consent	<-->	Innov	.016	.025	.644	.519	
Consent	<-->	Man	.033	.036	.921	.357	
Consent	<-->	Res	.006	.047	.130	.897	
Consent	<-->	Gov	.012	.045	.260	.795	
Consent	<-->	Alt	.163	.032	5.089	***	
EmpDev	<-->	Harmony	.240	.029	8.274	***	
EmpDev	<-->	CustOrient	.122	.022	5.483	***	
EmpDev	<-->	SocRes	.235	.034	7.007	***	
EmpDev	<-->	Innov	.269	.034	7.844	***	
EmpDev	<-->	Man	.255	.046	5.594	***	
EmpDev	<-->	Res	.316	.054	5.873	***	
EmpDev	<-->	Gov	.405	.056	7.236	***	
EmpDev	<-->	Alt	-.018	.030	-.599	.549	
Harmony	<-->	CustOrient	.104	.019	5.578	***	
Harmony	<-->	SocRes	.209	.028	7.415	***	
Harmony	<-->	Innov	.176	.026	6.884	***	
Harmony	<-->	Man	.214	.037	5.766	***	
Harmony	<-->	Res	.250	.043	5.864	***	
Harmony	<-->	Gov	.309	.045	6.939	***	
Harmony	<-->	Alt	-.015	.023	-.642	.521	
CustOrient	<-->	SocRes	.114	.022	5.121	***	
CustOrient	<-->	Innov	.101	.020	5.012	***	
CustOrient	<-->	Man	.106	.026	4.053	***	
CustOrient	<-->	Res	.117	.031	3.756	***	
CustOrient	<-->	Gov	.160	.034	4.723	***	
CustOrient	<-->	Alt	.035	.017	2.059	.039	
SocRes	<-->	Innov	.202	.033	6.211	***	
SocRes	<-->	Man	.253	.048	5.218	***	
SocRes	<-->	Res	.303	.058	5.235	***	
SocRes	<-->	Gov	.343	.057	5.971	***	
SocRes	<-->	Alt	-.060	.033	-1.796	.073	
Innov	<-->	Man	.193	.042	4.617	***	
Innov	<-->	Res	.275	.053	5.245	***	
Innov	<-->	Gov	.364	.055	6.623	***	
Innov	<-->	Alt	-.015	.029	-.508	.611	
Man	<-->	Res	.753	.103	7.277	***	
Man	<-->	Gov	.685	.098	7.015	***	
Man	<-->	Alt	-.047	.043	-1.093	.274	
Res	<-->	Gov	.951	.111	8.604	***	

			Estimate	S.E.	C.R.	P	Label
Res	<-->	Alt	-.139	.057	-2.442	.015	
Gov	<-->	Alt	-.093	.054	-1.715	.086	
Sports	<-->	RA	.403	.060	6.681	***	
Consent	<-->	RA	.041	.025	1.644	.100	
EmpDev	<-->	RA	.249	.033	7.611	***	
Harmony	<-->	RA	.206	.027	7.583	***	
CustOrient	<-->	RA	.114	.021	5.319	***	
SocRes	<-->	RA	.262	.035	7.494	***	
Innov	<-->	RA	.211	.031	6.749	***	
Man	<-->	RA	.298	.049	6.122	***	
Res	<-->	RA	.446	.059	7.559	***	
Gov	<-->	RA	.390	.056	7.020	***	
Alt	<-->	RA	.009	.029	.309	.757	
Sports	<-->	Inbound	.358	.057	6.320	***	
Consent	<-->	Inbound	.004	.024	.151	.880	
EmpDev	<-->	Inbound	.302	.034	8.800	***	
Harmony	<-->	Inbound	.228	.028	8.234	***	
CustOrient	<-->	Inbound	.135	.023	5.790	***	
SocRes	<-->	Inbound	.253	.033	7.588	***	
Innov	<-->	Inbound	.272	.034	8.067	***	
Man	<-->	Inbound	.263	.045	5.840	***	
Res	<-->	Inbound	.426	.056	7.582	***	
Gov	<-->	Inbound	.447	.056	7.934	***	
Alt	<-->	Inbound	-.002	.029	-.081	.936	
RA	<-->	Inbound	.269	.033	8.154	***	
Sports	<-->	Out-bound	.242	.063	3.843	***	
Consent	<-->	Out-bound	.160	.032	4.923	***	
EmpDev	<-->	Out-bound	.084	.031	2.714	.007	
Harmony	<-->	Out-bound	.074	.024	3.093	.002	
CustOrient	<-->	Out-bound	.085	.020	4.138	***	
SocRes	<-->	Out-bound	.076	.034	2.214	.027	
Innov	<-->	Out-bound	.041	.030	1.367	.171	
Man	<-->	Out-bound	.023	.043	.533	.594	
Res	<-->	Out-bound	-.049	.057	-.847	.397	
Gov	<-->	Out-bound	.027	.055	.491	.624	
Alt	<-->	Out-bound	.191	.038	5.041	***	
RA	<-->	Out-bound	.119	.031	3.790	***	
Inbound	<-->	Out-bound	.078	.030	2.621	.009	

Correlations: (Group number 1 - Default model)

			Estimate
Sports	<-->	Consent	.070
Sports	<-->	EmpDev	.390
Sports	<-->	Harmony	.483
Sports	<-->	CustOrient	.301
Sports	<-->	SocRes	.292
Sports	<-->	Innov	.273

			Estimate
Sports	<-->	Man	.361
Sports	<-->	Res	.347
Sports	<-->	Gov	.409
Sports	<-->	Alt	-.044
Consent	<-->	EmpDev	-.044
Consent	<-->	Harmony	.049
Consent	<-->	CustOrient	.147
Consent	<-->	SocRes	.089
Consent	<-->	Innov	.040
Consent	<-->	Man	.060
Consent	<-->	Res	.008
Consent	<-->	Gov	.016
Consent	<-->	Alt	.353
EmpDev	<-->	Harmony	.777
EmpDev	<-->	CustOrient	.562
EmpDev	<-->	SocRes	.502
EmpDev	<-->	Innov	.675
EmpDev	<-->	Man	.456
EmpDev	<-->	Res	.407
EmpDev	<-->	Gov	.554
EmpDev	<-->	Alt	-.038
Harmony	<-->	CustOrient	.636
Harmony	<-->	SocRes	.588
Harmony	<-->	Innov	.583
Harmony	<-->	Man	.505
Harmony	<-->	Res	.424
Harmony	<-->	Gov	.558
Harmony	<-->	Alt	-.041
CustOrient	<-->	SocRes	.459
CustOrient	<-->	Innov	.477
CustOrient	<-->	Man	.358
CustOrient	<-->	Res	.284
CustOrient	<-->	Gov	.414
CustOrient	<-->	Alt	.141
SocRes	<-->	Innov	.443
SocRes	<-->	Man	.394
SocRes	<-->	Res	.340
SocRes	<-->	Gov	.409
SocRes	<-->	Alt	-.111
Innov	<-->	Man	.354
Innov	<-->	Res	.363
Innov	<-->	Gov	.510
Innov	<-->	Alt	-.032
Man	<-->	Res	.706
Man	<-->	Gov	.683
Man	<-->	Alt	-.073
Res	<-->	Gov	.683
Res	<-->	Alt	-.156

			Estimate
Gov	<-->	Alt	-.111
Sports	<-->	RA	.487
Consent	<-->	RA	.103
EmpDev	<-->	RA	.616
Harmony	<-->	RA	.674
CustOrient	<-->	RA	.532
SocRes	<-->	RA	.565
Innov	<-->	RA	.535
Man	<-->	RA	.538
Res	<-->	RA	.580
Gov	<-->	RA	.540
Alt	<-->	RA	.020
Sports	<-->	Inbound	.447
Consent	<-->	Inbound	.009
EmpDev	<-->	Inbound	.771
Harmony	<-->	Inbound	.769
CustOrient	<-->	Inbound	.652
SocRes	<-->	Inbound	.564
Innov	<-->	Inbound	.713
Man	<-->	Inbound	.491
Res	<-->	Inbound	.571
Gov	<-->	Inbound	.637
Alt	<-->	Inbound	-.005
RA	<-->	Inbound	.696
Sports	<-->	Out-bound	.250
Consent	<-->	Out-bound	.344
EmpDev	<-->	Out-bound	.178
Harmony	<-->	Out-bound	.207
CustOrient	<-->	Out-bound	.337
SocRes	<-->	Out-bound	.140
Innov	<-->	Out-bound	.088
Man	<-->	Out-bound	.036
Res	<-->	Out-bound	-.054
Gov	<-->	Out-bound	.032
Alt	<-->	Out-bound	.352
RA	<-->	Out-bound	.254
Inbound	<-->	Out-bound	.173

Variances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
Sports	1.715	.197	8.685	***	
Consent	.395	.054	7.368	***	
EmpDev	.408	.049	8.305	***	
Harmony	.234	.034	6.806	***	
CustOrient	.115	.030	3.788	***	
SocRes	.538	.055	9.862	***	
Innov	.388	.054	7.143	***	

	Estimate	S.E.	C.R.	P	Label
Man	.767	.138	5.561	***	
Res	1.480	.154	9.621	***	
Gov	1.308	.151	8.680	***	
Alt	.538	.063	8.572	***	
RA	.399	.052	7.675	***	
Inbound	.375	.045	8.329	***	
Out-bound	.548	.067	8.222	***	
e1	.360	.035	10.321	***	
e2	.349	.037	9.449	***	
e3	.349	.032	10.902	***	
e4	.260	.031	8.359	***	
e5	.954	.087	10.929	***	
e6	.848	.085	9.971	***	
e7	.448	.062	7.246	***	
e8	.810	.076	10.614	***	
e9	.355	.032	11.005	***	
e10	.225	.028	8.077	***	
e11	.192	.026	7.396	***	
e12	.252	.024	10.372	***	
e13	.173	.019	9.234	***	
e14	.245	.022	11.269	***	
e15	.271	.023	11.621	***	
e16	.238	.023	10.572	***	
e17	.247	.022	11.168	***	
e18	.511	.041	12.427	***	
e19	.221	.021	10.461	***	
e20	.153	.021	7.370	***	
e21	.099	.022	4.494	***	
e22	.386	.031	12.376	***	
e23	.381	.034	11.139	***	
e24	.216	.022	9.647	***	
e25	.222	.024	9.114	***	
e26	.235	.022	10.691	***	
e27	1.354	.119	11.404	***	
e28	1.545	.127	12.184	***	
e29	.478	.061	7.880	***	
e30	.467	.058	7.987	***	
e31	1.019	.089	11.456	***	
e32	.624	.072	8.628	***	
e33	.544	.070	7.715	***	
e34	1.067	.091	11.710	***	
e35	.198	.020	9.996	***	
e36	.482	.041	11.822	***	
e37	.740	.057	12.934	***	
e38	.427	.038	11.300	***	
e39	.339	.033	10.206	***	
e40	.265	.027	9.841	***	
e41	.323	.029	11.045	***	

	Estimate	S.E.	C.R.	P	Label
e42	.198	.020	9.943	***	
e43	.429	.033	12.867	***	
e44	.233	.022	10.582	***	
e45	.295	.036	8.272	***	
e46	.536	.043	12.449	***	
e47	.257	.026	9.766	***	
e48	.280	.024	11.478	***	
e49	.224	.021	10.603	***	
e50	.337	.028	12.054	***	
e51	.242	.022	10.866	***	
e52	.440	.037	12.033	***	
e53	.354	.031	11.357	***	
e54	.247	.023	10.782	***	
e55	.538	.042	12.743	***	
e56	.608	.130	4.683	***	
e57	.467	.039	12.012	***	
e58	1.338	.105	12.737	***	
e59	.252	.021	11.847	***	
e60	.325	.037	8.711	***	

FINAL MEASUREMENT MODEL (SOME ITEMS REMOVED)

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	193	2002.733	1133	.000	1.768
Saturated model	1326	.000	0		
Independence model	51	10946.404	1275	.000	8.585

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.052	.808	.775	.690
Saturated model	.000	1.000		
Independence model	.302	.202	.170	.194

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.817	.794	.911	.899	.910
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.889	.726	.809
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	869.733	748.938	998.349
Saturated model	.000	.000	.000
Independence model	9671.404	9340.669	10008.678

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	5.925	2.573	2.216	2.954
Saturated model	.000	.000	.000	.000
Independence model	32.386	28.614	27.635	29.611

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.048	.044	.051	.870
Independence model	.150	.147	.152	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	2388.733	2458.915	3127.151	3320.151
Saturated model	2652.000	3134.182	7725.276	9051.276
Independence model	11048.404	11066.950	11243.530	11294.530

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	7.067	6.710	7.448	7.275
Saturated model	7.846	7.846	7.846	9.273
Independence model	32.688	31.709	33.685	32.742

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	205	211
Independence model	42	44

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
OCB.Spo.4	<---	Sports	1.000				
OCB.Spo.3	<---	Sports	1.126	.063	17.779	***	
OCB.Spo.2	<---	Sports	1.140	.059	19.456	***	
OCB.Spo.1	<---	Sports	.985	.058	16.988	***	
OCB.Con.4	<---	Consent	1.000				
OCB.Con.3	<---	Consent	1.212	.083	14.542	***	
OCB.Con.2	<---	Consent	1.204	.082	14.702	***	
OC.EmpDev.4	<---	EmpDev	1.000				
OC.EmpDev.3	<---	EmpDev	1.014	.059	17.204	***	
OC.EmpDev.2	<---	EmpDev	.738	.054	13.780	***	
OC.Harmony.4	<---	Harmony	1.000				
OC.Harmony.3	<---	Harmony	1.217	.095	12.812	***	
OC.Harmony.2	<---	Harmony	1.098	.089	12.348	***	
OC.CustOrient.3	<---	CustOrient	1.038	.096	10.811	***	
OC.SocRes.4	<---	SocRes	1.000				
OC.SocRes.3	<---	SocRes	1.090	.052	20.900	***	
OC.SocRes.2	<---	SocRes	.604	.052	11.646	***	
OC.Innov.4	<---	Innov	1.000				
OC.Innov.3	<---	Innov	.999	.074	13.479	***	
OC.Innov.2	<---	Innov	1.092	.079	13.787	***	
OC.Innov.1	<---	Innov	.868	.069	12.598	***	
MT.Man.2	<---	Man	1.000				
MT.Res.3	<---	Res	1.000				
MT.Res.2	<---	Res	.973	.050	19.298	***	
MT.Res.1	<---	Res	.820	.057	14.500	***	
MT.Gov.3	<---	Gov	1.000				
MT.Gov.2	<---	Gov	1.035	.063	16.316	***	
MT.Gov.1	<---	Gov	.728	.062	11.667	***	
OCB.Alt.4	<---	Alt	.893	.065	13.801	***	
OCB.Alt.3	<---	Alt	1.008	.069	14.652	***	
OCB.Alt.2	<---	Alt	.783	.060	12.966	***	
OCB.Alt.1	<---	Alt	1.000				
OC.CustOrient.2	<---	CustOrient	1.108	.097	11.443	***	
OCB.Con.1	<---	Consent	.904	.082	11.004	***	
RA3	<---	RA	1.068	.083	12.897	***	
RA2	<---	RA	1.219	.085	14.417	***	
RA1	<---	RA	1.143	.078	14.702	***	
RA5	<---	RA	1.000				
IBOI.6	<---	Inbound	1.000				
IBOI.5	<---	Inbound	1.035	.064	16.108	***	
IBOI.2	<---	Inbound	.871	.064	13.518	***	

			Estimate	S.E.	C.R.	P	Label
OBOI.3	<---	Out-bound	1.000				
OBOI.1	<---	Out-bound	.791	.060	13.188	***	
OC.CustOrient.5	<---	CustOrient	1.000				
OC.EmpDev.5	<---	EmpDev	.684	.060	11.328	***	
OC.Harmony.5	<---	Harmony	1.126	.092	12.282	***	
OC.CustOrient.1	<---	CustOrient	1.034	.098	10.567	***	
MT.Man.3	<---	Man	2.009	.256	7.835	***	
RA6	<---	RA	.858	.077	11.100	***	
IBOI.1	<---	Inbound	.719	.058	12.357	***	
OBOI.4	<---	Out-bound	1.014	.074	13.646	***	

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
OCB.Spo.4	<---	Sports	.802
OCB.Spo.3	<---	Sports	.848
OCB.Spo.2	<---	Sports	.912
OCB.Spo.1	<---	Sports	.820
OCB.Con.4	<---	Consent	.726
OCB.Con.3	<---	Consent	.849
OCB.Con.2	<---	Consent	.865
OC.EmpDev.4	<---	EmpDev	.802
OC.EmpDev.3	<---	EmpDev	.872
OC.EmpDev.2	<---	EmpDev	.717
OC.Harmony.4	<---	Harmony	.698
OC.Harmony.3	<---	Harmony	.782
OC.Harmony.2	<---	Harmony	.749
OC.CustOrient.3	<---	CustOrient	.702
OC.SocRes.4	<---	SocRes	.891
OC.SocRes.3	<---	SocRes	.928
OC.SocRes.2	<---	SocRes	.582
OC.Innov.4	<---	Innov	.712
OC.Innov.3	<---	Innov	.802
OC.Innov.2	<---	Innov	.824
OC.Innov.1	<---	Innov	.744
MT.Man.2	<---	Man	.516
MT.Res.3	<---	Res	.872
MT.Res.2	<---	Res	.866
MT.Res.1	<---	Res	.703
MT.Gov.3	<---	Gov	.823
MT.Gov.2	<---	Gov	.850
MT.Gov.1	<---	Gov	.626
OCB.Alt.4	<---	Alt	.738
OCB.Alt.3	<---	Alt	.781
OCB.Alt.2	<---	Alt	.698
OCB.Alt.1	<---	Alt	.822
OC.CustOrient.2	<---	CustOrient	.758
OCB.Con.1	<---	Consent	.634

			Estimate
RA3	<---	RA	.718
RA2	<---	RA	.798
RA1	<---	RA	.813
RA5	<---	RA	.745
IBOI.6	<---	Inbound	.789
IBOI.5	<---	Inbound	.824
IBOI.2	<---	Inbound	.711
OBOI.3	<---	Out-bound	.797
OBOI.1	<---	Out-bound	.755
OC.CustOrient.5	<---	CustOrient	.680
OC.EmpDev.5	<---	EmpDev	.607
OC.Harmony.5	<---	Harmony	.745
OC.CustOrient.1	<---	CustOrient	.682
MT.Man.3	<---	Man	.961
RA6	<---	RA	.622
IBOI.1	<---	Inbound	.658
OBOI.4	<---	Out-bound	.795

Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
Sports	<-->	Consent	.058	.050	1.158	.247	
Sports	<-->	EmpDev	.307	.057	5.369	***	
Sports	<-->	Harmony	.303	.048	6.285	***	
Sports	<-->	CustOrient	.180	.040	4.441	***	
Sports	<-->	SocRes	.285	.061	4.656	***	
Sports	<-->	Innov	.224	.054	4.174	***	
Sports	<-->	Man	.369	.078	4.734	***	
Sports	<-->	Res	.554	.105	5.289	***	
Sports	<-->	Gov	.613	.104	5.913	***	
Sports	<-->	Alt	-.043	.059	-.718	.473	
Consent	<-->	EmpDev	-.020	.026	-.791	.429	
Consent	<-->	Harmony	.018	.020	.891	.373	
Consent	<-->	CustOrient	.040	.019	2.146	.032	
Consent	<-->	SocRes	.041	.028	1.442	.149	
Consent	<-->	Innov	.016	.025	.644	.519	
Consent	<-->	Man	.021	.029	.742	.458	
Consent	<-->	Res	.006	.048	.129	.898	
Consent	<-->	Gov	.012	.045	.263	.793	
Consent	<-->	Alt	.163	.032	5.091	***	
EmpDev	<-->	Harmony	.229	.029	7.990	***	
EmpDev	<-->	CustOrient	.147	.023	6.366	***	
EmpDev	<-->	SocRes	.228	.034	6.746	***	
EmpDev	<-->	Innov	.262	.034	7.695	***	
EmpDev	<-->	Man	.205	.041	4.951	***	
EmpDev	<-->	Res	.283	.054	5.276	***	
EmpDev	<-->	Gov	.385	.056	6.918	***	
EmpDev	<-->	Alt	-.012	.030	-.405	.685	

			Estimate	S.E.	C.R.	P	Label
Harmony	<-->	CustOrient	.138	.020	6.913	***	
Harmony	<-->	SocRes	.211	.029	7.320	***	
Harmony	<-->	Innov	.178	.026	6.839	***	
Harmony	<-->	Man	.168	.034	4.987	***	
Harmony	<-->	Res	.236	.043	5.486	***	
Harmony	<-->	Gov	.303	.045	6.738	***	
Harmony	<-->	Alt	-.008	.024	-.356	.722	
CustOrient	<-->	SocRes	.144	.024	5.895	***	
CustOrient	<-->	Innov	.122	.022	5.591	***	
CustOrient	<-->	Man	.126	.028	4.465	***	
CustOrient	<-->	Res	.155	.038	4.120	***	
CustOrient	<-->	Gov	.204	.038	5.328	***	
CustOrient	<-->	Alt	.046	.022	2.114	.035	
SocRes	<-->	Innov	.201	.033	6.128	***	
SocRes	<-->	Man	.206	.044	4.737	***	
SocRes	<-->	Res	.308	.059	5.252	***	
SocRes	<-->	Gov	.343	.058	5.926	***	
SocRes	<-->	Alt	-.060	.034	-1.764	.078	
Innov	<-->	Man	.166	.037	4.437	***	
Innov	<-->	Res	.277	.053	5.255	***	
Innov	<-->	Gov	.364	.055	6.626	***	
Innov	<-->	Alt	-.015	.029	-.510	.610	
Man	<-->	Res	.620	.102	6.086	***	
Man	<-->	Gov	.551	.094	5.897	***	
Man	<-->	Alt	-.052	.035	-1.497	.134	
Res	<-->	Gov	.955	.111	8.618	***	
Res	<-->	Alt	-.140	.057	-2.445	.014	
Gov	<-->	Alt	-.094	.054	-1.721	.085	
Sports	<-->	RA	.410	.061	6.750	***	
Consent	<-->	RA	.041	.025	1.636	.102	
EmpDev	<-->	RA	.237	.032	7.322	***	
Harmony	<-->	RA	.207	.028	7.535	***	
CustOrient	<-->	RA	.150	.023	6.473	***	
SocRes	<-->	RA	.266	.035	7.527	***	
Innov	<-->	RA	.212	.031	6.764	***	
Man	<-->	RA	.248	.046	5.413	***	
Res	<-->	RA	.446	.059	7.544	***	
Gov	<-->	RA	.390	.056	7.011	***	
Alt	<-->	RA	.009	.029	.292	.770	
Sports	<-->	Inbound	.356	.057	6.258	***	
Consent	<-->	Inbound	.001	.024	.060	.953	
EmpDev	<-->	Inbound	.290	.034	8.566	***	
Harmony	<-->	Inbound	.224	.028	8.097	***	
CustOrient	<-->	Inbound	.170	.024	7.191	***	
SocRes	<-->	Inbound	.254	.034	7.541	***	
Innov	<-->	Inbound	.277	.034	8.126	***	
Man	<-->	Inbound	.213	.041	5.164	***	
Res	<-->	Inbound	.420	.056	7.484	***	

			Estimate	S.E.	C.R.	P	Label
Gov	<-->	Inbound	.444	.056	7.883	***	
Alt	<-->	Inbound	-.004	.029	-.122	.903	
RA	<-->	Inbound	.270	.033	8.153	***	
Sports	<-->	Out-bound	.247	.063	3.924	***	
Consent	<-->	Out-bound	.158	.032	4.900	***	
EmpDev	<-->	Out-bound	.085	.031	2.708	.007	
Harmony	<-->	Out-bound	.078	.025	3.172	.002	
CustOrient	<-->	Out-bound	.117	.024	4.837	***	
SocRes	<-->	Out-bound	.078	.034	2.280	.023	
Innov	<-->	Out-bound	.041	.030	1.382	.167	
Man	<-->	Out-bound	.035	.035	1.006	.314	
Res	<-->	Out-bound	-.044	.057	-.777	.437	
Gov	<-->	Out-bound	.032	.055	.583	.560	
Alt	<-->	Out-bound	.186	.038	4.938	***	
RA	<-->	Out-bound	.125	.031	3.975	***	
Inbound	<-->	Out-bound	.084	.030	2.798	.005	

Correlations: (Group number 1 - Default model)

			Estimate
Sports	<-->	Consent	.070
Sports	<-->	EmpDev	.360
Sports	<-->	Harmony	.466
Sports	<-->	CustOrient	.307
Sports	<-->	SocRes	.294
Sports	<-->	Innov	.273
Sports	<-->	Man	.375
Sports	<-->	Res	.347
Sports	<-->	Gov	.409
Sports	<-->	Alt	-.044
Consent	<-->	EmpDev	-.049
Consent	<-->	Harmony	.057
Consent	<-->	CustOrient	.142
Consent	<-->	SocRes	.088
Consent	<-->	Innov	.040
Consent	<-->	Man	.045
Consent	<-->	Res	.008
Consent	<-->	Gov	.017
Consent	<-->	Alt	.353
EmpDev	<-->	Harmony	.707
EmpDev	<-->	CustOrient	.505
EmpDev	<-->	SocRes	.473
EmpDev	<-->	Innov	.644
EmpDev	<-->	Man	.419
EmpDev	<-->	Res	.355
EmpDev	<-->	Gov	.516
EmpDev	<-->	Alt	-.026
Harmony	<-->	CustOrient	.624

			Estimate
Harmony	<-->	SocRes	.574
Harmony	<-->	Innov	.574
Harmony	<-->	Man	.451
Harmony	<-->	Res	.390
Harmony	<-->	Gov	.533
Harmony	<-->	Alt	-.023
CustOrient	<-->	SocRes	.435
CustOrient	<-->	Innov	.436
CustOrient	<-->	Man	.375
CustOrient	<-->	Res	.285
CustOrient	<-->	Gov	.399
CustOrient	<-->	Alt	.142
SocRes	<-->	Innov	.435
SocRes	<-->	Man	.371
SocRes	<-->	Res	.341
SocRes	<-->	Gov	.405
SocRes	<-->	Alt	-.110
Innov	<-->	Man	.354
Innov	<-->	Res	.363
Innov	<-->	Gov	.510
Innov	<-->	Alt	-.032
Man	<-->	Res	.676
Man	<-->	Gov	.642
Man	<-->	Alt	-.094
Res	<-->	Gov	.684
Res	<-->	Alt	-.156
Gov	<-->	Alt	-.111
Sports	<-->	RA	.494
Consent	<-->	RA	.103
EmpDev	<-->	RA	.573
Harmony	<-->	RA	.661
CustOrient	<-->	RA	.531
SocRes	<-->	RA	.568
Innov	<-->	RA	.536
Man	<-->	RA	.521
Res	<-->	RA	.577
Gov	<-->	RA	.539
Alt	<-->	RA	.018
Sports	<-->	Inbound	.441
Consent	<-->	Inbound	.004
EmpDev	<-->	Inbound	.724
Harmony	<-->	Inbound	.735
CustOrient	<-->	Inbound	.621
SocRes	<-->	Inbound	.559
Innov	<-->	Inbound	.721
Man	<-->	Inbound	.462
Res	<-->	Inbound	.560
Gov	<-->	Inbound	.631

			Estimate
Alt	<-->	Inbound	-.008
RA	<-->	Inbound	.695
Sports	<-->	Out-bound	.257
Consent	<-->	Out-bound	.344
EmpDev	<-->	Out-bound	.178
Harmony	<-->	Out-bound	.216
CustOrient	<-->	Out-bound	.359
SocRes	<-->	Out-bound	.145
Innov	<-->	Out-bound	.090
Man	<-->	Out-bound	.063
Res	<-->	Out-bound	-.050
Gov	<-->	Out-bound	.038
Alt	<-->	Out-bound	.346
RA	<-->	Out-bound	.270
Inbound	<-->	Out-bound	.186

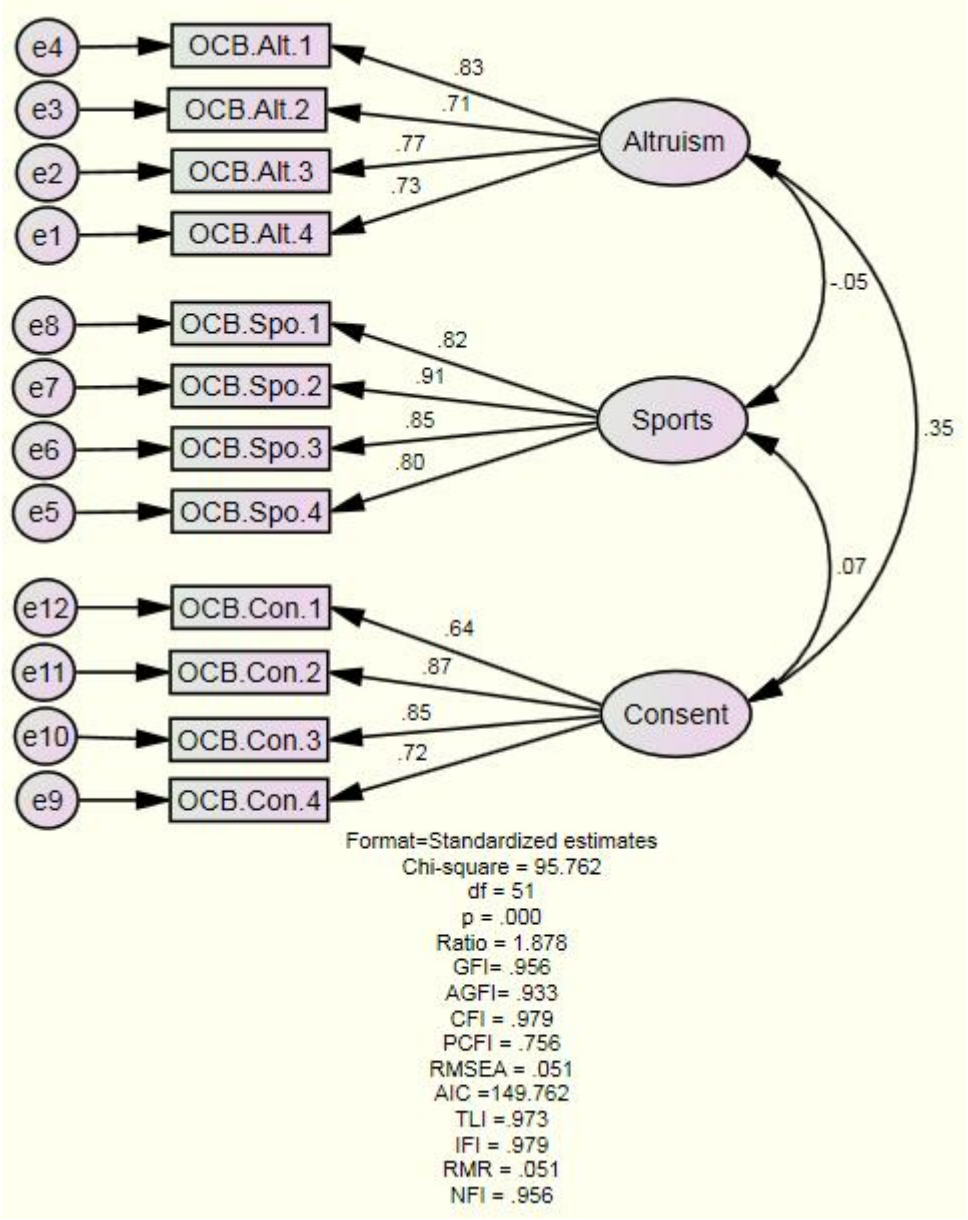
Variances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
Sports	1.717	.198	8.691	***	
Consent	.395	.054	7.371	***	
EmpDev	.425	.050	8.521	***	
Harmony	.246	.035	6.957	***	
CustOrient	.199	.031	6.525	***	
SocRes	.548	.055	9.915	***	
Innov	.391	.054	7.171	***	
Man	.564	.122	4.607	***	
Res	1.489	.154	9.673	***	
Gov	1.308	.151	8.675	***	
Alt	.540	.063	8.592	***	
RA	.401	.052	7.695	***	
Inbound	.378	.045	8.354	***	
Out-bound	.535	.067	8.021	***	
e1	.361	.035	10.335	***	
e2	.350	.037	9.459	***	
e3	.349	.032	10.902	***	
e4	.258	.031	8.303	***	
e5	.952	.087	10.922	***	
e6	.847	.085	9.968	***	
e7	.449	.062	7.267	***	
e8	.810	.076	10.612	***	
e9	.354	.032	10.999	***	
e10	.224	.028	8.058	***	
e11	.193	.026	7.429	***	
e12	.235	.024	9.902	***	
e13	.138	.018	7.662	***	
e14	.219	.019	11.237	***	
e15	.259	.023	11.194	***	
e16	.231	.023	9.968	***	
e17	.232	.022	10.546	***	
e19	.221	.021	10.388	***	
e20	.143	.022	6.565	***	
e21	.104	.024	4.426	***	
e22	.392	.032	12.386	***	
e23	.379	.034	11.117	***	
e24	.217	.022	9.666	***	
e25	.221	.024	9.092	***	
e26	.237	.022	10.723	***	
e27	1.557	.131	11.917	***	
e29	.470	.060	7.822	***	
e30	.471	.058	8.094	***	
e31	1.026	.089	11.495	***	
e32	.625	.072	8.616	***	
e33	.537	.070	7.613	***	
e34	1.076	.092	11.737	***	

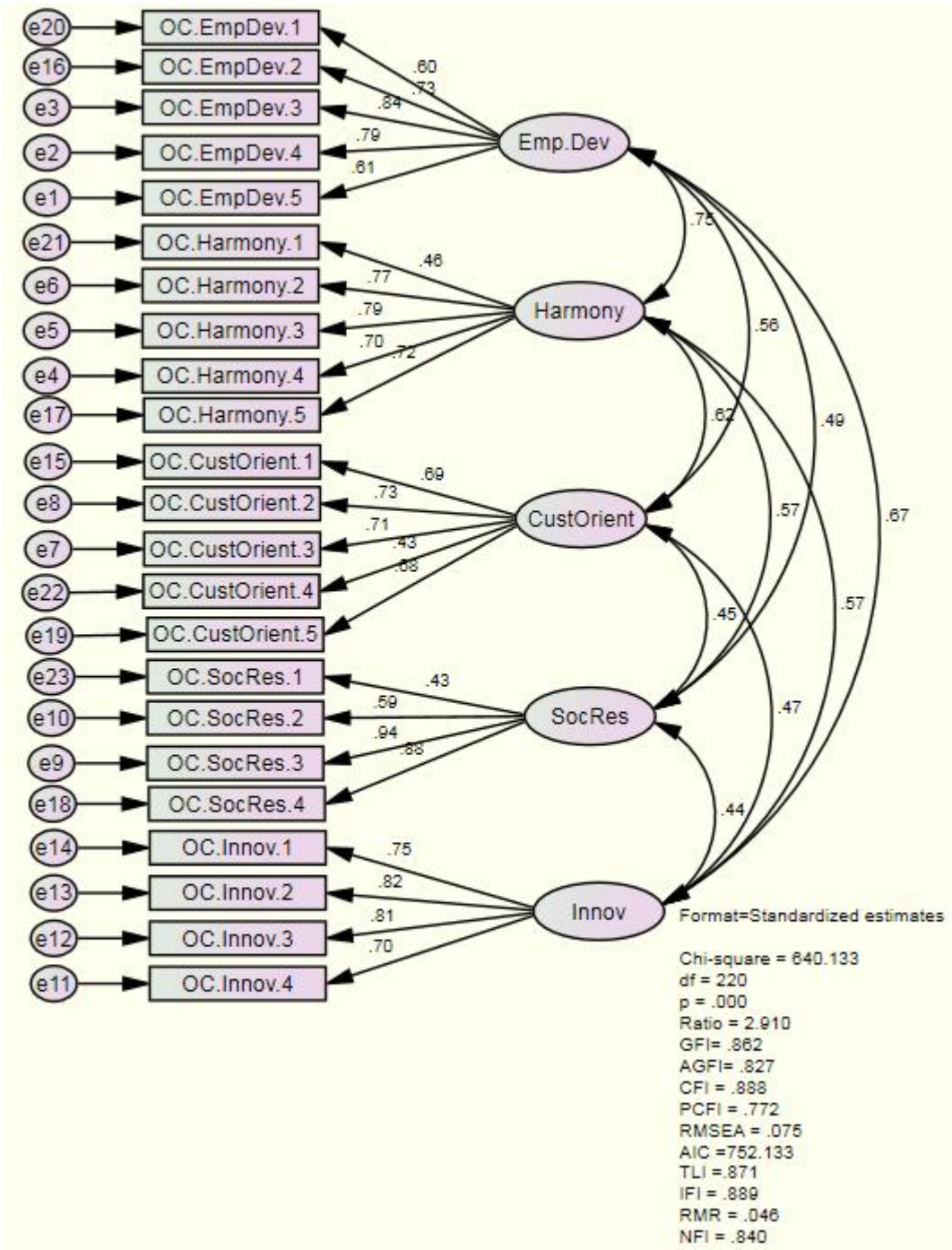
	Estimate	S.E.	C.R.	P	Label
e35	.181	.019	9.350	***	
e36	.482	.041	11.819	***	
e38	.430	.038	11.319	***	
e39	.339	.033	10.198	***	
e40	.268	.027	9.870	***	
e41	.321	.029	11.017	***	
e42	.192	.020	9.642	***	
e44	.230	.022	10.410	***	
e45	.308	.037	8.318	***	
e47	.252	.027	9.463	***	
e48	.281	.025	11.422	***	
e49	.231	.022	10.685	***	
e50	.340	.028	12.042	***	
e51	.250	.024	10.614	***	
e54	.245	.023	10.664	***	
e56	.189	.211	.893	.372	
e57	.467	.039	12.005	***	
e59	.256	.022	11.827	***	
e60	.321	.038	8.380	***	

INITIAL AND FINAL MEASUREMENT MODELS FOR EACH VARIABLE

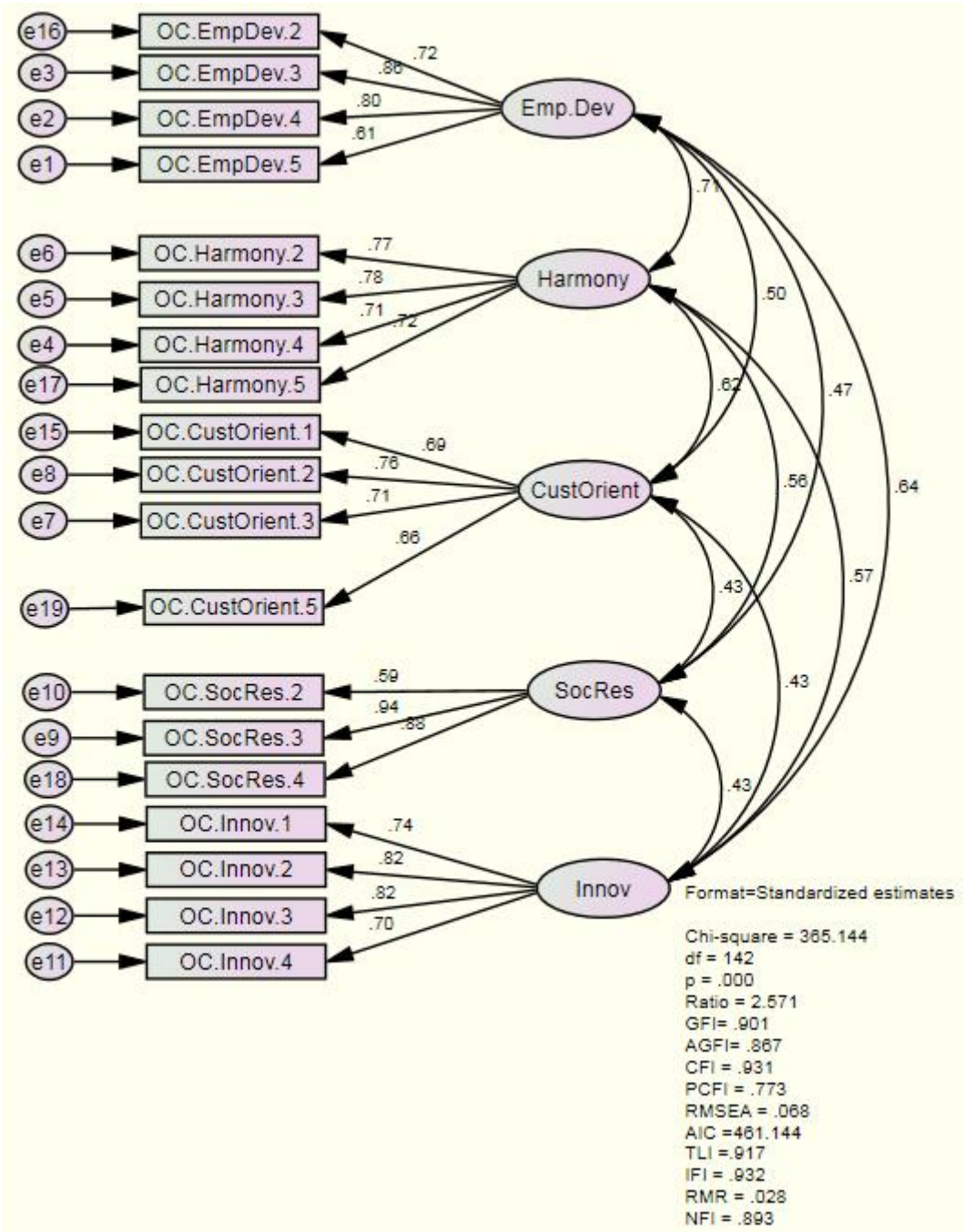
ORGANIZATIONAL CITIZENSHIP BEHAVIOUR (INITIAL AND FINAL)



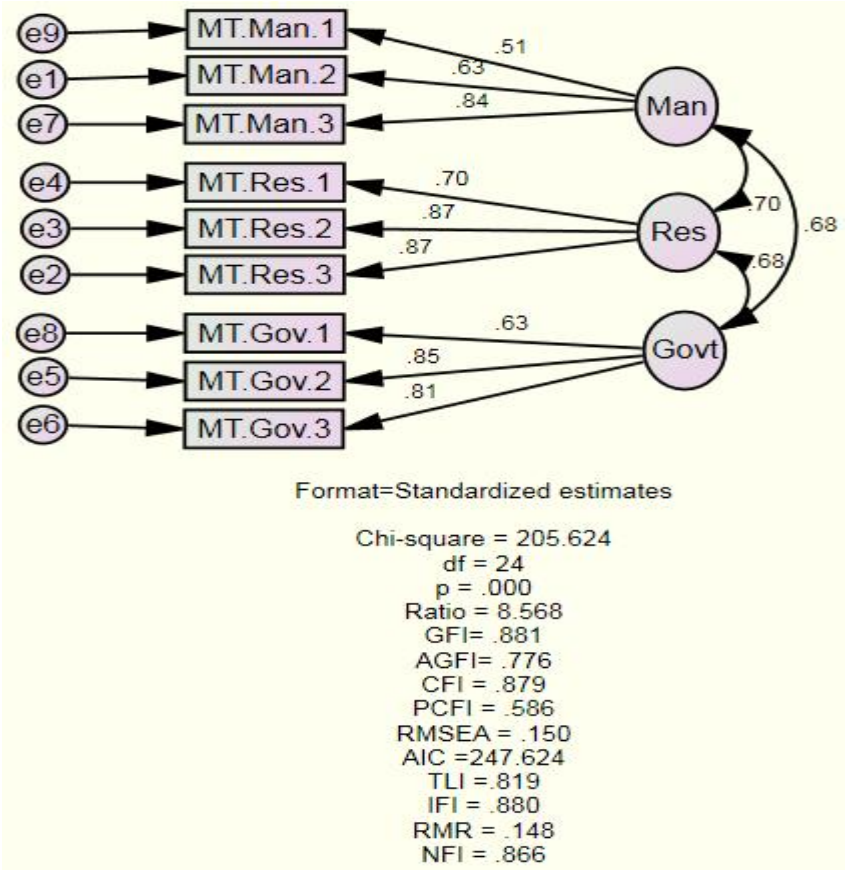
ORGANIZATIONAL CULTURE (INITIAL MODEL)



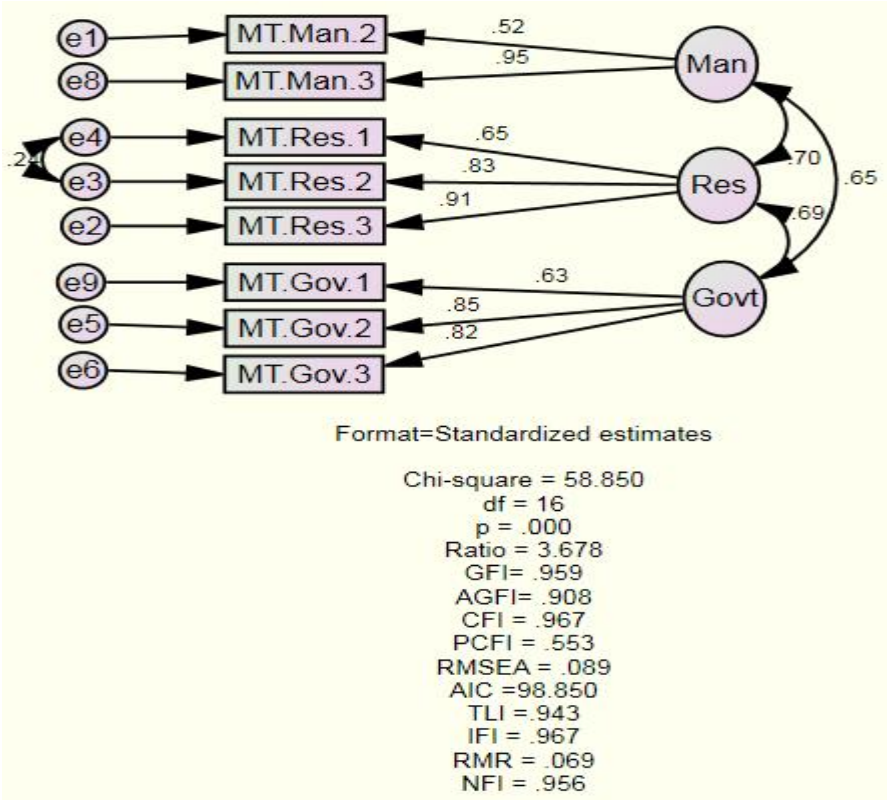
ORGANIZATIONAL CULTURE (FINAL MODEL)



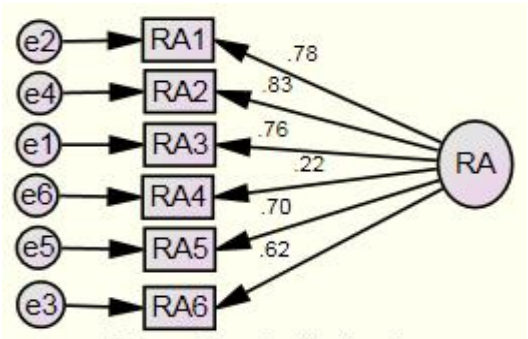
MANAGERIAL TIES (INITIAL MODEL)



MANAGERIAL TIES (FINAL MODEL)



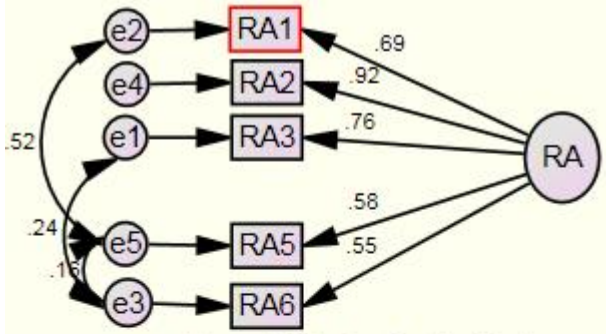
REGIMES OF APPROPRIABILITY (INITIAL MODEL)



Format=Standardized estimates

Chi-square = 116.727
df = 9
p = .000
Ratio = 12.970
GFI= .897
AGFI= .760
CFI = .870
PCFI = .522
RMSEA = .188
AIC =140.727
TLI =.783
IFI = .870
RMR = .046
NFI = .861

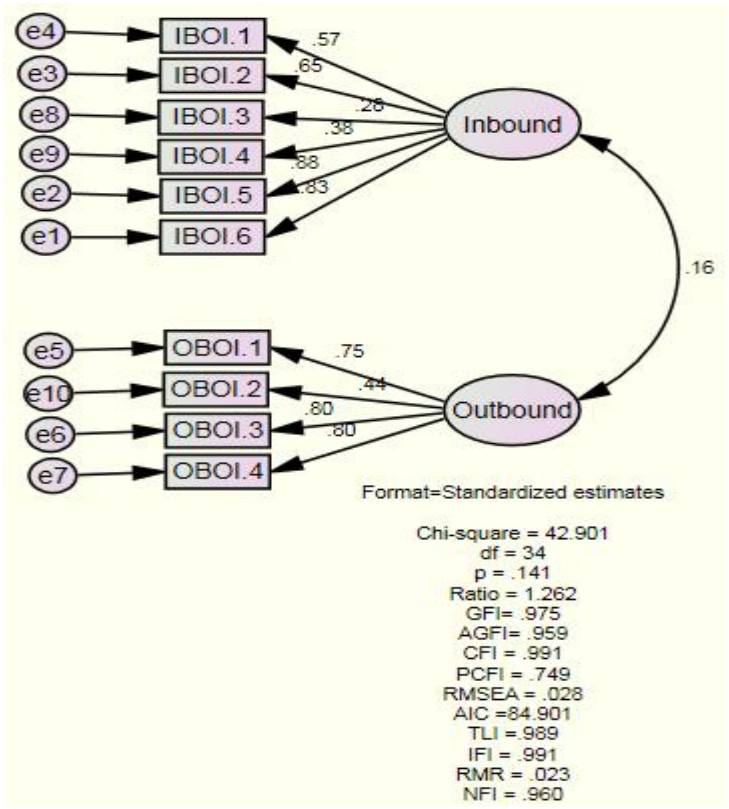
REGIMES OF APPROPRIABILITY (FINAL MODEL)



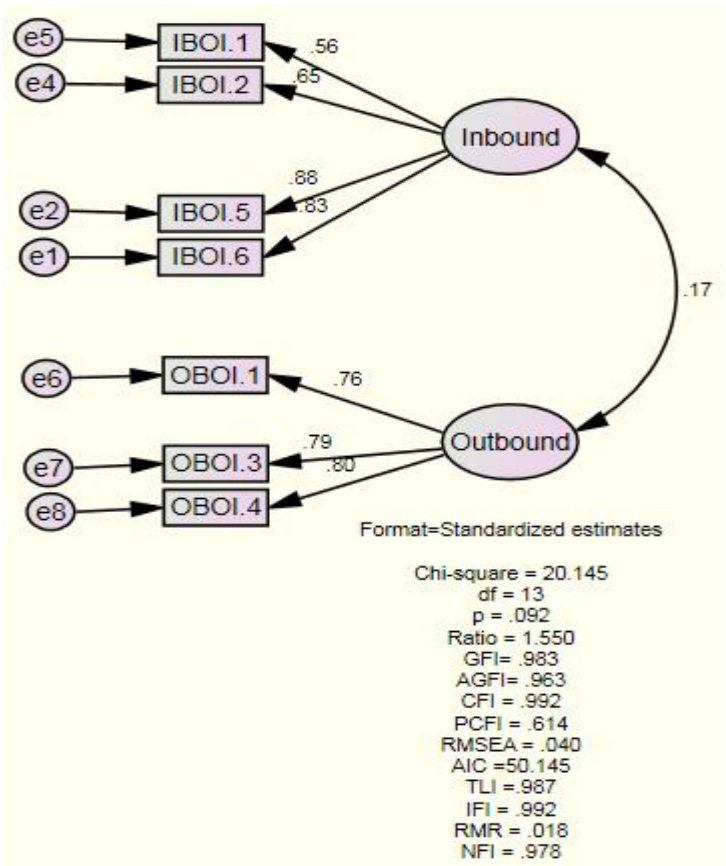
Format=Standardized estimates

Chi-square = 2.899
df = 2
p = .235
Ratio = 1.449
GFI= .997
AGFI= .975
CFI = .999
PCFI = .200
RMSEA = .036
AIC =28.899
TLI =.994
IFI = .999
RMR = .010
NFI = .996

OPEN INNOVATION (INITIAL MODEL)



OPEN INNOVATION (FINAL MODEL)



INITIAL MEASUREMENT MODEL

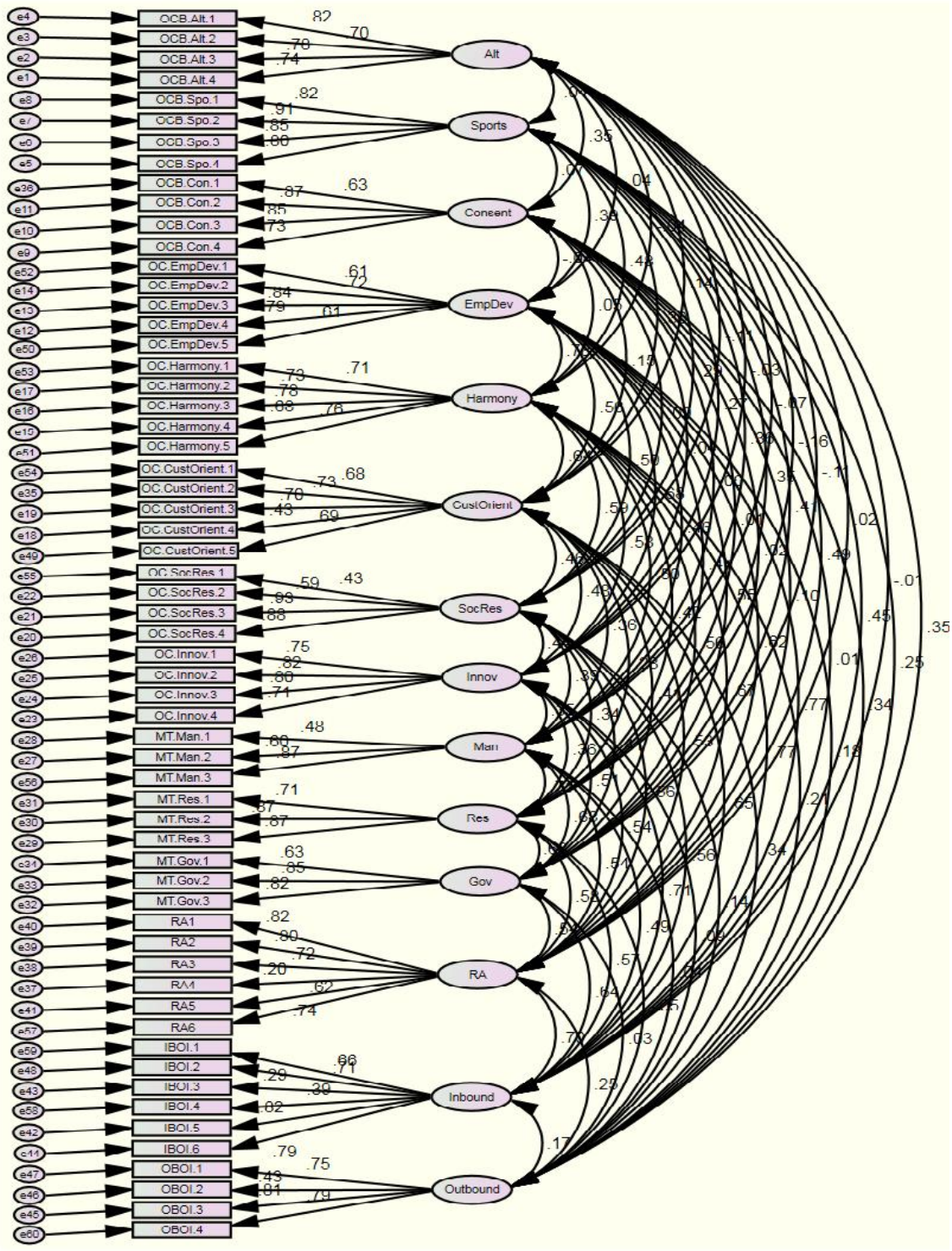


Figure: Showing the initial measurement model with all items

χ^2/df	CFI	RMSEA
1.882	.867	.051

FINAL MEASUREMENT MODEL

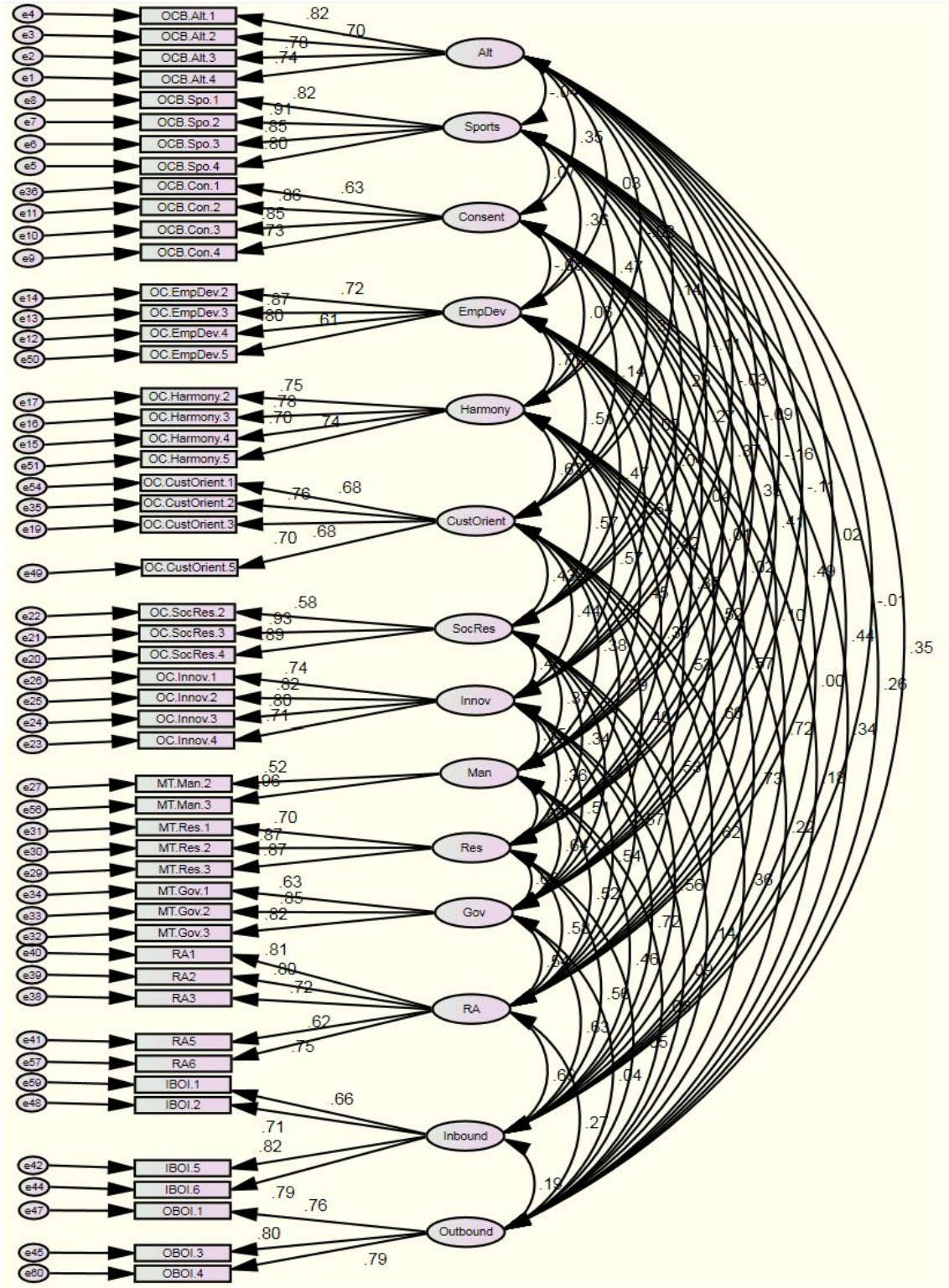


Figure: Showing the final measurement model with 'offending' items dropped

χ^2/df	CFI	RMSEA
1.774	.909	.048

HIERARCHICAL REGRESSION – INBOUND OPEN INNOVATION

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.446[a]	.199	.182	.54775	.199	11.714	7	331	.000
2	.778[b]	.605	.587	.38923	.407	41.563	8	323	.000
3	.786[c]	.617	.598	.38389	.012	10.044	1	322	.002
4	.797[d]	.635	.608	.37932	.018	1.976	8	314	.049

a. Predictors: (Constant), ForeignOwnership, Computers, StateOwned, PublicallyOwned, Aerospace, Electronics, PrivatelyOwned

b. Predictors: (Constant), ForeignOwnership, Computers, StateOwned, PublicallyOwned, Aerospace, Electronics, PrivatelyOwned, OCB.CON, MT.MAN, Hierarchy.Culture, OCB.SPO, OCB.ALT, MT.GOV, MT.RES, Highly.Integrative

c. Predictors: (Constant), ForeignOwnership, Computers, StateOwned, PublicallyOwned, Aerospace, Electronics, PrivatelyOwned, OCB.CON, MT.MAN, Hierarchy.Culture, OCB.SPO, OCB.ALT, MT.GOV, MT.RES, Highly.Integrative, RA.TOTAL

d. Predictors: (Constant), ForeignOwnership, Computers, StateOwned, PublicallyOwned, Aerospace, Electronics, PrivatelyOwned, OCB.CON, MT.MAN, Hierarchy.Culture, OCB.SPO, OCB.ALT, MT.GOV, MT.RES, Highly.Integrative, RA.TOTAL, zRAxOCB.CON, zRAxOCB.SPO, zRAxMT.MAN, zRAxOCB.ALT, zRAxMT.GOVT, zRAxMT.RES, HighlyXRA, HierarchyXRA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24.601	7	3.514	11.714	.000[b]
	Residual	99.309	331	.300		
	Total	123.911	338			
2	Regression	74.976	15	4.998	32.993	.000[c]
	Residual	48.935	323	.152		
	Total	123.911	338			
3	Regression	76.456	16	4.779	32.425	.000[d]
	Residual	47.454	322	.147		
	Total	123.911	338			
4	Regression	78.731	24	3.280	22.800	.000[e]
	Residual	45.179	314	.144		
	Total	123.911	338			

a. Dependent Variable: INBOUND.OI

b. Predictors: (Constant), ForeignOwnership, Computers, StateOwned, PublicallyOwned, Aerospace, Electronics, PrivatelyOwned

c. Predictors: (Constant), ForeignOwnership, Computers, StateOwned, PublicallyOwned, Aerospace, Electronics, PrivatelyOwned, OCB.CON, MT.MAN, Hierarchy.Culture, OCB.SPO, OCB.ALT, MT.GOV, MT.RES, Highly.Integrative

d. Predictors: (Constant), ForeignOwnership, Computers, StateOwned, PublicallyOwned, Aerospace, Electronics, PrivatelyOwned, OCB.CON, MT.MAN, Hierarchy.Culture, OCB.SPO, OCB.ALT, MT.GOV, MT.RES, Highly.Integrative, RA.TOTAL

e. Predictors: (Constant), ForeignOwnership, Computers, StateOwned, PublicallyOwned, Aerospace, Electronics, PrivatelyOwned, OCB.CON, MT.MAN, Hierarchy.Culture, OCB.SPO, OCB.ALT, MT.GOV, MT.RES, Highly.Integrative, RA.TOTAL, zRAxOCB.CON, zRAxOCB.SPO, zRAxMT.MAN, zRAxOCB.ALT, zRAxMT.GOVT, zRAxMT.RES, HighlyXRA, HierarchyXRA

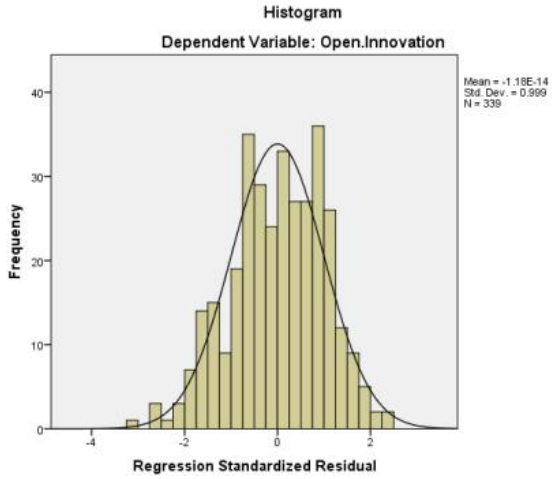
Coefficients											
Model		Unstandardized		Standardized	t	Sig.	Correlations			Collinearity	
		B	Std.	Beta			Zero-	Partial	Part	Tolerance	VIF
1	(Constant)	4.022	.117		34.268	.000					
	Aerospace	-.218	.087	-.148	-2.511	.013	-.145	-.137	-.124	.697	1.435
	Computers	.275	.082	.198	3.345	.001	.319	.181	.165	.688	1.454
	Electronics	-.243	.086	-.168	-2.836	.005	-.167	-.154	-.140	.693	1.442
	Publically Owned	-.192	.154	-.085	-1.252	.211	-.223	-.069	-.062	.529	1.890
	Privately Owned	.351	.116	.290	3.025	.003	.141	.164	.149	.264	3.786
	State Owned	.009	.174	.003	.051	.959	-.104	.003	.003	.648	1.544
	Foreign Ownership	.378	.120	.292	3.139	.002	.091	.170	.154	.279	3.586
2	(Constant)	3.081	.259		11.913	.000					
	Aerospace	-.183	.067	-.125	-2.721	.007	-.145	-.150	-.095	.584	1.713
	Computers	.085	.062	.061	1.367	.173	.319	.076	.048	.604	1.654
	Electronics	-.078	.068	-.054	-1.143	.254	-.167	-.063	-.040	.552	1.810
	PubliclyOwned	-.022	.112	-.010	-.192	.848	-.223	-.011	-.007	.499	2.004
	PrivatelyOwned	.131	.085	.108	1.529	.127	.141	.085	.053	.246	4.068
	StateOwned	.082	.127	.029	.642	.521	-.104	.036	.022	.611	1.636
	ForeignOwnership	.154	.089	.119	1.734	.084	.091	.096	.061	.258	3.882
	OCB.ALT	.071	.032	.086	2.190	.029	.008	.121	.077	.794	1.260
	OCB.SPO	.032	.017	.076	1.827	.006	.397	.101	.064	.703	1.422
	OCB.CON	.075	.031	.092	2.435	.015	.039	.134	.085	.865	1.156
	MT.MAN	-.011	.018	-.023	-.584	.559	.200	-.032	-.020	.819	1.222
	MT.RES	.100	.023	.204	4.427	.000	.467	.239	.155	.573	1.744
	MT.GOV	.068	.024	.132	2.791	.006	.525	.153	.098	.544	1.839
	Highly.Integrative	.500	.056	.414	8.933	.000	.681	.445	.312	.571	1.753
	Hierarchy.Culture	-.225	.070	-.131	-3.242	.001	-.434	-.178	-.113	.747	1.338
3	(Constant)	2.725	.279		9.781	.000					
	Aerospace	-.152	.067	-.103	-2.267	.024	-.145	-.125	-.078	.571	1.750
	Computers	.059	.062	.043	.954	.341	.319	.053	.033	.594	1.684
	Electronics	-.096	.068	-.066	-1.422	.156	-.167	-.079	-.049	.548	1.823
	PubliclyOwned	-.009	.111	-.004	-.085	.932	-.223	-.005	-.003	.498	2.007
	PrivatelyOwned	.138	.084	.114	1.640	.102	.141	.091	.057	.246	4.072
	StateOwned	.074	.126	.026	.590	.555	-.104	.033	.020	.611	1.636
	ForeignOwnership	.146	.088	.113	1.666	.097	.091	.092	.057	.257	3.886
	OCB.ALT	.066	.032	.081	2.080	.038	.008	.115	.072	.792	1.262
	OCB.SPO	.021	.017	.050	1.202	.230	.397	.067	.041	.677	1.478
	OCB.CON	.073	.030	.088	2.385	.018	.039	.132	.082	.864	1.157
	MT.MAN	-.012	.018	-.027	-.700	.484	.200	-.039	-.024	.818	1.223
	MT.RES	.076	.024	.155	3.215	.001	.467	.176	.111	.513	1.950
	MT.GOV	.066	.024	.128	2.726	.007	.525	.150	.094	.543	1.841
	Highly.Integrative	.453	.057	.375	7.921	.000	.681	.404	.273	.532	1.880
	Hierarchy.Culture	-.159	.072	-.092	-2.213	.028	-.434	-.122	-.076	.683	1.464
	RA.TOTAL	.136	.043	.162	3.169	.002	.616	.174	.109	.455	2.196
4	(Constant)	2.461	.366		6.724	.000					
	Aerospace	-.131	.068	-.089	-1.925	.055	-.145	-.108	-.066	.545	1.834
	Computers	.056	.063	.040	.890	.374	.319	.050	.030	.569	1.756
	Electronics	-.096	.068	-.066	-1.400	.163	-.167	-.079	-.048	.522	1.914
	PubliclyOwned	-.010	.112	-.004	-.089	.929	-.223	-.005	-.003	.477	2.097
	PrivatelyOwned	.132	.084	.109	1.564	.119	.141	.088	.053	.240	4.174
	StateOwned	.109	.126	.038	.863	.389	-.104	.049	.029	.597	1.675

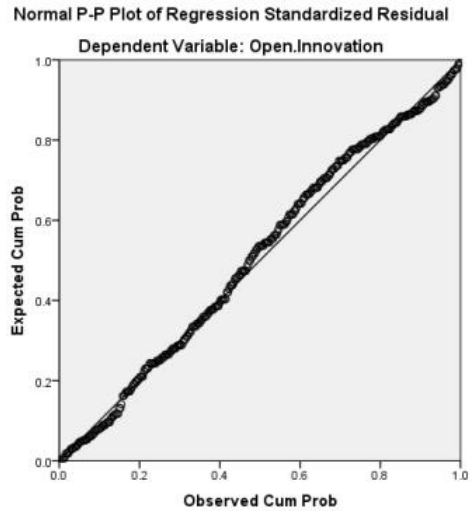
Coefficients										
Model	Unstandardized		Standardized	t	Sig.	Correlations			Collinearity	
	B	Std.	Beta			Zero-	Partial	Part	Tolerance	VIF
ForeignOwnership	.161	.088	.125	1.838	.067	.091	.103	.063	.253	3.957
OCB.ALT	.063	.032	.077	1.969	.050	.008	.110	.067	.767	1.304
OCB.SPO	.020	.018	.048	1.120	.264	.397	.063	.038	.641	1.559
OCB.CON	.079	.031	.096	2.590	.010	.039	.145	.088	.840	1.191
MT.MAN	-.018	.018	-.038	-.974	.331	.200	-.055	-.033	.754	1.327
MT.RES	.085	.024	.173	3.524	.000	.467	.195	.120	.481	2.077
MT.GOV	.058	.024	.112	2.358	.019	.525	.132	.080	.518	1.932
Highly.Integrative	.432	.058	.357	7.388	.000	.681	.385	.252	.498	2.009
Hierarchy.Culture	-.221	.106	-.129	-2.080	.038	-.434	-.117	-.071	.303	3.296
RA.TOTAL	.216	.066	.258	3.264	.001	.616	.181	.111	.186	5.367
zRAxOCB.ALT	.012	.024	.019	.500	.618	.003	.028	.017	.773	1.294
zRAxOCB.SPO	.054	.025	.084	2.110	.036	.076	.118	.072	.740	1.351
zRAxOCB.CON	.043	.024	.068	1.759	.080	.093	.099	.060	.786	1.272
zRAxMT.MAN	-.009	.023	-.015	-.377	.706	-.193	-.021	-.013	.703	1.422
zRAxMT.RES	.026	.025	.050	1.052	.294	-.169	.059	.036	.521	1.920
zRAxMT.GOVT	-.053	.027	-.086	-1.959	.051	-.174	-.110	-.067	.604	1.656
HighlyXRA	-.042	.063	-.040	-.659	.510	.455	-.037	-.022	.320	3.122
HierarchyXRA	-.134	.089	-.107	-1.506	.133	.390	-.085	-.051	.230	4.340

a. Dependent Variable: INBOUND.OI

NORMALITY, HOMOSCEDASCITY AND LINEARITY

Organizational Citizenship Behaviour





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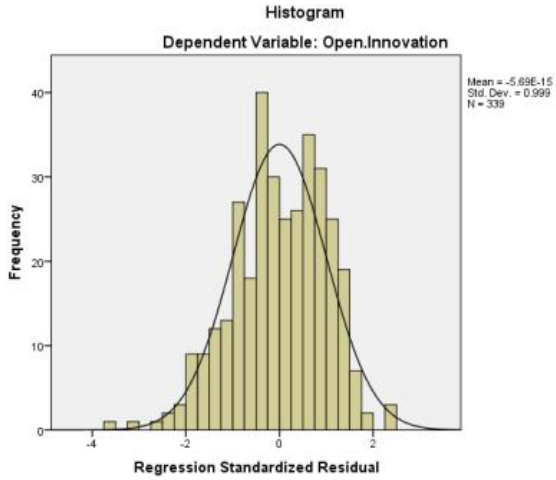
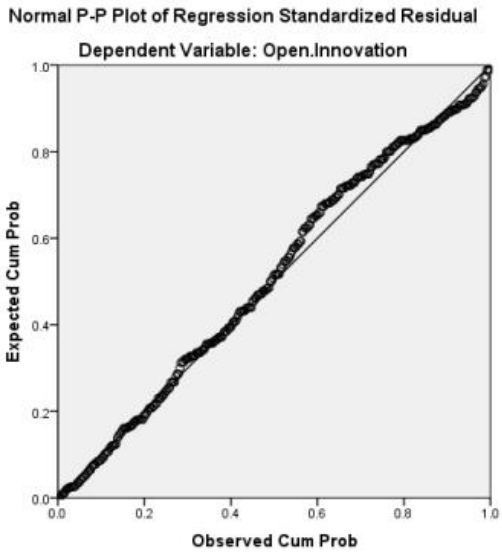
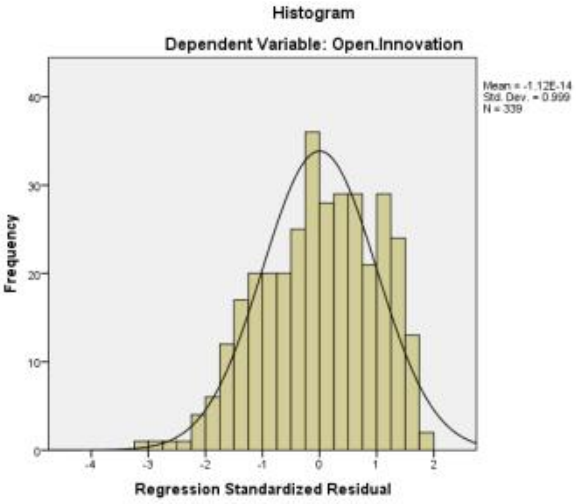
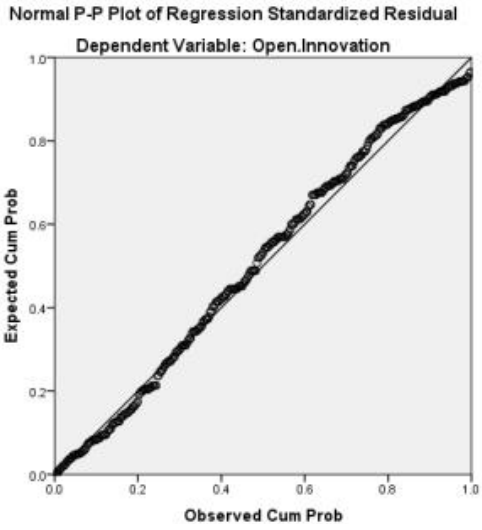
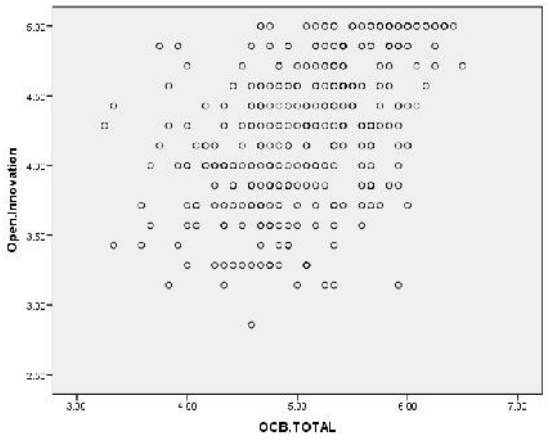




Managerial Ties



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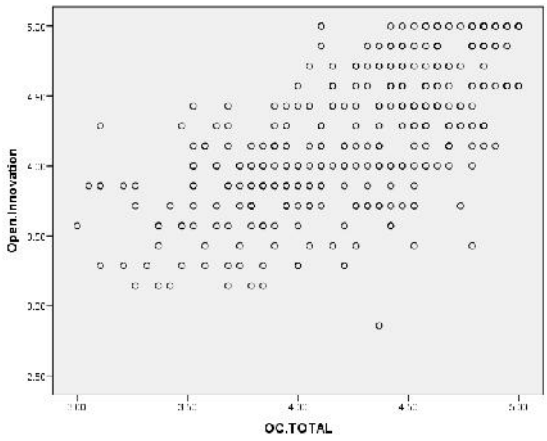
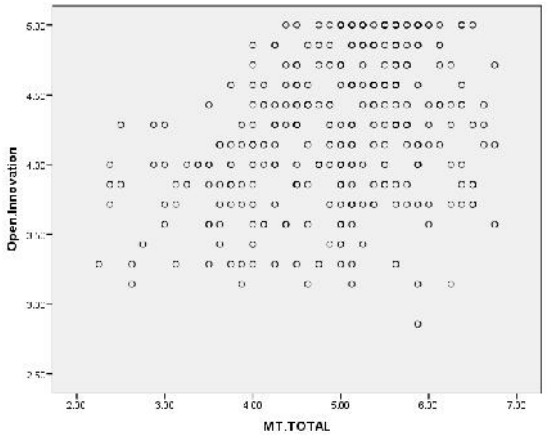
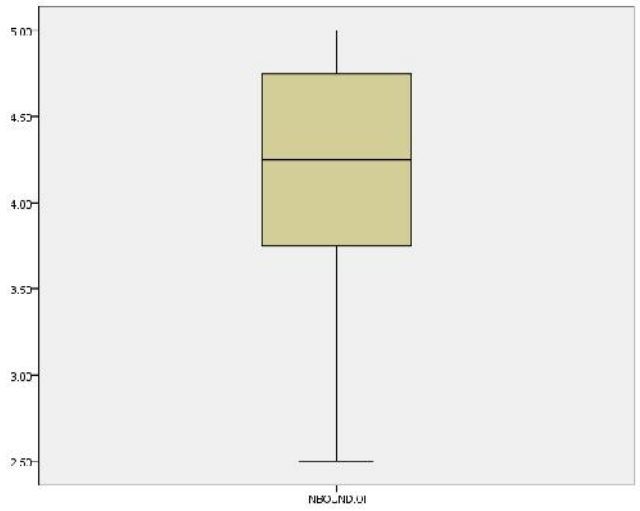
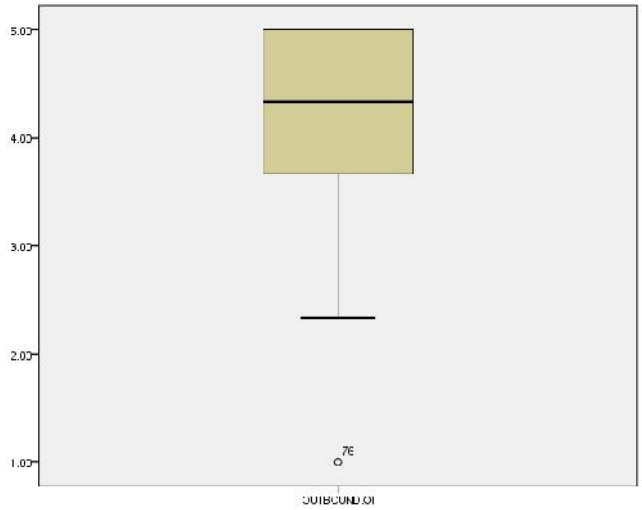
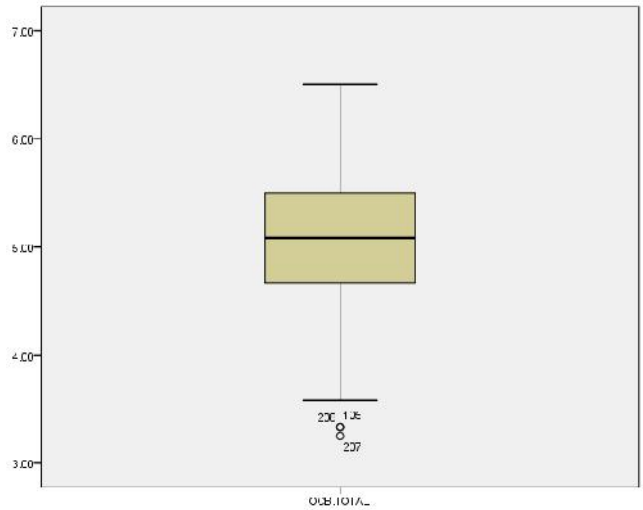
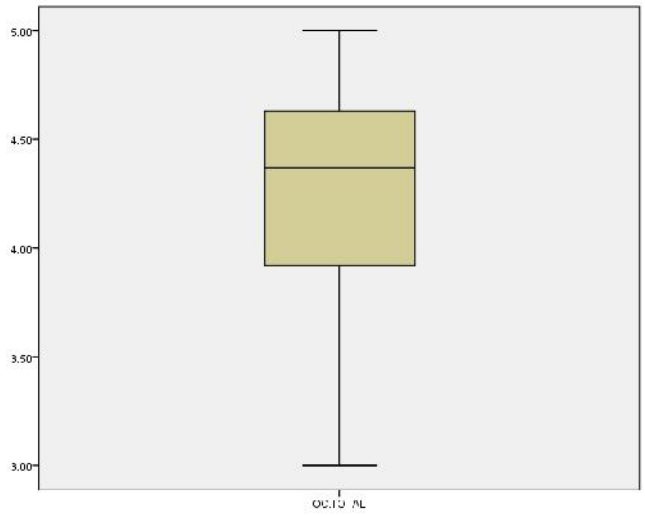

Open.Innovation
OC.TOTAL


Open.Innovation
MT.TOTAL





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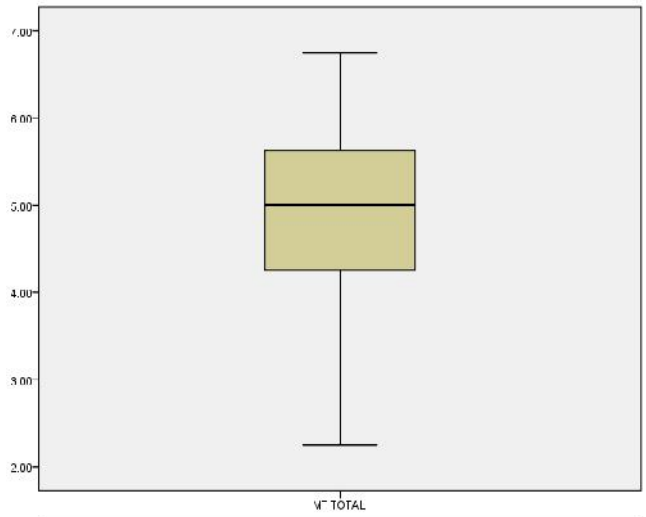
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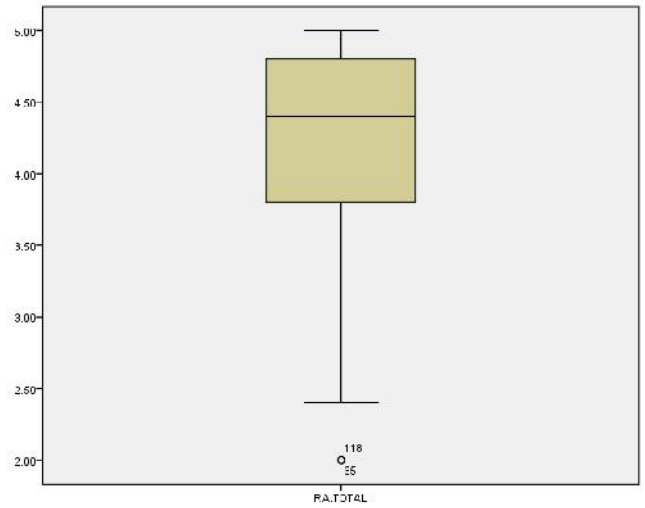
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References

Abdullah, A. (1992). The influence of ethnic values on managerial practices in Malaysia. *Malaysian Management Review, As cited in: Yusoff (2011), Organizational Culture and Its Impact on Firm Performance: Case Study of Malaysian Public Listed Companies. International Conference on Management Proceeding*.

Abulrub, A.H.G., & Lee, J. (2012). Open innovation management: challenges and prospects. *Procedia-Social and Behavioral Sciences, 41*, 130-138.

Acha, V, & Cusmano, L. (2005). Governance and co-ordination of distributed innovation processes: patterns of R&D co-operation in the upstream petroleum industry. *Economics of Innovation and New Technology, 14*(1-2), 1-21.

Ackfeldt, Anna-Lena, & Coote, Leonard V. (2005). A study of organizational citizenship behaviors in a retail setting. *Journal of Business Research, 58*(2), 151-159.

Adler, P.S., & Kwon, Seok Woo. (2002). Social capital: Prospects for a new concept. *The Academy of Management Review, 27*(1), 17-40.

Ahmed, P.K. (1998). Culture and climate for innovation. *European Journal of Innovation Management, 1*(1), 30-43.

Al-Alawi, A.I., Al-Marzooqi, N.Y., & Mohammed, Y.F. (2007). Organizational culture and knowledge sharing: critical success factors. *Journal of Knowledge Management, 11*(2), 22-42.

Aluko, MAO. (2003). The impact of culture on organizational performance in selected textile firms in Nigeria. *Nordic Journal of African Studies, 12*(2), 164-179.

Anton, JJ, & Yao, DA. (2004). Little patents and big secrets: Managing intellectual property. *The RAND Journal of Economics, 35*(1), 1-22.

Archabal, D., Badgett, M., Chu, J., & Kalyanam, K. (2005). Cross channel optimization. Somers, NY: IBM Corporation.

Arora, Ashish, & Gambardella, Alfonso. (2010). Ideas for rent: an overview of markets for technology. *Industrial and Corporate Change, 19*(3), 775-803.

Asmawi, Arnifa , & Mohan, Avvari V. (2011). Unveiling dimensions of organizational culture: an exploratory study in Malaysian R&D organizations. *R&D Management, 41*(5), 509-523.

Atkins, M. H. (1998). The role of appropriability in sustaining competitive advantage--an electronic auction system case study. *The Journal of Strategic Information Systems, 7*(2), 131-152.

Atuahene-Gima, K., & Murray, J.Y. (2004). Antecedents and outcomes of marketing strategy comprehensiveness. *Journal of Marketing, 68*(4), 33-46.

Avila, RA, Fern, EF, & Mann, OK. (1988). Unraveling criteria for assessing the performance of sales people: A causal analysis. *Journal of Personal Selling and Sales Management, 8*(1), 45-54.

Barksdale, K., & Werner, J.M. (2001). Managerial ratings of in-role behaviors, organizational citizenship behaviors, and overall performance: testing different models of their relationship. *Journal of Business Research, 51*(2), 145-155.

Barney, Jay B. (1986). Organizational Culture: Can It Be a Source of Sustained Competitive Advantage? *The Academy of Management Review, 11*(3), 656-665.

Baron, R.M., & Kenny, D.A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182.

Bateman, Thomas S., & Organ, Dennis W. (1983). Job Satisfaction and the Good Soldier: The Relationship Between Affect and Employee "Citizenship". *The Academy of Management Journal, 26*(4), 587-595.

Batjargal, B. (2003). Social capital and entrepreneurial performance in Russia: A longitudinal study. *Organization Studies, 24*(4), 535.

Bell, John, & Laurent, Brigitte. (2012). *Developing an Internal Culture that Promotes Open Innovation.* Paper presented at the European Open Innovation Summit and Conference, Brussels, Belgium (Summary by Stefan Lindegaard read on Spetember 03, 2012 at: http://www.15inno.com/2012/05/24/innovationculture/).

Bell, S.J., & Menguc, B. (2002). The employee-organization relationship, organizational citizenship behaviors, and superior service quality. *Journal of Retailing, 78*(2), 131-146.

Bennett, Milton J. (2005). Paradigmatic assumption of intercultural communication. Hillsboro: Intercultural Development Research.

Bentler, P.M., & Chou, C.P. (1987). Practical issues in structural modeling. *Sociological Methods & Research, 16*(1), 78-117.

Berg, N. (2010). *Non-response bias*. Retrieved from http://mpra.ub.uni-muenchen.de/26373/1/BergNon-ResponseBiasMay2002.pdf on August 02, 2012

Bernama. (October 25, 2011). Go For Open Innovation Model, Malaysian Firms Urged, *Bernama*. Retrieved from http://www.bernama.com.my/bernama/v5/newsbusiness.php?id=620931 on October 30, 2011

Bierly, P., & Chakrabarti, A. (1996). Generic knowledge strategies in the US pharmaceutical industry. *Strategic Management Journal, 17*(WINTER), 123-135.

Bigliardi, B., Dormio, A.I., & Galati, F. (2012). The adoption of open innovation within the telecommunication industry. *European Journal of Innovation Management, 15*(1), 27-54.

Blau, P. M. (1964). *Exchange and power in social life*. New York: Wiley.

Bolino, M.C., Turnley, W.H., & Averett, T. (2003). Going the Extra Mile: Cultivating and Managing Employee Citizenship Behavior [and Executive Commentary]. *The Academy of Management Executive (1993-2005)*, 60-73.

Bono, J.E., & McNamara, G. (2011). Publishing in AMJ—Part 2: Research Design. *Academy of Management Journal, 54*(4), 657-660.

Borman, WC, & Motowidlo, SJ. (1997a). Organizational Citizenship Behavior and Contextual Performance. *Human Performance, 10*(2), 67-69.

Borman, WC, & Motowidlo, SJ. (1997b). Task performance and contextual performance: The meaning for personnel selection research. *Human Performance, 10*(2), 99-109.

Boschma, R. (2005). Proximity and innovation: a critical assessment. *Regional Studies, 39*(1), 61-74.

Boström, G., Hallqvist, J., Haglund, B.J.A., Romelsjö, A., Svanström, L., & Diderichsen, F. (1993). Socioeconomic differences in smoking in an urban Swedish population. *Scandinavian Journal of Public Health, 21*(2), 77-82.

Boyne, GA. (2002). Public and private management: What's the difference? *Journal of Management Studies, 39*(1), 97-122.

Brief, Arthur P., & Motowidlo, Stephan J. (1986). Prosocial Organizational Behaviors. *The Academy of Management Review, 11*(4), 710-725.

Brodbeck, PW. (2002). Complexity theory and organization procedure design. *Business Process Management Journal, 8*(4), 377-402.

Burney, S.M. Aqil. (2008). Inductive and Decuctive Research Approach. Retrieved June 18, 2012, from http://www.drburney.net/INDUCTIVE%20&%20DEDUCTIVE%20RESEARCH%20APPROACH%2006032008.pdf

Burt, R.S. (1997a). The contingent value of social capital. *Administrative Science Quarterly, 42*(2), 339-365.

Burt, R.S. (1997b). A note on social capital and network content. *Social Networks, 19*(4), 355-373.

Byrne, M. Barbara. (2001). *Structural Equation Modeling with AMOS. Basic Concepts, Application, and Programming*. London: Lawrence Erlbaum Associates.

Cadiou, J.C., & Boldrini, J.C. (2012). Shaping partnerships between universities and SMEs within the open innovation framework. *Retrieved September 03, 2012 from: http://tiec.com.eg/SiteCollectionDocuments/Shaping%20_partnerships_%20between%20_universities%20and%20SMEs.pdf*.

Cameron, K.S., & Freeman, S.J. (1991). Cultural congruence, strength, and type: Relationships to effectiveness. *Research in Organizational Change and Development, 5*(1), 23-58.

Cameron, Kim S., & Quinn, Robert E. (2006). *Diagnosing and Changing Organizational Culture: Based on the Competing Values Framework* (Revised ed.). San Francisco, CA: Jossey-Bass.

Campbell, D.T., & Fiske, D.W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin, 56*(2), 81-105.

Canalejo, M. (1995). *Innovación organizativa en Alcatel Standard Eléctrica, SA.* Paper presented at the Congreso Nacional de la Asociación Científica de Economía y Dirección de la Empresa (ACEDE), San Lorenzo de El Escorial. Madrid. As cited in: Organizational Culture for Innovation and New Technological Behavior (Claver et al., 1995), University of Alicante (Spain).

Carbone, F., Contreras, J., & Hernandez, J. (2010). Enterprise 2.0 and Semantic Technologies: A Technological Framework for Open Innovation Support. *Proceedings of the 11th European Conference on Knowledge Management, Vols 1 and 2,* 191-199.

Cavana, R., Delahaye, B. L., & Sekeran, U. (2001). *Applied Business research: Qualitative and Quantitative Methods*. Australia: John Wiley & Sons.

Chang, S.C., & Lee, M.S. (2007). The effects of organizational culture and knowledge management mechanisms on organizational innovation: An empirical study in Taiwan. *The Business Review, 7*(1), 295-301.

Chatman, Jennifer A, & Jehn, Karen A. (1994). Assessing the relationship between industry characteristics and organizational culture: how different can you be? *Academy of Management Journal*, 522-553.

Chen, Chung J, & Huang, Jing W. (2007). How organizational climate and structure affect knowledge management--The social interaction perspective. *International Journal of Information Management, 27*(2), 104-118.

Cheng, E.W.L. (2001). SEM being more effective than multiple regression in parsimonious model testing for management development research. *Journal of Management Development, 20*(7), 650-667.

Chesbrough, H. (2007). The market for innovation: implications for corporate strategy. *California Management Review, 49*(3), 45.

Chesbrough, H., & Crowther, A. K. (2006). Beyond high tech: early adopters of open innovation in other industries. *R & D Management, 36*(3), 229-236.

Chesbrough, H. W. (2003a). *Open innovation: The new imperative for creating and profiting from technology*. Boston: Harvard Business Press.

Chesbrough, Henry. (2011). Bringing Open Innovation to Services. *Mit Sloan Management Review, 52*(2), 85-90.

Chesbrough, HW. (2003b). The era of open innovation. *Mit Sloan Management Review, 44*(3), 35-41.

Chesbrough, HW. (2006). The era of open innovation. In D. Mayle (Ed.), *Managing Innovation and Change* (pp. 127-138). London: Sage Publications Ltd.

Chesbrough, HW, Vanhaverbeke, W, & West, J. (2006). *Open innovation: Researching a new paradigm*. Oxford: Oxford University Press.

Chiaroni, Davide, Chiesa, Vittorio, & Frattini, Federico. (2011). The Open Innovation Journey: How firms dynamically implement the emerging innovation management paradigm. *Technovation, 31*(1), 34-43.

Chih, W.H., Huang, L.C., & Yang, T.J. (2011). Organizational culture and performance: The mediating roles of innovation capacity. *African Journal of Business Management, 5*(21), 8500-8510.

Chong, A.Y.L., Ooi, K.B., & Sohal, A. (2009). The relationship between supply chain factors and adoption of e-Collaboration tools: An empirical examination. *International Journal of Production Economics, 122*(1), 150-160.

Chung, Hsi-Mei. (2006). Managerial ties, control and deregulation: An investigation of business groups entering the deregulated banking industry in Taiwan. *Asia Pacific Journal of Management, 23*(4), 505-520.

Churchill Jr, G.A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research, 16*(1), 64-73.

Cloodt, Myriam, Hagedoorn, John, & Van Kranenburg, Hans. (2006). Mergers and acquisitions: Their effect on the innovative performance of companies in high-tech industries. *Research Policy, 35*(5), 642-654.

Cohen, W.M., Nelson, R.R., & Walsh, J.P. (2002). Links and impacts: the influence of public research on industrial R&D. *Management Science, 48*(1), 1-23.

Cohen, W.M., & Walsh, J.P. (2001). *R&D Spillovers, Appropriability and R&D Intensity: A Survey Based Approach*. Paper presented at the Economic Evaluation of Technological Change, Georgetown University Conference Centre, Washington, D.C.

Cohen, Wesley M., & Levinthal, Daniel A. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly, 35*(1), 128-152.

Coleman, V.I., & Borman, W.C. (2000). Investigating the underlying structure of the citizenship performance domain. *Human Resource Management Review, 10*(1), 25-44.

Comte, August. (1856). *A general view of positivism [Discours sur I'Esprit, 1884]*. London: Chapman.

Corbett, L.M., & Rastrick, K.N. (2000). Quality performance and organizational culture: A New Zealand study. *International Journal of Quality & Reliability Management, 17*(1), 14-26.

Cronbach, L.J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*(3), 297-334.

Crozier, M. (1964). *The bureaucratic phenomenon*. Chicago: The University of Chicago Press.

Dahlander, L, & Gann, DM. (2010). How open is innovation? *Research Policy, 39*(6), 699-709.

Das, TK, & Teng, BS. (2000). Instabilities of strategic alliances: An internal tensions perspective. *Organization Science, 11*(1), 77-101.

Dasanayaka, S.W.S.B. . (2009). Implications of Organizational Culture on Innovation: An Exploratory Micro Study of Sri Lankan Gift and Decorative-ware Sector Firms. http://www.merit.unu.edu/MEIDE/papers/2009/1234932173_SD.pdf on September, 08, 2012

Davis, D. (2005). *Business Research for Decision Making* (6th ed.). Belmont, CA: Thomas Brooks/Cole.

Davis, S.M. (1990). *Managing corporate culture*. Cambridge, MA: Ballinger Pub Co.

De Jong, J. P. J., Vanhaverbeke, W., & de Vrande, V. V. (2007). Open innovation in SMEs: Trends, motives and management challenges. *ISMOT'07: Proceedings of the Fifth International Symposium on Management of Technology, Vols 1 and 2*, 257-261.

Deal, T.E., & Kennedy, A.A. (1982). *Corporate Cultures: The Rites and Rituals of Corporate Life*. Reading, MA: Addison-Wesley Pub. Co.

Denison, D. R., & Mishra, A. K. (1995). Toward a Theory of Organizational Culture and Effectiveness. *Organization Science, 6*(2), 204-223.

Denison, D.R. (1990). *Corporate culture and organizational effectiveness*. New York: John Wiley & Sons.

Detert, J.R., Schroeder, R.G., & Mauriel, J.J. (2000). A framework for linking culture and improvement initiatives in organizations. *Academy of Management Review*, 850-863.

Dodgson, M., Gann, D., & Salter, A. (2006). The role of technology in the shift towards open innovation: the case of Procter & Gamble. *R & D Management, 36*(3), 333-346.

Doz, YL, & Hamel, G. (1998). *Alliance advantage: The art of creating value through partnering*: Harvard Business Press.

Dunlop, PD, & Lee, K. (2003). Workplace deviance, organizational citizenship behavior, and business unit performance: The bad apples do spoil the whole barrel. *Journal of Organizational Behavior, 25*(1), 67-80.

Duysters, G, Heimeriks, KH, & Jurriëns, JA. (2004). An integrated perspective on alliance management. *Journal on Chain and Network Science, 4*(2), 83-94.

Dyne, Linn Van, Graham, Jill W., & Dienesch, Richard M. (1994). Organizational Citizenship Behavior: Construct Redefinition, Measurement, and Validation. *The Academy of Management Journal, 37*(4), 765-802.

Edith, Penrose. (1959). *The Theory of the Growth of the Firm*. Oxford: Basil Blackwell.

Ehrhart, MG, Bliese, PD, & Thomas, JL. (2006). Unit-level OCB and unit effectiveness: Examining the incremental effect of helping behavior. *Human Performance, 19*(2), 159-173.

Emden, Z., Calantone, R.J., & Droge, C. (2006). Collaborating for new product development: selecting the partner with maximum potential to create value. *Journal of Product Innovation Management, 23*(4), 330-341.

Emerson, R.M. (1976). Social exchange theory. *Annual Review of Sociology, 2*, 335-362.

Enkel, E., Gassmann, O., & Chesbrough, H. (2009). Open R&D and open innovation: exploring the phenomenon. *R & D Management, 39*(4), 311-316.

Evan, F. (2009). Pre-competitive Collaboration and Open Innovation: Finding Solutions for Industry-wide Materials and Process Changes to Address Regulatory, Market, or Environmental Issues. *Nip 25: Digital Fabrication 2009, Technical Program and Proceedings*, 180-183.

Fabrizio, K. (2005). Opening the dam or building channels: University patenting and the use of public science in industrial innovation. Georgia, USA: Goizueta School of Business, Emory University.

Fabrizio, K. (2006). The use of university research in firm innovation. In H. Chesbrough, W. Vanhaverbeke & J. West (Eds.), *Open innovation: researching a new paradigm* (pp. 134-160).

Faems, D, Van Looy, B, & Debackere, K. (2005). Interorganizational Collaboration and Innovation: Toward a Portfolio Approach. *Journal of Product Innovation Management, 22*(3), 238-250.

Fetterhoff, T.J., & Voelkel, D. (2006). Managing open innovation in biotechnology. *Research-Technology Management, 49*(3), 14-18.

Frels, J.K., Shervani, T., & Srivastava, R.K. (2003). The integrated networks model: Explaining resource allocations in network markets. *Journal of Marketing, 67*(1), 29-45.

Fritsch, Michael, & Rolf, Lukas. (1999). Innovation co-operation, and the region. In B. D. Audretsch & R. Thurik (Eds.), *Innovation, Industry Evolution and Employment*. Cambridge: Cambridge University Press.

Gao, S. X., Xu, K., & Yang, J. J. (2008). Managerial ties, absorptive capacity, and innovation. *Asia Pacific Journal of Management, 25*(3), 395-412.

Garver, M.S., & Mentzer, J.T. (1999). Logistics research methods: employing structural equation modeling to test for construct validity. *Journal of Business Logistics, 20*(1), 33-57.

Gassmann, O. (2006). Opening up the innovation process: towards an agenda. *R&D Management, 36*(3), 223-228.

Gassmann, O., & Enkel, E. (2004). *Towards a theory of open innovation: three core process archetypes.* Paper presented at the R&D Management Conference (RADMA), Lisabon, Portugal.

Gassmann, O., Enkel, E., & Chesbrough, H. (2010). The future of open innovation. *R & D Management, 40*(3), 213-221.

Gavetti, Giovanni. (2005). Cognition and hierarchy: Rethinking the microfoundations of capabilities' development. *Organization Science, 16*(6), 599-617.

Geletkanycz, Marta A., & Hambrick, Donald C. (1997). The External Ties of Top Executives: Implications for Strategic Choice and Performance. *Administrative Science Quarterly, 42*(4), 654-681.

George, JM, & Brief, AP. (1992). Feeling good-doing good: A conceptual analysis of the mood at work-organizational spontaneity relationship. *Psychological Bulletin, 112*(2), 310-329.

Gilsing, V., & Nooteboom, B. (2005). Density and strength of ties in innovation networks: an analysis of multimedia and biotechnology. *European Management Review, 2*(3), 179-197.

Goffee, R., & Jones, G. (1998). *The character of a corporation: How your company's culture can make or break your business*. New York: Harper Business.

Golightly, J., Ford, C., Sureka, P., & Reid, B. (2012). Realising the Value of Open Innovation. London: Big Innovation Centre (The Work Foundation and Lancaster University). Retrieved November 21, 2012 from: www.biginnovationcentre.com/Assets/Docs/Reports/Realising_theValue_ofOI_FINAL.pdf.

González-Álvarez, Nuria, & Nieto-Antolín, Mariano. (2007). Appropriability of innovation results: An empirical study in Spanish manufacturing firms. *Technovation, 27*(5), 280-295.

Gordon, G.G. (1985). The relationship of corporate culture to industry sector and corporate performance. In R. H. Kilmann, M. J. Saxton & R. Serpa (Eds.), *Gaining control of the corporate culture* (pp. 103-125). San Francisco: Jossey-Bass.

Govindarajan, V, & Trimble, C. (2005). *Ten rules for strategic innovators: From idea to execution*: Harvard Business School Press.

Graham, JW. (1991). An essay on organizational citizenship behavior. *Employee Responsibilities and Rights Journal, 4*(4), 249-270.

Granovetter, M. (1985). Economic Action and Social Structure: The Problem of Embeddedness. *American Journal of Sociology, 91*(3), 481-510.

Grant, A.M., & Mayer, D.M. (2009). Good soldiers and good actors: prosocial and impression management motives as interactive predictors of affiliative citizenship behaviors. *Journal of Applied Psychology, 94*(4), 900.

Grant, RM, & Baden Fuller, C. (2004). A knowledge accessing theory of strategic alliances. *Journal of Management Studies, 41*(1), 61-84.

Gronum, Sarel, Verreynne, Martie-Louise, & Kastelle, Tim. (2012). The Role of Networks in Small and Medium-Sized Enterprise Innovation and Firm Performance. *Journal of Small Business Management, 50*(2), 257-282.

Hagel, J, & Brown, JS. (2005). *The only sustainable edge: Why business strategy depends on productive friction and dynamic specialization*: Harvard Business Press.

Hair, J.F., Anderson, R.E., Tatham, R.L., & William, C.B. (1998). *Multivariate Data Analysis* (5th ed.). Upper Sadle River, New Jersey: Prentice Hall.

Hair, J.F., Black, W.C., Babin, B.J., & Anderson, R.E. (2010). *Multivariate Data Analysis - A Global Perspective* (7th ed.). New Jersey: Pearson Prentice Hall.

Hair, J.F., Money, A.H., Samouel, P., & Page, M. (2007). *Research methods for business*: John Wiley & Sons West Sussex.

Hamdan, H., Yusof, F., Omar, D., Abdullah, F., Nasrudin, N., & Abullah, I.C. (2011). University Industrial Linkages: Relationship Towards Economic Growth and Development in Malaysia. *World Academy of Science, Engineering and Technology, 58*.

Hamel, Gary. (1991). Competition for Competence and Inter-Partner Learning Within International Strategic Alliances. *Strategic Management Journal, 12*, 83.

Harabi, Najib. (1992). Appropriability, Technological Opportunity, Market Demand, and Technical Change-Empirical Evidence from Switzerland. *WWI-Arbeitspapiere, Reihe D* (Vol. 22, pp. 1-46): Institute of Economics at the University of Zurich. Retrieved on April 16, 2011 from: http://mpra.ub.uni-muenchen.de/26221/.

Harabi, Najib. (1995). Appropriability of technical innovations an empirical analysis. *Research Policy, 24*(6), 981-992.

Hatzichronoglou, Thomas. (1997). Revision of the High-Technology Sector and Product Classification. *OECD Science, Technology and Industry Working Papers*: OECD Publishing.

Hause, O. R. (2000). *Relationships between organizational culture strength and organizational effectiveness in an electrical utility company*. University Of Georgia, Athens, Georgia. *As cited in:* Chi, H., Lan, C.-H., & Dorjgotov, B. (2011). The Influences of Organizational Culture and Human Resource Development on R&D organizational Effectiveness – the Mediating Effect of Knowledge Management. Journal of International Management Studies 6(1).

Haynes, S.N., Richard, D., & Kubany, E.S. (1995). Content validity in psychological assessment: A functional approach to concepts and methods. *Psychological Assessment, 7*(3), 238-247.

Henkel, J. (2006). Selective revealing in open innovation processes: The case of embedded Linux. *Research Policy, 35*(7), 953-969.

Hennart, JF, & Zeng, M. (2005). Structural determinants of joint venture performance. *European Management Review, 2*(2), 105-115.

Herzog, Philipp, & Leker, J. (2011). Open and closed innovation – different innovation cultures for different strategies. *International Journal of Technology Management, 52*(3), 322-343.

Hoffmann, W.H., & Schlosser, R. (2001). Success Factors of Strategic Alliances in Small and Medium-sized Enterprises--An Empirical Survey. *Long Range Planning, 34*(3), 357-381.

Hofstede, G. (1980). *Culture's consequences: International differences in work-related values*. London: Sage.

Hofstede, Geert. (1991). *Cultures and organizations: software of the mind*: Berkshire: McGraw-Hill Book Company.

Hofstede, Geert, Neuijen, Bram, Ohayv, Denise Daval, & Sanders, Geert. (1990). Measuring Organizational Cultures: A Qualitative and Quantitative Study Across Twenty Cases. *Administrative Science Quarterly, 35*(2), 286-316.

Homans, G.C. (1958). Social behavior as exchange. *The American Journal of Sociology, 63*(6), 597-606.

Hoskisson, R.E., Eden, L., Lau, C.M., & Wright, M. (2000). Strategy in emerging economies. *The Academy of Management Journal, 43*(3), 249-267.

Hurmelinna, Pia, Kyläheiko, Kalevi, & Jauhiainen, Tiina. (2007). The Janus face of the appropriability regime in the protection of innovations: Theoretical re-appraisal and empirical analysis. *Technovation, 27*(3), 133-144.

Husin, Solha Binti. (2009). *Human Resource Management and Employee Perception of Service Quality in the Malaysian Golf Clubs.* (Doctor of Philosophy), University of Malaya, Kuala Lumpur.

Huston, L., & Sakkab, N. (2006). Connect and develop: Inside Procter and Gamble's new model for innovation. *Harvard Business Review, 84*(3), 58-66.

Iivari, J., Hirschheim, R., & Klein, H.K. (1998). A paradigmatic analysis contrasting information systems development approaches and methodologies. *Information Systems Research, 9*, 164-193.

Ili, S., Albers, A., & Miller, S. (2010). Open innovation in the automotive industry. *R & D Management, 40*(3), 246-255.

International Monetary Fund. (2010). Construction of Sampling Frames. *East AFRITAC Determination and Allocation Workshop*. Retreived on June 12, 2012 from: http://www.eastafritac.org/images/uploads/documents_storage/ConstructionofSamplingFrames.pdf

Ishak, N. A. (2005). Promoting employees' innovativeness and organisational citizenship behaviour through superior-subordinate relationship in the workplace. *Research and Practice in Human Resource Management, 13*(2), 16-30.

Jarad, Ismael Younis Abu, Yusof, Nor'Aini, & Nikbin, Davoud (2011). A Review Paper on Organizational Culture and Organizational Performance. *International Journal of Business and Social Science, 1*(3), 26-46.

Jaskyte, K. (2004). Transformational leadership, organizational culture, and innovativeness in nonprofit organizations. *Nonprofit Management and Leadership, 15*(2), 153-168.

Jaskyte, Kristina (2005). Organizational Culture and Innovation in Nonprofit Organizations (Phase II). Georgia, USA: School of Social Work, The University of Georgia.

Jex, S.M. (2002). *Organizational psychology: A scientist-practitioner approach*. New York: John Wiley & Sons Inc.

Johnson, P., & Duberley, J. (2000). *Understanding Management Research: An introduction to epistemology*: Sage Publications Ltd.

Kafouros, Mario I., & Buckley, Peter J. (2008). Under what conditions do firms benefit from the research efforts of other organizations? *Research Policy, 37*(2), 225-239.

Kale, Prashant, Singh, Harbir, & Perlmutter, Howard. (2000). Learning and Protection of Proprietary Assets in Strategic Alliances: Building Relational Capital. *Strategic Management Journal, 21*(3), 217-237.

Katz, D, & Kahn, RL. (1978). *The social psychology of organizations*. New York: Wiley

Katz, R., & Allen, T.J. (1982). Investigating the Not Invented Here (NIH) syndrome: A look at the performance, tenure, and communication patterns of 50 R & D Project Groups. *R&D Management, 12*(1), 7-20.

Keesing, R.M. (1974). Theories of culture. *Annual Review of Anthropology, 3*, 73-97.

Kelley, H.H., & Thibaut, J.W. (1959). *The Social Psychology of Groups*. New York: Wiley.

Kemppainen, K, & Vepsäläinen, APJ. (2003). Trends in industrial supply chains and networks. *International Journal of Physical Distribution & Logistics Management, 33*(8), 701-719.

Kesler, GC. (2002). Why the leadership bench never gets deeper: Ten insights about executive talent development. *Human Resource Planning, 25*(1), 32-45.

Keupp, MM, & Gassmann, O. (2009). Determinants and archetype users of open innovation. *R&D Management, 39*(4), 331-341.

Khanna, T., & Palepu, K. (1997). Why focused strategies may be wrong for emerging markets. *Harvard Business Review, 75*(4), 41-48.

Khazanchi, S., Lewis, M.W., & Boyer, K.K. (2007). Innovation-supportive culture: The impact of organizational values on process innovation. *Journal of Operations Management, 25*(4), 871-884.

King, N. (1990). Innovation at work: The research literature. In M. West & J. Farr (Eds.), *Innovation and creativity at work: the research literature* (pp. 15-61). New York: John Wiley and Sons.

Kline, Rex. B. (2005). *Principles and Practice of Structural Equation Modeling* (2nd ed.). New York: The Guilford Press.

Koruna, S. M. (2004). External technology commercialization - policy guidelines. *International Journal of Technology Management, 27*(2/3), 241-254.

Kotter, J.P., & Heskett, J.L. (1992). *Corporate culture and performance*. New York: Free Press.

Koufteros, X, Vonderembse, M, & Jayaram, J. (2005). Internal and external integration for product development: The contingency effects of uncertainty, equivocality, and platform strategy. *Decision Sciences, 36*(1), 97-133.

Koys, DJ. (2001). The effects of employee satisfaction, organizational citizenship behavior, and turnover on organizational effectiveness: A unit-level, longitudinal study. *Personnel Psychology, 54*(1), 101-114.

Krapez, J., Škerlavaj, M., & Groznik, A. (2012). Contextual variables of open innovation paradigm in the business environment of Slovenian companies. *Economic and Business Review, 14*(1), 17-38.

Krilowicz, TJ, & Lowery, CM. (1996). The impact of organizational citizenship behavior on the performance appraisal process: A cross-cultural study. *International Journal of Management, 13*, 94-100.

Larsson, R, Bengtsson, L, Henriksson, K, & Sparks, J. (1998). The interorganizational learning dilemma: Collective knowledge development in strategic alliances. *Organization Science, 9*(3), 285-305.

Lau, Chung-Ming, & Ngo, Hang-Yue. (2004). The HR system, organizational culture, and product innovation. *International business review, 13*(6), 685-703.

Laursen, K., & Salter, A. (2004). Searching low and high: What types of firms use universities as a source of innovation. *Research Policy, 33*(8), 1201-1215.

Laursen, K., & Salter, A. (2005). *The paradox of openness of knowledge for innovation.* Paper presented at the All-Academy Symposium "Open Innovation: Empirical Research on Locating and Incorporating External Innovations", August 9, 2005, 2:30 p.m. (Session #1064), Academy of Management Conference 2005, August 5-10., Honolulu, Hawaii, USA.

Laursen, K., & Salter, A. (2006). Open for innovation: The role of openness in explaining innovation performance among UK manufacturing firms. *Strategic Management Journal, 27*(2), 131-150.

Lawler, E.E. (1992). *The ultimate advantage: Creating the high-involvement organization*. San Francisco, CA: Jossey-Bass.

Lazzarotti, V., Manzini, R., & Pellegrini, L. (2010). Open innovation models adopted in practice: An extensive study in Italy. *Measuring Business Excellence, 14*(4), 11-23.

Lee, Sungjoo, Park, Gwangman, Yoon, Byungun, & Park, Jinwoo. (2010). Open innovation in SMEs—An intermediated network model. *Research Policy, 39*(2), 290-300.

Lee, T.W. (1999). *Using qualitative methods in organizational research*. California: Sage Publications, Inc.

LePine, J. A., Erez, A., & Johnson, D. E. (2002). The nature and dimensionality of organizational citizenship behavior: A critical review and meta-analysis. *Journal of Applied Psychology, 87*(1), 52-65.

Lev, B, & Zambon, S. (2003). Intangibles and intellectual capital: an introduction to a special issue. *European Accounting Review, 12*(4), 597-603.

Levin, RC, Klevorick, AK, Nelson, RR, & Winter, SG. (1983). Questionnaire on Industrial Research and Development. Technical Report: Yale University.

Levin, RC, Klevorick, AK, Nelson, RR, Winter, SG, Gilbert, R, & Griliches, Z. (1987). Appropriating the returns from industrial research and development. *Brookings papers on economic activity, 1987*(3), 783-831.

Lewin, K. (1947). Frontiers in group dynamics: Concept, method and reality in social science; social equilibria and social change. *Human Relations, 1*(1), 5.

Leydesdorff, L. (2012). The Triple Helix of university-industry-government relations. Retrieved from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1996760 on October 21, 2012.

Li, J. J., Poppo, L., & Zhou, K. Z. (2008). Do managerial ties in China always produce value? Competition, uncertainty, and domestic vs. foreign firms. *Strategic Management Journal, 29*(4), 383-400.

Li, J. J., & Zhou, K. Z. (2010). How foreign firms achieve competitive advantage in the Chinese emerging economy: Managerial ties and market orientation. *Journal of Business Research, 63*(8), 856-862.

Li, J. J., Zhou, K. Z., & Shao, A. T. (2009). Competitive position, managerial ties, and profitability of foreign firms in China: An interactive perspective. *Journal of International Business Studies, 40*(2), 339-352.

Li, J.J. (2008). How to retain local senior managers in international joint ventures: The effects of alliance relationship characteristics. *Journal of Business Research, 61*(9), 986-994.

Li, X., & Zhang, R. Q. (2007). *The enterprises' human resource management in open innovation*. Paper presented at the International Conference on Management Innovation, Toronto.

Lichtenthaler, U. (2008). Open innovation in practice: an analysis of strategic approaches to technology transactions. *Engineering Management, IEEE Transactions on, 55*(1), 148-157.

Lichtenthaler, U. (2009). Outbound open innovation and its effect on firm performance: examining environmental influences. *R&D Management, 39*(4), 317-330.

Lichtenthaler, U. (2010a). Determinants of proactive and reactive technology licensing: A contingency perspective. *Research Policy, 39*(1), 55-66.

Lichtenthaler, U. (2011). Open Innovation: Past Research, Current Debates, and Future Directions. *The Academy of Management Perspectives (formerly The Academy of Management Executive)(AMP), 25*(1), 75-93.

Lichtenthaler, U., & Ernst, H. (2009). Technology licensing strategies: The interaction of process and content characteristics. *Strategic Organization, 7*(2), 183-221.

Lichtenthaler, Ulrich. (2010b). Technology exploitation in the context of open innovation: Finding the right 'job' for your technology. *Technovation, 30*(7-8), 429-435.

Lichtenthaler, Ulrich, & Lichtenthaler, Eckhard. (2010). Technology Transfer across Organizational Boundaries: Absorptive Capacity and Desorptive Capacity. *California Management Review, 53*(1), 154-170.

Lindegaard, Stefan. (2010). *The Open Innovation Revolution: Essentials, Roadblocks, and Leadership Skills* (1 ed.): Wiley.

Lindegaard, Stefan. (2011). *Making Open Innovation Work.* Retrieved from www.15inno.com on June 15, 2012

Lindegaard, Stefan. (2012). Top 5 Countries for Open Innovation in Asia. Retrieved from http://www.15inno.com/2011/12/07/openinnovationasia/ on April 20, 2012

Locander, WB. (2005). Staying within the flock. *Marketing Management, 14*(2), 52-54.

López, Luis E., & Roberts, Edward B. (2002). First-mover advantages in regimes of weak appropriability: the case of financial services innovations. *Journal of Business Research, 55*(12), 997-1005.

Love, PED, Irani, Z, Cheng, E, & Li, H. (2002). A model for supporting inter organizational relations in the supply chain. *Engineering Construction and Architectural Management, 9*(1), 2-15.

Lu, C.S., Lai, K., & Cheng, TCE. (2007). Application of structural equation modeling to evaluate the intention of shippers to use Internet services in liner shipping. *European Journal of Operational Research, 180*(2), 845-867.

Luo, Y., & Chen, M. (1997). Does guanxi influence firm performance? *Asia Pacific Journal of Management, 14*(1), 1-16.

MacKenzie, SB, Podsakoff, PM, & Fetter, R. (1991). Organizational citizenship behavior and objective productivity as determinants of managerial evaluations of

salespersons' performance. *Organizational Behavior and Human Decision Processes, 50*(1), 123-150.

Malaysian Aerospace Council. (2011). Retrieved July 20, 2011 from Malaysian Industry-Government Group For High Technology (MIGHT), Government of Malaysia. http://steer.might.org.my/aironline/index2.php

Malaysian Manufacturers' Directory. (2011). Retrieved July 15, 2011 http://e-directory.com.my/

Malhotra, Naresh K. (2004). *Marketing Research: An Applied Orientation*. New Jersey: Pearson Prentice Hall.

March, J.G. (1991). Exploration and exploitation in organizational learning. *Organization Science, 2*(1), 71-87.

Maria, Elmquist, Tobias, Fredberg, & Susanne, Ollila. (2009). Exploring the field of open innovation. *European Journal of Innovation Management, 12*(3), 326-345.

Martino, Gail. (2011). Presentation on critical personal competencies needed for Open Innovation success. *Quoted in Lindegaard, S. (2011). Making Open Innovation Work, pp. 66. Retrieved from www.15inno.com on June 15, 2012*

Mavondo, F., & Farrell, M. (2003). Cultural orientation: Its relationship with market orientation, innovation and organisational performance. *Management Decision, 41*(3), 241-249.

McDermott, R., & O'Dell, C. (2001). Overcoming cultural barriers to sharing knowledge. *Journal of Knowledge Management, 5*(1), 76-85.

Meade, A.W., Watson, A.M., & Kroustalis, C.M. (2007). *Assessing Common Methods Bias in Organizational Research.* Paper presented at the 22nd Annual Meeting of the Society for Industrial and Organizational Psychology, New York.

Miron, E., Erez, M., & Naveh, E. (2004). Do personal characteristics and cultural values that promote innovation, quality, and efficiency compete or complement each other? *Journal of Organizational Behavior, 25*(2), 175-199.

Mirza, H, & Giroud, A. (2004). Regionalization, foreign direct investment and poverty reduction: Lessons from Vietnam in ASEAN. *Journal of the Asia Pacific Economy, 9*(2), 223-248.

Moffat, L, & Archer, N. (2004). Knowledge management in production alliances. *Information Systems and e-Business Management, 2*(2), 241-267.

Mohr, J., & Spekman, R. (1994). Characteristics of partnership success: partnership attributes, communication behavior, and conflict resolution techniques. *Strategic Management Journal, 15*(2), 135-152.

Morrison, Elizabeth Wolfe. (1994). Role Definitions and Organizational Citizenship Behavior: The Importance of the Employee's Perspective. *The Academy of Management Journal, 37*(6), 1543-1567.

Motowidlo, Stephan J. (2000). Some Basic Issues Related to Contextual Performance and Organizational Citizenship Behavior in Human Resource Management. *Human Resource Management Review, 10*(1), 115-126.

Nacinovic, I., Galetic, L., & Cavlek, N. (2009). Corporate culture and innovation: Implications for reward systems. *World Academy of Science and Technology, 53*, 397-402.

Naranjo-Valencia, J.C., Jiménez-Jiménez, D., & Sanz-Valle, R. (2011). Innovation or imitation? The role of organizational culture. *Management Decision, 49*(1), 55-72.

Narasimhan, Ram, Nair, Anand, Griffith, David A., Arlbjorn, Jan Stentoft, & Bendoly, Elliot. (2009). Lock-in situations in supply chains: A social exchange theoretic study of sourcing arrangements in buyer-supplier relationships. *Journal of Operations Management, 27*(5), 374-389.

Nee, V. (1992). Organizational Dynamics of Market Transition: Hybrid Forms, Property Rights, and Mixed Economy in China. *Administrative Science Quarterly*, *37*(1), 1-27.

Nielsen, Tjai M., Hrivnak, George A., & Shaw, Megan. (2009). Organizational Citizenship Behavior and Performance: A Meta-Analysis of Group-Level Research. *Small Group Research, 40*(5), 555-577.

North, D. (2005). *Understanding the process of economic change*. Princeton, NJ: Oxford University Press.

Nunnally, JC. (1978). *Psychometric theory*. New York: McGraw-Hill.

O'Reilly, CA, & Chatman, JA. (1996). Culture as social control: Corporations, cults, and commitment. *Research in Organizational Behavior, 18*, 157-200.

O'Reilly, Charles A, Chatman, Jennifer, & Caldwell, David F. (1991). People and organizational culture: A profile comparison approach to assessing person-organization fit. *Academy of Management Journal, 34*(3), 487-516.

O'Reilly III, C.A., Chatman, J., & Caldwell, D.F. (1991). People and organizational culture: A profile comparison approach to assessing person-organization fit. *Academy of Management Journal*, 487-516.

OECD. (1997). Revision of High Technology Sector and Product Classification. Paris: OECD.

Ogbonna, E., & Harris, L.C. (2000). Leadership style, organizational culture and performance: empirical evidence from UK companies. *International Journal of Human Resource Management, 11*(4), 766-788.

Olsen, C., & George, St. DMM. (2004). Cross-sectional study design and data analysis. Retrieved June 18, 2012, from http://www.collegeboard.com/prod_downloads/yes/4297_MODULE_05.pdf

Omta, SWF, & Van Rossum, W. (1999). The management of social capital in R&D collaborations. In R. A. J. Leenders & S. M. Gabbay (Eds.), *Corporate Social Capital and Liability* (pp. 356-376): Springer US.

Oparanma, A. O. (2010). The Organizational Culture and Corporate Performance in Nigeria. *International Journal of African Studies*(3), 34-40.

Organ, D.W. (1997). Organizational citizenship behavior: It's construct clean-up time. *Human Performance, 10*(2), 85-97.

Organ, DW. (1988). *Organizational citizenship behavior: The good soldier syndrome*. Lexington, MA: Lexington Books

Organ, DW, Podsakoff, PM, & MacKenzie, SB. (2005). *Organizational Citizenship Behavior: Its Nature, Antecedents, and Consequences*. California: Sage Publications, Inc.

Oslo Manual. (2005). Guidelines for Collecting and Interpreting Innovation Data. *A joint publication of OECD and Eurostat, Organization for Economic Co-Operation and Development. Statistical Office of the European Communities* (3rd ed.): OECD.

Othman, Normah, & Uthayakumaran, Arulselvi. (2012). *The Possible University-Industry Partnership between DRB-HICOM and University Malaysia Pahang*. Paper presented at the Global Conference of Academic Researchers, Hotel Grand Season, Kuala Lumpur. Retreived from: umpir.ump.edu.my/2672/2/GCAR_conference_paper.pdf on December 01, 2013

Ott, J.S. (1989). *The organizational culture perspective*. Chicago: Dorsey Press

Ouchi, W. (1981). *Theory Z: How American business can meet the Japanese challenge*. Reading, MA: Addison-Wesley.

Pallant, Julie. (2007). *A Step by Step Guide to Data Analysis using SPSS for Windows* (3rd ed.). New York: Mc Graw Hill.

Palmisano, Samuel J. (2006a). Global Innovation Outlook 2.0. Armonk, New York: IBM Corporation. Retrieved on January 15, 2011 from: http://www.ibm.com/ibm/gio/media/pdf/GIO_06_Book_SnglPgs_zz.pdf

Palmisano, Samuel J. (2006b). Global Innovation Outlook 2.0. *Retrieved on January 15, 2011 from: http://www.ibm.com/ibm/gio/media/pdf/GIO_06_Book_SnglPgs_zz.pdf*.

Parida, V., Westerberg, M., & Frishammar, J. (2011). *Effect of Open Innovation Practices on SMEs Innovative Performance: An Empirical Study*. Paper presented at the 56th Annual ICSB World Conference, Stockholm, Sweden. Retrieved on March 03, 2012 from: http://www.icsb2011.org/download/18.62efe22412f41132d41800012696/

Parida, V., Westerberg, M., & Frishammar, J. (2012). Inbound Open Innovation Activities in High-Tech SMEs: The Impact on Innovation Performance. *Journal of Small Business Management, 50*(2), 283-309.

Parise, S, & Henderson, JC. (2001). Knowledge resource exchange in strategic alliances. *IBM Systems Journal, 40*(4), 908-924.

Park, H., Ribiere, V., & Schulte Jr, W.D. (2004). Critical attributes of organizational culture that promote knowledge management technology implementation success. *Journal of Knowledge Management, 8*(3), 106-117.

Paswan, AK. (2003). Channel support activities and perceived goal orientation: an exploration in the Indian market. *Asia Pacific Journal of Marketing and Logistics, 15*(4), 19-41.

Peng, M. W., & Luo, Y. D. (2000). Managerial ties and firm performance in a transition economy: The nature of a micro-macro link. *Academy of Management Journal, 43*(3), 486-501.

Peng, M.W., & Heath, P.S. (1996). The growth of the firm in planned economies in transition: Institutions, organizations, and strategic choice. *Academy of Management Review, 21*(2), 492-528.

Peng, M.W., & Zhou, J.Q. (2005). How network strategies and institutional transitions evolve in Asia. *Asia Pacific Journal of Management, 22*(4), 321-336.

Perkmann, M., & Walsh, K. (2007). University-industry relationships and open innovation: Towards a research agenda. *International Journal of Management Reviews, 9*(4), 259-280.

Peter, J.P. (1979). Reliability: A review of psychometric basics and recent marketing practices. *Journal of Marketing Research*, 6-17.

Peters, T.J., & Waterman, R.H. (1982). *In Search of Excellence*. New York: Harper & Row.

Pettigrew, A.M. (1979). On studying organizational cultures. *Administrative Science Quarterly, 24*(4), 570-581.

Petty, M. M., Beadles, N. A., Lowery, C. M., Chapman, D. F., & Connell, D. W. (1995). Relationships between Organizational Culture and Organizational Performance. *Psychological Reports*, *76*(2), 483-492.

Pfeffer, J., & Salancik, G. (2003). *The external control of organizations: A resource dependence perspective*. Stanford, California: Stanford University Press.

Philbin, S. (2008). Process model for university-industry research collaboration. *European Journal of Innovation Management, 11*(4), 488-521.

Phillips, Jeffrey (2007). Creating a Culture of Innovation: Changing your culture to accept and embrace innovation: NetCentrics.

Pietersen, WG. (2001). *Strategic learning: A leadership process for creating and implementing breakthrough strategies*. New York.

Pitt, L.F., & Jeantrout, B. (1994). Management of customer expectations in service firms: a study and a checklist. *Service Industries Journal, 14*(2), 170-189.

Podsakoff, Nathan P., Whiting, Steven W., Podsakoff, Philip M., & Blume, Brian D. (2009). Individual- and Organizational-Level Consequences of Organizational Citizenship Behaviors: A Meta-Analysis. *Journal of Applied Psychology, 94*(1), 122-141.

Podsakoff, P M, & MacKenzie, S B. (1997). Impact of Organizational Citizenship Behavior on Organizational Performance: A Review and Suggestion for Future Research. *Human Performance, 10*(2), 133-151.

Podsakoff, P. M., Ahearne, M., & MacKenzie, S. B. (1997). Organizational citizenship behavior and the quantity and quality of work group performance. *Journal of Applied Psychology, 82*(2), 262-270.

Podsakoff, P. M., & Mackenzie, S. B. (1994). Organizational Citizenship Behaviors and Sales Unit Effectiveness. *Journal of Marketing Research, 31*(3), 351-363.

Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y., & Podsakoff, N.P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879.

Podsakoff, S. B, & Philip, M. (1990). Transformational leader behaviors and their effects on followers' trust in leader, satisfaction, and organizational citizenship behaviors. *The Leadership Quarterly, 1*(2), 107-142.

Pool, S.W. (2000). Organizational culture and its relationship between job tension in measuring outcomes among business executives. *Journal of Management Development, 19*(1), 32-49.

Porter, M.E. (1980). *Competitive strategy*. New York: Free Press.

Posdakoff, Philip M., & MacKenzie, Scott B. (1994). Organizational Citizenship Behaviors and Sales Unit Effectiveness. *Journal of Marketing Research, 31*(3), 351-363.

Prahalad, CK, & Hamel, G. (1994). Competing for the Future. *Harvard Business Review, 72*(4), 122-128.

Qin, W., & Shanxing, G. (2010). *Managerial Ties and Innovative Performance: An Open Innovation Perspective.* Paper presented at the Proceedings of the 7th International Conference on Innovation & Management, WUHAN University of Technology, China.

QS World University Rankings. (2012). QS World University Rankings 2012/2013. Retrieved September 21, 2012, from http://www.topuniversities.com/

Quick, James C. (1992). Crafting an organizational culture: Herb's hand at Southwest Airlines. *Organizational Dynamics, 21*(2), 45-56.

Ragatz, GL, Handfield, RB, & Petersen, KJ. (2002). Benefits associated with supplier integration into new product development under conditions of technology uncertainty. *Journal of Business Research, 55*(5), 389-400.

Ramos-Vielba, I., Fernandez-Esquinas, M., & Espinosa-de-los-Monteros, E. (2010). Measuring university-industry collaboration in a regional innovation system. *Scientometrics, 84*(3), 649-667.

Rashid, M.Z.A., Sambasivan, M., & Rahman, A.A. (2004). The influence of organizational culture on attitudes toward organizational change. *Leadership & Organization Development Journal, 25*(2), 161-179.

Rasiah, R., & Govindaraju, C.V.G.R. (2009). University-industry R&D collaboration in the automotive, biotechnology and electronics firms in Malaysia. *Retreived on April 05, 2011 from: http://smartech.gatech.edu/jspui/bitstream/1853/35252/1/1238218441_RR.pdf*.

Reynolds, P. D. (1986). Organizational Culture as Related to Industry, Position and Performance - a Preliminary-Report. *Journal of Management Studies, 23*(3), 333-345.

Ritter, T, & Gemünden, HG. (2004). The impact of a company's business strategy on its technological competence, network competence and innovation success. *Journal of Business Research, 57*(5), 548-556.

Russell, R.D. (1989). How organisational culture can help to institutionalise the spirit of innovation in entrepreneurial ventures. *Journal of Organizational Change Management, 2*(3), 7-15.

Sadri, G., & Lees, B. (2001). Developing corporate culture as a competitive advantage. *Journal of Management Development, 20*(10), 853-859.

Saffold, Guy S., III. (1988). Culture Traits, Strength, and Organizational Performance: Moving beyond "Strong" Culture. *The Academy of Management Review, 13*(4), 546-558.

Sakkab, N. (2002). Connect and develop complements research and develop at P&G. *Research-Technology Management, 45*(2), 38-45.

Salmi, P. (2012). The Impact of Public R&D Funding on Open Innovation. *Economia. Seria Management, 15*(1), 142-163.

Santos, Reynaldo J. (1999). Cronbach's Alpha: A Tool for Assessing the Reliability of Scales. *Journal of Extension, 37*(2), 1-5.

Savitskaya, I., Salmi, P., & Torkkeli, M. (2010). Barriers to Open Innovation: Case China. *Journal of Technology Management and Innovation, 5*(4), 10-21.

Schein, E.H. (1981). Does Japanese management style have a message for American managers? *Sloan Management Review, 23*(1), 55-67.

Schein, E.H. (1990). Organizational culture. *American Psychologist, 45*(2), 109-119.

Schein, E.H. (2004). *Organizational culture and leadership* (3rd ed.). San Francisco, CA: Jossey-Bass Inc Pub.

Scherer, FM, & Ross, D. (1992). Industrial market structure and economic performance. *Boston, MA.*

Schien, E.H. (1992). *Organizational culture and leadership*. San Francisco, CA: Jossey-Bass.

Schnake, M. (1991). Organizational citizenship: A review, proposed model, and research agenda. *Human Relations, 44*(7), 735-759.

Schumacker, R.E., & Lomax, R.G. (1996). *A Beginner's Guide to Structural Equation Modeling*. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Schumpeter, J. A. (1942). *Capitalism, Socialism, and Democracy*. New York: Harper.

Scopus. (2011). Database URL: http://www.scopus.com/search/form.url?zone=TopNavBar&origin=searcherror.

Scott, T., Mannion, R., Davies, H., & Marshall, M. (2003). The quantitative measurement of organizational culture in health care: a review of the available instruments. *Health Services Research, 38*(3), 923-945.

Sekaran, U. (2006). *Research methods for business: A skill building approach*: Wiley-India.

Seppälä, T., Lipponen, J., Bardi, A., & Pirttilä-Backman, A.M. (2012). Change-oriented organizational citizenship behaviour: An interactive product of openness to change values, work unit identification, and sense of power. *Journal of Occupational and Organizational Psychology, 85*(1), 136-155.

Shaw, MJ. (2000). Building an e-business from enterprise systems. *Information Systems Frontiers, 2*(1), 7-17.

Sheikh, K., & Mattingly, S. (1981). Investigating non-response bias in mail surveys. *Journal of Epidemiology and Community Health, 35*(4), 293-296.

Shu, C., Page, A.L., Gao, S., & Jiang, X. (2011). Managerial Ties and Firm Innovation: Is Knowledge Creation a Missing Link? *Journal of Product Innovation Management, 29*(1), 125-143.

Sim, AB, & Pandian, J.R. (2003). Emerging Asian MNEs and their internationalization strategies—Case study evidence on Taiwanese and Singaporean firms. *Asia Pacific Journal of Management, 20*(1), 27-50.

Sisodiya, Sanjay Ram. (2008). *The effect of open innovation on new product development success: The moderation of interfirm relational knowledge stores and social network characteristics.* (Doctoral dissertation), Washington State University, Washington, United States. Retrieved from http://proquest.umi.com/pqdweb?did=1627876311&sid=1&Fmt=2&clientId=18803&RQT=309&VName=PQD (1627876311)

Smith, CA, Organ, DW, & Near, JP. (1983). Organizational citizenship behavior: Its nature and antecedents. *Journal of Applied Psychology, 68*(4), 653-663.

Staw, BM, & Boettger, RD. (1990). Task revision: A neglected form of work performance. *Academy of Management Journal*, 534-559.

Subramani, M. (2004). How do suppliers benefit from information technology use in supply chain relationships? *MIS Quarterly, 28*(1), 45-73.

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha'. *International Journal of Medical Education, 2*(2), 53-55.

Taylor, A. (2005). An operations perspective on strategic alliance success factors: An exploratory study of alliance managers in the software industry. *International Journal of Operations & Production Management, 25*(5), 469-490.

Teece, D. J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy, 15*(6), 285-305.

Teece, D.J. (1988). Capturing value from technological innovation: Integration, strategic partnering, and licensing decisions. *Interfaces, 18*(3), 46-61.

Teece, D.J. (1992). Competition, cooperation, and innovation: Organizational arrangements for regimes of rapid technological progress. *Journal of Economic Behavior & Organization, 18*(1), 1-25.

Teece, D.J., Pisano, G. , & Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management Journal, 18*(7), 509-533.

Teece, David J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal, 28*(13), 1319-1350.

Tenbrunsel, A.E., Wade-Benzoni, K.A., Moag, J., & Bazerman, M.H. (1999). The Negotiation Matching Process: Relationships and Partner Selection. *Organizational Behavior and Human Decision Processes, 80*(3), 252-283.

Thorelli, Hans B. (1986). Networks: Between Markets and Hierarchies. *Strategic Management Journal, 7*(1 (Jan-Feb), 1986), 37-51.

Tödtling, F., Lehner, P., & Kaufmann, A. (2009). Do different types of innovation rely on specific kinds of knowledge interactions? *Technovation, 29*(1), 59-71.

Tsang, E.W.K. (1998). Can guanxi be a source of sustained competitive advantage for doing business in China? *The Academy of Management Executive (1993-2005), 12*(2), 64-73.

Tsui, A.S., Wang, H., & Xin, K.R. (2006). Organizational culture in China: An analysis of culture dimensions and culture types. *Management and Organization Review, 2*(3), 345-376.

Tsui, Anne S, Nifadkar, Sushil S, & Ou, Amy Yi. (2007). Cross-national, cross-cultural organizational behavior research: Advances, gaps, and recommendations. *Journal of Management, 33*(3), 426-478.

Turner, Anthony G. (2003). Sampling frames and master samples. Handbook on Designing of Household Sample Surveys: Statistics Division, United Nations Secretariat. Retrieved from

http://unstats.un.org/unsd/demographic/meetings/egm/Sampling_1203/docs/no_3.pdf on October 13, 2011.

Ulrich, D, & Smallwood, N. (2004). Capitalizing on capabilities. *Harvard Business Review, 82*(June), 119-128.

Valentina, Lazzarotti, Raffaella, Manzini, & Luisa, Pellegrini. (2010). Open innovation models adopted in practice: an extensive study in Italy. *Measuring Business Excellence, 14*(4), 11-23.

van de Vrande, V., de Jong, J. P. J., Vanhaverbeke, W., & de Rochemont, M. (2009). Open innovation in SMEs: Trends, motives and management challenges. *Technovation, 29*(6-7), 423-437.

Van Dyne, L, Graham, JW, & Dienesch, RM. (1994a). Organizational citizenship behavior: Construct redefinition, measurement, and validation. *Academy of Management Journal, 37*(4), 765-802.

Van Dyne, Linn , Graham, Jill W., & Dienesch, Richard M. (1994b). Organizational Citizenship Behavior: Construct Redefinition, Measurement, and Validation. *The Academy of Management Journal, 37*(4), 765-802.

Vanhaverbeke, W, Van de Vrande, V, & Chesbrough, H. (2008). Understanding the advantages of open innovation practices in corporate venturing in terms of real options. *Creativity and Innovation Management, 17*(4), 251-258.

Vanhaverbeke, Wim. (2006). The interorganizational Context of Open Innovation. In H. Chesbrough, W. Vanhaverbeke & J. West (Eds.), *Open innovation: researching a new paradigm* (pp. 205-219). USA: Oxford University Press, USA.

Verbano, C., Crema, M., & Venturini, K. (2011). Integration and Selectivity in Open Innovation: An Empirical Analysis in SMEs. *Globalization, 90*(5), 32.

von Hippel, E, & Katz, Ralph. (2002). Shifting Innovation to Users via Toolkits. *Management Science, 48*(7), 821-833.

von Hippel, E. (2001). Innovation by user communities: Learning from open-source software. *Mit Sloan Management Review, 42*(4), 82-86.

Von Hippel, E. (2005). *Democratizing innovation*. Cambridge, MA: The MIT Press.

Warren, D.E., Dunfee, T.W., & Li, N. (2004). Social exchange in China: The double-edged sword of Guanxi. *Journal of Business Ethics, 55*(4), 353-370.

Wernerfelt, Birger. (1984). A resource-based view of the firm. *Strategic Management Journal, 5*(2), 171-180.

West, J., Vanhaverbeke, W., & Chesbrough, H. (2006a). Does Appropriability Enable or Retard Open Innovation? In H. Chesbrough, W. Vanhaverbeke & J. West (Eds.), *Open Innovation: Researching a New Paradigm* (pp. 109-133). New York: Oxford University Press.

West, J., Vanhaverbeke, W., & Chesbrough, H. (2006b). Open Innovation: A Research Agenda. In H. Chesbrough, W. Vanhaverbeke & J. West (Eds.), *Open innovation: researching a new paradigm* (pp. 285-307).

West, Joel, & Gallagher, Scott. (2004). Key Challenges of Open Innovation: Lessons from Open Source Software. Retrieved from: http://www.cob.sjsu.edu/west_j/Papers/WestGallagher2004.pdf on Sept 08, 2012.

Westhead, P., Storey, D.J., & Britain, G. (1994). *An assessment of firms located on and off science parks in the United Kingdom*: HM Stationery Office.

Wilkins, Alan L., & Ouchi, William G. (1983). Efficient Cultures: Exploring the Relationship Between Culture and Organizational Performance. *Administrative Science Quarterly, 28*(3), 468-481.

Williams, L.J., & Anderson, S.E. (1991). Job satisfaction and organizational commitment as predictors of organizational citizenship and in-role behaviors. *Journal of Management, 17*(3), 601-617.

Witt, LA. (1991). Exchange Ideology as a Moderator of Job Attitudes-Organizational Citizenship Behaviors Relationships1. *Journal of Applied Social Psychology, 21*(18), 1490-1501.

Witzeman, S., Slowinski, G., Dirkx, R., Gollob, L., Tao, J., Ward, S., & Miraglia, S. (2006). Harnessing external technology for innovation. *Research-Technology Management, 49*(3), 19-27.

Woo, B., Trail, GT, Kwon, H.H., & Anderson, D.F. (2009). Testing models of motives and points of attachment. *Sport Marketing Quarterly, 18*, 38-53.

Wright, P. M., Gardner, T. M., & Moynihan, L. M. (2003). The impact of HR practices on the performance of business units. *Human Resource Management Journal, 13*, 21-36.

Xin, K. R., Tsui, A. S., Wang, H., Zhang, Z., & Chen, W. (2002). Corporate culture in Chinese state-owned enterprises: An inductive analysis of dimensions and influences. In A. S. Tsui & C. M. Lau (Eds.), *The Management of Enterprises in the People's Republic of China*. Boston, MA Kluwer.

Xin, Katherine R., & Pearce, Jone L. (1996). Guanxi: Connections as substitutes for formal institutional support. *The Academy of Management Journal, 39*(6), 1641-1658.

Yen, HsiuJu Rebecca, Li, Eldon Y., & Niehoff, Brian P. (2008). Do organizational citizenship behaviors lead to information system success?: Testing the mediation effects of integration climate and project management. *Information and Management, 45*(6), 394-402.

Yeo, R. K. (2005). Learning: The Secret of the Art of War. *Management Research News, 28*(8), 27-33.

Yiing, Lee Huey, & Ahmad, Kamarul Zaman Bin (2009). The moderating effects of organizational culture on the relationships between leadership behaviour and

organizational commitment and between organizational commitment and job satisfaction and performance. *Leadership & Organization Development Journal, 30*(1), 53-86.

Yoon, Cheolho. (2009). The effects of organizational citizenship behaviors on ERP system success. *Computers in Human Behavior, 25*(2), 421-428.

Yusoff, Wan Fauziah Wan. (2011, 13-14 June). *Organizational Culture and its Impact on Firm Performance: Case Study of Malaysian Public Listed Companies.* Paper presented at the International Conference on Management (ICM), Hydro Hotel, Penang, Malaysia.

Zahra, Shaker A., & George, Gerard. (2002). Absorptive Capacity: A Review, Reconceptualization, and Extension. *The Academy of Management Review, 27*(2), 185-203.

Zaltman, G., Duncan, R., & Holbek, J. (1973). *Innovations and organizations*. New York: Wiley.

Zhu, Xuefeng, & He, Yuanqiong. (2010). *How managerial ties influence firm performance in China: A perspective of sensemaking.* Paper presented at the Industrial Engineering and Engineering Management (IEEM), 2010 IEEE International Conference Macao.

Zikmund, WG. (1997). *Business Research Methods*. Fort Worth, Texas: The Dryden Press, Harcourt College Publishers.